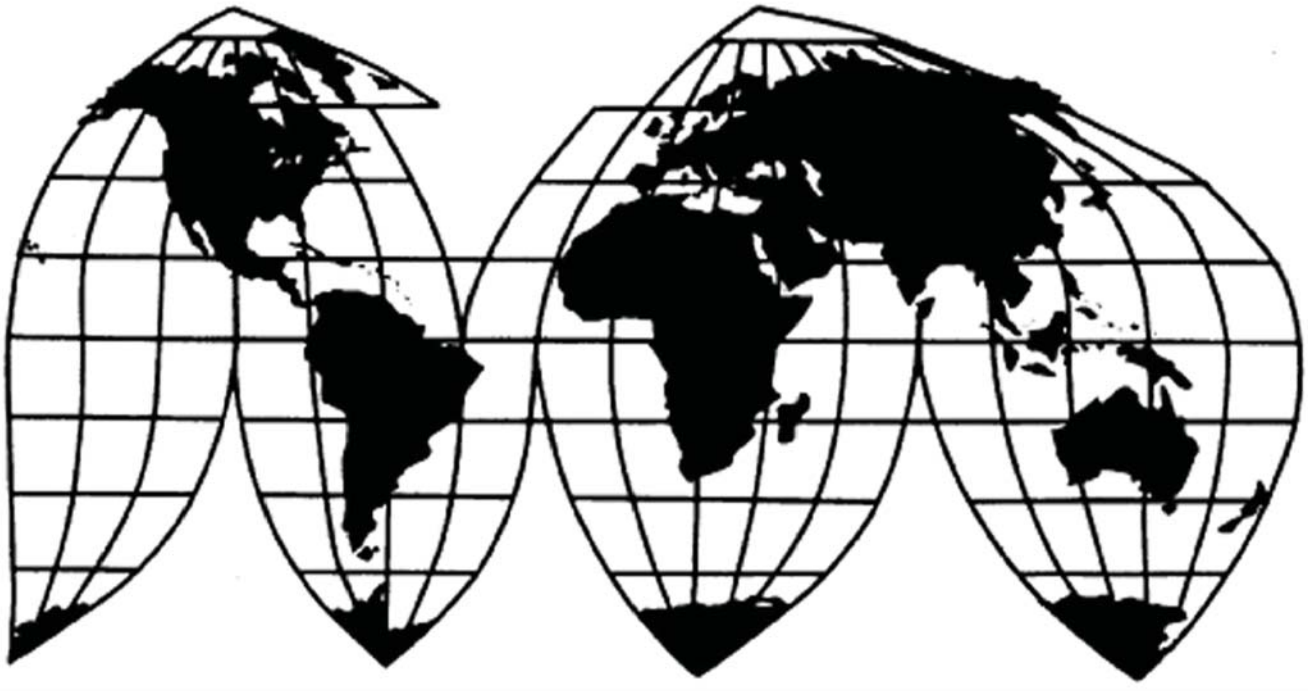
In the Matter of

CERTAIN SEMICONDUCTOR INTEGRATION CIRCUITS USING TUNGSTEN METALLIZATION AND PRODUCTS CONTAINING SAME

Investigation No. 337-TA-648

Publication 4252 **August 2011**

U.S. International Trade Commission



Washington, DC 20436

U.S. International Trade Commission

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In the Matter of

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UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, D.C.

In the Matter of **CERTAIN SEMICONDUCTOR INTEGRATION CIRCUITS USING TUNGSTEN METALLIZATION AND PRODUCTS CONTAINING SAME**	**Investigation No. 337-TA-648**

NOTICE OF COMMISSION DECISION TO DISMISS THE INVESTIGATION AS MOOT

AGENCY: U.S. International Trade Commission.

ACTION: Notice.

SUMMARY: Notice is hereby given that the U.S. International Trade Commission has determined to issue an order dismissing the above-captioned investigation as moot.

FOR FURTHER INFORMATION CONTACT: Clint Gerdine, Esq., Office of the General Counsel, U.S. International Trade Commission, 500 E Street, S.W., Washington, D.C. 20436, telephone (202) 708-2310. 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, S.W., 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: The Commission instituted this investigation on May 21, 2008, based on a complaint filed on April 18, 2008, by LSI Corporation of Milpitas, California and Agere Systems Inc. of Allentown, Pennsylvania. The complaint, as amended, alleged violations of section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337, in the importation into the United States, the sale for importation, and the sale within the United States after importation of certain semiconductor integrated circuits using tungsten metallization and products containing the same by reason of infringement of one or more of claims 1, 3, and 4 of U.S. Patent No. 5,227,335 ("the '335 patent"). The amended complaint named numerous respondents. Several respondents were terminated from the investigation due to settlement or

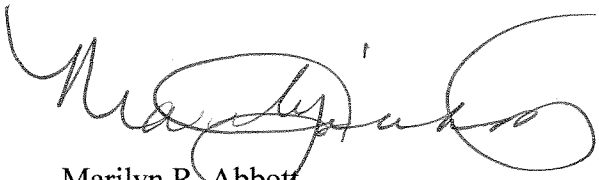
failure to name the proper party. The following six respondents remained in the investigation: Tower Semiconductor, Ltd. of Israel; Jazz Semiconductor of Newport Beach, California; Powerchip Semiconductor Corporation of Taiwan; Grace Semiconductor Manufacturing Corporation of China; Integrated Device Technology, Inc. of San Jose, California; and Nanya Technology Corporation of Taiwan. The complaint further alleged that an industry in the United States exists as required by subsection (a)(2) of section 337.

On March 22, 2010, the Commission issued notice of its final determination finding no violation, by reason of invalidity of the asserted claims of the '335 patent, of section 337 by the remaining respondents. Complainants appealed the Commission's final determination to the U.S. Court of Appeals for the Federal Circuit ("Federal Circuit").

While the appeal was pending, the '335 patent expired. The Commission moved to dismiss the appeal as moot and complainants responded. On November 15, 2010, the Federal Circuit issued an order vacating the Commission's final determination and remanding the investigation to the Commission with instructions to dismiss the investigation as moot. *LSI Corp v. United States Int'l Trade Commission*, Appeal No. 10-1352 (Fed. Cir. Nov. 15, 2010). Accordingly, the Commission has determined to issue an order dismissing Investigation No. 337-TA-648 as moot.

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

By order of the Commission.



Marilyn R. Abbott
Secretary to the Commission

Issued: November 30, 2010

UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, D.C.

In the Matter of **CERTAIN SEMICONDUCTOR INTEGRATION CIRCUITS USING TUNGSTEN METALLIZATION AND PRODUCTS CONTAINING SAME**	**Investigation No. 337-TA-648**

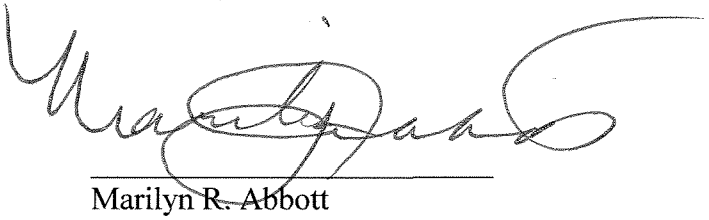
ORDER

On November 15, 2010, the U.S. Court of Appeals for the Federal Circuit ("Federal Circuit") issued an Order vacating the Commission's final determination in the above-captioned investigation as moot because the patent at issue expired shortly after the filing of the appeal of the Commission's determination. *LSI Corp v. United States Int'l Trade Commission*, Appeal No. 10-1352 (Fed. Cir. Nov. 15, 2010). The Federal Circuit's Order also remanded the case to the Commission with instructions to dismiss the investigation as moot.

Accordingly, it is hereby ORDERED that:

Investigation No. 337-TA-648 is dismissed as moot.

By order of the Commission.



Marilyn R. Abbott
Secretary to the Commission

Issued: November 30, 2010

CERTAIN SEMICONDUCTOR INTEGRATED CIRCUITS USING TUNGSTEN METALLIZATION AND PRODUCTS CONTAINING SAME **337-TA-648**

CERTIFICATE OF SERVICE

I, Marilyn R. Abbott, hereby certify that the attached **NOTICE OF COMMISSION DECISION TO DISMISS THE INVESTIGATION AS MOOT** has been served by hand upon the Commission Investigative Attorney, Rett Snotherly, Esq., and the following parties as indicated has been served, on NOV 30 2010.

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

In the Matter of **CERTAIN SEMICONDUCTOR INTEGRATION CIRCUITS USING TUNGSTEN METALLIZATION AND PRODUCTS CONTAINING SAME**	**Investigation No. 337-TA-648**

COMMISSION OPINION

I. INTRODUCTION

On September 21, 2009, the presiding administrative law judge ("ALJ") issued his final initial determination ("ID") in the above-captioned investigation, finding no violation of section 337 of the Tariff Act of 1930, 19 U.S.C. § 1337 ("section 337"). On November 23, 2009, the Commission decided to review the ALJ's invalidity findings with respect to claims 1, 3, and 4 of U.S. Patent No. 5,227,335 ("the '335 patent") related to the so-called IBM Process A, IBM Process B, and the AMD prior art, and his finding regarding one respondent's stipulation that its process meets the complete, third-recited step of claim 1 of the '335 patent. In addition, the Commission issued an order remanding the investigation to the ALJ for further proceedings relating to whether claim 4 of the '335 patent is obvious in light of IBM Process A and the prior art asserted by respondents and the Commission investigative attorney ("IA").

On January 15, 2010, the ALJ issued his remand determination finding that claim 4 is not rendered obvious by IBM Process A and other prior art asserted by respondents and the IA. On March 22, 2010, the Commission determined to review the ALJ's remand determination. On review of the remand determination and final ID, the Commission has determined to affirm the

ALJ's ultimate determination of no violation, but on different grounds with respect to claim 4 of the '335 patent.

II. BACKGROUND

The Commission instituted this investigation on May 21, 2008, based on a complaint filed by LSI Corporation of Milpitas, California and Agere Systems Inc. of Allentown, Pennsylvania (collectively "complainants"). 73 *Fed. Reg.* 29534-35 (May 21, 2008). The amended complaint alleged violations of section 337 in the importation into the United States, the sale for importation, and the sale within the United States after importation of certain semiconductor integrated circuits using tungsten metallization and products containing the same by reason of infringement of claims 1, 3, and 4 of the '335 patent. The complaint, as amended, named over twenty respondents. Several respondents have been terminated from the investigation due to settlement or because they were not proper parties. The following six respondents remain in the investigation: Tower Semiconductor, Ltd. ("Tower") of Israel; Jazz Semiconductor ("Jazz") of Newport Beach, California; Powerchip Semiconductor Corporation of Taiwan; Grace Semiconductor Manufacturing Corporation of China; Integrated Device Technology, Inc. of San Jose, California; and Nanya Technology Corporation of Taiwan. The complaint further alleged that an industry in the United States exists as required by subsection (a)(2) of section 337.

On September 21, 2009, the ALJ issued his final ID finding no violation of section 337 by the six remaining respondents. He concluded that each respondent's accused process was covered by one or more of asserted claims 1, 3, and 4 of the '335 patent, but that all of the asserted claims were anticipated under 35 U.S.C. § 102(g) in view of IBM Process A. He also

asserted claims were anticipated under 35 U.S.C. § 102(g) in view of IBM Process A. He also found that none of the asserted claims were invalid under 35 U.S.C. § 102(g) or 35 U.S.C. § 103 in view of IBM Process B or the AMD prior art. On November 23, 2009, the Commission issued notice of its determination to review the following findings in the ALJ's final ID: (1) invalidity of claims 1, 3, and 4 of the '335 patent under 35 U.S.C. §§ 102(g) & 103 with respect to IBM Process A, IBM Process B, and the AMD prior art; and (2) Jazz's stipulation regarding whether its process meets the complete, third-recited step of claim 1, *i.e.*, "depositing a tungsten layer by chemical vapor deposition, said tungsten layer covering said glue layer on said dielectric and said exposed material." 74 *Fed. Reg.* 62592-93 (Nov. 30, 2009). The Commission determined not to review the remainder of the final ID.

The Commission also issued an order remanding the investigation to the ALJ for further proceedings relating to whether claim 4 is obvious in light of IBM Process A and the other prior art asserted by respondents and the IA. The Commission requested written submissions on the ALJ's remand determination, and briefing on remedy, the public interest, and bonding.

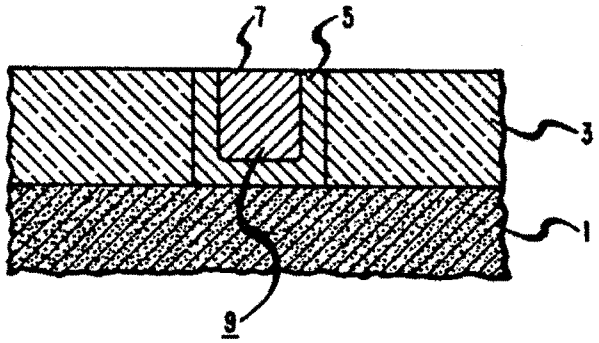
On January 15, 2010, the ALJ issued his remand determination finding that claim 4 is not rendered obvious by IBM Process A and the other prior art asserted by respondents and the IA. On January 21, 2010, the Commission extended the target date by two months to March 22, 2010, to accommodate the remand proceedings. On February 2 and 12, 2010, respectively, complainants and respondents each filed a brief and reply brief on the issues for which the Commission requested written submissions. On February 2 and 16, 2010, respectively, the IA filed a brief and a reply brief on the issues for which the Commission requested written submissions. In addition, Tower and Jazz also filed a joint reply brief on February 12, 2010.

A. Patented Process at Issue

This investigation pertains to a claimed process for making semiconductor integrated circuits ("ICs"), specifically ICs that use tungsten as the metal layer. ICs are used in a variety of products including mobile phones, cameras, and memory cards. ICs are made using transistors to build circuits on a silicon wafer. The circuits are usually of microscopic scope in order to allow millions of them to be built on a wafer. The semiconductor IC comprises a plurality of layers designed to enhance connectivity and operation - *e.g.*, an insulating layer, dielectric layer, and a metal layer from bottom to top - where the metal layer, tungsten (W) in this case, is used to make all of the electrical connections for the circuits. A particular process, *i.e.*, chemical vapor deposition ("CVD"), is used to effectively lay the metal layer on the silicon by inserting the tungsten through an opening or a window (a "via" or a "hole") in the dielectric layer to generate better connectivity (contact) throughout the circuits. *See* ID at 8-12. As disclosed in the '335 patent specification, it is common to etch (or planarize) the deposited tungsten to form a planar surface with the wafer/dielectric layer thereby leaving only the top metal layer of tungsten exposed in the contact hole. *See* '335 patent, FIG. 2; col. 2:34-41; col. 4:52-53. The tungsten remaining in the contact hole is referred to as a "tungsten contact plug." *Id.*

FIG. 2 of the '335 patent (shown below) illustrates this "tungsten contact plug" (7) deposited on top of a glue layer (5) in a contact hole (9) within a dielectric layer (3) that is above a silicon layer (1) in the semiconductor device. *Id.*

FIG. 2



One problem, however, with using tungsten is that it does not stick well to the dielectric layer. The asserted claims of the '335 patent pertain to the process of using a specialized glue layer inserted between the metal layer and dielectric layer to improve the adhesion of the tungsten to the dielectric. According to the invention, the glue layer (5), which is inserted using a window, covers both the sidewall dielectric layer and an exposed underlying layer (*e.g.*, silicon or a conducting silicide formed on the silicon surface) beneath the dielectric layer. As claimed, the specialized glue layer comprises at least one material selected from the group consisting of aluminum (Al) and conducting nitrides such as titanium nitride (TiN). Complainants contend that respondents make their semiconductor ICs using the processes recited in claims 1, 3, and 4 of the '335 patent.

Asserted claims 1, 3, and 4 read as follows:

1. A method of fabricating an integrated circuit comprising the steps of:

patterning a dielectric layer to form holes which expose the underlying material, said exposed underlying material comprises an electrically conducting material;

depositing a glue layer covering said dielectric and said exposed

underlying material;

depositing a tungsten layer by chemical vapor deposition, said tungsten layer covering said glue layer on said dielectric and said exposed material;

CHARACTERIZED IN THAT said glue layer comprises at least one member selected from the group consisting of conducting nitrides.

3. A method as recited in claim 1 in which said material comprises a metallic silicide.

4. A method as recited in claim 1 further comprising etching said tungsten and said glue layer to form a planar surface of said dielectric and said tungsten in said hole, said tungsten being etched before said glue layer.

B. Relevant Prior Art - IBM Process A

IBM Process A is described in an invention disclosure form created by John Cronin, Pei-Ing Lee, Carter Kaanta, and Mike Leach. It shows that the process was conceived and reduced to practice in October of 1985 by a team of IBM employees including John Cronin and Pei-Ing Lee, who were part of IBM's CMOS (complimentary metal oxide semiconductor technology) team. ID at 80. The CMOS team was working on a solution to adhesion problems related to tungsten interconnects in IBM semiconductor technology. *Id.*; *citing* Cronin, Tr. at 1962, 1972, 1977-78; Lee, Tr. at 1221-22; RX-216 (IBM Process A). The invention disclosure form also included a description of two related processes, IBM Process B[1] and IBM Process C. *Id.* IBM filed a patent application on IBM Process A on March 30, 1987, which resulted in issued U.S. Patent No. 5,760,475 ("the '475 patent"). The invention disclosure form specifically describes and illustrates a process for making a semiconductor IC that uses a glue layer of titantium

[1] Process B used reactive sputtering of TiN, rather than nitridization as in IBM Process A. ID at 88; RX-216.

nitride, where the glue layer is formed by sputtering titanium (Ti) onto the wafer surface and then the Ti layer is thermally annealed in nitrogen (nitridized) to form a TiN/Ti stack. *Id.* IBM Process A became part of the IBM "Process of Record," which is the company's standard process for building a device on a wafer. *Id.*; *citing* Lee at 1224, 1245-47, 1268-72.

III. DISCUSSION

For the reasons set forth below, we have determined to reverse the remand determination, affirm-in-part, reverse-in-part, and modify-in-part the final ID, and find no violation of section 337 by respondents. We adopt the ALJ's findings in his final ID that are not inconsistent with our determinations and opinion.

A. Invalidity due to anticipation under 35 U.S.C. § 102(g)(2) in view of IBM Process A

We determined to review the ALJ's finding that claims 1, 3, and 4 of the '335 patent are anticipated by IBM Process A under section 102(g)(2). Section 102(g)(2) provides that a person shall be entitled to a patent unless "before such person's invention thereof, the invention was made in this country by another inventor who had not abandoned, suppressed, or concealed it." 35 U.S.C. § 102(g)(2). Further, this subsection states that:

> [i]n determining priority of invention under this subsection, there shall be considered not only the respective dates of conception and reduction to practice of the invention, but also reasonable diligence of one who was first to conceive and last to reduce to practice, from a time prior to conception by the other.

Id.

1. *Initial Determination*

The ALJ determined that respondents established by clear and convincing evidence that IBM Process A anticipates claims 1, 3, and 4 of the '335 patent. ID at 80-87. First, the ALJ found, and the parties do not dispute, that IBM Process A predates the claimed invention of the '335 patent because the evidence showed that IBM inventors disclosed IBM Process A in October of 1985 (*i.e.*, via the invention disclosure form), well before the earliest conception date for the '335 patent, March 1986. *Id.* at 80-81. The ALJ then found that IBM Process A was not abandoned, suppressed, or concealed under section 102(g). *Id.* at 81-82. Although there was a 17-month gap between the invention disclosure and the filing of the IBM patent application (leading to the '475 patent), the ALJ found that the evidence showed that during this period the inventors worked to commercialize IBM Process A, and that therefore in accordance with Federal Circuit precedent, it was not abandoned, suppressed, or concealed. *Id.* at 82. He further found that the invention disclosure was reviewed by IBM attorneys and engineers before an application could be filed, a process that usually took between six months and two years. *Id.* In addition, he found that the IBM inventors were working steadily to improve the part of the invention that pertains to a glue layer deposited by reactive sputtering (IBM Process B) and a description of this improvement was made a part of the '475 patent specification. *Id.* at 82-83 (*citing* Cronin, Tr. at 1976-1984).

The ALJ concluded that all of the steps recited in claims 1, 3, and 4 are disclosed by IBM Process A, including "depositing a glue layer" because IBM Process A teaches depositing a glue layer nitride using nitridization which he determined was encompassed by his claim construction. *Id.* at 83-88. In reaching his conclusion that dependent claim 4 is anticipated, the

ALJ determined that IBM Process A also discloses the "etching" step, *i.e.*, "etching said tungsten and said glue layer to form a planar surface of said dielectric and said tungsten in said hole, said tungsten being etched before said glue layer," recited in that claim. *Id.* at 85-87. He relied on respondents' expert and inventor testimony to find that although the IBM Process of Record (based on IBM Process A) may not have specifically included etching, the invention disclosure nevertheless teaches that tungsten can be etched back when it says that IBM Process A is integratable with metal "chemical mechanical polishing (CMP)." *Id.* at 86; *citing* Cronin, Tr. at 1980-81, 2014-16. Specifically, he noted that Mr. Cronin (one of the '475 patent inventors) testified that metal CMP, integratable with IBM Process A, was defined as "[polishing] back the metal to the surface of the wafer . . . it would only expose the metal in the contact holes." *Id.*; *citing* Cronin, Tr. at 1980-81. The ALJ noted that Mr. Cronin's testimony was corroborated by information including IBM documents, but the ALJ did not cite to any particular exhibit containing this corroborating information. *Id.* at 87; RX-216. Based on the foregoing, the ALJ found that claim 4 was anticipated by clear and convincing evidence.

2. *Analysis*

We agree with the ALJ's determination that IBM Process A clearly and convincingly discloses each and every element of claims 1 and 3 and that therefore both claims are anticipated by IBM Process A. Thus, we adopt his invalidity conclusions regarding claims 1 and 3.

With respect to claim 4, we disagree with the ALJ's conclusion. The ALJ found, based on Mr. Cronin's testimony, that the invention disclosure form describes CMP and that this is sufficient to disclose etching the tungsten and the glue layer to form a planar surface as required by this claim. We agree, however, with the IA that the IBM Process A invention disclosure form

does not show that the inventors reduced the recited etching step to practice. Although Mr. Cronin, one of the inventors, testified that CMP means polishing back to the metal, testimony of reduction to practice of the recited etching step must be corroborated. *See Finnigan Corp. v. Int'l Trade Comm'n*, 180 F.3d 1354, 1367 (Fed. Cir. 1999) (*quoting Price v. Symsek*, 988 F.2d 1187, 1194 (Fed. Cir. 1993). We do not believe that the IBM invention disclosure is sufficient evidence to corroborate his testimony. *See* RX-216 at 4; Cronin, Tr. at 1980-81. The invention disclosure form simply mentions CMP ("chemical mechanical polishing"), but makes no mention of (or illustrates) the recited step of etching both the tungsten and glue layer down to just the metal surface of the tungsten contact plug planarized with the dielectric. *Id.*

Although the respondents and their expert (Dr. Thomas) agree that CMP would be understood to mean polishing and planarizing the tungsten layer, we believe that this is insufficient evidence to suggest to one of ordinary skill in the art that the invention disclosure form discloses and reduces to practice etching of both the tungsten and glue layer. RX-216; Thomas, Tr. at 1624. This lack of clear and convincing evidence is especially true where proof of reduction to practice of the etching step is only supported by direct inventor (Mr. Cronin) testimony, which, as noted by the IA and complainants, is inconsistent with his testimony under cross-examination and is not supported or corroborated by documents or other inventor testimony. Cronin, Tr. at 1980-81; 2014-16; Lee, Tr. at 1367-69; Hartswick, Tr. at 1384. During cross-examination, Mr. Cronin testified that, in the Process of Record based on IBM Process A, the glue layer used was not etched back. Cronin, Tr. at 2014-16. Moreover, our conclusion that the invention disclosure form lacks clear and convincing evidence of reduction to practice is supported by the fact that both the commercialized IBM Process of Record and the

issued patent (the '475 patent), which were developed from the IBM Process A and B research, omit any mention of the recited step of etching to form a planar surface or CMP. RX-216; RX-3 (the '475 patent).

Accordingly, we reverse the ALJ's ruling that claim 4 is anticipated under 35 U.S.C. § 102(g) by IBM Process A. However, as described *infra*, we ultimately conclude there is no violation of section 337 because claim 4 is obvious in view of IBM Process A and the other prior art asserted by the IA and respondents.

B. Invalidity due to obviousness of claim 4 under 35 U.S.C. § 103 in view of IBM Process A and other asserted prior art

We remanded the issue of whether claim 4 is rendered obvious in view of IBM Process A and other prior art asserted by respondents and the IA, and determined to review the ALJ's remand determination on this issue.

1. *Remand Determination*

The ALJ determined that claim 4 is not obvious in view of IBM Process A and other prior art asserted by the IA and respondents. Remand Det. at 2-5. Particularly, the ALJ discounted their arguments that "tungsten plugs" predate the '335 patent, that the inventors admitted that over-etching to form a plug was "conventional," and the assertion that one of ordinary skill in the art would have been motivated to combine such additional prior art with IBM Process A to meet all of the limitations of claim 4. *Id.*; *citing* Respondents' Post-Hearing Br. at 46 (*citing* the '335 patent, col. 4:52-60) and IA's Post-Hearing Br. at 71. The ALJ found that they only provided conclusory generalizations of obviousness and found that they failed to

show both how and why the prior art references would have been combined. *Id.* (*citing Innogenetics N.V. v. Abbott Labs.*, 512 F.3d 1363, 1373 (Fed. Cir. 2008)).

The ALJ further found that the prior art does not disclose the type of planarization required by claim 4 in connection with the fabrication of a device that meets all the limitations of the claim. Nor was there any substantive showing of how one of ordinary skill in the art would have made the specific combination consisting of IBM Process A and other prior art, or how one would have successfully accomplished such a combination of elements. Finally, he found lacking a discussion of secondary considerations. *Id.* Based on the foregoing, the ALJ concluded that neither the IA nor respondents had demonstrated by clear and convincing evidence that claim 4 of the '335 patent is invalid due to obviousness.

2. *Analysis*

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." *See* 35 U.S.C. § 103(a). 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." *See Smiths Indus. Med. Sys., Inc. v. Vital Signs, Inc.*, 183 F.3d 1347, 1354 (Fed. Cir. 1999) (*citing Graham v. John Deere Co.*, 383 U.S. 1, 17 (1966)).

The ALJ concluded that the IA and respondents merely listed prior art references and failed to show how one of ordinary skill in the art would have been motivated to make a specific combination of IBM Process A with the other asserted prior art. *See* Remand Det. at 4. The ALJ also found that it was unclear how one of ordinary skill in the art would have successfully accomplished such a combination of elements. *Id.*

We find, however, that the IA and respondents did more than simply list prior art references. They sufficiently showed, through the references themselves and through expert testimony, how and why one of ordinary skill would have been motivated to successfully combine IBM Process A and the asserted prior art to arrive at the claimed invention. *See* Respondents' Post-Hearing Br. at 46-48; Respondents' Petition for Review of Final ID at 44-47; IA's Post-Hearing Br. at 71; IA's Petition for Review of Final ID at 6-7; Blewer, Tr. at 1906-11, 1955-57; Thomas, Tr. at 1569-71; Ho, Tr. at 2299-301. Particularly, the IA and respondents asserted that claim 4 is obvious in view of IBM Process A in combination with the Smith ("CVD Tungsten Contact Plugs by In Situ Deposition and Etchback" - 1985), Sachdev ("Blanket Tungsten Applications in VLSI Processing" - 1985), or Chow (U.S. Patent No. 4,789,648) prior art references by clear and convincing evidence. *Id.* They argued that Smith, Sachdev, and Chow each discloses the recited element of etching the metal, that Smith and Sachdev disclose the glue layer, and that it would have been obvious to one of ordinary skill in the art to combine any of these references with IBM Process A to arrive at the claimed invention. *See* Respondents' Post-Hearing Br. at 46-48; Respondents' Petition for Review of Final ID at 44-47; IA's Post-Hearing Br. at 71; IA's Petition for Review of Final ID at 6-7. We agree.

