William H. Manning (*pro hac vice*)
E-mail: WHManning@rkmc.com
Brad P. Engdahl (*pro hac vice*)
E-mail: BPEngdahl@rkmc.com
Jacob S. Zimmerman (*pro hac vice*)
E-mail: JSZimmerman@rkmc.com
Aaron R. Fahrenkrog (*pro hac vice*)
E-mail: ARFahrenkrog@rkmc.com
Robins, Kaplan, Miller & Ciresi L.L.P.
2800 LaSalle Plaza
800 LaSalle Avenue
Minneapolis, MN 55402
Telephone: 612-349-8500
Facsimile: 612-339-4181

David E. Marder (*pro hac vice*)
E-mail: DEMarder@rkmc.com
Robins, Kaplan, Miller & Ciresi L.L.P.
800 Boylston Street, 25th Floor
Boston, MA 02199
Telephone: 617-267-2300
Facsimile: 617-267-8288

John P. Bovich (SBN 150688)
E-mail: JBovich@reedsmith.com
Reed Smith LLP
Two Embarcadero Center, Suite 2000
San Francisco, CA 94111
Telephone: 415-543-8700

Attorneys for Plaintiffs Advanced Micro Devices, Inc. and ATI Technologies, ULC

UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

SAN FRANCISCO DIVISION

ADVANCED MICRO DEVICES, INC., et al.,

Plaintiffs,

v.

SAMSUNG ELECTRONICS CO., LTD., et al.,

Defendants.

Case No. CV-08-0986-SI

PLAINTIFFS' OPPOSITION TO SAMSUNG'S MOTION FOR SUMMARY JUDGMENT OF INVALIDITY OF U.S. PATENT NO. 5,545,592

Date: **May 8, 2009**
Time: **9:00 a.m.**
Courtroom: **10, 19th Floor**
Judge: **The Honorable Susan Illston**

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I. INTRODUCTION

Samsung[1] cannot show that claims 1 and 4 of U.S. Patent No. 5,545,592 ("'592") are anticipated because the allegedly anticipatory reference does not expressly or inherently disclose the claimed step of "exposing said metal silicide layer to nitrogen ionized in a plasma…." Samsung cannot show obviousness because Samsung did not provide admissible evidence on any of the fact questions underlying obviousness. Therefore, Plaintiffs Advanced Micro Devices, Inc. and ATI Technologies ULC, Inc. (collectively "AMD") oppose Samsung's Motion for Summary Judgment ("Samsung's Motion"). Because Samsung, who bears the burden of proving invalidity by clear and convincing evidence, cannot establish that Hillman U.S. Patent No. 5,975,912 ("'912") anticipates or renders obvious the asserted Iacoponi '592 patent claims, Samsung's Motion must be denied.

II. STATEMENT OF ISSUES TO BE DECIDED

Whether there is a genuine dispute as to the following issues:

1. Whether the process described at 15:29-37 of Hillman '912 expressly discloses the Iacoponi '592 patent's claimed step of "exposing said metal silicide layer to nitrogen ionized in a plasma."

2. Whether the process described at 15:29-37 of Hillman '912 always results in a metal silicide being exposed to nitrogen ionized in a plasma.

3. Whether the process described at 3:47-58 of Hillman '912 expressly discloses each and every step of '592 claims 1 or 4.

4. Whether the process described at 3:47-53 of Hillman '912 always results in a metal silicide being exposed to nitrogen ionized in a plasma.

5. Whether the disclosures of columns 3 and 15 of Hillman '912 are sufficiently linked that one of ordinary skill in the art would understand them to apply to the same process.

[1] "Samsung" refers collectively to defendants Samsung Electronic Co., Ltd., Samsung Semiconductor, Inc., Samsung Austin Semiconductor, LLC, Samsung Electronics America, Inc., Samsung Telecommunications America, LLC, Samsung Techwin Co., Ltd., and Samsung Opto-Electronics America, Inc.

6. Whether the combination of the processes described at 15:29-37 and 3:47-53 of Hillman '912 expressly discloses each and every step of '592 claims 1 or 4.

7. Whether the combination of the processes described at 15:29-37 and 3:47-53 of Hillman '912 inherently discloses each and every step of '592 claims 1 or 4.

8. Whether Samsung provided admissible evidence to clearly and convincingly establish each fact underlying its obviousness defense.

III. FACTUAL BACKGROUND

A. The Technology of the '592 Patent

The Iacoponi '592 patent teaches a novel method for fabricating contacts in semiconductors. Contacts supply voltage to the source and drain of a transistor. *See* Declaration of Alexander Glew ("Glew Decl.") ¶9. Contacts are typically made of layers of different materials. *Id*. The Iacoponi invention focuses on the use of three separate materials: titanium silicide, titanium nitride, and tungsten. *See* Glew Decl. ¶10.

The Iacoponi '592 patent uses terms that have clear meaning to one of ordinary skill in the art. *See* Glew Decl. ¶11. For example, Iacoponi refers to a "semiconductor body." *See* '592 at 4:34-35, attached as Ex. 1 to the Declaration of Jacob Zimmerman ("Zimmerman Decl"). A semiconductor body is generally understood as the silicon wafer on which semiconductors are fabricated. *See* Glew Decl. ¶11. The semiconductor body is the foundation in and on which transistors and other devices are built. *Id*.

Iacoponi discusses the use of several metals, including titanium and tungsten. *See* '592 at 1:26, 4:28-30. One of ordinary skill understands that in the context of semiconductor fabrication, a "metal" is different than metallic compounds like metal silicides or metal nitrides. *See* Glew Decl. ¶12. Unlike a metal, a "metal silicide" is a compound made up of a metal (such as titanium) combined with silicon. *See* Glew Decl. ¶13; *see also* '592 at 1:32-34. There are several ways to make a metal silicide during semiconductor fabrication. *See* Glew Decl. ¶14. Iacoponi describes and claims one method, which describes depositing titanium on a silicon substrate, and then subjecting the device to an anneal. *See* '592 at 1:32-34, 4:52-55 (claim 3). An "anneal" is a process which exposes the wafer to high temperatures. *See* Glew Decl. ¶15. High temperatures

can enable and speed up chemical reactions. *Id*. The final material composition resulting from any given anneal depends upon the material that is being annealed, the annealing atmosphere, the annealing time, and the annealing temperature. *See* Glew Decl. ¶15. For example, the anneal described in the Iacoponi patent causes silicon to diffuse (or "migrate") from the substrate into the layer of titanium to form titanium silicide. *See id*.; *see also* Glew Decl. Ex. A.

A "metal nitride" is a compound made up of a metal (*e.g.*, titanium) combined with nitrogen atoms. *See* '592 at 3:54-57; Glew Decl. ¶17. There are several ways to make titanium nitride during semiconductor fabrication. *See* Glew Decl. ¶17. Iacoponi '592 describes two different techniques. One way is to convert titanium silicide into titanium nitride by plasma nitridation. '592 at 3:30-43; *see also* Glew Decl. ¶17. Plasma nitridation is the process of converting a metal (*e.g.*, titanium) or metal compound (*e.g.*, titanium silicide) into a metal nitride using a plasma. *See* Glew Decl. ¶16. Plasma nitridation only converts a thin portion starting at the surface. *Id*.

A "plasma" is partially ionized gas that is electrically conductive and that responds to magnetic fields. *See* Glew Decl. ¶18; *see also* Declaration of Michael Thomas in Support of Samsung's Motion for Summary Judgment (Dkt. #144) ("Thomas Decl.") at ¶10. "Partially ionized" means that some of the gas molecules are missing electrons or have extra electrons. *See* Glew Decl. ¶18. Ionized molecules tend to be more reactive than regular molecules. *Id*. During plasma nitridation, ionized nitrogen bonds with titanium to form titanium nitride. *Id*.

Iacoponi also describes using a process of depositing a layer of titanium nitride using a process called chemical vapor deposition ("CVD"). *See* '592 at 4:1-6; *see also* Glew Decl. ¶19. This process combines various gases in a chemical reaction that causes titanium nitride to form on the surface of the device. *See* Glew Decl. ¶19. One of ordinary skill understands that *depositing* titanium nitride is fundamentally different than using a plasma to *convert* titanium to titanium nitride. *Id*.

AMD has asserted two '592 patent claims against Samsung: claims 1 and 4. Claim 1 of the '592 patent is a method claim that recites the following limitations:

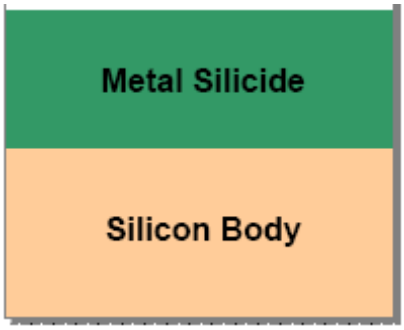
A method for forming a contact to a semiconductor body, said

> method comprising the steps of:
>
> forming a metal silicide layer on said body;
>
> exposing said metal silicide layer to nitrogen ionized in a plasma, thereby converting a portion of said metal silicide layer to a first metal nitride layer;
>
> depositing a layer of a second metal nitride over said metal silicide layer, such that said second metal nitride layer overlays and engages said first metal nitride layer; and
>
> depositing a layer of a second metal over said second metal nitride layer.

'592 at claim 1. Claim 4 depends from claim 1 and adds limitations where the metal silicide layer is titanium silicide, and the second metal nitride layer is titanium nitride. '592 at claim 4.

The following excerpts from Dr. Glew's Declaration graphically depict Iacoponi's claimed process:

Iacoponi's first method step is to form a metal silicide layer, such as titanium silicide, on a semiconductor body. *See* '592 at 4:34-36; Glew Decl. ¶23.



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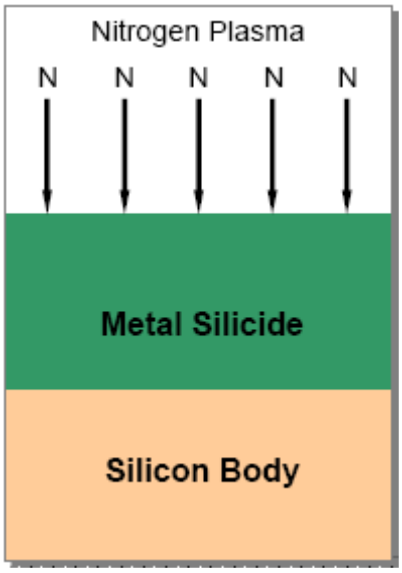
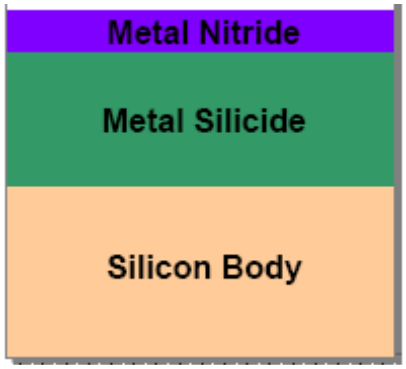
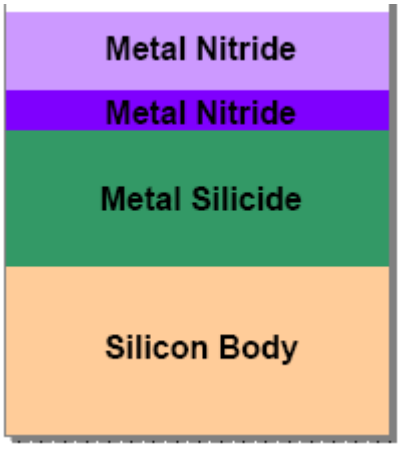
The next step is to expose the titanium silicide layer to nitrogen ionized in a plasma. *See* '592 at 4:37-38; Glew Decl. ¶24. As is explained in section V below, this critical step is missing from the Hillman '912 disclosure.