As mentioned above, we adopt the ALJ's conclusion that IBM Process A discloses all of the elements of claim 1. Accordingly, the only limitation left to be found in the prior art is claim 4's recitation of "etching said tungsten and said glue layer to form a planar surface of said dielectric and said tungsten in said hole, said tungsten being etched before said glue layer." *See* '335 patent, claim 4. The Smith and Sachdev references both disclose this limitation because they describe depositing a tungsten plug on top of a glue layer using CVD. As discussed earlier, a tungsten plug is the deposited tungsten etched back to form a planar surface with the dielectric layer of the semiconductor device. Thus, they both disclose etching back a tungsten layer and a glue layer to form a planar surface as required by claim 4. *See* RX-16 (Smith); RX-17 (Sachdev); Blewer, Tr. at 1906-09, 1955-57; Ho, Tr. at 2301. The Sachdev reference in particular shows a clear picture (see FIG. 1 below) of an etched-back tungsten "planarized plug," and respondents' expert, Dr. Blewer, testified that one of ordinary skill in the art would have recognized that the reference discloses tungsten plugs used with a glue layer. RX-17 at 480; Blewer, Tr. at 1955-57.

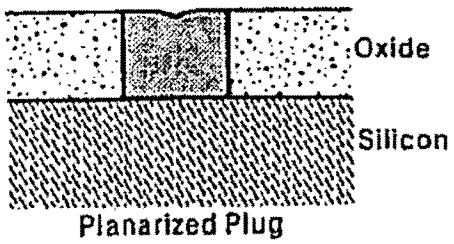


FIG. 1

In addition, Dr. Blewer testified that the inventors of the '335 patent were not the first to use tungsten plugs in view of this prior art. Blewer, Tr. at 1911. Dr. Blewer testified that Chow also discloses this limitation by teaching the use of CVD tungsten plugs without the use of a glue

layer. RX-131; Blewer, Tr. at 1910. Finally, during prosecution, the inventors of the '335 patent admitted that the dependent claims (*e.g.*, issued claim 4) stand or fall with claim 1 (which does not include the etching step), thereby admitting that the etching step is not novel. RX-242 at 128538.

Thus, the recited etching step of dependent claim 4 is simply the application of a well-known technique to prior art ready for the improvement, which the Supreme Court indicated would render the claimed invention obvious. *See KSR Int'l Co. v. Teleflex Inc.*, 500 U.S. 398, 417 (2007) ("[I]f a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill."). The known technique disclosed in the Smith, Sachdev, and Chow references is etching back tungsten plugs to form a planar surface, and in these references, the technique was used to improve a tungsten metallization semiconductor device. A tungsten metallization semiconductor device is so similar to the claimed tungsten metallization semiconductor integrated circuit using a glue layer of conducting nitrides that a person of ordinary skill in the art would have recognized that it could improve a tungsten metallization semiconductor integrated circuit in the same manner. Accordingly, one of ordinary skill would have been motivated to use the well-known technique to improve the prior art device, *i.e.*, a tungsten metallization semiconductor device using a glue layer of conducting nitrides, to arrive at the claimed combination of claim 4. One of ordinary skill in the art reading Smith, Sachdev, or Chow would have been motivated and able to combine any one of these prior art references with IBM Process A - a tungsten metallization semiconductor integrated circuit using a glue layer of conducting nitrides - by etching the

tungsten and glue layer back to form a planar surface of tungsten and the dielectric. Moreover, nothing suggests that doing so would be beyond such a person's skill. See Blewer, Tr. at 1906-11, 1955-57.

Moreover, one of ordinary skill in the art would have been further motivated to combine IBM Process A with Smith, Sachdev, or Chow because they all cover the same subject matter. The '335 patent and this prior art all relate to and disclose a semiconductor integrated circuit using CVD tungsten as the metal layer. Both Smith and Sachdev disclose all of the elements of claim 4, including a glue layer, except for a glue layer comprising "conducting nitrides." Further, the inventors of the '335 patent have previously cited to Smith for its teaching that tungsten films can be etched to form tungsten plugs, and have admitted during deposition that it was well-known that tungsten needed to be etched back to form a plug. *See* CX-246C at 0487011, 19; CX-248C at 0486966, 82; CX-242, col. 56:12-19, 57:18-21. Thus, the combination of IBM Process A and the asserted prior art would have resulted in a successful, improved device that produced an etched-back tungsten plug that formed a planar surface on the IBM Process A semiconductor integrated circuit device as recited in claim 4.

Further regarding motivation, the Smith reference, consistent with respondents' expert testimony, discloses the advantages of using such tungsten plugs with a glue layer in a semiconductor device by stating that the "[t]ungsten contact plugs were fabricated in a low pressure chemical vapor deposition reactor with etching capability . . . [t]he deposition itself nearly planarized the surface . . . CVD tungsten is attractive as an interconnect metallization for VLSI [Very Large Scale Integration] circuits . . .." RX-16 at 350. Also, Smith states that "[t]he thick tungsten, if used as the first level metal presents difficult[ies] . . . [a] more favorable

solution is to plug planarize the contact using tungsten, then deposit a thin (3000 A) aluminum alloy layer as the interconnect layer." RX-16 at 350-51; Thomas, Tr. at 1569-71; RDX-19. The prior art further states that "[t]he goals in producing planarized non-selective contact plugs are [to:] 1) develop a highly uniform deposition minimizing the voiding problem . . . 2) [d]evelop a uniform high rate tungsten etch which is selective to oxide." RX-16 at 352. Thus, we see no impediment to combining these references, and one of ordinary skill in the art would have been motivated to combine them to produce the claimed invention of claim 4, a tungsten metal layer etched back to form a planar surface with the semiconductor device. Dr. Ho, complainants' expert, fails to adequately rebut this obviousness evidence as he points to no evidence why any omission of a glue layer with conducting nitrides negatively impacts the desirability of tungsten plugs, and specifically fails to adequately rebut the Sachdev reference which clearly discloses a glue layer. Ho, Tr. at 2299-30.

Accordingly, the submitted evidence clearly and convincingly shows how and why it would have been obvious to one of ordinary skill in the art to use the prior art etched-back tungsten plugs in combination with IBM Process A to arrive at the claimed invention of claim 4. And although we note the commercial success of complainants' domestic product, this strong *prima facie* showing of obviousness is not overcome by secondary considerations. *See Agrizap, Inc. v. Woodstream Corp.*, 520 F.3d 1337, 1344 (Fed. Cir. 2008); *Leapfrog Enterprises, Inc. v. Fisher-Price, Inc.*, 485 F.3d 1157, 1162 (Fed. Cir. 2007).

Accordingly, we reverse the ALJ's remand determination and find that claim 4 is obvious, by clear and convincing evidence, under 35 U.S.C. § 103 in view of IBM Process A in

combination with Smith (1985), Sachdev, or Chow. Thus, we ultimately conclude that there is no violation of section 337.

C. Invalidity due to anticipation under 35 U.S.C. § 102(g) in view of IBM Process B or the AMD prior art, and due to obviousness under 35 U.S.C. § 103 in view of IBM Process B or the AMD prior art.

We determined to review whether claims 1 and 3 are anticipated by IBM Process B, whether claim 1 is anticipated by the AMD prior art, and whether claims 1, 3, and/or 4 are rendered obvious in view of IBM Process B or the AMD prior art. As discussed *supra*, the Commission concludes that there is no violation of section 337 based on invalidity of all asserted claims in view of IBM Process A. Thus, it is unnecessary for us to reach the issues of whether claims 1, 3, and/or 4 are invalid in view of IBM Process B or the AMD prior art. Accordingly, the Commission takes no position on these issues. *Beloit Corp. v. U.S. Int'l Trade Comm'n*, 742 F.2d 1421, 1423 (Fed. Cir. 1984).

D. Jazz's stipulation regarding claim 1

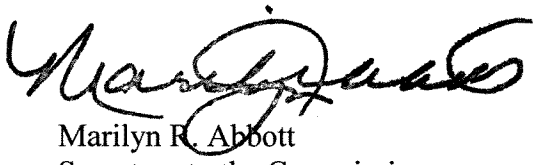
We determined to review the ALJ's finding that Jazz stipulated to practicing both portions of the third recited step of claim 1 of the '335 patent. We find that a slight error was made and that Jazz only stipulated to the first portion of the third recited step of claim 1, *i.e.*, "depositing a tungsten layer by chemical vapor deposition," but not the second portion of this step, *i.e.*, "said tungsten layer covering said glue layer on said dielectric and said exposed material." *See* ID at 73-75; Tower/Jazz's Pet. at 5-6; IA's resp. at 22-23; '335 patent, col. 6:1-3. Accordingly, we modify the ALJ's ruling to find that Jazz's stipulation to the third step in claim 1 only includes the step of "depositing a tungsten layer by chemical vapor deposition." This modification has no impact on the ALJ's unreviewed conclusion, that each respondent's accused

process is covered by one or more of asserted claims 1, 3, and 4 of the '335 patent.

IV. CONCLUSION

In view of our findings that the asserted claims of the '335 patent are invalid, we terminate the investigation with a finding of no violation of section 337.

By order of the Commission.



Marilyn R. Abbott
Secretary to the Commission

Issued: April 19, 2010

CERTAIN SEMICONDUCTOR INTEGRATED CIRCUITS USING TUNGSTEN METALLIZATION AND PRODUCTS CONTAINING SAME **337-TA-648**

CERTIFICATE OF SERVICE

I, Marilyn R. Abbott, hereby certify that the attached **COMMISSION OPINION** has been served by hand upon the Commission Investigative Attorney, Rett Snotherly, Esq., and the following parties as indicated, on APR 20 2010.

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UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, D.C.

In the Matter of **CERTAIN SEMICONDUCTOR INTEGRATION CIRCUITS USING TUNGSTEN METALLIZATION AND PRODUCTS CONTAINING SAME**	**Investigation No. 337-TA-648**

NOTICE OF COMMISSION DECISION TO REVIEW A REMAND INITIAL DETERMINATION OF THE ADMINISTRATIVE LAW JUDGE AND ON REVIEW, TO REVERSE THE REMAND INITIAL DETERMINATION FINDING CLAIM 4 OF U.S. PATENT NO. 5,227,335 NOT OBVIOUS; TO AFFIRM-IN-PART, REVERSE-IN-PART, AND MODIFY-IN-PART A FINAL INITIAL DETERMINATION FINDING NO VIOLATION OF SECTION 337; AND TO TERMINATE THE INVESTIGATION WITH A FINDING OF NO VIOLATION

AGENCY: U.S. International Trade Commission.

ACTION: Notice.

SUMMARY: Notice is hereby given that the U.S. International Trade Commission has determined to reverse a remand initial determination ("remand ID") of the presiding administrative law judge ("ALJ"), and to affirm-in-part, reverse-in-part, and modify-in-part a final initial determination ("ID") of the presiding administrative law judge ("ALJ"). The Commission has determined that there is no violation of section 337 in the above-captioned investigation, and has terminated the investigation. The Commission will issue an opinion shortly.

FOR FURTHER INFORMATION CONTACT: Clint Gerdine, Esq., Office of the General Counsel, U.S. International Trade Commission, 500 E Street, S.W., Washington, D.C. 20436, telephone (202) 708-2310. 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, S.W., 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: The Commission instituted this investigation on May 21, 2008, based on a complaint filed on April 18, 2008, by LSI Corporation of Milpitas, California and Agere Systems Inc. of Allentown, Pennsylvania. The complaint, as amended, alleged violations of section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337, in the importation into the United States, the sale for importation, and the sale within the United States after importation of certain semiconductor integrated circuits using tungsten metallization and products containing the same by reason of infringement of one or more of claims 1, 3, and 4 of U.S. Patent No. 5,227,335. The amended complaint named numerous respondents. Several respondents have been terminated from the investigation due to settlement or failure to name the proper party. The following six respondents remain in the investigation: Tower Semiconductor, Ltd. ("Tower") of Israel; Jazz Semiconductor ("Jazz") of Newport Beach, California; Powerchip Semiconductor Corporation of Taiwan; Grace Semiconductor Manufacturing Corporation of China; Integrated Device Technology, Inc. of San Jose, California; and Nanya Technology Corporation of Taiwan. The complaint further alleged that an industry in the United States exists as required by subsection (a)(2) of section 337.

On September 21, 2009, the ALJ issued his final ID finding no violation of section 337 by the remaining respondents. On November 23, 2009, the Commission issued notice of its determination to review-in-part the ID and issued an order remanding the investigation to the ALJ for further proceedings relating to whether claim 4 is rendered obvious by IBM Process A in light of the other prior art asserted by respondents and the Commission investigative attorney ("IA"). Specifically, the Commission determined to review: (1) invalidity of claims 1, 3, and 4 of the '335 patent under 35 U.S.C. §§ 102(g) & 103 with respect to IBM Process A, IBM Process B, and the AMD prior art; and (2) Jazz's stipulation regarding whether its process meets the complete, third recited step of claim 1, *i.e.*, "depositing a tungsten layer by chemical vapor deposition, said tungsten layer covering said glue layer on said dielectric and said exposed material." The Commission determined not to review the remainder of the ID. Also, the Commission requested written submissions on the ALJ's remand determination and responses to the written submissions, and briefing on remedy, the public interest, and bonding.

On January 15, 2010, the ALJ issued his remand ID finding that claim 4 is not rendered obvious by IBM Process A and other prior art asserted by respondents and the IA. On February 2 and 12, 2010, respectively, complainants and respondents each filed a brief and reply brief on the issues for which the Commission requested written submissions. On February 2 and 16, 2010, respectively, the IA filed a brief and a reply brief on the issues for which the Commission requested written submissions. Also, on February 12, 2010, Tower and Jazz filed a joint, separate reply brief.

Having reviewed the record in this investigation, including the remand and final IDs and the parties' written submissions, the Commission has determined to reverse the remand ID, and affirm-in-part, reverse-in-part, and modify-in-part the final ID. The Commission has determined that there is no violation of section 337 by the remaining respondents. Particularly, the

Commission has reversed the ALJ's finding that claim 4 is invalid due to anticipation in view of IBM Process A, but has found claim 4 to be invalid due to obviousness in view of IBM Process A in combination with the other prior art asserted by the IA and respondents. Also, the Commission has affirmed the ALJ's finding that claims 1 and 3 are invalid due to anticipation in view of IBM Process A. The Commission has also modified the ALJ's ruling that Jazz stipulated to the complete, third recited step of claim 1, and instead it has determined that Jazz's stipulation to the third step only includes the step of "depositing a tungsten layer by chemical vapor deposition." The Commission has determined to take no position on the ALJ's rulings that claims 1 and 3 are not anticipated in view of IBM Process B, claim 1 is not anticipated in view of the AMD prior art, and claims 1, 3, and/or 4 are not obvious in view of IBM Process B or the AMD prior art.

The authority for the Commission's determination is contained in section 337 of the Tariff Act of 1930, as amended (19 U.S.C. § 1337), and in section 210.45 of the Commission's Rules of Practice and Procedure (19 C.F.R.§ 210.45).

By order of the Commission.

Marilyn R. Abbott
Secretary to the Commission

Issued: March 22, 2010

CERTAIN SEMICONDUCTOR INTEGRATED CIRCUITS USING TUNGSTEN METALLIZATION AND PRODUCTS CONTAINING SAME **337-TA-648**

CERTIFICATE OF SERVICE

I, Marilyn R. Abbott, hereby certify that the attached **NOTICE OF COMMISSION DECISION TO REVIEW A REMAND INITIAL DETERMINATION OF THE ADMINISTRATIVE LAW JUDGE AND ON REVIEW, TO REVERSE THE REMAND INITIAL DETERMINATION FINDING CLAIM 4 OF U.S. PATENT NO. 5,227,335 NOT OBVIOUS; TO AFFIRM-IN-PART, REVERSE—IN-PART, AND MODIFY-IN-PART A FINAL INITIAL DETERMINATION FINDING NO VIOLATION OF SECTION 337; AND TO TERMINATE THE INVESTIGATION WITH A FINDING OF NO VIOLATION** has been served by hand upon the Commission Investigative Attorney, Rett Snotherly, Esq., and the following parties as indicated has been served, on March 23, 2010.

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PUBLIC VERSION

UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, D.C.

In the Matter of	
CERTAIN SEMICONDUCTOR INTEGRATED CIRCUITS USING TUNGSTEN METALLIZATION AND PRODUCTS CONTAINING SAME	**Inv. No. 337-TA-648**

INITIAL DETERMINATION
Administrative Law Judge Carl C. Charneski

Pursuant to the notice of investigation, 73 Fed. Reg. 29534 (2008), this is the Initial Determination in the matter of *Certain Semiconductor Integrated Circuits Using Tungsten Metallization and Products Containing Same*, United States International Trade Commission Investigation No. 337-TA-648. *See* 19 C.F.R. § 210.42(a).

It is held that no violation of section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337, has occurred in the importation into the United States, the sale for importation, or the sale within the United States after importation, of certain semiconductor integrated circuits using tungsten metallization or products containing same that infringe claim 1, 3, or 4 of U.S. Patent No. 5,227,335.

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The following abbreviations may be used in this Initial Determination:

ALJ	-	Administrative Law Judge
ALJX	-	Administrative Law Judge Exhibit
CDX	-	Complainants' Demonstrative Exhibit
CPX	-	Complainants' Physical Exhibit
CX	-	Complainants' Exhibit
Dep.	-	Deposition
EDIS	-	Electronic Document Imaging System
FF	-	Finding(s) of Fact
JPX	-	Joint Physical Exhibit
JX	-	Joint Exhibit
PCL	-	Proposed Conclusion of Law (CPCL, RPCL or SPCL)
PFF	-	Proposed FF (CPFF, RPFF or SPFF)
RDX	-	Respondents' Demonstrative Exhibit
RPX	-	Respondents' Physical Exhibit
RX	-	Respondents' Exhibit
SX	-	Commission Investigative Staff Exhibit
Tr.	-	Transcript.

I. Background

A. Institution and Procedural History of This Investigation

By publication of a notice in the *Federal Register* on May 21, 2008, pursuant to subsection (b) of section 337 of the Tariff Act of 1930, as amended, the Commission instituted this investigation to determine:

> [W]hether there is a violation of subsection (a)(1)(B) of section 337 in the importation into the United States, the sale for importation, or the sale within the United States after importation of certain semiconductor integrated circuits using tungsten metallization or products containing same that infringe claim 1 of U.S. Patent No. 5,227,335, and whether an industry in the United States exists as required by subsection (a)(2) of section 337.

73 Fed. Reg. 29534 (2008).

The complainants are: LSI Corporation ("LSI") of Milpitas, California; and Agere Systems, Inc. ("Agere") of Allentown, Pennsylvania (collectively, "complainants"). *Id.* The Commission Investigative Staff ("Staff") of the Office of Unfair Import Investigations is a party in this investigation. *Id.*

In the notice of investigation, the Commission named the following companies as respondents:

> United Microelectronics Corporation ("UMC") of Hsinchu-Chu City, Taiwan;[1]
>
> Integrated Device Technology, Inc. ("IDT") of San Jose, California;

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[1] UMC was terminated from the investigation on the basis of a settlement agreement. *See* Notice of a Commission Determination Not to Review an Initial Determination Terminating the Investigation As to United Microelectronics Corporation (June 29, 2009).

AMIC Technology Corporation ("AMIC") of Hsinchu, Taiwan;[2]

Cypress Semiconductor Corporation ("Cypress") of San Jose, California;[3]

Elpida Memory, Inc. ("Elpida") of Tokyo, Japan;[4]

Freescale Semiconductor, Inc. ("Freescale") of Austin, Texas;[5]

Grace Semiconductor Manufacturing Corporation ("Grace") of Shanghai, China;

Microchip Technology, Inc. ("Microchip") of Chandler, Arizona;[6]

Micronas Semiconductor Holding, AG ("Micronas AG") of Zurich, Switzerland;[7]

---

[2] AMIC was terminated from the investigation of the basis of a settlement and patent license agreement. *See* Notice of a Commission Determination Not to Review an Initial Determination Terminating the Investigation As to AMIC Technology Corporation. (Feb. 9, 2009).

[3] Cypress was terminated from the investigation of the basis of a settlement agreement. *See* Notice of a Commission Determination Not to Review an Initial Determination Terminating the Investigation As to Cypress Semiconductor Corporation (May 13, 2009).

[4] Elpida was terminated from the investigation of the basis of a patent license agreement. *See* Notice of a Commission Determination Not to Review an Initial Determination Terminating the Investigation As to Elpida Memory, Inc. (July 15, 2009).

[5] Freescale was terminated from the investigation on the basis of a settlement agreement. *See* Notice of a Commission Determination Not to Review an Initial Determination Terminating the Investigation As to Freescale Semiconductor, Inc. (Dec. 22, 2008).

[6] Microchip was terminated from the investigation on the basis of a settlement agreement. *See* Notice of a Commission Determination Not to Review Initial Determinations Terminating the Investigation As to Microchip Technology, Inc. and Magnachip Semiconductor, Ltd. (Aug. 12, 2009).

[7] Micronas GmbH of Germany was substituted for Micronas AG. *See* Notice of Commission Decision Not to Review an Initial Determination Granting Motion to Amend the Complaint and Notice of Investigation (Oct. 8, 2008).

(continued...)

National Semiconductor Corporation ("NSC") of Santa Clara, California;[8]

Nanya Technology Corporation ("Nanya") of Kueishan, Taoyuan County, Taiwan;

NXP B.V. ("NXP BV") of Eindhoven, Netherlands;[9]

ON Semiconductor Corporation ("ON") of Phoenix, Arizona;[10]

Powerchip Semiconductor Corporation ("Powerchip") of Hsinchu, Taiwan;

ProMOS Technologies, Inc. ("ProMOS") of Hsinchu, Taiwan;[11]

Spansion, Inc. of Sunnyvale, California;

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[7](...continued)
Micronas GmbH was terminated from the investigation on the basis of a settlement agreement. *See* Notice of a Commission Determination Not to Review Initial Determinations Terminating the Investigation As to National Semiconductor Corporation and Micronas GmbH (Aug. 5, 2009).

[8] NSC was terminated from the investigation on the basis of a settlement agreement. *See* Notice of a Commission Determination Not to Review Initial Determinations Terminating the Investigation As to National Semiconductor Corporation and Micronas GmbH (Aug. 5, 2009).

[9] NXP Semiconductors USA, Inc. ("NXP") was substituted for NXP BV. *See* Notice of Commission Decision Not to Review an Initial Determination Granting Motion to Amend the Complaint and Notice of Investigation (Sept. 2, 2008). Thereafter, NXP was terminated from the investigation based on a partial withdrawal of the complaint. *See* Notice of a Commission Determination Not to Review an Initial Determination Terminating the Investigation As to NXP Semiconductors USA, Inc. (Mar. 31, 2009).

[10] ON was terminated from the investigation of the basis of a settlement agreement. *See* Notice of Commission Determination Not to Review an Initial Determination Terminating the Investigation As to ON Semiconductor Corporation (Apr. 23, 2009).

[11] ProMOS was terminated from the investigation on the basis of a settlement agreement. *See* Notice of a Commission Determination Not to Review an Initial Determination Terminating the Investigation As to Promos Technologies, Inc. (Aug. 19, 2009).

STMicroelectronics NV ("STMicroelectronics") of Geneva, Switzerland;[12] and

Vanguard International Semiconductor Corporation ("Vanguard") of Hsinchu, Taiwan.[13]

Id.

The following respondents were added to the investigation pursuant to Order No. 15:

Dongbu HiTek Semiconductor Business ("Dongbu") of Seoul, Korea;[14]

Jazz Semiconductor ("Jazz") of Newport Beach, California;

MagnaChip Semiconductor ("Magnachip") of Chungbuk, Korea;[15]

Qimonda AG ("Qimonda") of Munich, Germany;[16] and

Tower Semiconductor, Ltd. ("Tower") of Migal Haemek, Israel.

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[12] STMicroelectronics was terminated from the investigation based upon a finding of no section 337 violation. *See* Notice of a Commission Determination Not to Review an Initial Determination Granting Respondent STMicroelectronics N.V.'s Motion for Summary Determination, and Terminating of the Investigation As to STMicroelectronics N.V. (July 20, 2009).

[13] Vanguard was terminated from the investigation on the basis of a settlement agreement. *See* Notice of Commission Determination Not to Review an Initial Determination Terminating the Investigation As to Vanguard International Semiconductor Corporation (Apr. 23, 2009).

[14] Dongbu was terminated from the investigation on the basis of a settlement agreement. *See* Notice of a Commission Determination Not to Review an Initial Determination Terminating the Investigation As to Dongbu HiTek Semiconductor Business (Aug. 5, 2009).

[15] MagnaChip was terminated from the investigation on the basis of a settlement agreement. *See* Notice of a Commission Determination Not to Review Initial Determinations Terminating the Investigation As to Microchip Technology, Inc. and Magnachip Semiconductor, Ltd. (Aug. 12, 2009).

[16] Pursuant to a preliminary injunction issued by the United States Bankruptcy Court for the Eastern District of Virginia, Alexandria Division, Case No. 09-14766 (RGM), the investigation was stayed as to Qimonda. *See* Order No. 110.

See Notice of Commission Decision Not to Review an Initial Determination Granting a Motion to Amend the Complaint and Notice of Investigation (Oct. 17, 2008).

In addition, pursuant to Order No. 17, the complaint and notice of investigation were amended to add to the investigation claims 3 and 4 of the asserted patent, *i.e.,* United States Patent No. 5,227,335 ("the '335 patent"). *See* Notice of Commission Decision Not to Review an Initial Determination Granting, in-Part, a Motion to Amend the Complaint and Notice of Investigation (Nov. 19, 2009).

As originally issued, the notice of investigation stated that "[t]he Commission notes that the patent at issue was the subject of earlier litigation which raises the issue of whether the complainants are precluded from asserting that patent. In instituting this investigation, the Commission has not made any determination as to whether the complainants are so precluded. Accordingly, the presiding administrative law judge may wish to consider this issue at an early date." 73 Fed. Reg. 29534 (2008).

The prior litigation in question is *Agere Sys., Inc. v. Atmel Corp.*, No. 02-864 (E.D. Pa.) ("*Atmel*"), in which the district court ruled the patent invalid. After judgment was entered, the parties settled their dispute and, on motion, the district court vacated its summary judgment orders, the jury verdict, and the judgment. *In re Cypress Semiconductor Corp.* Misc. Dkt. No. 898, Order at 1-2 (Fed. Cir. Apr. 2, 2009). Before settling with complainants and being terminated from this investigation, "Cypress filed a motion for summary determination arguing that Agere is precluded from relitigating the validity of the patent based on the Eastern District of Pennsylvania's rulings in *Atmel.* The undersigned administrative law judge denied the motion and the Commission affirmed the ALJ's ruling that the *Atmel* judgment did not preclude Agere

from relitigating the patent's validity." *Id.* at 2. Cypress then filed before the Court of Appeals for the Federal Circuit "a petition for a writ of mandamus directing the Commission to halt its proceedings." *Id.*

The Federal Circuit held that "[t]he remedy of mandamus is available only in extraordinary situations to correct a clear abuse of discretion or usurpation of judicial power. *In re Calmar, Inc.*, 854 F.2d 461, 464 (Fed. Cir. 1988). A party seeking a writ bears the burden of proving that it has no other means of attaining the relief desired, *Mallard v. U. S. Dist. Court for S. Dist. of Iowa*, 490 U.S. 296, 309 (1989), and that the right to issuance of the writ is 'clear and indisputable,' *Allied Chemical Corp. v. Daiflon, Inc.*, 449 U.S. 33, 35 (1980)." *Id.* at 2 With respect to the specific question presented concerning the preclusive effect, if any, of the *Atmel* litigation, it was held that "[b]ecause any appeal of the Commission's final determination would be within this court's exclusive jurisdiction, we apply Federal Circuit law to the res judicata issue." *Id.* at 4. The Federal Circuit ultimately held that "[t]o decide the question presented by this mandamus petition, we need only decide whether Cypress has shown that the Commission clearly and indisputably erred in ruling that the Commission may proceed with its investigation. We determine that Cypress has not met its burden and thus deny the petition." *Id.* at 5.

The following seven companies remain as active respondents in this investigation: IDT, Grace, Nanya, Powerchip, Spansion, Jazz, and Tower (and are referred to collectively as "respondents").

A tutorial was held on June 9, 2009. The session was transcribed for future reference, and a copy of the transcript is available on EDIS (Doc. Identification No. 404939).