As a result of the exposure to a plasma, a thin portion at the top of the titanium silicide layer is converted to titanium nitride—the "first metal nitride" of claim 1. *See* '592 at 4:38-39; Glew Decl. ¶25.



The third step is to deposit a layer of titanium nitride on top of the first layer of titanium nitride. This is the "second metal nitride" described in claim 1. *See* '592 at 4:40-43; Glew Decl. ¶26.



The fourth and final step is to deposit a layer of metal, such as tungsten, on top of the second layer of titanium nitride. *See* '592 at 4:44-45; Glew Decl. ¶27.

In addition to these drawings, Exhibit A to Dr. Glew's Declaration includes a short animation depicting the methods recited in these claims. *See* Glew Decl. Ex. A. That animation is useful because this is a method patent, and the difference between Iacoponi's method and the Hillman patent are not easily depicted in still drawings. Therefore, AMD respectfully requests that the Court view the short animation.

The terms of the Iacoponi claims are relatively straightforward. Neither party identified any terms needing construction during the process leading up to the *Markman* hearing. While the parties now disagree about whether the preamble to claim 1 is limiting, it does not appear that there are any disputes regarding claim scope that impact the outcome of Samsung's Motion on anticipation.[2]

B. Hillman '912 Patent

Hillman '912 is one of a series of Hillman patents that describes a manufacturing tool for use in the fabrication of semiconductor devices. *See* Glew Decl. ¶28. In particular, Hillman '912

[2] Samsung has argued that the preamble to claim 1 is not a limitation. AMD disagrees. The preamble supplies the antecedent basis for the term "said body" in the first method step. As such, the preamble is limiting. *See Catalina Mktg. Int'l, Inc. v. Coolsavings.com*, 289 F.3d 801, 808 (Fed. Cir. 2002) ("[D]ependence on a particular disputed preamble phrase for antecedent basis may limit a claim scope because it indicates a reliance on both the preamble and claim body to define the claimed invention."). That said, determination of this construction does not impact AMD's opposition to Samsung's anticipation defense because, for purposes of this motion, AMD does not dispute that Hillman's column 15 process describes forming a contact to a semiconductor body.

discloses a tool that can be used to create various layers during the fabrication of semiconductor devices, by using a combination of CVD, plasma, high temperature anneal, rotation, and other techniques. *See* Glew Decl. ¶28; *see* '912 at 4:10-6:54 (Zimmerman Decl. Ex. 2).

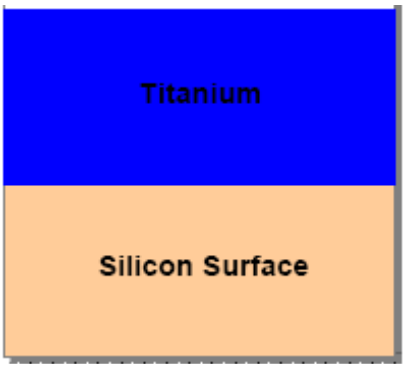
Hillman '912 describes many different fabrication processes—some of which have nothing to do with fabrication of contacts to a semiconductor body. *See, e.g.*, '912 at claim 2 (describing deposition of thin film on aluminum); *see also* Glew Decl. ¶29 (noting that aluminum is a conductor, not a semiconductor). Samsung has focused on two processes, described in columns 3 and 15 of the Hillman '912 patent. *See* Samsung's Motion at 6, 9. Those portions of Hillman's specification use a number of terms of art that do not appear in the Iacoponi patent.

One relevant term used by Hillman '912 is "ammonia plasma anneal." *See* '912 at 15:32. An "ammonia plasma anneal" is very different from the nitrogen plasma technique disclosed in Iacoponi '592. *See* Glew Decl. ¶33. An ammonia plasma anneal subjects the exposed top surface to ionized nitrogen molecules at the same time as it exposes the entire device to a high-temperature in an ammonia atmosphere. *See id.*; *see also* Glew Ex. A (depicting animated ammonia plasma anneal process). Thus, an ammonia plasma anneal combines two different fabrication processes: (1) an anneal and (2) a nitrogen plasma.

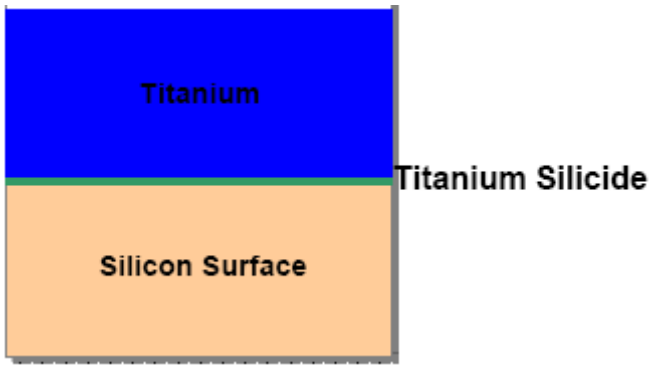
It is important to understand that the combination of these two processes does not mean that the chemical reactions take place at the same time or the same rate. *See* Glew Decl. ¶34. A plasma causes a very rapid chemical reaction in a very thin portion of the top surface of the device. *See id.* An anneal also causes chemical reactions, but an anneal is slower than a plasma. *See id.* Unlike a plasma, an anneal impacts all layers, not just the exposed portion of the top surface. *See id.*

The following excerpts from Dr. Glew's Declaration depict the process steps described in Column 15 of the Hillman '912 patent:

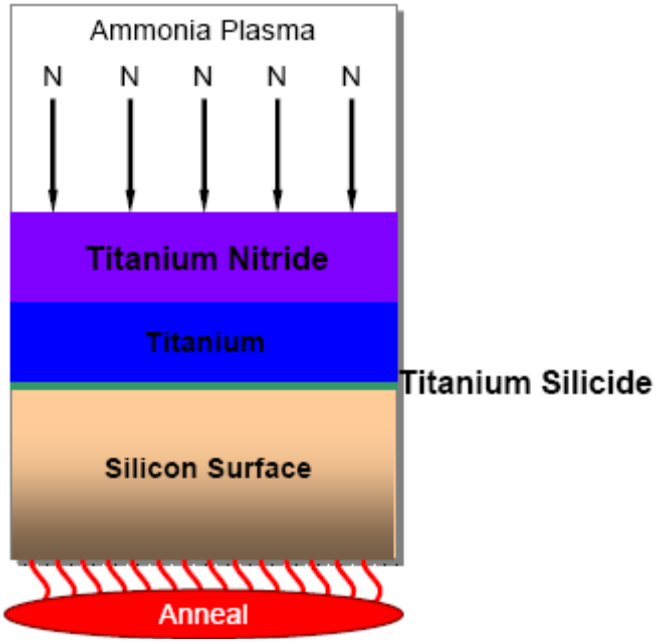
"An integrated contact metalization process can be used by first depositing titanium onto a silicon surface by PECVD." Hillman '912 at 15:29-30; *see* Glew Decl. ¶36.

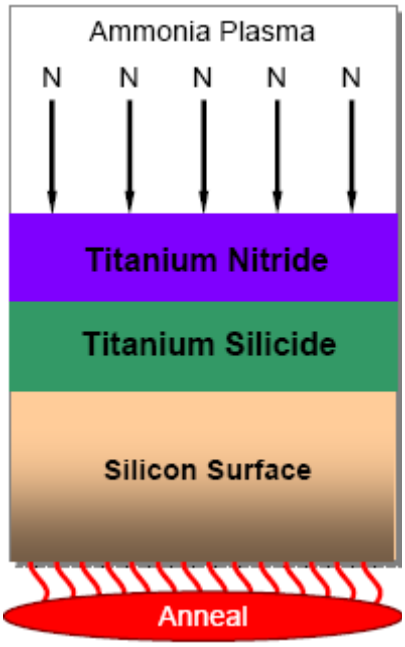


"This will form a layer of titanium silicide." Hillman '912 at 15:31. Hillman's Abstract explains that titanium silicide will form at the "juncture" between the silicon and the titanium during PE-CVD (plasma-enhanced CVD) deposition of titanium. *See* Hillman at Abstract; *see* Glew Decl. ¶¶32, 37, 49-50. Thus, this portion of the column 15 disclosure tells one of ordinary skill that the titanium silicide that forms during Hillman's titanium deposition will be covered by elemental titanium. *See* Glew Decl. ¶37.

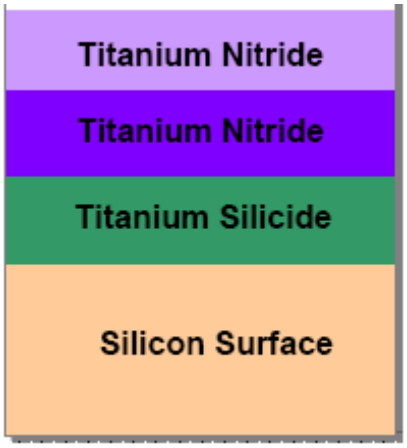


"After the titanium deposition an ammonia plasma anneal is performed to provide an upper layer of nitrided silicide titanium." Hillman '912 at 15:31-33. As the drawing on the right depicts, the initiation of Hillman's plasma converts the top of the titanium layer to titanium nitride almost immediately. *See* Glew Decl. ¶38.



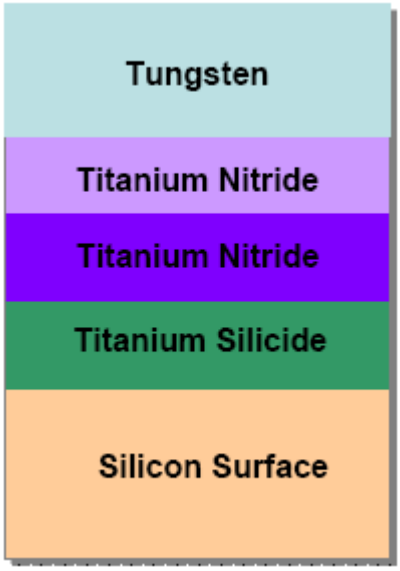


Meanwhile, the anneal causes silicon molecules to migrate from the silicon layer into the titanium. *See* Glew Decl. ¶¶15, 39. This silicon migration is much slower than the plasma reaction. *See* Glew Decl. ¶39. Depending on the anneal temperature and duration, three different outcomes are possible. First, the silicon might migrate completely through the remaining elemental titanium layer, up to the bottom of the titanium nitride, as depicted in the illustration on the right. *See id*. Second, the silicon can migrate part way through the titanium, leaving a layer of elemental titanium between the layers of titanium silicide and titanium nitride. *See id*. Third, if the anneal temperatures are high enough, the silicon can migrate all the way through the titanium and into the titanium nitride. *See id*.



Hillman's next step is to deposit a second layer of titanium nitride. "Finally, a titanium nitride layer can be deposited by PECVD, again in the same reaction chamber." Hillman '912 at 15:33-35; *see* Glew Decl. ¶40.

"Finally, following the deposition of the titanium nitride, aluminum or tungsten metal can be sputter deposited." Hillman '912 at 15:35-37; *see* Glew Decl. ¶41.



The timing of Hillman's fabrication processes relative to each other are critically important. *See* Glew Decl. ¶34. The timing cannot easily be depicted in still drawings, but is depicted in the animation attached as Ex. A to Dr. Glew's Declaration.