The six-day evidentiary hearing commenced on July 20, 2009, and concluded on July 27,

2009. Complainants, Staff and all active respondents were represented at the hearing.

Posthearing briefs and proposed findings, as well as reply briefs have been filed by complainants, the Staff, and respondents.[17] The issues are ripe for determination.

B. Technological Background

Integrated circuits are used in many products, including cell phones, video cameras, calculators, and memory cards. Thompson (Tutorial) Tr. 12. The first integrated circuits were made about 50 years ago, when scientists realized that they could build transistors and other devices required to make a particular circuit on the same piece of silicon, and hence integrate them. Thompson (Tutorial) Tr. 13.

Each transistor has a source, a drain, and a gate. These regions of the transistor are created by doping the silicon with impurities. A transistor functions like a switch because the gate can either allow, or prevent, current from flowing from the source to the drain. If a voltage is applied to the gate, the gate closes, thereby allowing current to flow. Thus, a transistor has two states that can be represented by a 0, or a 1. Consequently, transistors are used to perform binary logic functions as well as to store information on a chip. Thomas (Tutorial) Tr. 65-68.

Today, within a half-inch by half-inch square on the surface of a silicon wafer, there might be millions of transistors or other devices, all connected by wires. In fact, transistors are now smaller than bacteria. Before the wires are made, the wafer is covered with an insulating, or

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[17] For each of the two rounds of briefing (*i.e.,* main brief and replies), respondents' filings consist of two parts: (1) a joint brief (herein referred to as "RJoint Br."), and a joint reply (herein referred to as "Resps. Reply") addressing issues common to all respondents; and (2) shorter briefs and replies addressing issues relevant to a specific respondent, or group of respondents. In particular, shorter briefs and replies were filed on behalf of the following: (a) IDT; (b) Grace; (c) Nanya, Powerchip, and Spansion (collectively referred to as "NP&S"); (d) Jazz; and (e) Tower.

dielectric, layer to keep the wires from contacting the silicon in too many places. The insulating layer has holes etched into it so that after the wires are made, metal can contact the devices in the silicon in the right places. The insulating layer may be made of silicon dioxide, or sublayers of silicon dioxide and silicon nitrate. Above the insulating layer, a layer of metal, such as aluminum (Al) or tungsten (W), is applied. Tungsten is now the more likely choice for the metal layer, although aluminum was used historically. The metal layer is subjected to a lithographic process (also called a photolithographic process) so that it can be patterned into wires that connect the devices in the silicon. Typically there is a stack of metal layers, and each layer is insulated by more dielectric oxide layers so that wires from the various layers make contact at only specific points. In fact, due to the existence of multiple layers of wires, complex interconnections can be made in which wires jump over layers to make connections over relatively long distances. Thompson (Tutorial) Tr. 13-18, 22-24; Thomas (Tutorial) Tr. 72-73.

The basic lithographic process involves creating the desired pattern on a plate. Light shines through the plate onto a polymer, parts of which are then selectively removed so that the oxide layers underneath can be etched according to the desired pattern. As mentioned above, holes can then be added, into which metal is placed to make contacts at only the required points below. Thompson (Tutorial) Tr. 24.

Decades ago, when lithography was first used to make integrated circuits, the holes were relatively large by today's standards. The sidewalls of the holes were sometimes sloped, and the aluminum contacts in the holes were covered by more aluminum in metal layers. The sloping of the walls did not create a problem. Thompson (Tutorial) Tr. 24-25.

As the devices on the silicon got smaller and smaller, it was necessary to use only straight

sidewalls because sloped sidewalls took up too much space. Similarly, it became necessary to make the holes smaller. On account of those changes, aluminum was no longer suitable. For example, the aluminum was applied in a sputter deposition process.[18] The sputter deposition process would allow a small amount of metal to get to the bottom of the tall, vertical holes to make contact with the silicon. The problem is that the aluminum would grow in from the edges before enough aluminum could fill the length of the holes. Yet, filling the length of the holes was necessary to make good contacts. Thompson (Tutorial) Tr. 25-26.

One possible solution to the problem of filling the small, vertical holes was to use a chemical vapor deposition process,[19] rather than a sputtering process. A chemical vapor process

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[18] Sputter deposition is a type of physical vapor deposition or PVD process. In basic terms, it is accomplished by putting a metal, such as aluminum, on a relatively large plate that is very highly charged, positively on one side and negatively on the other. Due to the difference in charges, electrons will jump from one side to the other. A gas, usually argon, is introduced. The gas itself becomes charged, and begins to blow. At this point, there is a so-called plasma state. A discharge (akin to a lightening strike) is produced with many electrons flowing together in one direction. The electrons hit the aluminum so hard that they knock aluminum atoms off, which end up deposited as a film on the surface that one wishes to cover. This process can be used for creating adhesion or glue layers, frequently of titanium or titanium nitride (TiN). Thompson (Tutorial) Tr. 32-35, 39.

Ionized metal plasma deposition is another form of PVD. It uses two plasmas, and when an atom is sputtered off (for example, a titanium atom), an electron is also knocked off. Thus, the atom is made into an ion, and it is attracted to the substrate. Ionized metal plasma deposition is often used instead of the other sputter technique because it is better at filling holes. Thompson (Tutorial) Tr. 37-38.

Another technique for making a film or a layer is nitridization, which is also known as nitridation. Thompson (Tutorial) Tr. 44; Thomas (Tutorial) Tr. 81. A titanium film is heated up very rapidly in the presence of nitrogen (or ammonium) gas so that the nitrogen reacts with the titanium to form titanium nitride. After the process is completed, the crystal structure of the original film has changed because nitrogen has been introduced to the titanium. Original bonds have been broken, and new bonds have formed, in order to create a new compound. Thompson (Tutorial) Tr. 44-45; Thomas (Tutorial) Tr. 87-88.

[19] In chemical vapor deposition, or CVD, gases are put into a chamber at relatively high

(continued...)

allows the deposition of metal at the same rate along the walls of the hole, so as to prevent the formation of voids in which there was no aluminum. The problem with using that technique was that it had not been used with aluminum. However, the use of tungsten in a chemical vapor deposition process was well known. Thus, almost entirely to the exclusion of aluminum, tungsten became the choice for the manufacture of contacts in integrated circuits, and often for at least the first layer of wiring. In addition to its suitability for use with the chemical vapor deposition process, tungsten had other advantages. It is very thermally stable. It is resistant to electromigration, a phenomenon that causes metal to fail over time. Thus, even though aluminum has lower electrical resistence than tungsten, and adheres better to silicon dioxide, tungsten was used instead of aluminum because it could fill the small vertical holes. Thompson (Tutorial) Tr. 26-27.

In the 1980s, a lot of work was done to correct problems caused by the fact that tungsten forms weaker bonds with silicon dioxide than aluminum, and therefore was known to peel or pop off. A number of options were explored, including the successful use of a thin layer of some other material that would act as a glue because it would adhere well both to the dielectric layer

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[19](...continued)
pressure. The substrate upon which one wants deposition to occur is heated. The heat causes certain gases to be absorbed into the substrate to make the desired film, with unwanted gases leaving the system. Thompson (Tutorial) Tr. 38-40.

While CVD is often used to deposit a titanium nitride glue layer, it can also be used with tungsten for filling holes. If one uses tungsten with fluorine, the tungsten stays behind, and the fluorine can be taken out as a gas. Specifically, it is common to use tungsten hexafluoride (SiH_4) along with silicon difluoride (also called silane) to help the tungsten hexafluoride break down at lower temperatures. At first, the tungsten atoms that are left behind are only weakly bonded to the surface, are not bonded to each other, and thus can move around. Some of them form clusters that are big enough (though a process called nucleation) to run into other clusters; and eventually a continuous film is formed. Thompson (Tutorial) Tr. 42-44.

and to the tungsten. Thompson (Tutorial) 27-29.

Many times, even when tungsten is not used for the first layer of wiring, a plug of tungsten is left in the contacts. Through planarization, one can remove the portion of the tungsten that is unwanted, right down to the dielectric surface.[20] To optimize conductivity, aluminum, or a stack of metal layers and sublayers of coatings and films, is then deposited. Thompson (Tutorial) Tr. 29-30, 47-48.

C. The Products Accused in This Investigation

As discussed in further detail below in the section on claim construction, the asserted claims of the '335 patent are process claims. The products at issue are made, and identified, according to the accused processes of the individual respondents. *See* CPFF 148-199.

With respect to each respondent, complainants base their allegations on two or three specific processes, and so-called "similar" processes. The similar processes are numerous but are the subject of stipulations indicating that infringement as to the specified process constitutes infringement as to the similar processes. The specified and similar processes are enumerated in complainants' brief (the stipulations are cited therein). The specified, or exemplary processes,

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[20] Planarization is a term for the removal of material down to a specified level (*i.e.*, plane). There are a number of planarization techniques, including dry etching, and chemical mechanical polishing, known as CMP (which shares its acronym with a different process called chemical mechanical planarization). In dry etching, gases are used, typically with plasma, so that charged molecules accelerate toward the material to be etched (such as tungsten), and then actually knock off some of the material. Chemical mechanical polishing uses a rotating disc or plate called a platen that can be one or more feet in diameter. The platen has a sponging material on top, and a slurry containing hard particles is released that makes the surface like sandpaper. A rod holds the wafer face down on, and in contact with, the rotating platen to remove unwanted material from the wafer. The chemicals used during polishing can be selected to remove tungsten faster than the dielectric. That helps one not to over polish. Excessive polishing may result in "dishing," or a surface that is not perfectly planar. Thompson (Tutorial) Tr. 47-50.

and the claims that they are accused of infringing are, as follows:

IDT	[ ] (claims 1 and 3), [ ] (claims 1, 3, and 4);
Grace	[ ](claims 1, 3, and 4), [ ] (claims 1 and 4);
Nanya	[ ] process (claims 1 and 4), [ ] process (claims 1 and 4), [ ] process (claims 1 and 4);
Powerchip	[ ] (claim 1), [ ] (claim 1), [ ] process (claim 1);
Spansion	[ ] (claims 1, 3, and 4), [ ] (claims 1, 3, and 4);
Jazz	[ ] (claim 1), [ ] (claim 1), [ ] (claim 1);
Tower	[ ] (claim 1), [ ] (claim 1).

See Compls. Br. at 89-93 (Grace), 93-96 (IDT), 96-99 (Jazz), 99-103 (Nanya), 103-105 (Powerchip), 106-110 (Spansion), 110-112 (Tower).

II. Jurisdiction and Importation

A. General Findings

Regardless of whether respondents are ultimately found to be in violation of section 337, the Commission has subject matter jurisdiction over the allegations of unfair importation raised by complainants. *See Amgen, Inc. v. United States Int'l Trade Comm'n*, 902 F.2d 1532, 1536 (Fed. Cir. 1990). Further, all respondents appeared at the hearing to litigate the merits of their respective cases and it is undisputed that the Commission has personal jurisdiction over them. Nor is there any dispute that the Commission has *in rem* jurisdiction over any imported, accused products.

With the exception of Spansion Inc., no party contests importation. *See* RJoint Br. at 1,

66-67, 72; Staff Br. at 6-7; NP&S Br. at 1-5. Indeed, all respondents, except Spansion Inc., have stipulated to facts that demonstrate the importation of accused products. *See* CX-2326C (Grace); CX-2327C (Powerchip); CX-2328C (Nanya); CX-2329C (IDT); CX-2330C (Jazz); CX-2331C (Tower). Tower does, however, make an argument concerning the limited nature of its stipulation, which is discussed below.

B. Findings Specific to Tower

Tower argues in its brief that it stipulated only to the importation of a single wafer to a company called Alien. It is argued that complainants have failed to prove any additional importation. Tower argues that even if the Commission issues a remedy as a result of this investigation, an exclusion order could not reach "any Tower wafers other than the one sold to Alien," and could not reach downstream products. *See* Tower Br. at 1, 3, 14.

It is first noted that the importation of even a single infringing product constitutes a violation of section 337. *See Certain Trolley Wheel Assemblies*, 337-TA-161, Views of the Comm'n, USITC Pub. 1605 at 8 (Nov. 1984).

Furthermore, the Commission practice is to direct remedial orders to all products "covered by" the asserted patent claims as to which a violation has been found, rather than to limit orders to specific models. *See Certain Laser Bar Code Scanners and Scan Engines, Components Therefor, and Products Containing Same*, Comm'n Op., 2008 WL 240615 at *23 (May 2008) ("We reject Metrologic's invitation to deviate from the long-standing Commission practice of declining to limit exclusion orders to specific models."); *Certain Hardware Logic Emulation Systems and Components Thereof*, Inv. No. 337-TA-383, Comm'n Op., 1998 ITC LEXIS 138 at *31-32 (Mar. 1998). Thus, in the event that Tower is found to be in violation of

section 337, a remedy is likely to issue with respect to the infringing Tower process or processes, rather than with respect to the specific devices contained on the wafer sent by Tower to the Alien company in the United States.

Finally, to the extent that downstream products or other issues relating to the specific scope of any remedy need to be further addressed, they will be the subject of the Recommended Determination on remedy that will issue pursuant to 19 C.F.R. § 210.42(a)(1)(ii).

C. Findings Specific to Spansion Inc.

Spansion Inc. argues that it is a publicly traded holding company that does not import, sell for importation, or sell after importation, any accused product. In particular, it is argued that the Commission's notice of investigation limits this investigation to violations of section 337(a)(1)(b), which applies only to the importation, sale for importation, or sale after importation, of infringing articles by their owner, importer, or consignee or an agent thereof. Spansion argues that it is none of these, and thus should not even be a party in this investigation. *See* NP&S Br. at 3-5 (citing 19 U.S.C. § 1337(a)(1)(b)).

With respect to the evidence of record, Spansion Inc. argues that Don Devost (Spansion Inc.'s vice president of financial planning and analysis) appeared at the hearing, pursuant to a subpoena served by complainants, and testified that Spansion Inc. neither sells, imports, nor sells for importation any accused products, and that no other entity does so on its behalf. *Id.* at 3-4. In fact, Spansion Inc. argues, the infringement evidence adduced by complainants with respect to the so-called "Spansion" process does not pertain to it, but rather to the products of "non-parties Spansion LLC or Spansion Japan." *See Id.*

Complainants argue that in its response to the complaint and notice of investigation, as

well as its response to the amended complaint, respondent Spansion Inc. admitted that it manufactures Flash memory integrated circuits, and did not dispute the characterization of certain exemplary products as those of Spansion Inc. Moreover, it is argued, even if Spansion LLC is the true operating entity, Spansion Inc. demonstrated effective control over Spansion LLC by responding to interrogatories regarding the manufacture and sale of accused Spansion products, by producing Spansion LLC documents in discovery, and by producing Spansion LLC employees as its corporate designees. *See* Compls. Br. at 5-7.

Further, complainants argue that at no point did Spansion Inc. plead lack of jurisdiction as an affirmative defense and thereby afford complainants an opportunity to substitute Spansion LLC for Spansion Inc. (as complainants substituted NXP for NXP BV and GmbH Micronas for Micronas AG). Rather, complainants argue, Spansion Inc. even opposed a motion to compel by arguing that it had produced certain documents and provided certain interrogatory responses, and further that it expected to produce "additional process flow documents from its Austin fab and from its Japanese fab next week." *See Id.* at 7-8 (quoting Spansion Inc. Response to Motion to Compel (Oct. 10, 2008)). In fact, complainants argue that Spansion Inc. participated in this investigation as though "it were fully responsible for the activities of Spansion LLC." *Id.* at 7 (citing *Star Brite Distrib., Inc. v. Gavin*, 746 F. Supp. 633, 639-40 (N.D. Miss. 1990) ("*prima facie* case for piercing the corporate veil" under Mississippi and Florida law)).

In its reply, Spansion Inc. argues that although it did not plead lack of subject matter jurisdiction as an affirmative defense, it is a bedrock principle of law that lack of such jurisdiction is an issue that is never waived and may be raised at any time. Moreover, it is argued, Spansion Inc. specifically notified complainants that they had named the wrong party as

early as February 2009 (*i.e.,* more than five months before the hearing, and more than five weeks before the first of two depositions of Spansion Inc.). Also, in a May, 2009, opposition to a motion to compel, Spansion Inc. stated that it "is a bankrupt holding company that does not engage in any manufacturing, sales or importation activities" and that the discovery sought "mainly concerns alleged activities of foreign and domestic third parties (also in bankruptcy) that are direct or indirect subsidiaries of Spansion Inc., but that LSI did not name as respondents." NS&P Reply at 1-5.[21]

Given the circumstances surrounding Spansion Inc.'s activities and its involvement in this investigation, it is found that the Commission has subject matter and personal jurisdiction over the respondent. The larger question, however, is whether complainants can prove the importation or sale element of a section 337 violation with respect to Spansion Inc., and thus whether there are any circumstances in which Spansion Inc. could be found to be in violation of section 337. The answer to that question is in the negative. As discussed below, the evidence shows that Spansion Inc. is not in violation of section 337.

It has not been established that respondent Spansion Inc. has directly, or through an agent, sold for importation, imported, or sold after importation, any accused products. Indeed, it appears from complainants' arguments and proposed findings that they have forgone any attempt to prove actual importation or sale by Spansion Inc. Rather, complainants rely only on

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[21] Spansion Inc. also argues that although complainants did not mention the *alter ego* theory by name (and cited only one related case), they did essentially make such arguments. Nevertheless, Spansion Inc. argues in its reply, under a full application of the demanding requirements of the *alter ego* theory, complainants failed to prove that respondent Spansion Inc. is the *alter ego* of its subsidiary Spansion LLC. *See* NS&P Reply at 7-10.

importations and sales by Spansion Inc.'s subsidiary, Spansion LLC. *See* Compls. Br. at 5-6.[22]

It is undisputed, and the evidence demonstrates, that Spansion LLC is a subsidiary of respondent Spansion Inc. In particular, Spansion Inc. owns 60% of Spansion LLC. The remaining 40% of Spansion, LLC is owned by Spansion Technology, Inc., which is entirely owned by Spansion Inc. *See* Devost Tr. 2275. Yet, no party argues that Spansion LLC's importations are chargeable to respondent Spansion Inc. merely because of their subsidiary-parent relationship. Rather, as summarized above, complainants' arguments hinge on an alleged pattern of representations and other behavior on the part of respondent Spansion Inc. that shows Spansion Inc.'s control over its subsidiary, and that led complainants to believe that they had named the correct company in this investigation. The evidence, however, shows the contrary.

Spansion Inc.'s first substantive act in this investigation was to respond to the complaint and notice of investigation. As indicated above, complainants argue that in its response to the complaint, Spansion Inc. admitted to manufacturing flash memory integrated circuits, and did not dispute the characterization of certain exemplary products as those of Spansion Inc. Complainants' arguments tell only part of the story. For reasons that are unclear, Spansion Inc. did in one instance admit that it is a flash memory manufacturer (yet in another, appears to have denied it). Further, it is not clear that Spansion Inc. admitted a connection to certain exemplary products. Moreover, when Spansion Inc. had the opportunity in its response to make clear and

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[22] It appears to be undisputed that Spansion LLC has in fact imported accused products. Such a lack of controversy is arguably of diminished significance inasmuch as non-party Spansion LLC did not appear at the hearing, and thus was in no position to agree or disagree that its activities satisfy an element of a section 337 violation. In any event, there is record evidence to support a finding that Spansion LLC has imported and sold accused products. *See* Staff Br. at 7, 12; CX-1309C; CX-1330C; Devost Tr. 2275-2277.

direct denials of any sale or importation of accused products, it did so. Specifically, in paragraph 20 of the complaint, complainants declare, as follows:

> 20. On information and belief, Spansion, Inc. ("Spansion") is a corporation organized under the laws of the State of Delaware with its principal place of business at 915 Deguigne Drive, Sunnyvale, California. ***On information and belief, Spansion is a manufacturer and importer of semiconductor devices.***

Compl., ¶ 20 (Apr. 18, 2008) (emphasis added).

Spansion Inc. responded, as follows:

> 20. Responding to the allegations of paragraph 20 of the complaint, Spansion admits that it is a corporation organized under the laws of Delaware, with its principal place of business in Sunnyvale, California. ***Except as so admitted, Spansion denies the allegations of paragraph 20 of the complaint.***

Spansion Inc. Resp. to Compl. (emphasis added).

This plain denial by Spansion Inc. that it is "a manufacturer and importer of semiconductor devices" should have raised a concern at the outset of this investigation that possibly (as in the case of NXP B.V. and Micronas AG) the wrong party had been named, or at a minimum, that possibly another Spansion-related company should be added.

In paragraph 87 of their complaint, complainants declared, as follows:

> 87. On information and belief, Spansion manufactures infringing semiconductor integrated circuits. On information and belief, Spansion imports into the United States, sells for importation into the United States, and/or sells after importation into the United States infringing semiconductor integrated circuits. The specific instance of importation of infringing semiconductor integrated circuits set forth below is a representative example of unlawful importation and/or sale after importation of infringing

products.

Compl., ¶ 87.

Spansion Inc. responded, as follows:

> 87. Responding to the allegations of paragraph 87 of the complaint, Spansion admits that it manufactures Flash memory integrated circuits. Except as so admitted, Spansion denies the allegations of paragraph 87 of the complaint.

Spansion Inc. Resp. to Compl. at 19. [23]

Thus, although Spansion Inc. described itself in this instance as a manufacturer of flash integrated circuits, at the same time it denied allegations concerning importation, and concerning exemplary products that are the subject of the complaint.

Spansion Inc. made the same denials, eights months later, when it filed its response to the amended complaint. *See* Amended Resp. to Compl. Under Section 337 of the Tariff Act of 1930, As Amended and to the Notice of Investigation at 6, 19-20 (Feb. 12, 2009).

It is also noted that in both Spansion Inc.'s original and amended responses to the complaint, it referred ambiguously to two specified products (*i.e.*, the [ ] and [ ).] Spansion Inc. denied allegations attempting to tie it to accused products, but in at least one portion of each response, referred to those specific products as being among "its" products. *See* Spansion Inc. Resp. to Compl. at 13-14; Spansion Inc. Amended Resp. to Compl. at 13-14. As pointed out by complainants in their brief, there have been occasions during this investigation in which Spansion Inc. has also referred to "its" products or fabrication

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[23] With respect to complainants' more detailed allegations of how it allegedly purchased "infringing Spansion semiconductor integrated circuit," Spansion Inc. responded that it lacked sufficient information to form a belief as to the truth of the allegations. *See* Compl., ¶ 88; Spansion Resp. to Compl. at 20.

facilities.

Throughout this investigation, Spansion Inc. has attempted to respond to complainants' discovery requests for itself while also trying to provide information about related companies, such as its subsidiary, Spansion LLC. It appears that, on occasion, Spansion Inc. may not have guarded its language closely enough to prevent any confusion between its own activities and those of other Spansion-related companies. *See* Respondents Nanya Technology Corporation, Powerchip Semiconductor Corporation, and Spansion, Inc.'s Opp. to Complainants LSI Corporation and Agere System, Inc.'s Motion to Compel at 2 (Oct. 10, 2008) (relied upon by complainants in their brief) (an approximately two-page document filed on behalf of the aforementioned respondents, which refers to "its Austin fab" and "its Japanese fab."). Yet, those occurrences cannot be read to outweigh or obfuscate the meaning of Spansion's clear denials of importation and sale.

Although Spansion Inc. was under no obligation to contact complainants to tell them that they had named a non-importing respondent, Spansion did exactly that. Spansion Inc. argues that its counsel sent an email to complainants' counsel on February 19, 2009 (*i.e.,* more than five months before the hearing, and more than five weeks before the first of two depositions of Spansion Inc.) stating plainly that it is not a proper party to the investigation. Similar email exchanges occurred between counsel in April and May, 2009. *See* NP&S Br. at 5. Complainants have not denied such contacts from Spansion Inc. In fact, the pleadings record shows that complainants stated to Spansion Inc. that even though Spansion Inc. claimed that it was not a proper party in an email of February 19, 2009, it was too late for Spansion Inc. to stop providing discovery. *See* Compls. Mot. for Leave to File a Reply (Mot. No. 648-125), Ex. 8.

Spansion Inc.'s filings informed complainants from the beginning of this investigation (*i.e.*, since Spansion Inc.'s original response to the complaint in April of 2008) that Spansion Inc. denied key elements of complainants' case, particularly with respect to the issue of importation or sale. Moreover, there is documentation of explicit statements from Spansion Inc. to complainants' counsel, which were made months before the hearing, that Spansion Inc. took the position it was not involved in the importation or sale of accused products, and thus is not a proper party. In view of that record, there is no unfairness to complainants in treating Spansion Inc. and its subsidiary Spansion LLC as separate legal entities, and in declining to impute any importations or sales of Spansion LLC to Spansion Inc., its parent company.

Moreover, Spansion Inc. bears no burden to show that it did not import accused products, or to show that it is not responsible for the activities of a subsidiary (absent a showing by complainants that such is in fact the case). Rather, by naming Spansion Inc. as a respondent, complainants assumed the burden of showing that the importation or sale requirement of section 337 is satisfied with respect to Spansion Inc., as it would have to do with respect to any respondent. This complainants have not done.

Accordingly, it cannot be found that Spansion Inc. has violated section 337.[24]

III. General Principles of Patent Law

A. Claim Construction

Pursuant to the Commission's notice of investigation, this is a patent-based investigation. *See* 73 Fed. Reg. 29534 (2008). All of the unfair acts alleged by complainants are instances of

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[24] Inasmuch as the record contains evidence of manufacturing processes imputed to Spansion Inc., in the interest of completeness, those processes are analyzed, *infra*.

alleged infringement of the asserted '335 patent. Any finding of patent infringement or non-infringement requires a two-step analytical approach. First, the asserted patent claims must be construed as a matter of law to determine their proper scope.[25] Second, a factual determination must be made as to whether the properly construed claims read on the accused devices. *See Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 976 (Fed. Cir. 1995) (*en banc*), *aff'd*, 517 U.S. 370 (1996).

Claim construction begins with the language of the claims themselves. Claims should be given their ordinary and customary meaning as understood by a person of ordinary skill in the art, viewing the claim terms in the context of the entire patent. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312-13 (Fed. Cir. 2005), *cert. denied*, 546 U.S. 1170 (2006).[26]

In some instances, claim terms do not have particular meaning in a field of art, and claim construction involves little more than the application of the widely accepted meaning of commonly understood words. *Phillips*, 415 F.3d at 1314. "In such circumstances, general purpose dictionaries may be helpful." *Id.*

In many cases, claim terms have a specialized meaning and it is necessary to determine what a person of skill in the art would have understood the disputed claim language to mean.

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[25] Only those claim terms that are in controversy need to be construed, and only to the extent necessary to resolve the controversy. *Vanderlande Indus. Nederland BV v. Int'l Trade Comm.*, 366 F.3d 1311, 1323 (Fed. Cir. 2004); *Vivid Tech., Inc. v. American Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999).

[26] Factors that may be considered when determining the level of ordinary skill in the art include: "(1) the educational level of the inventor; (2) type of problems encountered in the art; (3) prior art solutions to those problems; (4) rapidity with which innovations are made; (5) sophistication of the technology; and (6) educational level of active workers in the field." *Environmental Designs, Ltd. v. Union Oil Co.*, 713 F.2d 693, 696 (Fed. Cir, 1983), *cert. denied*, 464 U.S. 1043 (1984).

"Because the meaning of a claim term as understood by persons of skill in the art is often not immediately apparent, and because patentees frequently use terms idiosyncratically, the court looks to 'those sources available to the public that show what a person of skill in the art would have understood disputed claim language to mean.'" *Id.* (quoting *Innova/Pure Water, Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1116 (Fed. Cir. 2004)). The "sources" identified by the *Phillips* Court include "the words of the claims themselves, the remainder of the specification, the prosecution history, and extrinsic evidence concerning relevant scientific principles, the meaning of technical terms, and the state of the art." *Id.*

In cases in which the meaning of a claim term is uncertain, the specification usually is the best guide to the meaning of the term. *Id.* at 1315. As a general rule, the particular examples or embodiments discussed in the specification are not to be read into the claims as limitations. *Markman*, 52 F.3d at 979. However, the specification is always highly relevant to the claim construction analysis, and is usually dispositive. *Id.* Moreover, "[t]he construction that stays true to the claim language and most naturally aligns with the patent's description of the invention will be, in the end, the correct construction." *Id.* at 1316.