IV. LEGAL STANDARDS

A. Legal Standard For Anticipation

Samsung has moved for summary judgment that the '592 patent is anticipated by Hillman '912. "Anticipation must be proved by clear and convincing evidence." *Electro Med. Sys., S.A. v. Cooper Life Scis., Inc.*, 34 F.3d 1048, 1052 (Fed. Cir. 1994) (citations omitted).

A prior art reference anticipates a claim if and only if it describes each and every limitation recited in the patent claim. *See* 35 U.S.C. § 102; *see also Trintec Indus., Inc. v. TOP-U.S.A. Corp.*, 295 F.3d 1292, 1295 (Fed. Cir. 2002). The disclosures must be sufficiently detailed as to place a person of ordinary skill in possession of the invention. *Sanofi-Synthelabo v. Apotex, Inc.*, 550 F.3d 1075, 1082 (Fed. Cir. 2008) (citations omitted).

An anticipating reference "must not only disclose all elements of the claim within the four corners of the document, but must also disclose those elements 'arranged as in the claim.'" *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1369 (Fed. Cir. 2008) (quoting *Connell v. Sears, Roebuck & Co.*, 722 F.2d 1542, 1548 (Fed. Cir. 1983)). In particular, where a reference includes multiple disclosures, "[the] reference must clearly and unequivocally disclose the claimed

[invention] or direct those skilled in the art to the [invention] without any need for picking, choosing, and combining various disclosures not directly related to each other by the teachings of the cited reference." *Sanofi-Synthelabo*, 550 F.3d at 1083 (quoting *In re Arkley*, 455 F.2d 586, 587 (C.C.P.A. 1972)).

"[A] prior art reference may anticipate without disclosing a feature of the claimed invention if that missing characteristic is necessarily present, or inherent, in the single anticipating reference." *Schering Corp. v. Geneva Pharms., Inc.*, 339 F.3d 1373, 1377 (Fed. Cir. 2003) (citing *Continental Can Co. USA, Inc. v. Monsanto Co.*, 948 F.2d 1264, 1268 (Fed. Cir. 1991)). "The mere fact that a certain thing *may result* from a given set of circumstances is insufficient to prove anticipation." *Electro Med. Sys.*, 34 F.3d at 1052 (quoting *Continental Can Co.*, 948 F.2d at 1268-69)) (emphasis in original). "Inherent anticipation requires that the missing descriptive material is 'necessarily present,' not merely probably or possibly present, in the prior art." *Trintec Indus.*, 295 F.3d at 1295 (citing *In re Robertson*, 169 F.3d 743, 745 (Fed. Cir. 1999)).

B. Legal Standard For Obviousness

A patent claim is invalid when "the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains." 35 U.S.C. § 103. The question of "[o]bviousness is a question of law premised on underlying findings of fact." *Eolas Techs. Inc. v. Microsoft Corp.*, 399 F.3d 1325, 1332 (Fed. Cir. 2005), *cert. denied*, 546 U.S. 998 (2005) (citing *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966)). These underlying fact questions include (1) the level of ordinary skill in the art (2); a determination of the scope and content of the prior art; and (3) differences between the prior art and the claims at issue. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 427 (2007); *see also Graham*, 383 U.S. at 17. In addition to the *Graham* factors, the Court in *KSR* stated that a proper obviousness analysis considers:

> interrelated teachings of multiple patents; the effect of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.

KSR, 550 U.S. at 401, quoted in *ACCO Brands, Inc v. PC Guardian Anti-Theft Prods.*, 592 F. Supp. 2d 1208, 1220 (N.D. Cal. 2008).

C. Legal Standard For Summary Judgment Of Invalidity

Samsung is moving for summary judgment on anticipation and obviousness. Therefore, Samsung, as the moving party, bears the initial burden of demonstrating the absence of a genuine issue of material fact. *See Celotex Corp. v. Catrett*, 477 U.S. 317, 323 (1986). Samsung bears the burden of proof on both of these issues at trial. Therefore, Samsung must "present evidence that, if uncontroverted at trial, would entitle it to prevail on that issue." *Monolithic Power Sys., Inc. v. O2 Micro Int'l, Ltd.*, 476 F. Supp. 2d 1143, 1149 (N.D. Cal. 2007) (citing *UA Local 343 v. Nor-Cal Plumbing, Inc.*, 48 F.3d 1465, 1471 (9th Cir. 1994)).

If Samsung meets its initial burden, the burden of production then shifts to AMD to "set forth, by affidavit or as otherwise provided in Rule 56, 'specific facts showing that there is a genuine issue for trial.'" *See T.W. Elec. Serv., Inc., v. Pac. Elec. Contractors Ass'n*, 809 F.2d 626, 630 (9th Cir. 1987) (quoting Fed. R. Civ. P. 56(e)). A dispute is "genuine" if there is sufficient evidence for a reasonable jury to return a verdict for the nonmoving party. *Anderson v. Liberty Lobby, Inc.*, 477 U.S. 242, 248 (1986). A dispute is "material" if it could affect the outcome under the governing law. *Id.* "In a patent case, as in any other, summary judgment may be granted when there are no disputed issues of material fact, or when the non-movant cannot prevail on the evidence submitted when viewed in a light most favorable to it." *Knoll Pharm. Co., Inc. v. Teva Pharms. USA, Inc.*, 367 F.3d 1381, 1384 (Fed. Cir. 2004) (citations omitted).

The Supreme Court has stated that "in ruling on a motion for summary judgment, the judge must view the evidence presented through the prism of the substantive evidentiary burden." *Anderson*, 477 U.S. at 254. Here, Samsung bears the burden to prove invalidity by clear and convincing evidence. *See* 35 U.S.C. § 282; *see also U.S. Gypsum Co. v. Nat'l Gypsum Co.*, 74

F.3d 1209, 1212 (Fed. Cir. 1996). "Clear and convincing" evidence has been described as evidence which produces in the mind of the trier of fact "an abiding conviction that the truth of [the] factual contentions are 'highly probable.'" *Buildex, Inc. v. Kason Indus., Inc.*, 849 F.2d 1461, 1463 (Fed. Cir. 1988) (citations omitted).

V. HILLMAN DOES NOT ANTICIPATE THE IACOPONI '592 PATENT

Hillman '912 does not anticipate Iacoponi '592 claims 1 or 4 because Hillman does not disclose all of the steps of the asserted '592 claims. To anticipate a claim, a prior art reference must expressly or inherently disclose each claim limitation, and must do so in the same way that the limitations are recited in the claims. *See Net MoneyIN, Inc.*, 545 F.3d at 1371. The Iacoponi '592 claims require that a metal silicide be exposed to nitrogen plasma. *See* '592 at claim 1. In contrast, Hillman's process exposes titanium to nitrogen plasma. *See* Hillman '912 at 15:29-33; *see also* Glew Decl. ¶¶38, 39, 44, 47. Titanium is different than titanium silicide—one is a metal, the other is a metal silicide. *See* Glew Decl. ¶¶12-13, 44. This critical difference means that Hillman '912 does not disclose each and every limitation of the asserted Iacoponi '592 claims—and therefore cannot anticipate.

A. Hillman does not expressly or inherently describe the claimed step of "exposing" the metal silicide to nitrogen ionized in a plasma.

1. Samsung has failed to establish express disclosure of Iacoponi's method.

Hillman '912 does not anticipate because Hillman does not expressly describe the claimed step of exposing the metal silicide layer to nitrogen ionized in a plasma. A prior art reference anticipates only if it discloses each and every claim limitation. *See RCA Corp. v Applied Digital Data Sys., Inc.*, 730 F.2d 1440, 1444 (Fed. Cir. 1984). Iacoponi '592 claim 1 requires that the layer of metal silicide is exposed to nitrogen plasma. '592 at 4:37-38. Claim 4 adds a limitation where that metal silicide is a "titanium" silicide. '592 at 4:57-59. Hillman '912 does not expressly disclose Iacoponi's claimed step of exposing a metal silicide, in particular a titanium silicide, to nitrogen plasma.

The portion of column 15 that Samsung relies upon is:

> An integrated contact metalization process can be used by first depositing titanium onto a silicon surface by PECVD. This will form a layer of titanium silicide. After the titanium deposition an ammonia plasma anneal is performed to provide an upper layer of nitrided silicide titanium. Finally, a titanium nitride layer can be deposited by PECVD, again in the same reaction chamber. Finally, following the deposition of the titanium nitride, aluminum or tungsten metal can be sputter deposited.

Hillman '912 at 15:29-37. The plain language of this disclosure does not expressly state that titanium silicide is exposed to nitrogen ionized in a plasma.

The scope of a prior art patent's disclosure must be evaluated through the eyes of one of ordinary skill in the art. *See Scripps Clinic & Res. Found. v. Genentech, Inc.*, 927 F.2d 1565, 1576 (Fed. Cir. 1991) ("There must be no difference between the claimed invention and the reference disclosure, as viewed by a person of ordinary skill in the field of the invention."). As viewed through the eyes of one of ordinary skill, Hillman's disclosure of an "ammonia plasma anneal" does not expressly state that a layer of titanium silicide is exposed to the plasma. *See* Glew Decl. at ¶¶8, 47; *see also* Zimmerman Decl. Ex. 6 (setting forth AMD's proposed level of ordinary skill in the art); Section V.A.2 below (demonstrating that Hillman '912 does not necessarily result in a layer of titanium silicide being exposed to nitrogen plasma). Instead, one of ordinary skill understands that Hillman's titanium silicide can be covered by titanium at the time the plasma is initiated. *See* Glew Decl. ¶47. In that case, only the titanium is exposed to the plasma. *See id*. That is not the same as Iacoponi's claimed method and therefore does not expressly anticipate.

Nor does Hillman's statement that the ammonia plasma anneal results in a layer of "nitrided silicide titanium" expressly disclose Iacoponi's step of exposing titanium silicide to plasma. *See* Glew Decl. at ¶48; *see also* Section V.A.2 below. Neither Samsung's Motion nor the Thomas Declaration state that Hillman '912 expressly discloses the step of exposing titanium silicide to nitrogen ionized in a plasma. *See* Samsung's Motion; *see also* Thomas Decl. ¶¶22-23. Without admissible evidence of express disclosure, Samsung cannot prove that a person of ordinary skill in the art would find such an express disclosure in Hillman.

2. Samsung has failed to establish inherent disclosure of Iacoponi's method.

Samsung cannot establish inherent disclosure because Samsung cannot show that Hillman's column 15 process "necessarily" results in titanium silicide being exposed to nitrogen ionized in a plasma. "Inherent anticipation requires that the missing descriptive material is 'necessarily present,' not merely probably or possibly present, in the prior art." *Trintec Indus.*, 295 F.3d at 1295 (citations omitted); *see also Electro Med. Sys.*, 34 F.3d at 1052 ("The mere fact that a certain thing *may result* from a given set of circumstances is insufficient to prove anticipation."). Samsung, through its expert Dr. Thomas, relies on two aspects of Hillman's column 15 process to imply inherent disclosure. First, the Thomas Declaration implies that depositing titanium on a silicon surface necessarily results in the titanium being completely converted to titanium silicide. *See* Thomas Decl. ¶22. Second, Dr. Thomas interprets the phrase "nitrided silicide titanium" to mean that Hillman's plasma converts titanium silicide to titanium nitride. *See id.* Neither of those conclusory statements demonstrate inherent disclosure of the missing "exposing" step.