Claims are not necessarily, and are not usually, limited in scope to the preferred embodiment. *RF Delaware, Inc. v. Pacific Keystone Techs., Inc.*, 326 F.3d 1255, 1263 (Fed. Cir. 2003); *Decisioning.com, Inc, v. Federated Dep't Stores, Inc.*, 527 F.3d 1300, 1314 (Fed. Cir. 2008) ("[The] description of a preferred embodiment, in the absence of a clear intention to limit claim scope, is an insufficient basis on which to narrow the claims.").

Furthermore, claim interpretations that exclude the preferred embodiment are "rarely, if ever, correct and require highly persuasive evidentiary support." *Vitronics Corp. v.*

Conceptronic, Inc., 90 F.3d 1576, 1583 (Fed. Cir. 1996). Such a conclusion can be mandated in rare instances by clear intrinsic evidence, such as unambiguous claim language or a clear disclaimer by the patentees during patent prosecution. *Elekta Instrument v. O.U.R. Sci. Int'l*, 214 F.3d 1302, 1308 (Fed. Cir. 2000); *Rheox, Inc. v. Entact, Inc.*, 276 F.3d 1319 (Fed. Cir. 2002).

If the intrinsic evidence does not establish the meaning of a claim, then extrinsic evidence may be considered. Extrinsic evidence consists of all evidence external to the patent and the prosecution history, including inventor testimony, expert testimony, and learned treatises. *Phillips*, 415 F.3d at 1317. Inventor testimony can be useful to shed light on the relevant art. In evaluating expert testimony, a court should discount any expert testimony that is clearly at odds with the claim construction mandated by the claims themselves, the written description, and the prosecution history, in other words, with the written record of the patent. *Id.* at 1318. Extrinsic evidence may be considered if a court deems it helpful in determining the true meaning of language used in the patent claims. *Id.*

B. Patent Infringement

Under 35 U.S.C. §271(a), direct infringement consists of making, using, offering to sell, or selling a patented invention without consent of the patent owner. The complainant in a section 337 investigation bears the burden of proving infringement of the asserted patent claims by a "preponderance of the evidence." *Certain Flooring Products*, Inv. No. 337-TA-443, Comm'n Notice of Final Determination of No Violation of Section 337, 2002 WL 448690 at *59, (Mar. 22, 2002); *Enercon GmbH v. Int'l Trade Comm'n,* 151 F.3d 1376 (Fed. Cir. 1998).

Each patent claim element or limitation is considered material and essential. *London v.*

Carson Pirie Scott & Co., 946 F.2d 1534, 1538 (Fed. Cir. 1991).[27] Literal infringement of a claim occurs when every limitation recited in the claim appears in the accused device, *i.e.,* when the properly construed claim reads on the accused device exactly. *Amhil Enters., Ltd. v. Wawa, Inc.*, 81 F.3d 1554, 1562 (Fed. Cir. 1996); *Southwall Tech. v. Cardinal IG Co.*, 54 F.3d 1570, 1575 (Fed Cir. 1995).

If the accused product does not literally infringe the patent claim, infringement might be found under the doctrine of equivalents.[28] Complainants have not, however, relied on the doctrine of equivalents in their brief.

C. Validity

One cannot be held liable for practicing an invalid patent claim. *See Pandrol USA, LP v. AirBoss Railway Prods., Inc.*, 320 F.3d 1354, 1365 (Fed. Cir. 2003). However, the claims of a patent are presumed to be valid. 35 U.S.C. § 282; *DMI Inc. v. Deere & Co.*, 802 F.2d 421 (Fed. Cir. 1986). A respondent that has raised patent invalidity as an affirmative defense must overcome the presumption by "clear and convincing" evidence of invalidity. *Checkpoint Systems, Inc. v. United States Int'l Trade Comm'n*, 54 F.3d 756, 761 (Fed. Cir. 1995).

In this investigation, respondents and the Staff argue that the asserted claims of the '335 patent are invalid due to anticipation and, or, obviousness.

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[27] Thus, if an accused device lacks a limitation of an independent claim, the device cannot infringe a dependent claim. *See Wahpeton Canvas Co. v. Frontier, Inc.,* 870 F.2d 1546, 1552 n.9 (Fed. Cir. 1989).

[28] The Supreme Court has described the essential inquiry of the doctrine of equivalents analysis in terms of whether the accused product or process contains elements identical or equivalent to each claimed element of the patented invention. *Warner-Jenkinson Co., Inc. v. Hilton Davis Chemical Co.*, 520 U.S. 17, 40 (1997).

1. Anticipation

Pursuant to 35 U.S.C. § 102, prior art anticipates a patent claim when a single piece of art discloses each and every limitation of the claimed invention. *See Schering Corp. v. Geneva Pharms.*, 339 F.3d 1373, 1377 (Fed. Cir. 2003); *C.R. Bard v. M3 Sys.*, 157 F.3d 1340, 1349 (Fed. Cir. 2000). The disclosure by an invalidating reference need not be express, but may anticipate by inherency where such inherency would be appreciated by one of ordinary skill in the art. *EMI Group North America, Inc. v. Cypress Semiconductor Corp.*, 268 F.3d 1342, 1350 (Fed. Cir. 2001). Anticipation does not require that the reference "teach" the subject matter of the patent. It is necessary only that the claims being challenged "read on" something that is disclosed in the reference. *Celeritas Techs., Ltd. v. Rockwell Int'l*, 150 F.3d 1354, 1361 (Fed. Cir. 1998).

Section 102 provides that, depending on the circumstances, a claimed invention may be anticipated by variety of prior art, including publications, earlier-sold products, and patents. *See* 35 U.S.C. § 102. In this investigation, respondents and the Staff rely on anticipation pursuant to 35 U.S.C. §§ 102(e)(2) and (g)(2). *See* RJoint Br. at 19; Staff Br. at 67-74.

Section 102(e) provides in pertinent part that a person shall be entitled to a patent unless, "the invention was described in . . . a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent . . . ." 35 U.S.C. § 102(e).

Section 102(g)(2) provides in pertinent part that a person shall be entitled to a patent unless, "before such person's invention thereof, the invention was made in this country by another inventor who had not abandoned, suppressed, or concealed it. In determining priority of invention under this subsection, there shall be considered not only the respective dates of conception and reduction to practice of the invention, but also the reasonable diligence of one

who was first to conceive and last to reduce to practice, from a time prior to conception by the other." 35 U.S.C. § 102(g)(2).

Inventor testimony concerning the facts surrounding a claim of derivation or priority of invention cannot, standing alone, rise to the level of clear and convincing evidence. *See Price v. Symsek*, 988 F.2d 1187, 1194 (Fed. Cir. 1993). Corroboration is required. *See Hahn v. Wong*, 892 F.2d 1028, 1032 (Fed. Cir. 1989).

Anticipation, like all forms of patent invalidity, must be established by clear and convincing evidence. *Glaxo Inc. v. Novopharm Ltd.*, 52 F.3d 1043, 1047 (Fed. Cir. 1995). Whether a patent claim is anticipated is a question of fact. *See Smith Kline Beecham Corp. v. Apotex Corp.* 403 F.3d 1331, 1343 (Fed. Cir. 2005).

2. Obviousness

Obviousness is grounded in 35 U.S.C. § 103, which provides, *inter alia*, that:

> A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

35 U.S.C. § 103(a).

An allegation of obviousness is evaluated under the so-called *Graham* factors: (1) the scope and content of the prior art; (2) the differences between the prior art and the claims at issue; (3) the level of ordinary skill in the art; and (4) objective evidence of nonobviousness, the so-called "secondary considerations," *e.g.*, commercial success, long felt need, and failure of

others. *See Graham v. John Deere Co.*, 383 U.S. 1, 13-17 (1966); *Dystar Textilfarben GmbH v. C.H. Patrick Co.*, 464 F.3d 1356, 1361 (Fed. Cir. 2006).[29]

"[E]vidence arising out of the so-called 'secondary considerations' must always when present be considered en route to a determination of obviousness." *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1538 (Fed. Cir. 1983). Secondary considerations, such as commercial success, will not always dislodge a determination of obviousness based on analysis of the prior art. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 426 (2007) (commercial success did not alter conclusion of obviousness).

"One of the ways in which a patent's subject matter can be proved obvious is by noting that there existed at the time of invention a known problem for which there was an obvious solution encompassed by the patent's claims." *KSR*, 550 U.S. at 419-20. "[A]ny need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed." *Id.*

Specific teachings, suggestions, or motivations to combine prior art may provide helpful insights into the state of the art at the time of the alleged invention. *Id.* at 420. Nevertheless, "an 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." *Id.* "Under the correct analysis, any need or problem known in the field of endeavor at the time of invention and addressed by the patent can

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[29] "Before answering *Graham's* 'content' inquiry, it must be known whether a patent or publication is in the prior art under 35 U.S.C. § 102 – a legal question." *Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1561, 1568 (Fed. Cir. 1987).

provide a reason for combining the elements in the manner claimed." *Id.* A "person of ordinary skill is also a person of ordinary creativity . . . ." *Id.* at 421.

The Federal Circuit has harmonized the *KSR* opinion with many prior circuit court opinions by holding that when a patent challenger contends that a patent is invalid for obviousness based on a combination of prior art references, "the burden falls on the patent challenger to show by clear and convincing evidence that a person of ordinary skill in the art would have had reason to attempt to make the composition or device, or carry out the claimed process, and would have had a reasonable expectation of success in doing so." *PharmaStem Therapeutics, Inc. v. ViaCell, Inc.*, 491 F.3d 1342, 1360 (Fed. Cir. 2007); *see KSR*, 550 U.S. at 416 (a combination of elements must do more than yield a predictable result; combining elements that work together in an unexpected and fruitful manner would not have been obvious).[30]

The ultimate determination of whether an invention would have been obvious is a legal conclusion based on underlying findings of fact. *In re Dembiczak*, 175 F.3d 994, 998 (Fed. Cir. 1999).

IV. Claim Construction

A. Background of the Patent

The patent-in-suit, *i.e.,* United States Patent No. 5,227,335, entitled "Tungsten Metallization," issued on July 13, 1993, to Lowell H. Holschwandner and Virendra V.S. Rana,

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[30] Further, "when the prior art teaches away from combining certain known elements, discovery of a successful means of combining them is more likely to be nonobvious." *KSR*, 550 U.S. at 416 (citing *United States v. Adams*, 383 U.S. 39, 52 (1966)).

and was assigned to AT&T Bell Laboratories.[31] *See* CX-1 ('335 patent). The '335 patent issued upon application no. 517,973, which was filed on April 30, 1990, as a continuation of serial no. 448,473 (Apr. 14, 1989), which in turn was a continuation of serial no. 929,043 (Nov. 10, 1986) (abandoned).

The claimed invention of the '335 patent "relates generally to metallizations used in semiconductor devices, and particularly to devices having such metallizations which use tungsten." CX-1 ('335 patent), col. 1, lines 10-12 (Technical Field). The "Background of the Invention" portion of the patent's specification contains a discussion of many problems encountered by manufacturers of semiconductors as the size of such devices decreased, and the opportunity that the use of tungsten presented for solving those problems. The specification provides:

> As the complexity of integrated circuits continues to increase, the dimensions of the components of the integrated circuits continue to decrease. Not only do device dimensions decrease, but the dimensions of the interconnects, that is, the lines and windows used to connect devices decrease. The windows are often termed vias by those skilled in the art. It is noted that the term window is sometimes applied only to the openings to the source, gate, or drain electrodes while the term via is applied to the opening between levels in multilevel metal structures. Vias may be conveniently visualized as cylinders which are filled with a metal so that, e.g., devices located on different metallization levels can be electrically connected. As it is difficult to completely fill a small diameter cylinder with sputtered Al, a metal commonly used in integrated circuit metallizations, a heating step is frequently used to cause an overlying dielectric layer to flow into a portion of the via. The heating step creates a more easily filled conical shape. The conical shape is, of course, truncated at the bottom so that an electrical

[31] Complainant Agere is a successor-in-interest of Lucent Technologies, Inc., which was a successor-in-interest of AT&T. *See* Waskiewicz Tr. 145. Today, Agere is a wholly-owned subsidiary of complainant LSI. *Id.*

contact can be formed to the underlying conductor.

As smaller devices typically use relatively shallower junction depths than do larger devices, the use of high temperature thermal processing to taper the vias by causing a dielectric material to flow eventually becomes impossible as the via dimensions decrease. Consequently, the vias that must be filled with metal not only have a high aspect ratio, that is, a high ratio of height to width, but their walls are also substantially vertical. Aluminum is difficult to deposit uniformly in such vias and poor step coverage results for conventional deposition techniques such as sputtering. This not only leads to possible discontinuities in the metal coverage but also makes planarization of the surface, frequently required for subsequent processing such as second level metallization, very difficult.

Al metallizations suffer from several drawbacks. Al has a low electromigration resistance and is susceptible to hillock formation. Also, because of its low melting point and tendency to react with Si, severe limitations are placed on the maximum temperature that can be used in post-metallization processing.

Accordingly, alternatives to aluminum have been sought for at least portions of the metallization. One commonly contemplated alternative metal is low pressure chemical vapor deposition (LPCVD) tungsten. LPCVD tungsten is a desirable alternative because it has a conformal step coverage. LPCVD tungsten also offers advantages for use as interconnects. Besides having conformal step coverage, it has high electromigration resistance, resistance to hillock formation and high temperature stability. Although many methods of depositing LPCVD tungsten have been proposed, they are all included within two generic categories which are conveniently termed selective and blanket.

Selective deposition typically relies upon the reaction of a gas, such as tungsten hexafluoride, with substrates, such as silicon, to leave tungsten on the silicon surface. Selective deposition is also possible on metals and silicides. A carrier gas, such as hydrogen, is commonly used. Tungsten hexafluoride does not react with other materials, such as a surrounding dielectric region of silicon dioxide, and in theory, tungsten is deposited only on the silicon surface. However, selective deposition is difficult to obtain in practice in the thicknesses which are needed to fill deep vias

because of the loss of selectivity. This probably arises because some tungsten hexafluoride reacts with the hydrogen carrier gas thus forming HF as well as nucleating W. HF reacts with and etches the SiO_2, which is obviously an undesirable result.

With blanket deposition, tungsten is deposited over the entire surface and then etched back so that tungsten ideally remains only in the vias or as, for example, interconnects. While this process is conceptually simple, tungsten does not adhere well to silicon dioxide and practical problems arise. For example, after the deposition has been completed, the tungsten film may simply peel off the silicon dioxide which is also an obviously undesirable result.

The use of a glue layer has been proposed to overcome the adhesion problem just discussed. A glue layer is a layer of material deposited prior to the tungsten and which has good adhesion both to the underlying dielectric layer and to the tungsten. Several substances have been proposed for glue layers. For example, the use of both elemental metals, such as Ti, and metallic silicides, such as WSi_2, has been proposed. See, for example, Comparison of Two Contact Plug Techniques for Use with Planarized Oxide and A Contact Filling Process with CVD-Tungsten for Multilevel Metallization Systems, Proceedings of the V-MIC Conference, pp. 403-410, and pp. 443-449, Jun. 9-10, 1986, respectively. A common feature of the approaches adopted by these references is the use of relatively thick glue layers. Thicknesses of approximately 100 nm or more were used. It should be noted that the thickness of the Ti layer in the former reference is not explicitly given. However, FIG. **3** illustrates a plug after etching has been completed. It is evident that there is severe overetching of the glue layer which would not be visible if a thin glue layer had been used.

However, the use of a thick glue layer is undesirable because during the etch back step, severe undercutting of the tungsten layer occurs if, as is often the case, the glue layer etches more rapidly than does the tungsten. The undercutting may make subsequent processing very difficult. For example, voids may be left in the oxide and in subsequent metallizations after metal deposition.

Of course, the glue layer material should be electrically conducting. Only metals or silicides have been proposed as glue layer materials because of the rapid film growth in these materials.

> However, the use of some metals, such as aluminum, has not been seriously considered because a thick aluminum layer may cause spiking due to its rapid diffusion into the underlying material. Other conducting compounds have not yet been proposed as glue layers.

CX-1 ('355 patent), col. 1, line 15 - col. 2, line 68.

The specification describes the inventors' solution, and claimed invention, as follows:

> We have found that tungsten can be blanket deposited with good adhesion over a dielectric covering a portion of a silicon surface by first depositing a film comprising either Al or a conducting nitride such as TiN as a glue layer. The glue layer film may be deposited, through openings in the dielectric, directly on the silicon or on a conducting material, such as a silicide, overlying the silicon. Of course, the glue layer is also deposited on the dielectric. Both TiN and Al films provide good adhesion down to thicknesses as small as approximately 3 nm. The minimum thickness is determined primarily by the requirement that the entire wafer surface be covered adequately. The thinner glue layers are generally preferred as they minimize any problems that might be caused by either spiking of deposited metal or undercutting during reactive sputter etching (RSE). However, if interaction of W with the substrate is to be prevented, a thicker layer of TiN may be used. To prevent spiking, the Al layer is typically less than 25 nm thick although the maximum thickness will be determined by device design and processing parameters. Uses other than plugs are contemplated. In particular, interconnects and gate structures are also contemplated.

Id., col. 3, lines 3-26 ('335 patent) (Summary of the Invention).

B. The Level of Ordinary Skill in the Art

The parties agree that the expert witnesses provided similar descriptions of the level of ordinary skill in the relevant art. None of the parties' arguments concerning claim construction, infringement, or validity turns on any difference in the level of ordinary skill proposed by the experts. *See* Compls. Br. at 13 n.6; RJoint Br. at 43; Staff Br. at 14-15.

It is found that one of ordinary skill in the art relevant to the '335 patent would have a

bachelor of science degree in a field relevant to the manufacture of semiconductors (such as physics, chemistry, engineering or material science), and would also have approximately three years of experience working in the semiconductor industry. *See* Ho Tr. 285; Thomas Tr. 1630-1631; Glew Tr. 2071.

C. The Asserted Claims and the Disputed Claim Terms

Claims 1, 3, and 4 of the '335 patent are asserted by complainants. They provide as follows:

> **1.** A method of fabricating an integrated circuit comprising the steps of:
>
> patterning a dielectric layer to form holes which expose the underlying material, said exposed underlying material comprises an electrically conducting material;
>
> depositing a glue layer covering said dielectric and said exposed underlying material;
>
> depositing a tungsten layer by chemical vapor deposition, said tungsten layer covering said glue layer on said dielectric and said exposed material;
>
> CHARACTERIZED IN THAT said glue layer comprises at least one member selected from the group consisting of conducting nitrides.
>
> * * *
>
> **3.** A method as recited in claim **1** in which said material comprises a metallic silicide.
>
> **4.** A method as recited in claim **1** further comprising etching said tungsten and said glue layer to form a planar surface of said dielectric and said tungsten in said hole, said tungsten being etched before said glue layer.

CX-1 ('335 patent), col. 5, line 22 - col. 6, line 10.

Reproduced below are two Figures from the '335 patent. Figure 1 "is a schematic representation of an exemplary metallization according to this invention." CX-1 ('355 patent), col. 3, lines 29-30. Figure 2 "is a schematic representation of a via filled with tungsten after the etching step has been completed." *Id.*, col. 3, lines 31-32. "For reasons of clarity, the elements of the devices depicted are not drawn to scale." *Id.* at col. 3, lines 36-37.

According to the specification:

> Our invention will be described by reference to FIG. **1** which is a schematic representation of a tungsten metallization according to this invention. Depicted are silicon layer **1**, dielectric region **3**, glue layer **5** and tungsten metallization **7**. As can be seen, the glue layer and metallization extend into a via **9**. The glue layer covers the interior surface of the via as well as the underlying silicon layer **1**. The glue layer also covers the dielectric region **3**. It will be readily appreciated that the individual components of the integrated circuit are not depicted for reasons of clarity.

Id., col. 3, lines 40-50.

FIG. 1

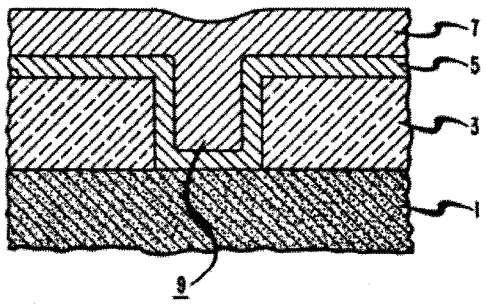
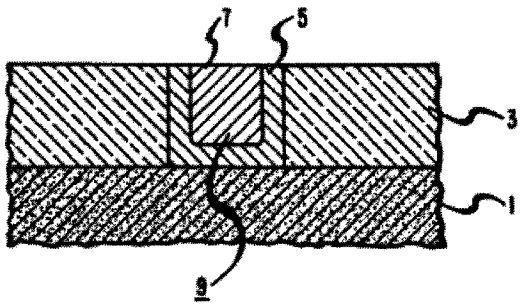


FIG. 2



CX-1 ('355 patent), Figs. 1 & 2 (Sheet 1 of 2).

The meanings of several claim terms are in dispute. Respondents have addressed claim construction in their joint brief and joint reply, and then again in each of the individual briefs and replies. *See* Tr. 2059. In some cases, a claim construction argument in an individual brief is unique to a particular respondent; in others, it is overlapping and repetitious. *See* IDT Br. at 14-15; Compls. Reply at 28.

All claim construction arguments made on behalf of all parties in all posthearing filings have considered. The following terms relating to independent claim 1, and to a lesser extent to its dependent claim 4, are construed below.

1. "depositing"

Complainants argue that the term "depositing" in claim 1 means: "Forming a layer on an underlying surface by physical vapor deposition (including sputtering) or chemical vapor deposition or both, as opposed to by a surface chemical reaction such as oxidation or nitridation."

Compls. Br. at 15.

Respondents argue that "depositing" means: "Applying a material to a substrate through the use of chemical, vapor, electrical, vacuum, or other processes." RJoint Br. at 4 (quoting Thomas Tr. 1594). This proposed construction is based on the definition of "deposition" in Graf's *Modern Dictionary of Electronics*. *See Id.* at 15; RX-21 (dictionary) at 185 ("[T]he application of a material to a substrate through the use of chemical, vapor, electrical, vacuum, or other processes.").

The Staff supports the definition of "depositing" proposed at the hearing by respondents' expert, Dr. Thomas, and thus proposes the same definition as respondents. *See* Staff Br. at 18.

Complainants' proposed construction of the term "depositing" is remarkable in that it not only states what should be included, but expressly excludes "oxidation or nitridization" from the definition. The Staff argues that, in fact, the crux of the dispute among the private parties is whether or not the term "depositing" can include nitridization. *See* Staff Br. at 15. In basic terms, nitridization is a process by which nitrogen is introduced into a surface material by nitrogen gas or a nitrogen-containing gas (such as one containing ammonia). *See* Thomas Tr. 1618-1619.[32] As discussed below, it is found that a process that includes nitridization can also satisfy the "depositing" limitation of claim 1.

A major thrust of complainants' argument is that there is a distinction between "depositing" or "directly depositing" a film or layer, and merely "forming" a layer by "conversion" or "converting" materials on an existing surface. In fact, complainants' reply

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[32] Nitridization is also called nitridation. Thomas Tr. 1618. It is a technique that was discussed during the tutorial as one of the basic ways of making a film or layer of titanium nitride. *See* Section I.B (Technological Background).

contains a particularly detailed discussion of this argument with logic diagrams to illustrate complainants' point, along with quotations from patents and other art that appear to distinguish between deposition techniques and other techniques. *See* Compls. Reply at 3-10. That distinction, in principle, is well-taken.

Yet, complainants' arguments do not effectively address the fact that in the case of nitridization, the existing material does not merely undergo a conversion (for example, by simple heating). Rather, a new element, namely nitrogen, is introduced onto and then into the surface of other materials in order to create a new layer. The question of whether or not the "depositing" limitation of claim 1 can include nitridization dominates the parties' briefing concerning this disputed claim term.

As in any claim construction analysis, the best place to start is in the patent itself, with the claims and the rest of the specification. The claims do not contain any express limitation on the method of deposition. Indeed, no party makes any argument to the contrary. The specification, however, provides insight into the claim term "depositing." In the Background of the Invention portion of the specification, quoted above, the patent uses terms such as "deposition" and "deposited" in general terms. In fact, it does so with respect to the creation of a glue layer, which is the ultimate goal of the deposition, and is a matter of dispute among the parties. CX-1 ('355 patent), col. 1, line 67 - col 2, line 2; col. 2, lines 28-33 ("A glue layer is a layer of material deposited prior to the tungsten and which has good adhesion both to the underlying dielectric layer and to the tungsten."). Moreover, with specific reference to the claimed invention, the specification later states that: "The glue layer is expediently deposited by well known techniques such as sputtering." CX-1 ('335 patent), col. 3, lines 66-67 (Detailed Description). Thus,

sputtering must be within the scope of the claimed invention, but so are other "well known techniques." In other words, the '335 patent is not a patent on a deposition technique itself. Rather, the patent permits any well known "depositing" technique to used.

During prosecution of the '335 patent, the applicants (through counsel) made several statements that each side in this investigation has interpreted to try to show that one of ordinary skill, reading the prosecution history, would find that nitridization is, or is not, included in the term "depositing." *See* Compls. Reply at 10-11 (quoting RX-242 (prosecution history) at 128487); RJoint Br. at 11 (quoting RX-242 at 128488); Staff Br. at 16 (quoting RX-242 at 128500).

The fact is that all sides have found statements to support their positions because while terms relating to "depositing," or "deposition," are abundant in the prosecution history, the questions presented in this investigation were never squarely addressed by the applicants or the examiner. It is, however, the case that in addressing a rejection based on a paper by Paul Rosser *et al.* (RX-14), the applicants stated that in the Rosser reference, the "TiN *is deposited* between the metallization, *e.g.*, Al or a silicide, and the silicon substrate." RX-242 at LSI-ITC0128500 (emphasis added). The Rosser article concerns the use of a titanium nitride layer that is formed through the nitridization of a pre-existing layer of titanium silicide. RX-14 (Rosser) at 4; Thomas Tr. 1616-1617. Thus, in this instance, the applicants used the term "deposited" in reference to a nitridization process.

Complainants' and respondents' briefs (and their expert witnesses during the hearing) have also drawn upon extrinsic evidence to try to show what one of ordinary skill would think when reading the term "depositing" in the '335 patent. The examples that the parties have

selected cut both ways. None of the authors of this extrinsic evidence faced the same claim construction question presented in this investigation with respect to claim 1, and their work must be read in context. Further, the extrinsic evidence shows that some deposition techniques directly place material on a surface, where before there was no additional film or layer; whereas nitridization builds upon material that is already present. Yet, that fact does not necessarily mean that nitridization fails to be a form of deposition.

For example, in United States Patent No. 5,760,475 (RX-3), relied upon by complainants, the patentees state that: "Two general techniques will be described for forming this layer. The first involves annealing a titanium layer in a nitride forming ambient, so as to nitridize at least the top surface of the titanium layer. The second involves directly depositing a titanium nitride layer." RX-3, col. 4, lines 48-53. Thus, a distinction is drawn between nitridization and directly depositing a layer, but both are referred to as "forming" the layer; and it does not answer the question of whether nitridization to one of ordinary skill is a form of deposition. While the Van Zant text relied upon by complainants' expert, Dr. Ho, draws a distinction between deposition and growth processes such as nitridization and oxidation, the glossary definition of deposition in the same text appears to cover such growth films. Ho Tr. 326, 505; CX-227 (Van Zant) at 89; RX-1025 (Van Zant) at 505.

Furthermore, many definitions and descriptions of deposition in texts presented through Drs. Ho and Thomas (respondents' expert) include nitridization as a form of depositing. *See* RX-1020 (Plummer reference) ("another method to deposit TiN films is first by sputtering Ti on the wafers and then annealing them in nitrogen or ammonia ambient above 600 degrees centigrade."); Ho Tr. 417 (discussing text); RX-23 (Kodas and Hampden-Smith reference)

("Titanium nitride films can be deposited by (1) thermal nitridization of titanium films in nitrogen or ammonia ambients . . .); Ho Tr. 514 (discussing text); RX-22 (Lee reference) ("Other deposition reactions involve reaction . . . of the underlying substrate itself. Examples of such ***deposition processes include thermal oxidation, nitridation***, or silicidation.") (emphasis added); Thomas Tr. 1599 (discussing text).

In summary, as stated in the specification, the term "depositing" in claim 1 must include "well known techniques." Nitridization is, and was, a well known technique. Further, the evidence shows that it can be used as a deposition process. Thus, nitridization is not excluded from the "depositing" limitation of claim 1 of the '335 patent.

2. "glue layer covering"

Complainants argue that "glue layer" means "one or more materials that promotes adhesion between an underlying dielectric region and a subsequently-deposited tungsten layer." They argue that "covering" means "lying or spreading over." Furthermore, complainants submit that the glue layer need not have direct contact with the material it is adhering, *e.g.,* it need not have direct contact with the dielectric. *See* Compls. Br. at 36-46.

Respondents' joint arguments concerning these claim terms are intertwined with their noninfringement arguments. Nevertheless, it is clear that they argue that the glue layer must promote adhesion to the underlying exposed material, and further that "glue layer" and "covering" are limited to a conducting nitride contacting the dielectric. *See* RJoint Br. at 51-63. However, in their reply, they state that for the purposes of the invalidity analysis, they "accepted Complainants' definition of the term *covering*." Resps. Reply at 4 (italics in original).

With respect to the "glue layer," the Staff supports the definition of complainants' expert,

Dr. Ho, (*i.e.,* one or more materials that promotes adhesion between an underlying dielectric region and a subsequently deposited tungsten layer) with the understanding that the word "promotes" connotes improvement. *See* Staff Br. at 18-24.

The Staff also argues that a glue layer must adhere to both the dielectric and the tungsten, and thus must be in direct contact with both. Consequently, in that regard, the Staff supports the proposal of respondents' expert, Dr. Glew (*i.e.,* "lying over and directly contacting"), rather than that of complainants and their expert, Dr. Ho, (*i.e.,* "lying or spreading over") because complainants' proposed construction could "lead to the odd result that a layer contacting neither the tungsten nor the dielectric (the two substances between which the patent intends to promote adhesion) could still constitute the 'glue layer' of claim 1." Staff Br. at 24-25.

With respect to the glue layer, the specification of the '335 patent plainly states that: "A glue layer is a layer of material deposited prior to the tungsten and which has good adhesion both to the underlying dielectric layer and to the tungsten." CX-1 ('355 patent), col. 2, lines 30-33. The applicants made a statement consistent with this definition when differentiating their claimed invention from the prior art. *See* CX-2 at LSI-ITC0128464 ("There is nothing in either reference that suggests that conducting nitrides promote adhesion between tungsten and a dielectric."). Consequently, the glue layer must promote good adhesion both to the underlying dielectric and to the tungsten.

During the hearing, respondents' expert (Dr. Glew) testified that the applicants' remarks should be read to mean that the glue layer must also improve adhesion between the tungsten and any exposed underlying material. *See* Glew Tr. 2086-2088. This argument is also detailed in respondents' brief with respect to noninfringement as they argue that adhesion must be promoted

"to not only the dielectric, but also to the exposed underlying materials at the bottom of the contact hole." *See* RJoint Br. at 51-55.

There is, however, nothing in the claim language or the specification to require such a limitation. As quoted and discussed above, the specification states that the glue layer must have good adhesion both to the underlying dielectric layer and to the tungsten, not to the bottom of the contact holes or any other exposed underlying material. In addition, the remarks of the applicants to the examiner are consistent with the other intrinsic evidence, and in this regard are insufficient to disclaim any scope of the claimed invention. Indeed, in a sentence that appears to be omitted from respondents' brief, the applicants, when distinguishing their claimed invention over the prior art stated that they found that "conducting nitrides, such as titanium nitride, form good glue layers because they have good adhesive characteristics with respect to dielectrics." RX-821 (prosecution history) at 107. Adhesion to the underlying material played no role in the inventor's comments.

The plain language of the claim also shows that the glue layer may be comprised of more than one layer (or sublayer). Claim 1 expressly provides that the "glue layer comprises at least one member selected from the group consisting of conducting nitrides." *See* CX-1 ('355 patent), col. 6, line 4-6. Indeed, it is well established that "comprising" is a term of art which, when used in a patent claim, means "including." *See Amgen Inc. v. Hoechst Marion Roussel, Inc.*, 314 F.3d 1313, 1344-45 (Fed. Cir. 2003).

However, there is no requirement in the claim or the specification that the nitride contact the dielectric (*e.g.,* the titanium nitride in the glue layer). Respondents cite to portions of the prosecution history to support their argument that the applicants so limited their claimed

invention in order to distinguish it from the prior art. *See* RJoint Br. at 61. During prosecution, the examiner stated that Wittmer (RX-40) (which is primarily concerned with the use of barrier layers rather than glues) taught TiN as a glue layer composed of a conducting nitride. In responding to the examiner, the applicants did refer to "the presence of TiN on the dielectric," but it appears that they used TiN to refer to the claimed glue layer itself rather than the nitride. It is not clear they meant to say that titanium nitride itself must actually contact the dielectric. *See* CX-2 (prosecution history) at LSI-ITC0128434 (discussing the Wittmer reference (RX-40)). The applicants statements are not a clear disavowal of subject matter. *See Omega Eng'g v. Raytek Corp.*, 334 F.3d 1314, 1324 (Fed. Cir. 2003) (disavowal in prosecution history must be unequivocal and not open to other interpretations).

With respect to the "covering" aspect of the glue layer, as indicated above, the specification states that a glue layer "is a layer of material deposited prior to the tungsten and which has good adhesion both to the underlying dielectric layer and to the tungsten." In order to have good adhesion to both the underlying dielectric layer and the tungsten (*i.e.*, to adhere to them, which is the very nature of a glue) the glue layer must come into contact with them.

3. "exposed underlying material"

Based upon the plain language of claim 1, there is no dispute that the glue layer must cover both the dielectric and the exposed underlying material. *See* Thompson Tr. 941-942. However, a question is raised by IDT's individual brief as to whether or not the "exposed underlying material" is limited to silicon or metallic silicides on the substrate. *See* IDT Br. at 14-16. Both complainants and the Staff argue that it is not. *See* Compls. Br. at 28; Staff Reply at 12-13.

There is nothing in the plain language of claim 1 itself to limit the term "exposed underlying material" in the manner proposed by IDT. In fact, claim 1 provides a meaning for the term where it states that "said exposed underlying material comprises an electrically conducting material." CX-1 ('355 patent), col. 5, lines 26-28. Further, the specification discloses the fact that a glue layer as disclosed in the specification is "particularly suited for upper levels in multilevel metallization schemes." CX-1 ('355patent), col. 5, lines 16-17. Such as statement is not consistent with IDT's construction. Thus, it is found that the "exposed underlying material" is not limited in the manner proposed by IDT.

4. "etching"

The term "etching," which appears in claim 4, is not put in issue in most of the parties' briefs. However, IDT and Grace argue in their individual briefs that the term should not be construed to include chemical mechanical polishing (or CMP). *See* IDT Br. at 16-17; Grace Br. at 9.

IDT and Grace center their arguments on a short exchange during the cross-examination of complainants' expert, Dr. Thompson. Dr. Thompson testified that many process engineers would distinguish between a CMP step and a dry etch step. His testimony was not, however, that CMP cannot be used to etch. *See* Thompson Tr. 1094. On the other hand, although the cross-examination of respondents' expert, Dr. Thomas, was also brief on this point, Dr. Thomas testified that it was his opinion that term "etching" includes chemical removal or physical removal, and further admitted that CMP is a form of etching. *See* Thomas Tr. 1774-1775.

Accordingly, it is not found that CMP is excluded as a type of "etching" as required by claim 4.

V. Infringement Determination

The complainants assert that the respondents in this investigation infringe the '335 patent as follows: (1) IDT infringes claims 1, 3, and 4 (the [ ] process infringes claims 1 and 3 & the [ ] process infringes claims 1, 3, and 4); (2) Grace infringes claims 1, 3, and 4 [ ] (3) Nanya infringes claims 1 and 4 (the [ ] process, the [ ] process, & the [ ] process each infringe claims 1 and 4); (4) Powerchip infringes claim 1 (the [ ] process, the [ ] process, & the [ ] process each infringe claim 1); (5) Spansion Inc. infringes claims 1, 3, and 4 (the [ ] & the [ ] process infringe claims 1, 3, and 4); (6) Jazz infringes claim 1 (the [ ] process, the [ ] process, & the [ ] process each infringe claim 1); and (7) Tower infringes claim 1 (the [ ] process, the [ ] process, & the [ ] process each infringe claim 1). *See* Order No. 54; Compls. Br. at 89-110.

In some respects, the Staff employs a different analysis than that of complainants. This is especially the case with respect to the "depositing" limitation of claim 1, due to the fact that the Staff proposes a claim construction that differs from that proposed by complainants. *See* Staff Br. at 31 n.7 (noting that the Staff's proposed construction is, in fact, broader than that of complainants). Nonetheless, the Staff argues that each accused process meets every element of each claim asserted against it.[33] *See* Staff Br. at 30-64.

IDT denies all of complainants' infringement allegations directed toward its processes.

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[33] Presumably, the Staff does not use the word "infringe" with respect to the accused processes because, as discussed in section VI, *infra,* the Staff argues that the asserted claims are invalid.

See IDT Br. at 17-20.

Grace denies all of complainants' infringement allegations directed toward its processes. *See* Grace Br. at 10-16.[34]

Nanya, Powerchip, and Spansion Inc. filed a joint brief in which they argue that their accused processes do not practice claim 1 under complainants' proposed construction of the "depositing" limitation. NP&S Br. at 7-10.[35] Additional grounds for non-infringement of claim 1, based on their proposed construction of "glue layer" and "covering," are set forth respect to certain Nanya and Spansion processes. *See Id.* at 10-11. Additional arguments are set forth with respect to the Spansion process and claim 3, as well as certain Nanya and Spansion processes and claim 4. *See Id.* at 11-14.

Jazz denies all of complainants' infringement allegations directed toward its processes. *See* Jazz Br. at 7-11.

Tower denies all of complainants' infringement allegations directed toward its processes. *See* Tower Br. at 7-11.

For ease of reference, many of the parties' arguments use a letter or number to refer to

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[34] Grace sets forth a brief "license defense," arguing that a substantial portion of its wafers are manufactured for customers that are licensed under the '335 patent. Accordingly, it is argued, any remedy issued by the Commission should expressly exclude such products from its scope. *See* Grace Br. at cover sheet, 16-17. That question will be addressed in the recommended determination on remedy that will issue separately, pursuant to 19 C.F.R. § 210.42(a)(1)(ii).

[35] Spansion Inc. refers to its accused processes as "Spansion LLC processes." *See* NP&S Br. at 7-14. Indeed, as discussed, *supra,* in section II.C., it has not been established that respondent Spansion Inc. has sold for importation, imported or sold any accused product, and therefore is not found to be in violation of section 337. Nor was it established that respondent Spansion Inc. manufactures any accused product. The analysis of so-called "Spansion" processes and the products made thereby is performed in the alternative.

particular elements of claim 1 (not including the preamble). Similarly, herein below, the first element of claim 1 ("patterning a dielectric layer . . .") is referred to as element [a]; the second element ("depositing a glue layer . . .") is referred to as element [b]; the third element ("depositing a tungsten layer . . .") is referred to as element [c]; and the final element ("CHARACTERIZED IN THAT . . .") is referred to as element [d]. Additionally, when presenting arguments relating to locations on devices made according to the accused processes, the parties often refer to "contact 1" and "contact 2," or "contact 1 level" and "contact 2 level," as did the expert witnesses during the hearing. A similar practice is adopted below.

A. IDT

IDT's noninfringement defense turns largely on disputed claim constructions proposed by respondents in their joint brief, and by IDT in its individual brief.[36] Those proposed constructions were rejected on points that are key to IDT's arguments. Such is the case with respect to many aspects of the definition of "glue layer," as well as with respect to the terms "exposed underlying material," and "etching."

In fact, the record shows by at least a preponderance of the evidence that the accused IDT processes practice the asserted claims. Specific, element-by-element findings are made below.

1. IDT [ ]

The evidence shows that IDT Process [ ] meets every element of claims 1, 3,

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[36] IDT states that '[i]n terms of the evidence offered at the hearing, there was no disagreement regarding operation steps and recipes used in ITD's accused processes [ ] IDT Br. at 17. Similarly, "there was agreement among the parties' experts with respect to the operation steps and recipes employed at [ ]." *Id.* at 19.

and 4.[37]

a. Claim 1

Element [a] (Patterning a Dielectric Layer)

The parties have stipulated that all IDT products accused of infringement meet element [a] of claim 1. CX-2337C.

Element [b] (Depositing a Glue layer)

[ ]

The evidence shows that IDT [ ] meets element [b] of claim 1 [ ]. *See* Thompson Tr. 741-749 ( );[38] CX-154C, Tab 3, Pages IDT002554, 2600, 2602 ( ).

[ ]

The evidence shows that IDT Process [ ] meets element [b] of claim 1 [ ] *See* Thompson Tr. 741-749 (deposition of TiN), 751-753; CX-154C, Tab 3, Page IDT002557, 2602 [ ]

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[37] The parties have stipulated that the IDT processes set forth in CX-2337C are the same as [ ] for purposes of the infringement analysis with respect to claims 1, 3, and 4.

[38] The infringement testimony of complainants' expert Dr. Thompson as to all respondents is illustrated by a series of documentary exhibits with corresponding demonstratives. *See* CX-150 (Grace); CX-151C (Grace); CX-153C (IDT); CX-154C (IDT); CX-155C (Jazz); CX-156C (Jazz); CX-157C (Jazz); CX-164C (Nanya); CX-165C (Nanya); CX-166 (Nanya); CX-171C (Powerchip); CX-172C (Powerchip); CX-173C (Powerchip); CX-182C (Spansion); CX-183C (Spansion); CX-184C (Tower); CX-185C (Tower); CDX-150C (Grace); CDX-151C (Grace); CDX-153C (IDT); CDX-154C (IDT); CDX-155C (Jazz); CDX-156C (Jazz); CDX-157C (Jazz) CDX-164 (Nanya); CDX-165 (Nanya); CDX-166 (Nanya); CDX-171C (Powerchip); CDX-172C (Powerchip); CDX-173C (Powerchip); CDX-182C (Spansion); CDX-183C (Spansion); CDX-184C (Tower); CDX-185C (Tower).

Element [c] (Depositing a Tungsten Layer)

[ ]

The parties have stipulated that all of the IDT products accused of infringement meet element [c] of claim 1. CX-2337.

Element [d] (Characterized in That Glue Layer Comprises at Least One Conducting Nitride)

[ ]

The evidence shows that IDT [ ] meets element [d] of claim 1 [ ] *See* Thompson Tr. 744-748, 639-40; CX-154C, Tab 3, Pages IDT002579, 2600, 2602.

[ ]

The evidence shows that IDT [ ] meets element [d] of claim 1 [.] *See* Thompson Tr. 744-749, 751-753; CX-154C, Tab 3, Pages IDT002557, 2602 [ ]

b. Claim 3

The evidence shows that IDT [ ] meets the "said material comprises a metallic silicide" limitation of claim 3 [ ] *See* Thompson Tr. 749-750 (tungsten silicide at the gate region); CX-154C, Tab 2, Page IDT095565 (Step 2125, Tungsten Silicide).

c. Claim 4

[ ]

The evidence shows that IDT [ ] meets the "comprising etching said tungsten and said glue layer to form a planar surface of said dielectric and said tungsten in said hole, said tungsten being etched before said glue layer" limitation of claim 4 at [ ] *See*

Thompson Tr. 749-750; CX-154C, Tab 2, Page IDT095568 [ ]

[ ]

The evidence shows that IDT [ ] meets the "comprising etching said tungsten and said glue layer to form a planar surface of said dielectric and said tungsten in said hole, said tungsten being etched before said glue layer" limitation of claim 4 at [ ] *See* Thompson Tr. 749-750; CX-182C, Tab 2, Page IDT095568 [.]

2. IDT [ ]

The evidence shows that IDT [ ] meets every element of claims 1, and 3.[39]

a. Claim 1

Element [a] (Patterning a Dielectric Layer)

The parties have stipulated that all IDT products accused of infringement meet element [a] of claim 1. CX-233C.

Element [b] (Depositing a Glue Layer)

IDT argues that in its processes, [

.] *See* IDT Br. at 17-18; Glew Tr. 2128, 2130. During the hearing, IDT's expert offered no evidence that [

.] Rather, he based his opinion primarily on his experience working with tungsten. *See* Glew Tr. 2167.

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[39] The parties have stipulated that the IDT processes set forth in CX-2337C are the same [ ] for purposes of the infringement analysis with respect to claims 1 and 3.

During cross-examination, it became apparent that the article that Dr. Glew relied upon at the hearing to support his theory teaches [ ] but it does not describe a [ ] In fact, the author refers in his paper to the [ ] as a tungsten layer, with no mention at all of [ ] Similarly, one of Dr. Glew's own patents, which he also used to support his theory about the IDT process, [ ] but not [ ] The patent discloses [.] *See* Glew Tr. 2168-2171. Moreover, an IDT process engineer testified that [ ] On cross-examination, Dr. Glew's testimony showed that he could not be sure whether [ ] *See* Glew Tr. 2179-2180; *see also* Glew Tr. 2119-2120 (complex structure with numerous parameters).[40]

While it is ultimately complainants' burden to show infringement by respondents' accused processes, IDT failed to raise doubts about [ ] as a result of its accused processes.

[ ]

The evidence shows that IDT [ ] meets element [b] of claim 1 at [ ] *See* Thompson Tr. 761-763 [ ] CX-153C, Tab 3, Pages IDT002560 [ ]

---

[40] The respondents criticize complainants for not conducting tests to determine whether the glue layers in products made by accused processes actually promote adhesion. *See* RJoint Br. at 57. Yet, it is undisputed that without a glue layer, CVD tungsten adheres poorly to a dielectric. *See* Thompson Tr. 1184; CX-1 ('335 patent), col. 2, lines 22-25. There has been no suggestion or evidence presented by any party to the effect that the glue layers in respondents' products fail to promote adhesion.

[ ]

The evidence shows that IDT [ ] meets element [b] of claim 1 [ ] *See* Thompson Tr. 763-764 [ ] CX-153C, Tab 3, Page IDT002555 [ ]

Element [c] (Depositing a Tungsten Layer)

[ ]

The evidence shows that IDT [ ] meets element [c] of claim 1 [ ]. *See* Thompson Tr. 761-762; CX-153C, Tab 3, Pages IDT096069 (Step 6280).

[ ]

The parties have stipulated that all of the IDT products accused of infringement use the same tungsten CVD deposition recipe to meet the "dielectric and said exposed material" limitation of claim 1. CX-233C. The evidence shows that IDT [ ] meets element [c] of claim 1 [ ] *See* Thompson Tr. 764; CX-153C, Tab 3, Pages IDT096069]

Element [d] (Characterized in That Glue Layer Comprises at Least One Conducting Nitride)

[ ]

The evidence shows that IDT [ ] meets element [d] of claim 1 [ ] *See* Thompson Tr. 761-763; CX-153C, Tab 3, Pages IDT002560 [ ]

[ ]

The evidence shows that IDT [ ] meets element [d] of claim 1 [ ]

See Thompson Tr. 763-764; CX-153C, Tab 3, Page IDT002555 [

]

b. Claim 3

The evidence shows that IDT [ ] meets the "said material comprises a metallic silicide" limitation of claim 3 [ ] *See* Thompson Tr. 764-765 [

] CX-153C, Tab 2, Page IDT09066 (Step 2129, Tungsten Silicide).

B. Grace

Grace's noninfringement arguments hinge primarily on its proposed construction of "glue layer" and "etching," which are rejected above in the section of claim construction. In particular, it was found that there is no requirement that the nitride of the glue layer contact the dielectric. Further, it was not found that CMP is excluded as a type of "etching," required by claim 4. Grace also bases its arguments on complainants' proposed construction of "depositing," which was rejected in favor of a construction that may include a nitridization process.

1. Grace [ ]

As demonstrated below, the evidence shows that Grace Process [

] meets every element of claims 1, 3, and 4.[41]

a. Claim 1

Element [a] (Patterning a Dielectric Layer)

The parties have stipulated that all Grace products accused of infringement meet element 1 of claim 1. CX-2333C.

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[41] The parties have stipulated that the Grace processes set forth in CX-2333C are the same as [ ] for purposes of the infringement analysis with respect to claims 1, 3, and 4.

Element [b] (Depositing a Glue Layer)

[ ]

The evidence shows that Grace Process [ ] meets element [b] of claim 1 at [ ] *See* Thompson Tr. 771-772, 796-797; CX-150C, Tab 2,]

[ ]

The evidence shows that Grace Process [ ] meets element [b] of claim 1 at [.] *See* Thompson Tr. 797-798 [ ] Fair Tr. 2035-2039 [ ] CX-150C, Tab 2, [ ].[42]

Element [c] (Depositing a Tungsten Layer)

The parties have stipulated that a layer of tungsten is formed by chemical vapor deposition over the titanium nitride film. CX-2333C.

Element [d] (Characterized in That Glue Layer Comprises at Least One Conducting Nitride)

[ ]

The evidence shows that Grace Process [ ] meets element [d] of claim 1 at [ ] *See* Thompson Tr. 785-788, 796-797; CX-150C, Tab 3, Pages [.]

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[42] Complainants' expert, Dr. Thompson, testified that each respondent practices element [b] of claim 1, even though complainants' proposed construction of the term "depositing" excludes oxidation and nitridization. As discussed, *supra,* the construction adopted herein is broader in scope. It does not contain such an exclusion.

[ ]

The evidence shows that Grace Process [ ] meets element [d] of claim 1 at [ ] *See* Thompson Tr. 797-798; CX-150C, Tab 3, Pages [ ]

b. Claim 3

The evidence shows that Grace Process [ ] meets the "said material comprises a metallic silicide" limitation of claim 3 at [ ] *See* Thompson Tr.798-799 ; CX-150C, Tab 2, Pages [ ]

c. Claim 4

[ ]

The evidence shows that Grace Process [ ] meets the "comprising etching said tungsten and said glue layer to form a planar surface of said dielectric and said tungsten in said hole, said tungsten being etched before said glue layer" limitation of claim 4 at [ ] *See* Thompson Tr. 773, 799; CX-150C, Tab 2, [ ]

[ ]

The evidence shows that Grace Process [ ] meets the "comprising etching said tungsten and said glue layer to form a planar surface of said dielectric and said tungsten in said hole, said tungsten being etched before said glue layer" limitation of claim 4 at [.] *See* Thompson Tr. 799; CX-150C, Tab 2, [ ]

2. Grace [ ]

The parties have stipulated that the Grace Process [ ] is the same as [ ] (discussed above) for purposes of the infringement analysis with respect

to claims 1, 3, and 4. CX-2333C. Accordingly, this process infringes these claims asserted for the same reasons set forth above with respect to [ ] The products made by this process are set forth in CDX-152C, Tab 4; *see* Thompson Tr. 801-802.

3. Grace [ ]

As demonstrated below, the evidence shows that [ ] meets every element of claims 1 and 4.[43]

a. Claim 1

Element [a] (Patterning a Dielectric Layer)

The parties have stipulated that all Grace products accused of infringement meet element [a] of claim 1. CX-2333C.

Element [b] (Depositing a Glue Layer)

The evidence shows that Grace Process [ ] meets element [b] of claim 1 at [ ]. *See* Thompson Tr. 812; CX-151C, Tab 2, [.]

Element [c] (Depositing a Tungsten layer)

The parties have stipulated that a layer of tungsten is formed by chemical vapor deposition over the titanium nitride film. CX-2333C.

Element [d] (Characterized in That Glue Layer Comprises at Least One Conducting Nitride)

The evidence shows that Grace Process [ ] meets element [d] of claim 1 at [ ]. *See* Thompson Tr. 812; CX-151C, Tab 3, [

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[43] The parties have stipulated that the Grace processes set forth in CX-2333C are the same as [ ] for purposes of the infringement with respect to claims 1 and 4.

]

b. Claim 4

The evidence shows that Grace Process [ ] practices the "comprising etching said tungsten and said glue layer to form a planar surface of said dielectric and said tungsten in said hole, said tungsten being etched before said glue layer" limitation of claim 4 at [.] *See* Thompson Tr. 813; CX-151C , Tab 2, [.]

C. Nanya, Powerchip, and Spansion Inc.

Nanya, Powerchip and Spansion Inc. argue that their processes do not infringe the asserted claims of the '335 patent under complainants' proposed construction of the term "depositing" due to their methods of depositing titanium nitride. *See* NP&S Br. at 5-10. However, as discussed above, complainants' proposed construction for this term is rejected, particularly with respect to nitridization.

It is further argued that the Nanya and Spansion processes that deposit [ ] on the dielectric do not infringe claim 1. *See Id.* at 10-11. However, this argument is based on a proposed claim construction that would require the titanium nitride in the glue layer to be in direct contact with the dielectric, and that limitation that was rejected, above, in the section of claim construction.

Additionally, it is also argued by Nanya and Spansion Inc. that some of their processes include an [ ] that results in [ ] that prevent infringement of claim 4. In particular, it is argued that the processes that purposely [

] cannot infringe because they do not create a planar surface. *See Id.* at 12-13. However, the factual underpinnings of this argument are primarily the depositions of Nanya and Spansion

Inc. engineers whose testimony is at best equivocal on this point. In the case of Spansion Inc., the deposition testimony clearly indicates a [

] *See* CX-2343 at 110 (Spansion Inc.); CX-2355C at 180, 200, 207-208 (Nanya). In fact, complainants' expert (Dr. Thompson) having analyzed recipes, flow charts and other information, testified that in the Nanya and Spansion processes, there is a point at which [

] *See* Thompson Tr. 1134, 1137.

Specific references to the record that correlate with the elements of the asserted claims appear below.

1. Nanya

a. [ ] Process

As demonstrated below, the evidence shows that the Nanya [ ] Process meets every element of claims 1 and 4.

i. Claim 1

Element [a] (Patterning a Dielectric)

The parties have stipulated that all Nanya products accused of infringement [

] CX-2336C.

Element [b] (Depositing a Glue Layer)

[ ]

The evidence shows that the Nanya [ ] Process meets element [b] of claim 1 at [.] *See* Thompson Tr. 822-823; CX-164C, Tab 2, Page NTC 648-ITC-N-00003 (page 8) [ ]

[ ]

The evidence shows that the Nanya [ ] Process meets element [b] of claim 1 at [.] *See* Thompson Tr. 823-824; CX-164C, Tab 2, Page NTC 648-ITC-N-00003 (page 9) [.]

Element [c] (Depositing a Tungsten Layer)

[ ]

The evidence shows that the Nanya [ ] Process meets element [c] of claim 1 at [.] *See* Thompson Tr. 822-823; CX-164C, Tab 2, Page NTC 648-ITC-N-00003 (page 8) [ ].

[ ]

The evidence shows that the Nanya [ ] Process meets element [c] of claim 1 at [ ]. *See* Thompson Tr. 823-824; CX-164C, Tab 2, Page NTC 648-ITC-N-00003 (page 10) [.]

Element [d] (Characterized in That Glue Layer Comprises at Least One Conducting Nitride)

[ ]

The evidence shows that the Nanya [ ] Process meets element [d] of claim 1 at [ ]. *See* Thompson Tr. 822-823; CX-164C, Tab 3, Page NTC 648-ITC 00002339 ("Item 4," [ ].

[ ]

The evidence shows that the Nanya [ ] Process meets element [d] of claim 1 at[ ]. *See* Thompson Tr. 823-824; CX-164C, Tab 3, Page NTC 648-ITC 00002339 ("Item 4," [.]

ii. Claim 4

[ ]

The evidence shows that the Nanya [ ] Process practices the "comprising etching said tungsten and said glue layer to form a planar surface of said dielectric and said tungsten in said hole, said tungsten being etched before said glue layer" limitation of claim 4 at [ ]. *See* Thompson Tr. 824; CX-164C, Tab 2, Page NTC 648-ITC-N-00003 (page 8) [ ].

[ ]

The evidence shows that the Nanya [ ] Process meets the "comprising etching said tungsten and said glue layer to form a planar surface of said dielectric and said tungsten in said hole, said tungsten being etched before said glue layer" limitation of claim 4 at [ ]. *See* Thompson Tr. 824; CX-164C, Tab 2, Page NTC 648-ITC-N-00003 (page 10) [ ].

b. [ ] Process

As demonstrated below, the evidence shows that the Nanya [ ] Process meets every element of claims 1 and 4.

i. Claim 1

Element [a] (Patterning a Dielectric Layer)

The parties have stipulated that all Nanya products accused of infringement [

] CX-2336C.