To appreciate why Hillman's titanium silicide is not necessarily exposed to Hillman's plasma, it is important to understand how titanium silicide forms when titanium is deposited on a silicon surface. When titanium is deposited on a sufficiently hot silicon surface, a thin layer of titanium silicide forms at the interface of the titanium layer and the silicon. *See* Glew Decl. ¶50; *see also* Hillman '912 at Abstract. The conversion of titanium to titanium silicide is the result of diffusion of the underlying silicon into deposited titanium. *See* Glew Decl. ¶50. During this reaction, silicon molecules from the silicon substrate diffuse, or "migrate" through and react with the titanium to form titanium silicide. *See id.*; *see also* Glew Ex. A. Time and temperature play significant roles in the rate at which silicon diffuses through titanium, and along with thickness determine the resulting quantity of titanium silicide that is formed. *See* Glew Decl. ¶51. Given enough time and sufficiently high temperatures, silicon can migrate all the way through the titanium—in which case the entire layer of titanium becomes titanium silicide. *See id.*

Hillman's column 15 does not describe any of the process variables that define the extent to which titanium silicide will form while Hillman's titanium is being deposited. *See* Hillman

'912 at 15:29-37; *see also* Glew Decl. ¶52. Without knowing the process variables, Samsung cannot prove that silicon "necessarily" migrates all the way through Hillman's titanium, such that the entire titanium layer is converted to titanium silicide before the ammonia plasma anneal is initiated. *See* Glew Decl. ¶52.

The process variables define the diffusion of silicon. For example, if one deposits a thick layer of titanium on a relatively low-temperature silicon surface and then immediately exposes the titanium to an ammonia plasma anneal, the silicon will not have migrated all the way through the titanium before the plasma converts the top surface of the titanium into titanium nitride. *See* Glew Decl. ¶53. In that case, the titanium silicide would be completely covered by titanium. *See id*. Titanium, instead of the titanium silicide required by the Iacoponi claims, is exposed to nitrogen ionized in a plasma. *See id*. There could be no anticipation because Iacoponi's "exposing" step is absent.

Using a plasma to convert titanium (instead of titanium silicide) is exactly what Hillman '912 claimed. Hillman's claims 1, 7, and 11 describe methods in which titanium is deposited on a substrate. *See* '912 at 16:32-33; 16:65-67; 17:21-18:2; *see also* Glew Decl. ¶54. All three claims are broad enough to encompass a silicon substrate; claim 11 specifically recites a silicon surface. *See* '912 at 17:21-22. While all of the claims recite the step of depositing a titanium layer, none of the claims say that the deposited titanium is converted to titanium silicide. *See* '912 at 16:32-33; 16:65-67; 17:21-18:2; *see also* Glew Decl. ¶54.

Hillman's independent claims 1, 7, and 11 recite the step of converting the deposited titanium layer to titanium nitride. *See* '912 at 16:38-42; 17:1-3; 18:1-3; *see also* Glew Decl. ¶54. Even claim 11, which specifically recites depositing titanium on a silicon surface, recites a plasma converting *titanium* instead of titanium silicide. *See* '912 at 18:1-3. If the process of depositing titanium on silicon always results in the entire titanium layer being converted to titanium nitride, Hillman's claims that convert titanium to titanium nitride would be nonsensical. Hillman's claims on the use of a plasma to convert titanium into titanium nitride establish that Hillman's column 15 process does not always result in a layer of titanium silicide being exposed to a plasma. *See* Glew Decl. ¶54.

Hillman's specification teaches that titanium silicide forms during deposition, but Hillman's claims make it clear that Hillman's process is performed in such a way that titanium is left on top of the titanium silicide. *See* Glew Decl. ¶55; *see also* '912 at 16:38-42; 17:1-3; 18:1-3. Plasma conversion is restricted to the exposed portion of the surface layer. *See* Glew Decl. ¶¶33-34, 55. Hillman's claims demonstrate that the top layer in the Hillman process is (or, at a minimum, can be) titanium. Because Hillman's process does not "necessarily" result in a layer of titanium silicide being exposed to a plasma, Samsung cannot rely on this process to establish inherent disclosure. *See Trintec Indus.*, 295 F.3d at 1295.

Extrinsic evidence confirms that Hillman's titanium silicide layer can be covered by titanium. It is appropriate to consider extrinsic evidence when considering whether prior art inherently discloses a particular claim limitation. For example, in *SmithKline Beecham Corp. v. Apotex Corp.*, the Federal Circuit upheld a finding of inherent disclosure based on tests performed by expert witnesses to determine whether a particular chemical compound necessarily formed as a result of a prior art process. 403 F.3d 1331, 1343-1345 (Fed. Cir. 2005). Here, extrinsic evidence shows that when titanium is deposited according to the process described in Hillman '912, the titanium silicide layer can be covered by a layer of titanium.

Another Hillman patent, U.S. Patent 6,274,496 ("'496"), which incorporates the '912 patent specification by reference, expressly states that the titanium silicide layer formed during Hillman's PE-CVD titanium deposition, using Hillman's parameters, is covered by titanium:

> In an alternative embodiment of the present invention, an integrated contact metallization process is performed by first depositing titanium onto a silicon surface by PECVD, during which a layer of titanium silicide is formed between the silicon surface and the titanium film. After the titanium deposition, an ammonia or nitrogen plasma anneal is performed to provide an upper layer of nitrided silicide titanium. Finally, a titanium nitride layer is deposited by thermal CVD, again in the same reaction chamber.

Hillman '496 at 7:61-8:2 (emphasis added) (Zimmerman Decl. Ex. 3). This paragraph from the Hillman '496 patent is almost identical to the one that Samsung relies upon from the Hillman '912 patent. *See* Glew Decl. ¶57. However, the Hillman '496 patent makes clear that the layer of titanium silicide is covered by a layer of titanium. *See* Hillman '496 at 7:63-65, claim 23

("during the step of depositing the titanium film forming a layer of titanium silicide between the silicon wafer surface and the deposited titanium film."); Glew Decl. ¶57. Thus, as the Hillman '496 patent confirms, the substance being exposed to Hillman's plasma is titanium, not titanium silicide. *See id*.