Element [b] (Depositing a Glue Layer)

The evidence shows that the Nanya [ ] Process meets element [b] of claim 1 at contact 2. *See* Thompson Tr. 830; CX-165C, Tab 2, Page NTC 648-ITC-N-00002 (page 6) [

.]

Element [c] (Depositing a Tungsten Layer)

The evidence shows that the Nanya [ ] Process meets element [c] of claim 1 at [ ] *See* Thompson Tr. 830; CX-165C, Tab 2, Page NTC 648-ITC-N-00002 (page 6) [ ]

Element [d] (Characterized in That Glue Layer Comprises at Least One Conducting Nitride)

The evidence shows that the Nanya [ ] Process meets element [d] of claim 1 at [.] *See* Thompson Tr. 830; CX-165C, Tab 3, Page NTC 648-ITC 00002936 ("Item 1," [.]

ii. Claim 4

The evidence shows that the Nanya [ ] Process meets the "comprising etching said tungsten and said glue layer to form a planar surface of said dielectric and said tungsten in said hole, said tungsten being etched before said glue layer" limitation of claim 4 at [.] *See* Thompson Tr. 830; CX-165C, Tab 2, Page NTC 648-ITC-N-00002 (page 6) [.]

c. Nanya [ ]

As demonstrated below, the evidence shows that the Nanya [ ] Process meets every element of claims 1 and 4.

i. Claim 1

Element [a] (Patterning a Dielectric Layer)

The parties have stipulated that all Nanya products accused of infringement [ ] CX-2336C.

Element [b] (Depositing a Glue Layer)

[ ]

The evidence shows that the Nanya [ ] Process meets element [b] of claim 1 at

[.] *See* Thompson Tr. 834; CX-166C, Tab 2, Page NTC 648-ITC-N-00004 (page 8)

[.]

[ ]

The evidence shows that the Nanya [ ] Process meets element [b] of claim 1 at

[.] *See* Thompson Tr. 835; CX-166C, Tab 2, Page NTC 648-ITC-N-00004 (page 9)

[.]

Element [c] (Depositing a Tungsten Layer)

[ ]

The evidence shows that the Nanya [ ] Process meets element [c] of claim 1 at

[ ]. *See* Thompson Tr. 834-835; CX-166C, Tab 2, Page NTC 648-ITC-N-00004 (page 9)

[.]

[ ]

The evidence shows that the Nanya [ ] Process meets element [c] of claim 1 at

[.] *See* Thompson Tr. 835-836; CX-166C, Tab 2, Page NTC 648-ITC-N-00004 (page 9)

[.]

Element [d] (Characterized in That Glue Layer Comprises at Least One Conducting Nitride)

[ ]

The evidence shows that Nanya [ ] Process practices element [d] of claim 1 at

[.] *See* Thompson Tr. 834; CX-166C, Tab 3, Page NTC 648-ITC 00001633 ("TXZ 3X37

[ ]

[ ]

The evidence shows that the Nanya [ ] Process practices element [d] of claim 1 at [ ]. *See* Thompson Tr. 835-836; CX-166C, Tab 3, Page NTC 648-ITC 00001629 [

]

ii. Claim 4

[ ]

The evidence shows that the Nanya [ ] Process practices claim 4 at [ ]. *See* Thompson Tr. 836; CX-166C, Tab 2, Page NTC 648-ITC-N-00004 (page 9) [.]

[ ]

The evidence shows that Nanya [ ] Process practices claim 4 at [ ]. *See* Thompson Tr. 836; CX-166C, Tab 2, Page NTC 648-ITC-N-00004 (page 9) [.]

2. Powerchip

a. Process [ ]

i. Claim 1

Element [a] (Patterning a Dielectric Layer)

The parties have stipulated that Powerchip Process [

] of the accused process. CX-2335C.

Element [b] (Depositing a Glue Layer)

The evidence shows that the [ ] process meets element [b] of claim 1 at [.] *See* Thompson Tr. 843,857; CX-171C, Tab 2, Page PSC648-ITC00001225 [.]

Element [c] (Depositing a Tungsten Layer)

The evidence shows that the [ ] process meets element [c] of claim 1 at [ ]. *See* Thompson Tr. 843, 854-857; CX-171C, Tab 2, Page PSC648-ITC00001059 [ ].

Element [d] (Characterized in That Glue Layer Comprises at Least One Conducting Nitride)

The evidence shows that the [ ] process meets element [d] of claim 1 at [ ]. *See* Thompson Tr. 843, 850-854; CX-171C, Tab 3, Page PSC648-ITC00001059 ("Module Type [.]

b. Process [ ]

i. Claim 1

Element [a] (Patterning a Dielectric Layer)

The parties have stipulated that Powerchip Process [ ] CX-2355C.

Element [b] (Depositing a Glue Layer)

[ ]

The evidence shows that the [ ] process meets element [b] of claim 1 at [ ]. Thomson Tr. 859-861; CX-172C, Tab 2, Page PSC648-ITX00001205 [.]

Element [c] (Depositing a Tungsten Layer)

The parties have stipulated that Powerchip Process [ ] is identical to Powerchip Process [ ] with regard to the "dielectric and said exposed underlying material" limitation of claim 1 at [ ]. CX-2335C.

Element [d] (Characterized in That Glue Layer Comprises at Least One Conducting Nitride)

The evidence shows that the [ ] process meets element [d] of claim 1 at [ ]. *See* Thompson Tr. 859-861; CX-172C, Tab 3, Page PSC648-ITC00001059.

c. [ ] Process

i. Claim 1

Element [a] (Patterning a Dielectric Layer)

The parties have stipulated that the Powerchip [

] CX-2335C.

Element [b] (Depositing a Glue Layer)

The evidence shows that the [ ] process meets element [b] of claim 1 at [.] *See* Thompson Tr. 863-865; CX-173C, Tab 2, Page PSC648-N-ITC00037 [.]

Element [c] (Depositing a Tungsten Layer)

The parties have stipulated that the Powerchip [

] limitation of claim 1 at [ ]. CX-2335C.

Element [d] (Characterized in That Glue Layer Comprises at Least One Conducting Nitride)

The evidence shows that the [ ] process meets element [d] of claim 1 at [.] *See* Thompson Tr. 863; CX-173C, Tab 3, Page PSC648-ITC00001059 (Module Type [ ].

3. Spansion Inc.

a. Process [ ]

As demonstrated below, the evidence shows that Spansion Process [

] meets every element of claims 1, 3, and 4.[44]

i. Claim 1

Element [a] (Patterning a Dielectric)

[ ]

The evidence shows that Spansion Process [ ] meets element [a] of claim 1 at [ ]. *See* Thompson Tr. 581-603; CX-182C, Tab 2, Page SPSN00016468 [ ].

[ ]

The evidence shows that Spansion Process [ ] meets element [a] of claim 1 at [ ]. *See* Thompson Tr. 603; CX-182C, Tab 2, Page SPSN00016469]

Element [b] (Depositing a Glue Layer)

The evidence shows that Spansion Process [ ] meets element [b] of claim 1 at [ ]. *See* Thompson Tr. 604-614; CX-182C, Tab 3, Pages SPSN00000973-974 ("Section 'Sequences Specific to [ ]'").

[ ]

The evidence shows that Spansion Process [ ] meets element [b] of claim 1 at [ ]. *See* Thompson Tr. 614-617; CX-182C, Tab 3, Pages SPSN00000988-989 ("Recipe Select/ Down Load").

---

[44] The parties have stipulated that the Spansion processes set forth in CX-2334C are the same as [ ] for purposes of the infringement analysis with respect to claims 1, 3, and 4.

Element [c] (Depositing a Tungsten Layer)

[ ]

The evidence shows that Spansion Process [ ] meets element [c] of claim 1 at [ ]. *See* Thompson Tr. 617-620; CX-182C, Tab 3, Pages SPSN00011862,11864 ("Section 'Title: [ ]'" and "Section 'Recipe Parameters'").

[ ]

The evidence shows that Spansion Process [ ] meets element [c] of claim 1 at [ ]. *See* Thompson Tr. 619-620; CX-182C, Tab 3, Pages SPSN00011848, 11850 ("Section 'Title: [ ]'" and "Section 'Recipe Parameters'").

Element [d] (Characterized in That Glue Layer Comprises as Least One Conducting Nitride)

[ ]

The evidence shows that Spansion Process [ ] meets element [d] of claim 1 at [ ]. *See* Thompson Tr. 604-614, 639-40; CX-182C, Tab 3, Pages SPSN00000973-974 ("Section '[ ].

[ ]

The evidence shows that Spansion Process [ ] meets element [d] of claim 1 at [ ]. *See* Thompson Tr. 614-617,639-640; CX-182C, Tab 3, Pages SPSN00000988-989 ("Recipe Select/ Down Load," [ ].

ii. Claim 3

The evidence shows that Spansion Process [ ] practices the

"said material comprises a metallic silicide" limitation of claim 3 at [ ]. *See* Thompson Tr. 640-643; CX-182C, Tab 2, Pages SPSN00016467 [.]

iii. Claim 4

[ ]

The evidence shows that Spansion Process [ ] practices the "comprising etching said tungsten and said glue layer to form a planar surface of said dielectric and said tungsten in said hole, said tungsten being etched before said glue layer" limitation of claim 4 at [ ]. *See* Thompson Tr. 643-647; CX-182C, Tab 2, Pages SPSN00016468 [ ].

[ ]

The evidence shows that Spansion Process [ ] practices the "comprising etching said tungsten and said glue layer to form a planar surface of said dielectric and said tungsten in said hole, said tungsten being etched before said glue layer" limitation of claim 4 at [ ]. *See* Thompson Tr. 646-647; CX-182C, Tab 2, Pages SPSN00016469 [.]

b. Process [ ]

As demonstrated below, the evidence shows that Spansion Process [ ] meets every element of claims 1, 3, and 4.[45]

i. Claim 1

Element [a] (Patterning a Dielectric Layer)

[45] The parties have stipulated that the Spansion processes set forth in CX-2334C are the same as [ ] for purposes of the infringement analysis with respect to claims 1, 3, and 4.

[ ]

The evidence shows that Spansion Process [ ] meets element [a] of claim 1 at [ ]. *See* Thompson Tr. 720-721; CX-183C, Tab 2, Page SPSN00016396 [.]

Element [b] (Depositing a Glue Layer)

[ ]

The evidence shows that Spansion Process [ ] meets element [b] of claim 1 at [ ]. *See* Thompson Tr. 721-722; CX-183C, Tab 3, Pages SPSN00016396-397 [.]

Element [c] (Depositing a Tungsten Layer)

[ ]

The evidence shows that Spansion Process [ ] meets element [c] of claim 1 at [ ]. *See* Thompson Tr. 721-722; CX-183C, Tab 3, Page SPSN00016397 [.]

Element [d] (Characterized in That Glue Layer Comprises at Least One Conducting Nitride)

[ ]

The evidence shows that Spansion Process [ ] meets element [d] of claim 1 at [ ]. *See* Thompson Tr. 721-722; CX-183C, Tab 3, Pages SPSN000001079-1080 [ ].

ii. Claim 4

[ ]

The evidence shows that Spansion Process [ ] meets the "comprising etching said tungsten and said glue layer to form a planar surface of said dielectric and said tungsten in said hole, said tungsten being etched before said glue layer" limitation of claim 4 at [ ]. *See* Thompson Tr. 722-724; CX-183C, Tab 2, Pages SPSN00016397 [.]

D. Jazz

a. Process [ ]

As demonstrated below, the evidence shows that [ ] meets every element of claim 1.[46]

i. Claim 1

Element [a] (Patterning a Dielectric Layer)

The parties have stipulated that Jazz Process [ ] meets element 1 of claim 1 at [.] CX-2338C.

Element [b] (Depositing a Glue Layer)

[ ]

The evidence shows that Jazz Process [ ] meets element [b] of claim 1 at [.] *See* Thompson Tr. 870-874 (deposition of titanium nitride); CX-155C, Tab 2, Page [.]

[46] The parties have stipulated that the Jazz processes set forth in CX-2338C are the same as Process [.]

[ ]

The evidence shows that Jazz Process [ ] meets element [b] of claim 1 at [.]

See Thompson Tr. 870-874; CX-155C, Tab 2, Page [.]

Element [c] (Depositing a Tungsten Layer)

The parties have stipulated that Jazz Process [ ] meets element [c] of claim 1 at [ ]. CX-2338C.

Element [d] (Characterized in That Glue Layer Comprises at Least One Conducting Nitride)

Contact 1

The evidence shows that Jazz Process [ ] meets element [d] of claim 1 at [.]

See Thompson Tr. 870-874; CX-155C, Tab 3, Page [.]

[ ]

The evidence shows that Jazz Process [ ] meets element [d] of claim 1 at [ ].

See Thompson Tr. 870-874; CX-155C, Tab 3, Page [

]

B. Process [ ]

As demonstrated below, the evidence shows that Jazz Process [ ] meets every element of claim 1.[47]

[47] The parties have stipulated that the Jazz processes set forth in CX-2338C are the same as Process [ ] for purposes of the infringement analysis with respect to claim 1.

i. Claim 1

Element [a] (Patterning a Dielectric Layer)

[ ]

The parties have stipulated that Jazz Process [ ] meets element [a] of claim 1 at [.] CX-2338C.

Element [b] (Depositing a Glue Layer)

[ ]

The evidence shows that Jazz Process CA18HR meets element [b] of claim 1 at [ ]. *See* Thompson Tr. 886-888 (deposition of titanium nitride); CX-156C, Tab 2, Page [.]

[ ]

The evidence shows that Jazz Process [ ] meets element [b] of claim 1 at [.] *See* Thompson Tr. 886-888; CX-156C, Tab 3, Page [.]

Element [c] (Depositing a Tungsten Layer)

The parties have stipulated that Jazz Process [ ] meets element [c] of claim 1 at [ ] CX-2338C.

Element [d] (Characterized in That Glue layer Comprises at Least One Conducting Nitride)

[ ]

The evidence shows that Jazz Process [ ] meets element [d] of claim 1 at [.] *See* Thompson Tr. 886-888 (deposition of tungsten); CX-156C, Tab 3, Page [.]

[ ]

The evidence shows that Jazz Process [ ] meets element [d] of claim 1 at [ ] *See* Thompson Tr. 886-888; CX-156C, Tab 3, Page [.]

C. Process [ ]

As demonstrated below, the evidence shows that Jazz Process [ ] meets every element of claim 1.

1. Claim 1

Element [a] (Patterning a Dielectric Layer)

The parties have stipulated that Jazz Process [ ] meets element [a] of claim 1 at [ ]. CX-2338C.

Element [b] (Depositing a Glue Layer)

[ ]

The evidence shows that Jazz Process [ ] meets element [b] of claim 1 at [ ]. *See* Thompson Tr. 891-893; CX-157C, Tab 2, Page [.]

[ ]

The evidence shows that Jazz Process [ ] meets element [b] of claim 1 at contact 2. *See* Thompson Tr. 894-896; CX-157C, Tab 2, Page [ ].

Element [c] (Depositing a Tungsten Layer)

The parties have stipulated that Jazz Process [ ] meets element [c] of claim 1 at [.]

Element [d] (Characterized in That Glue Layer Comprises at Least One Conducting Nitride)

[ ]

The evidence shows that Jazz Process [ ] meets element [d] of claim 1 at [ ]. *See* Thompson Tr. 896-897; CX-157C, Tab 3, Pages [.]

[ ]

The evidence shows that Jazz Process [ ] meets element [d] of claim 1 at [ ]. *See* Thompson Tr. 896-897; CX-157C, Tab 3, Pages [.]

E. Tower

1. Process [ ]

As demonstrated below, the evidence shows that Tower Process [ ] meets every element of claim 1.[48]

a. Claim 1

Element [a] (Patterning a Dielectric Layer)

[ ]

The parties have stipulated that Tower Process [ ] meets element [a] of claim [.] CX-2339C.

[48] The parties have stipulated that the Tower processes set forth in CX-2339C are the same as [ ] for purposes of the infringement analysis with respect to claim 1.

Element [b] (Depositing a Glue Layer)

[ ]

The evidence shows that Tower Process [ ] meets element [b] of claim 1 at [ ]. *See* Thompson Tr. 902-906; CX-184C, Tab 2, Pages [.]

[ ]

The evidence shows that Tower Process [ ] meets element [b] of claim 1 at [ ]. *See* Thompson Tr. 902-906; CX-184C, Tab 2, Page [.]

Element [c] (Depositing a Tungsten Layer)

[ ]

The evidence shows that Tower Process [ ] meets element [c] of claim 1 at [ ]. *See* Thompson Tr. 905-907, 913-916; CX-184C, Tab 2, Pages [ ]

[ ]

The evidence shows that Tower Process [ ] meets element [c] of claim 1 at [.] *See* Thompson Tr. 905-907, 913-916; CX-184C, Tab 2, Pages [.]

Element [d] (Characterized in That Glue Layer Comprises at Least One Conducting Nitride)

[ ]

The evidence shows that Tower Process [ ] meets element [d] of claim 1 at [ ]. *See* Thompson Tr. 902-906; CX-184C, Tab 3, Pages [

.]

[ ]

The evidence shows that Tower Process [ ] meets element [d] of claim 1 at [ ] *See* Thompson Tr. 902-906; CX-184C, Tab 3, Pages [ ).]

2. Process [ ]

As demonstrated below, the evidence shows that Tower Process [ ] meets every element of claim 1.[49]

a. Claim 1

Element [a] (Patterning a Dielectric Layer)

The parties have stipulated that Tower Process [ ] meets element [a] of claim 1 at [ ]. CX-2339C.

Element [b] (Depositing a Glue Layer)

The evidence shows that Tower Process [ ] meets element [b] of claim 1 at [ ]. *See* Thompson Tr. 919-922; CX-184C, Tab 2, Pages [.]

Element [c] (Depositing a Tungsten Layer)

The evidence shows that Tower Process [ ] meets element [c] of claim 1 at [ ]. *See* Thompson Tr. 920-922; CX-185C, Tab 2, Pages [ ]

Element [d] (Characterized in That Glue Layer Comprises at Least One Conducting Nitride)

The evidence shows that Tower Process [ ] meets element [d] of claim 1 at

---

[49] The parties have stipulated that the Tower processes set forth in CX-2339C are the same as [ ] for purposes of the infringement analysis with respect to claim 1.

[ ]. *See* Thompson Tr. 919-922; CX-185C, Tab 2, Pages [.]

VI. Validity Determination

Respondents argue that the asserted claims of the '335 patent are invalid as anticipated under 35 U.S.C. § 102. Specifically, they argue that two processes developed at IBM, and which are referred to by the parties as "IBM Process A" and "IBM Process B," each render claims 1, 3, and 4 invalid as anticipated under 35 U.S.C. § 102(g). *See* RJoint Br. at 20-31. In addition, respondents argue that work done at Advanced Micro Devices ("AMD"), referred to by respondents as the "AMD structure," invalidates claims 1 and 4 as anticipated under 35 U.S.C. § 102(g). *See Id.* at 31-36. Finally, respondents also argue that claim 1 is rendered invalid as anticipated under 35 U.S.C. § 102(e) by each of two patents, *i.e.,* United States Patent No. 4,640,004 to Thomas et al. ("the '004 patent) (RX-10), and United States Patent No. 4,920,071 to Thomas et al. ("the '071 patent") (RX-11). *See Id.* at 37-41.

Respondents also argue that claims 1, 3, and 4 of the '335 patent are invalid as obvious under 35 U.S.C. § 103. *See* RJoint Br. at 42-51. With respect to claim 1, respondents do not provide a clear discussion of its limitations in view of specific prior art. It appears, however, that respondents rely on the IBM Processes A and B, as well as two extremely short arguments to the effect that it was obvious: (1) to deposit tungsten by CVD in view of the '004 and '071 patents and other information known to one of ordinary skill; and (2) to sputter or CVD TiN instead of nitridizing titanium in view of the IBM Processes. *See Id.* at 42, 48-49.

With respect to claim 3 of the '335 patent and the question of obviousness, respondents argue that silicide contacts were well known at the time of the alleged invention. *See Id.* at

44-45. With respect to claim 4, respondents likewise argue that tungsten plugs were well known at the time of the alleged invention. *See Id.* at 46-48.

The Staff argues that IBM Process A anticipates claims 1 and 3 of the asserted '335 patent, but not claim 4. Nevertheless, the Staff argues, Process A renders claim 4 invalid as obvious. The Staff argues that the work done at AMD renders claim 1 invalid as anticipated, and claims 3 and 4 invalid as obvious. The Staff argues neither the '004 nor the '071 patent renders claim 1 invalid. *See* Staff Br. at 68, 70, 74-76.

Complainants reject all the invalidity arguments of respondents and the Staff. *See* Compls. Br. at 48-81; Compls. Reply at 29-58.

A. IBM Process A

During the mid-1980s, John Cronin, Pei-Ing Lee and others were part of IBM's "CMOS IV" team, which refers to IBM's fourth generation of complementary metal oxide semiconductor technology. The team sought an acceptable solution to adhesion problems that existed with tungsten interconnects. *See* Cronin Tr. 1962; Lee Tr. 1221-1222. An "Invention Disclosure Form," signed by the inventors in late October 1985, details their findings and reductions to practice. *See* RX-216 (invention disclosure); Cronin Tr. 1970 (reviewed and signed by Cronin on November 22, 1985). The research would eventually lead to the issuance of U.S. Patent No. 5,760,475 ("the '475 patent"). RX-3 (patent). The Invention Disclosure Form depicts three processes (labeled Process A, B, and C), each with a different glue layer. The drawing of Process A depicts a glue layer in which a layer of titanium is sputtered onto the surface and then thermal annealed in nitrogen (nitridized) to form a TiN/Ti stack. The evidence shows that Process A was reduced to practice prior to October 21, 1985. *See* Cronin Tr. 1972, 1977-1978.

Process B depicts a glue layer of TiN formed by reactive sputtering. Process C depicts a glue layer formed by reactively sputtering TiN on the surface of the underlying material and dielectric, and then thermal annealing it. Process A became part of the IBM "Process of Record," which is the company's standard process for building a device on a wafer. *See* Lee Tr. 1224, 1245-1247, 1268-1272.

1. IBM Process A Predates the '335 Patent

Complainants argue that asserted claims 1, 3, and 4 of the '335 patent have conception dates in March and April of 1986, but they do not deny the fact that those dates alone are insufficient to disqualify IBM Process A as prior art. *See* Compls. Br. at 52-56. Rather, complainants argue that IBM "Process A does not anticipate the '335 Patent because (a) it does not contain each limitation found in Claim 1; and (b) it is not prior art since under 35 U.S.C. § 102(g) it was suppressed and concealed." Compls. Br. at 60.

Thus, complainants' answer to respondents' affirmative defense of invalidity with respect to IBM Process A is two-fold. Each of those issues is discussed below. In each case, it is found that the IBM process satisfies the standards set forth under section 102(g) in order to anticipate the asserted claims.

2. IBM Process A Was Not Suppressed, or Concealed

Section 102(g), which is quoted in full above in section III, provides in part that a person shall be entitled to a patent unless, "before such person's invention thereof, the invention was made in this country by another inventor who had not ***abandoned, suppressed, or concealed it***." 35 U.S.C. § 102(g)(2) (emphasis added). As indicated above, complainants do not argue in their brief that IBM at any time abandoned its Process A. Indeed, there is no evidence of that.

Complainants do, however, argue that IBM suppressed and concealed Process A "to gain a competitive edge over its rivals." *See* Compls. Br. at 62-63.

The work done by the CMOS IV team, including Process A, was of commercial benefit to IBM; and IBM appreciated that fact. *See* RX-216 at 6; Cronin 2016-2017. The evidence does not, however, support the conclusion that IBM suppressed or concealed Process A.

There was a 17-month gap between the invention disclosure and the application that led to the '475 patent. *See* RX-216; RX-3. However, as explained in the two cases relied upon by complainants, *Lutzker v. Plet*, 843 F.2d 1364, 1367 (Fed. Cir. 1988) (concealment found after a delay of 51 months) and *Young v. Dworkin*, 489 F.2d 1277, 1281 (C.C.P.A. 1974) (concealment found after 27 months), concealment does not occur if, during the time between reduction to practice and public disclosure, the inventor was perfecting the invention in ways reflected in the patent specification.

In this case, the evidence shows that during the period of time between the invention disclosure and the application for the '475 patent, IBM worked to make Process A its process of record, and thus to commercialize it.[50] Further, the invention disclosure was reviewed by IBM attorneys and engineers before an application could be filed. That process usually took between six months and two years. *See* Lee Tr. 1271-1274. Additionally, during that time, IBM employees (and CMOS IV team members) Lee and Hartswick were working steadily and intensely to improve the part of the invention that pertains to a glue layer deposited by the

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[50] *See Dow Chem. Co. v. Astro-Valcour, Inc.*, 267 F.3d 1334, 1343-44 (Fed. Cir. 2000) (inventors made reasonable efforts towards commercialization and, therefore, did not suppress or conceal); *Fujikawa v. Wattanasin*, 93 F.3d 1559, 1569 (Fed. Cir. 1996) (17-month period for filing patent application did not warrant an inference of suppression or concealment).

reactive sputtering of TiN (IBM Process B). *See* Cronin Tr. 1976-1984. In fact, the work of Lee and Hartswick with respect to the glue layer formed by reactive sputtering of TiN was described in the specification of the patent application that issued as the '475 patent. *See* Cronin Tr. 1983-1984.

Accordingly, it is found that IBM Process A was not abandoned, suppressed or concealed.

3. IBM Process A Contains All Limitations of the Asserted Claims

a. Claim 1

Complainants argue that "because IBM Process A does not disclose 'depositing' a glue layer containing at least one conducting nitride, IBM Process A does not anticipate Claim 1 of the '335 patent." Compls. Br. at 62. Complainants present a succinct argument to show that IBM Process A uses nitridization to form a glue layer. As discussed above, complainants argue that nitridization does not satisfy the "depositing" limitation of claim 1. While complainants' brief indicates that IBM selected a nitridization process due to its resulting gradient of nitrogen content in the titanium, it does not appear that complainants challenge the fact that the glue layer does, in fact, include a nitride. According to complainants' brief, the problem with IBM Process A anticipating claim 1 of the '335 patent lies in IBM's method of forming the glue layer, *i.e.*, nitridization. *See* Compls. Br. at 60-62.

As discussed above in the section IV.C., the "depositing" limitation of claim 1 does not exclude nitridization as a method of deposition. Thus, based on complainants' arguments, there is no basis to refrain from finding that IBM Process A discloses all elements of claim 1 of the '335 patent. Further, the evidence of record established that fact.

As to the first claimed element (referred to above in the infringement section as element [a] (Patterning a Dielectric Layer)), the IBM invention disclosure covering Process A describes an architecture in which a dielectric (BPSG) is etched to form holes which expose an underlying electrically conducting material ($TiSi_x$). *See* RX-216 at 9; Thomas Tr. 1576. As to the second element (element [b] (Depositing a Glue Layer)), the Ti/TiN layer created through sputtering, and subsequent annealing meets the "depositing a glue layer" step of claim 1. *See* Thomas Tr. 1582; RX-216 at 3 ("Process A used a thermal annealed TiN on top of pure Ti."); Lee Tr. 1249 (describing the process of depositing the Ti/TiN glue layer of Process A). As to the third element (element [c] (Depositing a Tungsten Layer)), the invention disclosure describes depositing the tungsten layer by chemical vapor deposition. *See* Thomas Tr. 1583; RX-216 at 2 ("Title: TiN Adhesion Layer and Contact Barrier for LPCVD Tungsten"), at 9 (topmost layer referred to "CVD W"); Lee Tr. 1250; Thomas Tr. 1635-36. As to the final element of claim 1 (element [d] (Characterized in That Glue Layer Comprises at Least One Conducting Nitride)), the glue layer employed, Ti/TiN, and this contains a conducting nitride, TiN. *See* Thomas Tr. 1583-84.[51]

b. Claim 3

Complainants devote only one paragraph of their brief to dependent claims 3 and 4. They

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[51] In addition, a document entitled "CMOS IV Process Complexity Update" from February 6, 1986, details the processing steps for the front and back end of line ("FEOL" and "BEOL," respectively) used to make prototypes of Process A, the process of record (or POR), in an effort to improve and optimize it for eventual commercial manufacture. RX-225; Lee Tr. 1268-69. The CMOS IV Process Complexity Update describes several process steps indicating the sputtering and annealing of a titanium layer to form the TiN/Ti glue layer and the deposition of tungsten in the subsequent step. RX-225 at NSC-01282040 ("M1 Sput. Ti & Anneal" and "CVD W M1"); Lee Tr. 1271-1272.

argue that "[b]ecause the IBM Reference does not anticipate Claim 1, it also cannot anticipate Claims 3 or 4." Compls. Br. at 70.

No further argument is presented with respect to claim 3. As discussed above, claim 1 is, in fact, anticipated by IBM Process A. Thus, applying complainants' reasoning, claim 3 should also be found invalid.

In addition, claim 3 merely adds the limitation, "in which said material comprises a metallic silicide." *See* CX-1 ('335 patent), col. 6, lines 9-10. This point was not placed in issue, even at the hearing. Record evidence confirms that a metallic silicide was present under the glue layer in IBM Process A. *See* RX-216 (IBM invention disclosure) at 9; Cronin Tr. 1979-1981; Lee Tr. 1246-47; Thomas Tr. 1585; *see also* RX-225 ("CMOS IV Process Complexity Update") at IBM001918-19; Lee Tr. 1270.

Accordingly, there is clear and convincing evidence that claim 3 is invalid as anticipated.

c. Claim 4

Claim 4 adds the limitation "etching said tungsten and said glue layer to form a planar surface of said dielectric and said tungsten in said hole, said tungsten being etched before said glue layer." CX-1 ('355 patent), col. 6, lines 11-14.

Complainants argue that "Dr. Thomas's only basis for claiming that the IBM Reference anticipates Claim 4 is a single statement in the reference stating "integratable with metal chemmech polishing," and that "Dr. Lee admitted that the Process of Record in which IBM incorporated Process A did not involve an etchback of tungsten at all (*i.e.,* IBM patterned the tungsten to form metal lines – the exact opposite of an etchback process)." Compls. Br. at 70 (citing RX-216 at 4; Thomas Tr. 1624; Lee Tr. 1366). It is argued that Dr. Lee further admitted

that the use of CMP was for the dielectric, rather than for tungsten. *See Id.* at 70 (citing Lee Tr. 1368).

The Staff agues that the IBM process of record left some of the deposited tungsten to use as the first metallization level, "and thus the glue layer and tungsten were not etched back to form a tungsten plug." Staff Br. at 70-71 (citing Cronin Tr. 2014-2016). "In other words," according to the Staff, "in employing the tungsten in this manner, the process would not etch down the tungsten to the point where it was planar to the dielectric in regions over the interconnects." *Id.* Nevertheless, the Staff argues, "there is considerable prior art describing the use of tungsten plugs with another metal as the metallization layer," and thus claim 4 should be found invalid due to obviousness. *Id.* at 71.

Respondents argue that the record shows that claim 4 was anticipated, and, in the alternative, was also rendered obvious. *See* RJoint Br. at 31, 46; Resps. Reply at 26.

A review of the testimony from the same witnesses relied upon by complainants and the Staff shows that the IBM process of record (which was based on Process A) may not have included etching back to form a tungsten plug. *See* Cronin Tr. 2014-2016. Nevertheless, as respondents' expert explained, the IBM disclosure shows that the tungsten can be etched back. *See* Thomas Tr. 1624. He also testified, "Metal CMP means they remove the metal and the barrier layer from the dielectric surface. So this is, this is a process that, an etch process that removes the materials." *Id.*

As summarized above, complainants argue that Dr. Thomas read too much into the IBM disclosure where it specified the use of CMP. Yet, it is undisputed that Cronin was at IBM at the time that Process A was developed, and his testimony shows that in at least some instances, IBM

did etch back the tungsten. Corroborating information contained IBM documents, Cronin testified in pertinent part, as follows:

> Q. All right. If you could look at Number 7, in RX-216. Number 7. It says, "integrateable with metal chemical-MECH or chemical mechanical polishing." Do you see that?
>
> A. Yes.
>
> Q. What does that mean?
>
> A. Another first for this crazy group was we decided, instead of etching wafers at all levels, is that we would define a contact hole or an opening, like a line, and we could put the metal in it, and then literally with what looks like a sander, we would have a polishing with some chemistry, ***so polish back the metal to the surface of the wafer***.
>
> And when you did that, ***it would only expose the metal in the contact holes***. So we were really first on doing this CHEM-MECH polishing of metals.
>
> Q. Were the Process A, B, and C structures that we have seen in figure 3, were those integrateable with the chemical-mechanical polishing surface?
>
> A. Yes.

Cronin Tr. 1980-1981 (emphasis added).

Consequently, it is found by clear and convincing evidence that claim 4 was anticipated by IBM Process A.

4. Summary

For the reasons stated above, pursuant to 35 U.S.C. § 102(g), it is found by clear and convincing evidence that IBM Process A renders invalid claims 1, 3, and 4 of the '335 patent as

anticipated.[52]

B. IBM Process B

As indicated above, the October 1985 IBM disclosure form covered Processes A, B and C. Process B used reactive sputtering of TiN (rather than nitridization, as in Process A). Respondents argue that Process B anticipated the asserted claims of the '335 patent, a position that is rejected by both complainants and the Staff. *See* RJoint Br. at 19-20; Complainants' Br. at 64-70; Staff Reply at 19 n.9.

Unlike IBM Process A, discussed above, IBM Process B did not become IBM's process of record. In fact, the evidence shows that even after the October 1985 invention disclosure was signed, the CMOS IV team had to conduct "hundreds of experiments in different ways to make that work." *See* Cronin Tr. 1983-1984.

There is not clear and convincing evidence of when IBM Process B was reduced to practice. Consequently, it is not found that the asserted claims of the '335 patent are invalid due to anticipation or obviousness in view of IBM Process B.

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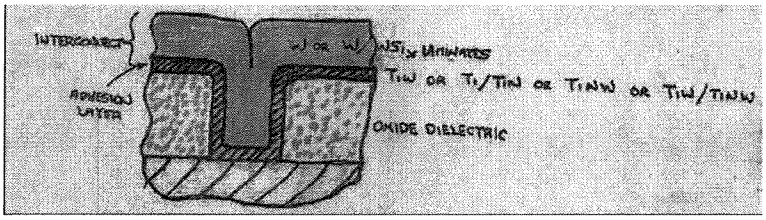
[52] Respondents offer their obviousness arguments strictly in the alternative, and only out of "an abundance of caution." *See* RJoint Br. at 42. Further, claim 4, which the Staff argues is obvious, has been found to be anticipated. Thus, inasmuch as anticipation has been found as to all three asserted claims of the '335 patent, it is not necessary to address the details of respondents' obviousness arguments. Nevertheless, obviousness is addressed, *infra*, to the extent that it is appropriate, with respect to specific items alleged to be prior art (especially with respect to the '004 and '071 patents).

Moreover, respondents' obviousness arguments do not concern the relationship of IBM Process A to claim 1. Rather, they focus on claims 3 and 4, and with respect to claim 1, assume *arguendo* that "depositing" is found not to include nitridization. Such a limited construction would be incorrect, and was rejected in the construction of the claim. In addition, respondents base their obviousness arguments on IBM Process B (Sputtering TiN) and the AMD structure. As discussed, *infra*, there is a lack of clear and convincing evidence concerning key elements of respondents' case involving IBM Process B and the AMD structure. Arguments built upon them would fail.

C. AMD Structure

The evidentiary record in this investigation shows that, not unlike their counterparts at AT&T (the original assignee of the '335 patent) and IBM (discussed above), during the mid-1980s, AMD engineers in the company's VLSI (very large-scale integration) research group were researching ways to adhere tungsten. The VLSI research group was led by Dr. Pankaj Dixit and his manager Jack Sliwa. *See* Dixit Tr. 1420-1427.

A notebook page (RX-5) prepared by Sliwa, signed by Sliwa and Dixit, and dated November 13, 1985, contains a cross-sectional drawing of a structure with an "OXIDE DIELECTRIC," under an "ADHESION LAYER," under an "INTERCONNECT." Next to the adhesion layer, there is the notation "TiW OR Ti/TiN or TiNW or TiN/TiNW." The structure is reproduced below.



RX-5 (AMD notebook page).

The document states that Mr. Sliwa discussed with Dr. Dixit "USING TIW UNDER CVD TUNGSTEN. SPUTTERED TIW WOULD SERVE AS AN ADHESION LAYER AND A BARRIER TO PREVENT THE W PROCESS FROM DAMAGING THE CONTACTS." The document goes on to say that "TINW OR TI/TIN OR TINW OR TIW/TINW ALL MAY GIVE THE SAME ADHESION/BARRIER PERFORMANCE AS TIW ALONE WHILE POSSIBLY PRESENTING ETCH OR CORROSION ADVANTAGES." RX-5.

AMD continued work along the lines recorded in Sliwa's notebook. During the hearing,

Dr. Dixit testified that in February of 1986, they completed their testing, and at that time concluded that a Ti/TiN structure would solve their research problem. Dr. Dixit further testified that he could now remember that they completed their work in February of 1986 because of his first wedding anniversary, which would arrive approximately one month later, on March 16th. However, during Dixit's deposition, his precise recollection of the timing of events that took place over 23 years ago was not as clear. He testified, apparently by reading a notation made by Sliwa in an invention disclosure, that the work may have been completed in February or March of 1986. *See* 1436-1437, 1518-1521.

Indeed, on August 21, 1986, an AMD Invention Disclosure Form was signed by Dr. Dixit and Sliwa. The invention disclosure is far more detailed than the Sliwa notebook page *See* RX-7 (invention disclosure); Dixit Tr. 1438. Based on that invention disclosure, an application for a patent was filed on February 19, 1987; and on November 28, 1989, U.S. Patent No. 4,884,123, entitled "Contact Plug and Interconnect Employing a Barrier Lining and a Backfilled Conductor Material," issued to Dixit, Sliwa and three other named inventors. *See* RX-9; Dixit Tr. 1451.

Respondents argue that "the AMD structure," was "built and tested by February 14, 1986," and anticipates claims 1 and 4 of the '335 patent. *See* Resp. Br. at 31-36. The Staff argues that the "AMD Reference" anticipates claims 1 and 4, and renders claim 3 obvious. The Staff does not define the term "AMD Reference," as used in its brief, but refers to the Sliwa notebook entry of November 13, 1985 (RX-5), and the February 1986 invention disclosure prepared at AMD. *See* Staff Br. 71-75. Complainants reject all of the invalidity arguments based on the work of AMD. *See* Compls. Br. at 70-77.

A threshold issue to be determined is whether the AMD work is prior art to the subject

claims of the '335 patent. Based primarily upon the deposition testimony of Virendra Rana, one of the named inventors of the '335 patent, as well as certain documents alleged to support his testimony, complainants argue that claim 1 is entitled to a priority date of no later than March 3, 1986 for claims 1 and 4, and that claim 4 is entitled to a priority date of no later than April 2, 1986. *See* Compls. Br. at 52-59.

Respondents argue that even if complainants are correct about the priority dates of the asserted claims of the '335 patent, "[b]y any measure the AMD structure is invalidating prior art" based on a November 13, 1985 conception date, and a February 14, 1986 date for the reduction to practice. *See* Resps. Reply at 18-19.

The task, however, of determining when AMD conceived and reduced to practice its own structure (or claimed invention) is problematic. This is especially the case when the evidence is measured against the standard of clear and convincing standard.

Conception is the formation in the mind of the inventor of "a definite and permanent idea of the complete and operative invention, as it is thereafter to be applied in practice." It "must encompass all limitations of the claimed invention," and it "is complete only when the idea is so clearly defined in the inventor's mind that only ordinary skill would be necessary to reduce the invention to practice, without extensive research or experimentation." *Brown v. Barbacid*, 276 F.3d 1327, 1335-36 (Fed. Cir. 2002).

During the hearing, respondents' expert (Dr. Thomas) testified that each element or limitation of claims 1 and 4 of the '335 patent is found in the AMD invention disclosure of August 21, 1986. *See* Thomas Tr. 1632-1639, 1660. That is the testimony cited in respondents' brief to argue that the AMD structure discloses all elements of claim 1 and 4 of the '335 patent.

See RJoint Br. at 36. Yet, it has not been disputed that the invention disclosure occurred too late to qualify as prior art. In fact, the disclosure was amended as late as October 1986. *See* Dixit Tr. 1512-1513. So, in order to show conception and reduction of practice of the AMD structure in such a way that it qualifies as prior art, respondents must rely on other evidence.

Indeed, respondents argue that the AMD structure was conceived on November 13, 1985 (based on the testimony of Dr. Dixit and the date of the Sliwa notebook entry), and reduced to practice by February 14, 1986 (based on the testimony of Dr. Dixit and information contained in the invention disclosure). *See* Resps. Reply at 18, 21.

With respect to the November 13, 1985, notebook entry and related testimony, it is not clear from the expert testimony that all limitations of '335 patent claims at issue were encompassed by any conception that took place on that date. Nor is it clear that all elements were included in the AMD structure as of February 1986, inasmuch as the invention disclosure was not completed until many months later.

Moreover, the evidence is far from clear and convincing that AMD even had a definite and permanent idea of the complete invention (or "AMD structure," in respondents' words) when Sliwa wrote the 1985 notebook entry (RX-5). In fact, the evidence shows the opposite. The plain language of the notebook entry shows Ti/TiN along with other possibilities "may give the same adhesion/barrier performance as TiW alone while possibly presenting etch or corrosion advantages." *See Id.* Dr. Dixit's hearing testimony confirmed that at the time of the notebook entry, Ti tungsten was recognized as a possibility under consideration, but not necessarily as a solution. *See* Dixit Tr. 1490, 1466-1467. In addition, Dr. Dixit admitted that Ti tungsten is not a conducting nitride (as required by the '335 patent), and it was also quickly rejected as inadequate.

See Dixit Tr. 1466-1470.

AMD eventually decided to use Ti/TiNitride. *Id.* However, Dr. Dixit admitted that it was only at some point after November 13, 1985, that AMD came up with the idea of using Ti/TiNitride in the context described in the notebook entry. *See* Dixit Tr. 1493-1494. Consequently, Sliwa's notebook entry (RX-5) does not record, or corroborate, the conception of an AMD structure capable of anticipating any asserted claim of the '335 patent.

In addition, the invention disclosure (RX-7) does not adequately corroborate Dr. Dixit's testimony concerning a reduction to practice in February of 1986. As indicated above, on the issue of the date of reduction to practice, Dixit's deposition and hearing testimony are inconsistent. Neither offers clear and convincing evidence. Further, a printed question on the AMD invention disclosure asks, "Construction and Test of Device: Date Completed." The handwritten answer simply states, "Films Made – Feb 86." That statement does not even purport to provide evidence that would confirm the "February 14, 1986" date proposed by respondents, and the "mid-February" date proposed by the Staff. *See* RX-7 at AMD0005. In fact, no party was able to show where the disclosure provides details as to what experimentation or testing was actually done between the alleged conception and the alleged reduction to practice.

Accordingly, it has not been established by clear and convincing evidence that the work done by AMD, including the "AMD structure" relied upon by respondents, anticipates or renders obvious any asserted claim of the '335 patent.

D. The '004 and '071 Patents

Respondents argue that each of two patents issued to their expert Dr. Thomas, the '004 patent (RX-10) and the '071 patent (RX-11), discloses all the elements of claim 1 of the '335

patent, thus rendering claim 1 invalid as anticipated under 35 U.S.C. § 102(e) (patent-based anticipation). *See* RJoint Br. at 37-41. Complainants argue that respondents have failed to present clear and convincing evidence of anticipation with respect either patent. *See* Compls. Br. at 77-79. Similarly, the Staff argues that the evidence does not clearly and convincingly show that either the '004, or the '071 patent, anticipates claim 1. *See* Staff Br. at 75-76.

The '004 patent, entitled "Method and Structure for Inhibiting Dopant Out-Diffusion," discloses, among other things, a representation of the preferred method for constructing a device in accordance with the claimed invention, along with a detailed description of the method and various layers of the resulting device. *See* RX-10 ('004 patent), col. 2, lines 57-59; col. 2, line 66 - col. 5, line 26. Indeed, the '004 patent discloses a barrier layer system. Thomas Tr. 1789.

Several limitations, or elements, of claim 1 of the '335 patent are lacking in the '004 patent. Dr. Thomas admitted that there is no mention in the '004 patent of CVD tungsten, which is required by claim 1 of the '335 patent. Thomas Tr. 1788. Thus, the '004 patent does not address or disclose solutions for the adhesion problems with the dielectric caused by the use of CVD tungsten (including the effects on adhesion caused by the fluorine used in the CVD process). *See* Thomas Tr. 1643-1645, 1788; Ho Tr. 268. Dr. Thomas also admitted that there is no mention in the '004 patent of the need for an adhesion layer, although he testified that he believes adhesion is an inherent property of a barrier layer (a point that was not fully developed by respondents). *See* Thomas Tr. 1789. Consequently, it is not found that the '004 patent anticipates claim 1 of the '335 patent.[53]

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[53] The '004 patent also discloses the formation of a silicide to reduce contact resistance to the underlying substrate. Yet, unlike claim 3 of the '335 patent, the method of the '004 patent forms the silicide after the contact holes are open, rather than before they are open. *See* Thomas Tr. 1789.

In addition, it is not found that the '004 patent renders claim 1 of the '335 patent obvious. Inasmuch as the '004 patent is in no way connected to an adhesion problem caused by CVD tungsten (and the fluorine commonly used in the process) it is unclear how they offer a solution to this problem, or why one of ordinary skill would consult the patent to find a solution.

The '071 patent, entitled "High Temperature Interconnect System for an Integrated Circuit," like the '004 patent, does not mention the use of CVD tungsten, although it does incorporate a patent application (RX-12) that refers to the process. However, there is no indication that even in that application, tungsten is used to fill holes. In fact, some portions of the application teach away from the '335 patent as they disclose metal interconnects that are formed first before etching, as well as the subsequent deposition of dielectric in the etched regions.

Further, in the '071 patent there is no mention for the need for an adhesion layer. Respondents' expert advanced the opinion that the barrier layer of his patent would inherently disclose a glue layer, but did not prove this by clear and convincing evidence. *See* Thomas 1654-1655, 1789-1790. Consequently, it has not been shown that the '071 patent contains all elements of claim 1 of the '335 patent, or that the claim would be rendered obvious to one of ordinary skill.

VII. Domestic Industry

The notice of investigation, 73 Fed. Reg. 29534 (2008), provides that a determination must be made as to whether an industry in the United States exists, as required by 19 U.S.C.

§ 1337(a)(2). The complainant bears the burden of proving the existence of a domestic industry. *Certain Methods of Making Carbonated Candy Products,* Inv. No. 337-TA-292, Comm'n Op. at 34-35, USITC Pub. 2390 (June 1991). In any investigation, the domestic industry requirement must be satisfied as to each asserted patent. *See* 19 U.S.C. § 1337(a)(2).

A domestic industry is defined in subsection 337(a)(3) as follows:

> (3) For purposes of paragraph (2), an industry in the United States shall be considered to exist if there is in the United States, with respect to the articles protected by the patent, copyright, trademark or mask work concerned --
>
> (A) significant investment in plant and equipment;
>
> (B) significant employment of labor or capital; or
>
> (C) substantial investment in its exploitation, including engineering, research and development, or licensing.

19 U.S.C. § 1337(a)(3).

Thus, a complainant must show that there is a "nexus" between the activities upon which it relies and any asserted patent. *See Certain Microlithographic Machines and Components Thereof,* Inv. No. 337-TA-468, Initial Determination at 346 (*adopted in relevant part in* Notice of Commission Determination Not to Review a Final Initial Determination Finding No Violation of Section 337 [and] Termination of the Investigation (Mar. 17, 2003)).

In order to show the existence of a domestic industry, complainants rely on the definition provided by section 337(a)(3)©) and argue that a domestic industry exists as a result of their licensing activities. Complainants submit that they have substantial investments, [

] in an in-house licensing program (with employees in Pennsylvania,

California, Colorado and New Jersey), along with substantial payments to outside counsel and consultants. It is further submitted that their licensing program has generated substantial royalty revenue, and further that a substantial portion of their licensing activities are attributable to the asserted '335 patent. *See* Compls. Br. at 112-117; Compls. Reply at 69-70.

Respondents argue that complainants have failed to establish the requisite nexus between their licensing activities and the '335 patent. In particular, it is argued that complainants have "failed to break out or account for expenditures specifically for the '335 patent." *See* RJoint Br. at 63-66.

The Staff argues that complainants have established the existence of a domestic industry based on their licensing activities. *See* Staff Br. at 9-12.

[

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Respondents' brief does not cite authority to require complainants to break out their expenses in order to show a nexus between the '335 patent and the licensing program. However, the evidence shows that the '335 patent has played a prominent role in their licensing efforts. [

]

Consequently, complainants have shown a sufficient nexus between the '335 patent and their substantial licensing activities. The domestic industry requirement is, therefore, satisfied with respect to the '335 patent.

VIII. Conclusions of Law

1. The Commission has personal jurisdiction over the parties, and subject-matter jurisdiction over the investigation.

2. Except for respondent Spansion Inc., all respondents have sold for importation, imported and, or, sold after importation into the United States, products made according to accused processes.

3. It has not been established that respondent Spansion Inc. has imported or sold a product made according to an accused process. Consequently, it cannot be found that Spansion Inc. is in violation of section 337.

4. It otherwise has been established by at least a preponderance of the evidence that each accused process of each respondent practices each of the claims of the '335 patent asserted against it.

5. It has been established by clear and convincing evidence that claims 1, 3, and 4 of the '335 are invalid due to anticipation in view of IBM Process A. No other ground for invalidity has been established.

6. The domestic industry requirement is satisfied with respect to the '335 patent.

7. No violation of section 337 has occurred with respect to claim 1, 3, or 4 of the '335

patent.

IX. Initial Determination and Order

Based on the foregoing, it is the INITIAL DETERMINATION ("ID") of the undersigned that no violation of section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337, has occurred in the importation into the United States, the sale for importation, or the sale within the United States after importation of certain semiconductor integrated circuits using tungsten metallization or products containing same that infringe claim 1, 3, or 4 of U.S. Patent No. 5,227,335.

Further, this Initial Determination, together with the record of the hearing in this investigation consisting of:

(1) the transcript of the hearing, with appropriate corrections as may hereafter be ordered, and

(2) the exhibits received into evidence in this investigation, as listed in the attached exhibit lists, is CERTIFIED to the Commission.

In accordance with 19 C.F.R. § 210.39(c), all material found to be confidential by the undersigned under 19 C.F.R. § 210.5 is to be given *in camera* treatment.

The Secretary shall serve a public version of this ID upon all parties of record and the confidential version upon counsel who are signatories to the Protective Order (Order No. 1) issued in this investigation, and upon the Commission investigative attorney.

To expedite service of the public version, each party is hereby ORDERED to file with the Commission Secretary by no later than September 28, 2009, a copy of this ID with brackets that show any portion considered by the party (or its suppliers of information) to be confidential,

accompanied by a list indicating each page on which such a bracket is to be found. At least one copy of such a filing shall be served upon the Administrative Law Judge, and the brackets shall be marked in red. If a party (and its suppliers of information) considers nothing in the ID to be confidential, and thus makes no request that any portion be redacted from the public version of this ID, then a statement to that effect shall be filed in lieu of a document with brackets.

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 § 210.43(a) or the Commission, pursuant to § 210.44, orders on its own motion a review of the ID or certain issues herein.

Carl C Charneski

Carl C. Charneski
Administrative Law Judge

Issued: September 21, 2009

CERTAIN SEMICONDUCTOR INTEGRATED CIRCUITS USING TUNGSTEN METALLIZATION AND PRODUCTS CONTAINING SAME

INV. NO. 337-TA-648

PUBLIC CERTIFICATE OF SERVICE

I, Marilyn R. Abbott, hereby certify that the attached **INITIAL DETERMINATION** has been served upon the Commission Investigative Attorney, Ret Snotherly, Esq., and the following parties as indicated, on

January 29, 2010

Marilyn R. Abbott, Secretary
U.S. International Trade Commission
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CERTAIN SEMICONDUCTOR INTEGRATED CIRCUITS USING TUNGSTEN METALLIZATION AND PRODUCTS CONTAINING SAME

INV. NO. 337-TA-648

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CERTAIN SEMICONDUCTOR INTEGRATED CIRCUITS USING TUNGSTEN METALLIZATION AND PRODUCTS CONTAINING SAME

INV. NO. 337-TA-648

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

In the Matter of **CERTAIN SEMICONDUCTOR INTEGRATION CIRCUITS USING TUNGSTEN METALLIZATION AND PRODUCTS CONTAINING SAME**	**Investigation No. 337-TA-648**

NOTICE OF COMMISSION DETERMINATION TO REVIEW-IN-PART A FINAL INITIAL DETERMINATION FINDING NO VIOLATION OF SECTION 337 AND TO REMAND A PORTION OF THE INVESTIGATION; SCHEDULE FOR WRITTEN SUBMISSIONS RELATING TO REMAND, AND TO REMEDY, THE PUBLIC INTEREST, AND BONDING

AGENCY: U.S. International Trade Commission.

ACTION: Notice.

SUMMARY: Notice is hereby given that the U.S. International Trade Commission has determined to review-in-part a final initial determination ("ID") of the presiding administrative law judge ("ALJ") finding no violation of section 337 of the Tariff Act of 1930 (19 U.S.C. § 1337) in the above-captioned investigation, and has determined to remand a portion of the investigation to the ALJ.

FOR FURTHER INFORMATION CONTACT: Clint Gerdine, Esq., Office of the General Counsel, U.S. International Trade Commission, 500 E Street, S.W., Washington, D.C. 20436, telephone (202) 708-2310. 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, S.W., 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: The Commission instituted this investigation on May 21, 2008 based on a complaint filed on April 18, 2008, by LSI Corporation of Milpitas, California and Agere Systems Inc. of Allentown, Pennsylvania (collectively "complainants"). The complaint, as amended, alleged violations of section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337, in the importation into the United States, the sale for importation, and the sale within the United States after importation of certain semiconductor integrated

circuits using tungsten metallization and products containing same by reason of infringement of one or more of claims 1, 3, and 4 of U.S. Patent No. 5,227,335. The amended complaint named numerous respondents. Several respondents have been terminated from the investigation due to settlement. The following seven respondents remain in the investigation: Tower Semiconductor, Ltd. ("Tower") of Israel; Jazz Semiconductor ("Jazz") of Newport Beach, California; Powership Semiconductor Corporation ("Powerchip") of Taiwan; Grace Semiconductor Manufacturing Corporation ("Grace") of China; Integrated Device Technology, Inc. ("IDT") of San Jose, California; Spansion, Inc. ("Spansion") of Sunnyvale, California; and Nanya Technology Corporation ("Nanya") of Taiwan. The complaint further alleged that an industry in the United States exists as required by subsection (a)(2) of section 337.

On September 21, 2009, the ALJ issued his final ID finding no violation of section 337 by the remaining respondents. He concluded that each accused process was covered by one or more of asserted claims 1, 3, and 4 of the '335 patent, but also that all asserted claims were anticipated under 35 U.S.C. § 102(g) in view of the IBM Process A prior art. On October 5, 2009, complainants, respondents, and the Commission investigative attorney ("IA") filed petitions for review of the final ID. Also, four separate petitions for review were filed on the same date by respondents Grace, IDT, Tower/Jazz, and Nanya/Powerchip/Spansion. The IA, complainants, and respondents filed responses to the other parties' petitions on October 13, 2009.

Upon considering the parties' filings, the Commission has determined to review-in-part the ID. Specifically, the Commission has determined to review: (1) invalidity of claims 1, 3, and 4 of the '335 patent under 35 U.S.C. §§ 102(g) & 103 with respect to the IBM Process A, IBM Process B, and AMD prior art; and (2) Jazz's stipulation regarding whether its process meets the complete, third recited step of claim 1, *i.e.*, "depositing a tungsten layer by chemical vapor deposition, said tungsten layer covering said glue layer on said dielectric and said exposed material." The Commission has determined not to review the remainder of the ID.

In addition, the Commission has determined to issue an order remanding the investigation to the ALJ for further proceedings relating to whether claim 4 is rendered obvious by IBM Process A in light of the other prior art asserted by respondents.

The Commission has instructed the ALJ to make his determination on remand at the earliest practicable time, and to extend the target date of the above-captioned investigation as he deems necessary to accommodate the remand proceedings. The parties are invited to file written submissions on the ALJ's remand determination within fourteen days after service of the ALJ's determination and to file responses to the written submissions within seven days after service of the written submissions. The Commission also requests briefing on remedy, the public interest, and bonding from the parties, consistent with these submission dates, as described in detail below.

In connection with the final disposition of this investigation, the Commission may issue an order that results in the exclusion of the subject articles from entry into the United States. Accordingly, the Commission is interested in receiving written submissions that address the form

of remedy, if any, that should be ordered. If a party seeks exclusion of an article from entry into the United States for purposes other than entry for consumption, the party should so indicate and provide information establishing that activities involving other types of entry either are adversely affecting it or likely to do so. For background, *see In the Matter of Certain Devices for Connecting Computers via Telephone Lines*, Inv. No. 337-TA-360, USITC Pub. No. 2843 (December 1994) (Commission Opinion).

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

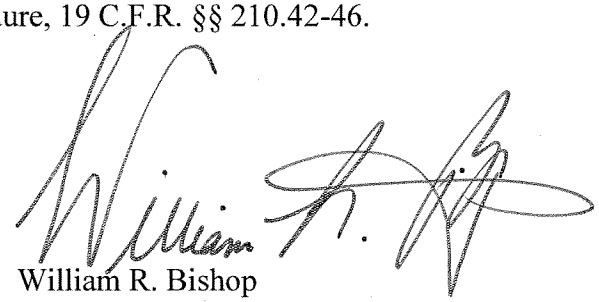
When the Commission orders some form of remedy, the U.S. Trade Representative, as delegated by the President, has 60 days to approve or disapprove the Commission's action. *See* section 337(j), 19 U.S.C. § 1337(j) and the Presidential Memorandum of July 21, 2005, 70 *Fed. Reg.* 43251 (July 26, 2005). During this period, the subject articles would be entitled to enter the United States under bond, in an amount determined by the Commission. The Commission is therefore interested in receiving submissions concerning the amount of the bond that should be imposed if a remedy is ordered.

WRITTEN SUBMISSIONS: Parties to the investigation, interested government agencies, and any other interested parties are encouraged to file written submissions on the issues of remedy, the public interest, and bonding, and such submissions should address the recommended determination by the ALJ on remedy and bonding. The complainant and the IA are also requested to submit proposed remedial orders for the Commission's consideration. Complainant is also requested to state the date that the patent at issue expires and the HTSUS numbers under which the accused articles are imported. The written submissions and proposed remedial orders, and any reply submissions, must be filed consistent with the dates stated above relating to the remand ID. No further submissions on these issues will be permitted unless otherwise ordered by the Commission.

Persons filing written submissions must file the original document and 12 true copies thereof on or before the deadlines stated above with the Office of the Secretary. Any person desiring to submit a document to the Commission in confidence must request confidential treatment unless the information has already been granted such treatment during the proceedings. All such requests should be directed to the Secretary of the Commission and must include a full statement of the reasons why the Commission should grant such treatment. *See* 19 C.F.R. § 210.6. Documents for which confidential treatment by the Commission is sought will be treated accordingly. All nonconfidential written submissions will be available for public inspection at the Office of the Secretary.

The authority for the Commission's determination is contained in section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337, and in sections 210.42-46 of the Commission's Rules of Practice and Procedure, 19 C.F.R. §§ 210.42-46.

By order of the Commission.



William R. Bishop
Acting Secretary to the Commission

Issued: November 23, 2009

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

In the Matter of **CERTAIN SEMICONDUCTOR INTEGRATED CIRCUITS USING TUNGSTEN METALLIZATION AND PRODUCTS CONTAINING SAME**	**Investigation No. 337-TA-648**

ORDER

The Commission instituted this investigation on May 21, 2008 based on a complaint filed on April 18, 2008, by LSI Corporation of Milpitas, California and Agere Systems Inc. of Allentown, Pennsylvania (collectively "complainants"). The complaint, as amended, alleged violations of section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337, in the importation into the United States, the sale for importation, and the sale within the United States after importation of certain semiconductor integrated circuits using tungsten metallization and products containing same by reason of infringement of one or more of claims 1, 3, and 4 of U.S. Patent No. 5,227,335 ("the '335 patent"). The amended complaint named numerous respondents. Several respondents have been terminated from the investigation due to settlement. The following seven respondents remain in the investigation: Tower Semiconductor, Ltd. ("Tower") of Israel; Jazz Semiconductor ("Jazz") of Newport Beach, California; Powership Semiconductor Corporation ("Powerchip") of Taiwan; Grace Semiconductor Manufacturing Corporation ("Grace") of China; Integrated Device Technology, Inc. ("IDT") of San Jose, California; Spansion, Inc. ("Spansion") of Sunnyvale, California; and Nanya Technology Corporation ("Nanya") of Taiwan. The complaint further alleged that an industry in the United States exists as required by subsection (a)(2) of section 337.

On September 21, 2009, the administrative law judge ("ALJ") issued his final initial determination ("ID") finding no violation of section 337 by the remaining respondents. He concluded that each accused process was covered by one or more of the asserted claims 1, 3, and 4 of the '335 patent, but also that all asserted claims were anticipated under 35 U.S.C. § 102(g) in view of the IBM Process A prior art. On October 5, 2009, complainants, respondents, and the Commission investigative attorney ("IA") filed petitions for review of the final ID. Also, four separate petitions for review were filed on the same date by respondents Grace, IDT, Tower/Jazz, and Nanya/Powerchip/Spansion. The IA, complainants, and respondents filed responses to the other parties' petitions on October 13, 2009.

Having examined the record in this investigation, including the ALJ's ID and the parties' submissions, the Commission has determined to review-in-part the ID. Specifically, the Commission has determined to review: (1) invalidity of claims 1, 3, and 4 of the '335 patent under 35 U.S.C. §§ 102(g) & 103 with respect to the IBM Process A, IBM Process B, and AMD prior art; and (2) Jazz's stipulation regarding whether its process meets the third recited step of claim 1, *i.e.*, "depositing a tungsten layer by chemical vapor deposition, said tungsten layer covering said glue layer on said dielectric and said exposed material." The Commission has determined not to review the remainder of the ID.

In addition, the Commission has determined to remand the investigation to the ALJ for further proceedings relating to whether claim 4 is rendered obvious by IBM Process A in light of the other prior art asserted by respondents.

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

1. The question of violation of section 337 with respect to claim 4 of the '335 patent is remanded to the ALJ for a remand determination addressing issues related to obviousness with respect to the reference(s) set forth in paragraph 2 below.

2. The ALJ shall consider whether respondents' and the IA's obviousness arguments related to IBM Process A have merit.

3. The ALJ shall make his remand determination of whether there is a violation of section 337 with regard to claim 4 of the '335 patent at the earliest practicable time, mindful that the '335 patent expires in July 2010.

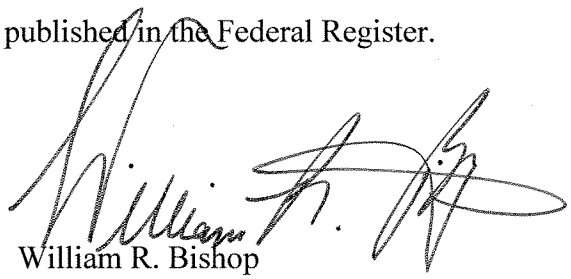
4. The ALJ shall issue an ID within 30 days of this Order extending the target date as he deems necessary to accommodate the remand proceedings.

5. The parties are invited to file written submissions on the ALJ's remand determination within fourteen days after service of the ALJ's determination and to file responses to the written submissions within seven days of the written submissions. The parties should also address remedy, the public interest, and bonding in accordance with the Commission's notice issued concurrently with this Order.

6. The Secretary shall serve copies of this Order upon each party of record in this investigation.

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

By order of the Commission.



William R. Bishop
Acting Secretary to the Commission

Issued: November 23, 2009

CERTAIN SEMICONDUCTOR INTEGRATED CIRCUITS USING TUNGSTEN METALLIZATION AND PRODUCTS CONTAINING SAME **337-TA-648**

CERTIFICATE OF SERVICE

I, Marilyn R. Abbott, hereby certify that the **NOTICE OF COMMISSION DETERMINATION TO REVIEW-IN-PART A FINAL INITIAL DETERMINATION FINDING NO VIOLATION OF SECTION 337 AND TO REMAND A PORTION OF THE INVESTIGATION; SCHEDULE FOR WRITTEN SUBMISSIONS RELATING TO REMAND, AND TO REMEDY, THE PUBLIC INTEREST, AND BONDING; ORDER** has been served by hand upon the Commission Investigative Attorney, Rett Snotherly, Esq., and the following parties as indicated has been served, on November 23, 2009.

Marilyn R. Abbott

Marilyn R. Abbott, Secretary
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PUBLIC VERSION

UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, D.C.

In the Matter of **CERTAIN SEMICONDUCTOR INTEGRATED CIRCUITS USING TUNGSTEN METALLIZATION AND PRODUCTS CONTAINING SAME**	**Investigation No. 337-TA-648**

COMMISSION OPINION

I. INTRODUCTION

On December 11, 2008, the presiding administrative law judge ("ALJ") issued the initial determination ("ID") (Order No. 26) denying respondents' motion for summary determination.[1] In their motion, respondents argued that complainants LSI Corporation and Agere Systems, Inc. ("Agere") are precluded from re-litigating the asserted patent in this investigation, U.S. Patent No. 5,227,335 ("the '335 patent").[2] Respondents based their motion on a judgment of invalidity that the U.S. District Court for the Eastern of Pennsylvania ("District Court") issued in a previous case between Agere and Atmel Corporation ("Atmel").[3] The District Court later vacated its judgment upon the request of Agere and Atmel as part of a settlement agreement between the parties.

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[1]Fourteen respondents, including Cypress Semiconductor Corp. ("Cypress") of San Jose, California, are joined in the motion and two other respondents are joined in Cypress' subsequent petition for review of Order No. 26 to the Commission.

[2]Additional relevant procedural history may be found in the subject ID.

[3] *See* Doc. No. 433, Order, *Agere Systems v. Atmel Corp.*, 2:02-cv-00864-LDD (E.D. Pa. June 19, 2006.)

The Commission determined to review the ID in part, and on review, to modify the subject ID to provide its own reasoning in support the ALJ's ultimate finding that Agere is not precluded from asserting the '335 patent in a Commission investigation.

II. DISCUSSION

A. Applicable Law on Issue Preclusion

The subject ID does not make a clear statement concerning the controlling law in determining whether issue preclusion should apply here. Respondents interpreted the ID as having applied the law of the Third Circuit, where the district court that issued the vacated judgment is located. In fact, the controlling law is that of the circuit that must determine whether to apply issue preclusion. *See Panduit Corp. v. AllStates Plastic Manufacturing Co., Inc.*, 744 F.2d 1564, 1574-75 (Fed. Cir. 1984) (the court stating that its policy of following regional circuit law, in procedural matters not unique to patent law, "does not preclude this court from following existing or creating new law regarding any and all matters in cases where this court has exclusive jurisdiction over all appeals from a particular court."); *R.F. Delaware, Inc. v. Pacific Keystone Technologies, Inc.*, 326 F.3d 1255, 1261 (Fed. Cir. 2003); *Dana v. E.S. Originals, Inc.*, 342 F.3d 1320, 1323 (Fed. Cir. 2003). The Federal Circuit has exclusive appellate jurisdiction for cases appealed from the Commission, therefore, Federal Circuit law on issue preclusion controls here. *See Certain NOR and NAND Flash Memory Devices and Products Containing Same*, Inv. No. 337-TA-560, Order No. 5 at 5, May 21, 2006 ("[t]he Commission and [the] Federal Circuit have used a four-part test to determine whether collateral estoppel applies.").

Under Federal Circuit law, the doctrine of issue preclusion can be applied only if: (1) the issue is identical to one decided in the first action; (2) the issue was actually litigated in the first action; (3) resolution of the issue was essential to a final judgment in the first action; and (4) the

plaintiff had a full and fair opportunity to litigate the issue in the first action. *See In Re Freeman*, 30 F.3d 1459, 1465 (Fed. Cir. 1994). The application of issue preclusion is discretionary and the court must determine if its application is appropriate in view of any equitable considerations. *See Freeman*, 30 F.3d at 1467. Unfortunately, the Federal Circuit has not spoken directly to the critical issue here - whether a judgment of patent invalidity that was vacated pursuant to a voluntary settlement agreement precludes the assertion of that patent in a later proceeding.

The parties dispute whether the third requirement for issue preclusion is met here, *i.e.*, whether a judgment of patent invalidity that is vacated pursuant to a voluntary settlement agreement constitutes a "final judgment." Respondents argue that basing preclusion on a vacated judgment is contrary to *U.S. Bancorp. Mortgage Co. v. Bonner Mall P'ship*, 513 U.S. 18, 26 (1994), in which the Supreme Court held that mootness by reason of settlement does not justify vacatur of a case under review. Respondents also argue that issue preclusion should not apply in view of the public policy, expressed by the Supreme Court, favoring the removal of invalid patents from the public domain. *See Blonder-Tongue Labs, Inc. v. University of Illinois Foundation*, 402 U.S. 313, 314 (1971); *Cardinal Chemical Co. v. Morton Int'l Inc.*, 508 U.S. 83, 100-101 (1993). However, those cases addressed the issue of whether an appellate court should vacate a lower court's judgment of patent invalidity when litigants voluntarily settle after the lower court's judgment. They do not answer the question before us, *i.e.*, whether an already vacated judgment of patent invalidity should be given preclusive effect. The ALJ based his decision not to apply preclusion under these circumstances on a concurring opinion in *Dana v. E.S. Originals, Inc.*, 342 F.3d 1320, 1328 (J. Dyk, concurring) which expressed a view that *U.S. Bancorp.*, by its terms, applied to Federal appellate courts and the Supreme Court only, and did not apply to District Courts. ID at 9-11,

Since the Federal Circuit has not ruled on the exact issue before us, opinions in other circuits are instructive. *See Hinck v. United States*, 446 F.3d 1307, 1310 (Fed. Cir. 2006) (Federal Circuit stating that in a case of first impression, the case law of other circuit and district courts is relevant to its analysis). Significantly, the Second, Fourth, and Seventh Circuits have declined to accord preclusive effect to judgments vacated as part of a settlement agreement. *See, e.g., Harris Trust & Sav. Bank v. John Hancock Mut. Life Ins. Co.*, 970 F.2d 1138 (2nd Cir. 1992); *Zeneca Ltd. v. Novopharm Ltd.*, 919 F. Supp 193 (D. Md. 1996) (applying 4th Cir. law); *Pontarelli Limousine, Inc. v. City of Chicago*, 929 F.2d at 339 (7th Cir. 1991). The Third, Fifth, and Ninth Circuits have ruled to the contrary. *See Sentinel Trust Co. v. Universal Bonding Ins. Co.*, 316 F.3d 213 (3rd Cir. 2003); *Chemetron Corp. v. Business Funds, Inc.*, 682 F.2d 1149 (5th Cir. 1983), *vacated on other grounds,* 460 U.S. 1007 (1983); *Bates v. Union Oil of California*, 944 F.2d 647, 650-1 (9th Cir. 1991). These cases applying preclusion, however, have been subsequently distinguished or criticized by the same circuit or other circuits.[4] In contrast, the cases from the circuits which have decided not to apply preclusion have not been criticized or distinguished.

Although there is no Federal Circuit law that is directly on point, it is relevant that the Federal Circuit generally does not apply preclusive effect to vacated judgments.[5] We especially

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[4] *Sentinel* noted that *Chemetron* (5th Cir.) has been criticized and that *Bates* (9th Cir.) has been distinguished by other circuits as unusual and narrow. *See Sentinel*, 316 F.3d at 222 fn. 2 (*citing Avondale Shipyards v. Insured Lloyd's*, 786 F.2d 1265 (5th Cir. 1986) and *J.R. Clearwater Ashland Chem. v. Ashland Chem.*, 93 F.3d 176 (5th Cir. 1996)); *U.S. Philips Corp. v. Sears Roebuck* & Co., 1992 U.S. Dist. LEXIS 15654 at *4-5 (N.D. Ill. Oct. 13, 1992); *Zeneca*, 919 F. Supp. at 197.

[5] *See Texas Instruments, Inc.. v. Int'l Trade Commn.*, 851 F.2d 342, 344 (Fed. Cir. 1988) ("[vacatur] clears the path for future relitigation of the issues between the parties and eliminates a judgment"); *quoting United States v. Munsingwear*, 340 U.S. 36, 39-40 (1950); *Kaw Nation v.*

note *Rumsfeld v. Freedom NY, Inc.*, 329 F.3d 1320, 1322 (Fed. Cir. 2003), which holds that "a vacated judgment has no preclusive force as a matter of collateral or direct estoppel or as a matter of the law of the case."

B. Equitable Considerations

As the doctrine of issue preclusion is based on principles of fairness, policy and equitable considerations are relevant when determining whether to apply issue preclusion. *See Freeman*, 30 F.3d at 1467 ("The doctrine of issue preclusion is premised on principles of fairness. Thus, a court is not without some discretion to decide whether a particular case is appropriate for application of the doctrine."); *citing, e.g., Blonder-Tongue Labs., Inc. v. Univ. of Ill. Found.*, 402 U.S. 313, 349 (1971). Consistent with principles of fairness, parties are generally entitled to the benefit of their bargain when entering into a contractual agreement. *See Silicon Image, Inc. v. Genesis Microchip Inc.*, 395 F.3d 1358, 1363-64 (Fed. Cir. 1993) (holding that a district court cannot alter the terms of the settlement agreement by judicial decree without the parties' consent). Further, consistent with public policy considerations, the finality of court orders, especially when the result of settlement between the parties, is to be acknowledged and not disturbed. *See Louisville Bedding Co. v. Pillowtex Corp.*, 455 F.3d 1377, 1381 (Fed. Cir. 2006).

Norton, 405 F.3d 1317, 1324 (Fed. Cir. 2005)(the Court teaching that vacatur ensures no "continuing collateral estoppel effect"); *Beacon Oil Co. v. United States*, 832 F.2d 593, 596 (Fed. Cir. 1987) (the Court teaching that vacatur avoids the "possibilities of unfair collateral estoppel"); *but see Aqua Marine Supply v. AIM Machining*, 247 F.3d 1216, 1220-21 (Fed. Cir. 2001) (the District Court refused to vacate its patent invalidity judgment, where vacatur was requested by the parties in accordance with a settlement agreement, and the Court on appeal, after considering *Bancorp*, decided not to overturn the District Court denial so the invalidity ruling could retain preclusive effect).

We find that the facts weigh in favor of not granting preclusive effect to the vacated judgment in the case at hand. Atmel, an innocent party not attempting to benefit from either vacatur or issue preclusion in this investigation, entered into a settlement agreement with Agere in which it was granted a license to practice the '335 patent in exchange for significant consideration. *See* Respondents' Br., Ex. L at Sec. 2.01(a). Applying issue preclusion here would destroy the negotiated settlement reached by Agere and Atmel. Moreover, there is no evidence of any bad-faith actions on the part of Agere in obtaining the vacatur. Thus, the equitable and policy considerations present here weigh in favor of not applying issue preclusion in this matter.

III. CONCLUSION

Accordingly, we reach the same conclusion as the ALJ in Order No. 26, but modify the ID as described herein, and affirm the ID in all other respects.

By order of the Commission.

Marilyn R. Abbott
Secretary to the Commission

Issued: February 18, 2009

CERTAIN SEMICONDUCTOR INTEGRATED CIRCUITS USING TUNGSTEN METALLIZATION AND PRODUCTS CONTAINING SAME **337-TA-648**

PUBLIC CERTIFICATE OF SERVICE

I, Marilyn R. Abbott, hereby certify that the attached **COMMISSION OPINION** has been served by hand upon the Commission Investigative Attorney, Rett Snotherly, Esq., and the following parties as indicated has been served, on FEB 19 2009.

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PUBLIC VERSION

UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, D.C.

In the Matter of **CERTAIN SEMICONDUCTOR INTEGRATED CIRCUITS USING TUNGSTEN METALLIZATION AND PRODUCTS CONTAINING SAME**	**Inv. No. 337-TA-648**

REMAND DETERMINATION

Background

On September 21, 2009, the undersigned issued the Initial Determination ("ID") on the question of violation of section 337 (19 U.S.C. § 1337) finding, *inter alia*, that it was "established by clear and convincing evidence that claims 1, 3, and 4 of [U.S. Patent No. 5,227,335 ("the '335 patent")] are invalid due to anticipation in view of IBM Process A.[1] No other ground for invalidity has been established." ID at 98 (conclusions of law). Accordingly, it was further found that "[n]o violation of section 337 has occurred with respect to claim 1, 3, or 4 of the '335 patent." *Id.* at 98-99.

The investigation, including the ID, is currently before the Commission. On November 23, 2009, the Commission issued a "Notice of Commission Determination to Review-in-Part a

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[1] As detailed in the ID, IBM Process A is a prior art process relating to the invalidity arguments made by respondents and the Investigative Attorney ("IA") of the Commission Investigative Staff ("Staff"). ID at 2-6 (identification of respondents), 79-81 (background of IBM Process A).

Final Initial Determination Finding No Violation of Section 337 and to Remand a Portion of the Investigation." On that date, the Commission also issued an Order ("the remand order"), which provides in part:

> 1. The question of violation of section 337 with respect to claim 4 of the '335 patent is remanded to the ALJ for a remand determination addressing issues related to obviousness with respect to the reference(s) set forth in paragraph 2 below.
>
> 2. The ALJ shall consider whether respondents' and the IA's obviousness arguments related to IBM Process A have merit.

Comm'n Order at 3.[2] The mandate of the Commission's remand order clearly is limited to IBM Process A alone, and thus, this remand determination will primarily address this narrowly drawn issue.

The text of claim 4 and independent claim 1 are addressed in the ID. *See* ID at 35-46 (claim construction); *see also* ID at 8-12 (technological background) & 28-30 (general discussion of the law relating to obviousness).

Discussion

For the reasons explained below, it is found that the respondents' and the IA's obviousness arguments relating to IBM Process A do not have merit. Thus, it has not been shown by "clear and convincing" evidence that claim 4 of the '335 patent is invalid due to obviousness under 35 U.S.C. § 103. *See Checkpoint Systems, Inc. v. United States Int'l Trade Comm'n,* 54 F.3d 756, 761 (Fed. Cir. 1995) (clear and convincing standard of proof).

In their post-hearing brief, respondents presented a two and one-half page argument

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[2] The undersigned was not served with the Commission's remand order.

relating to the alleged obviousness of claim 4. Resp. Br. at 46-48. Indeed, very little of this argument was directed to IBM Process A. In the Staff's post-hearing brief, the IA presented a one paragraph argument relating to the alleged obviousness of claim 4. Staff Br. at 71.[3]

In arguing that claim 4 is invalid due to obviousness, neither the respondents, nor the IA, relied solely on IBM Process A . Rather, they relied on other evidence, both intrinsic and extrinsic to the '335 patent, as support for their argument. Accordingly, given this fact and given the fact that the only art identified in the Commission's remand order is IBM Process A, it cannot be found that respondents or the IA have established that claim 4 is invalid as obvious.

Alternatively, reading the remand order more broadly than its literal terms suggest, respondents and the IA still must fail in their attempt to prove obviousness. In that regard, they argue that the use of "tungsten plugs" predates the '335 patent, and that the inventors acknowledged that over-etching to form plugs was "conventional." Indeed, respondents refer to examples in the prior art in which tungsten is deposited by CVD on a titanium "sticking layer," and then etched to planarize the surface. *See, e.g.,* Resp. Jt. Br. at 46 (citing, *inter alia*, CX-1 (the '335 patent), col. 4, lines 52-60).[4] Respondents and the IA conclude that one of ordinary

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[3] In response to the main post-hearing brief of complainants LSI Corporation and Agere Systems, Inc., respondents allocated a few paragraphs of their reply to the obviousness issue. Resp. Reply at 29-30. The IA did not revisit the question in the Staff's reply.

[4] Inasmuch as dependent claims normally add limitations to independent claims, the law provides that a dependent claim can be valid even when the independent claim is invalid. *See Scanner Technologies Corp. v. ICOS Vision Sys. Corp.*, 528 F.3d 1365, 1383 (Fed. Cir. 2008). However, respondents rely on a quotation from the prosecution of the '335 patent, in which the inventors stated that "the dependent claims will stand or fall with claim 1." Resp. Br. at 47-48 (quoting RX-242 (prosecution history) at 128538). That statement appears in an appeal brief filed before the PTO Board, in which counsel (on behalf of applicants) grouped the dependent claims with independent claim 1 for the purpose of discussing the use of conducting nitrides in

(continued...)

skill would have been motivated to combine such additional prior art *with* IBM Process A to meet all of the limitations of claim 4. *Id.* at 48; Staff Br. at 71. Respondents and the IA are wrong.

Listing prior art references, and concluding that the invention would have been obvious in view of those references is insufficient to show obviousness. Rather, the challenger must show clearly and convincingly both how and why prior art could have been combined. *Innogenetics N.V. v. Abbott Labs.*, 512 F.3d 1363, 1373 (Fed. Cir. 2008). That was not shown here by respondents and the IA.

The briefs of respondents and the IA show that tungsten plugs and planarization are found in the prior art. Yet, inasmuch as their arguments are based on alleged obviousness, there is no example from the prior art of the type of planarization required by claim 4 occurring in connection with the fabrication of a device that meets all the limitations of the claim (which include the limitations of independent claim 1). If one adopted their arguments, it is unclear how one could convincingly substantiate the fact that one of ordinary skill would have made a specific combination consisting of IBM Process A and other prior art, and further how one would have successfully accomplished such a combination of elements.[5]

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[4](...continued)
the claimed invention. That is not the issue presented by the additional limitations of claim 4.

Additionally, the prior art discussed in the successful appeal is the same as some of the principal prior art relied upon by respondents in their obviousness argument (*i.e.*, the Smith and Mehta references). Thus, that prior art was already considered by the PTO, with a determination ultimately made in the applicants' favor. Indeed, even if claims 1 and 4 were to "stand or fall" together, inasmuch as respondents have not shown that claim 1 is invalid due to obviousness (let alone in view of Smith and Mehta), claim 4 would also stand.

[5] Each party paid little or no attention to secondary considerations relating to the issue of (continued...)

Accordingly, it is found that respondents' and the IA's obviousness arguments related to IBM Process A do not have merit. Hence, neither respondents, nor the IA, have demonstrated by clear and convincing evidence that claim 4 of the '335 patent is invalid due to obviousness.

To expedite service of the public version, each party is hereby ORDERED to file with the Commission Secretary by no later than January 15, 2010, a copy of this document with brackets that show any portion considered by the party (or its suppliers of information) to be confidential. At least one copy of such a filing shall be served upon the Administrative Law Judge, and the brackets shall be marked in red. If a party (and its suppliers of information) considers nothing in the document to be confidential, and thus makes no request that any portion be redacted from the public version of this document, then a statement to that effect shall be filed in lieu of a document with brackets.

Carl C. Charneski
Administrative Law Judge

Issued: January 14, 2010

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[5](...continued)
obviousness. Clearly, there was a long felt need that motivated at least two companies to research the manufacture of tungsten semiconductors such as those covered by the '335 patent. *See* Compl. Br. at 52 n.16; Compl. Reply 57-58. Yet, as discussed in the ID, IBM actually developed the claimed method first. Thus, secondary considerations of nonobviousness carry no weight in this investigation.

CERTAIN SEMICONDUCTOR INTEGRATED CIRCUITS USING TUNGSTEN METALLIZATION AND PRODUCTS CONTAINING SAME

INV. NO. 337-TA-648

PUBLIC CERTIFICATE OF SERVICE

I, Marilyn R. Abbott, hereby certify that the attached **ORDER** has been served upon the Commission Investigative Attorney, Ret Snotherly, Esq., and the following parties as indicated, on January 29, 2010

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