Samsung's second argument for inherency relies on the phrase "nitrided silicide titanium" to imply that titanium silicide is exposed to nitrogen plasma. Samsung's Motion at 9, citing Thomas Decl. ¶22. That reliance is misplaced. The phrase "nitrided silicide titanium" does not require that silicon migrates completely through the titanium layer to convert it to titanium silicide before the plasma is initiated and the titanium nitride layer is formed. Glew Decl. ¶58.

"Nitrided silicide titanium" is not a commonly used term of art. Glew Decl. ¶59. At a minimum, the phrase is susceptible to more than one interpretation. *See id*. In addition to the meaning assumed by Samsung, the phrase can also refer to the silicidation of previously-formed titanium nitride—which can occur under sufficiently high temperatures such as an anneal. *See id*. Hillman's column 15 does not include any of the process variables that would allow a person of ordinary skill to determine whether or not silicon would migrate into the titanium nitride layer. *See id*. However, if Hillman's process is performed using sufficiently high temperatures, silicon could migrate into the titanium nitride layer.[3] *See id*.

"Nitrided silicide titanium" could also refer to a composite layer consisting of titanium nitride and titanium silicide layers, with or without an intermediate titanium layer. Glew Decl. ¶61. This is consistent with the use of that phrase in Hillman's '496 patent. *See* Hillman '496 at 7:61-8:2. There, use of the phrase "nitrided silicide titanium" does not mean that titanium silicide is exposed to plasma. *See id.*; *see also* Glew Decl. ¶61. Instead, the phrase "nitrided silicide titanium" describes a stratified layer created when a plasma converts titanium to titanium nitride,

[3] There is no anticipation even if silicon migrated far enough into the layer of titanium nitride formed by the plasma to be exposed to the plasma. The claim language, which requires conversion of metal silicide to a first metal nitride, would not be satisfied. *See* Iacoponi '592 claims 1 and 4; *see also* Glew Decl. ¶60. As set forth above, this would be siliciding a previously-nitrided layer. *See* Glew Decl. ¶60. The claims require that metal silicide be nitrided, not that a metal nitride layer be silicided. *See* Iacoponi '592 claims 1 and 4; *see also* Glew Decl. ¶60. In any event, Samsung has provided no evidence that such exposure would occur.

while an anneal slowly converts the remaining titanium to titanium silicide. *See* Glew Decl. ¶61. This evidence squarely rebuts the unsupported, conclusory assumption by Samsung's expert that the phrase "nitrided silicide titanium" refers to a layer of titanium silicide that is converted into titanium nitride. *See* Thomas Decl. ¶22.

Samsung has failed to show by clear and convincing evidence that the process described at column 15 of Hillman '912 expressly or inherently discloses the claimed step of "exposing said metal silicide layer to nitrogen ionized in a plasma." Because Samsung did not establish by clear and convincing evidence that each and every claimed step is expressly or inherently disclosed, Samsung's motion for summary judgment of anticipation must be denied.

B. The process described at Hillman column 3 does not disclose Iacoponi's claimed method.

The process briefly described at column 3 of the Hillman '912 patent does not anticipate because it does not describe each and every step recited in the Iacoponi '592 patent. If even one claimed step is missing, then this disclosure does not anticipate. *See Net MoneyIN*, 545 F.3d at 1371.

The process at Hillman '912 column 3 does not anticipate because it does not disclose all claimed steps. For example, column 3 does not expressly or inherently specify that titanium silicide, as opposed to titanium, is exposed to the plasma. *See* '912 at 3:47-53; *see also* Glew Decl. ¶62. Thus, column 3 fails to disclose the "exposing" method step for the same reasons as the process of column 15, above. Column 3 also does not describe Iacoponi's last step, in which a second metal (tungsten) is deposited on top of the second metal nitride layer. *See* '912 at 3:47-53; *see also* Glew Decl. ¶62. Thus, the generic process described in column 3 of Hillman '912 falls woefully short of anticipating any asserted claims of the '592 patent.

Samsung's Motion and the Thomas Declaration do not provide evidence that the process of column 3 discloses all claimed steps. Instead, Samsung relies on the column 3 process to bolster its argument that Hillman discloses the second step of Iacoponi claim 1 "exposing said metal silicide layer to nitrogen ionized in a plasma, thereby converting a portion of said metal silicide layer to a first metal nitride layer." *See* Samsung's Motion at 9. Samsung made no effort

to identify any of the other claim limitations in Hillman's meager column 3 process description.

It is clear from Samsung's Motion that Samsung intended to fill the gaps in the process described at Hillman '912 column 15 with the disclosure of column 3. That strategy of "picking" and "choosing" unrelated processes from different parts of a prior art reference has been soundly rejected by the Federal Circuit. *See Net MoneyIN*, 545 F.3d at 1371 (citing *In re Arkley*, 455 F.2d at 587) ("[T]he [prior art] reference must clearly and unequivocally disclose the claimed [invention] or direct those skilled in the art to the [invention] without any need for picking, choosing, and combining various disclosures not directly related to each other by the teachings of the cited reference.").

Where a party seeks to combine disparate disclosures from the same prior art patent, the Federal Circuit requires that the party asserting anticipation provide evidence that specifically links the disclosures. *See, e.g., Ecolochem, Inc. v. S. Cal. Edison Co.*, 227 F.3d 1361, 1369 (Fed. Cir. 2000). In *Ecolochem*, the Federal Circuit reversed a district court's anticipation holding. The district court's holding was based on the combination of a patent figure and accompanying text, which taught some portions of the claim, in conjunction with a separate passage discussing other aspects of the claim. *Id*. The Federal Circuit concluded that the reference could not anticipate because there was no link between the text and figure on one hand and the general discussion elsewhere in the specification on the other. *Id; see also Net MoneyIN*, 545 F.3d at 1370. Even though the Federal Circuit found that the reference as a whole disclosed all elements of the claim, it did not contain a discussion linking the two disparate disclosures, and thus did not show the invention arranged as in the claim. *Id*.; *see also Net MoneyIN*, 545 F.3d at 1370.

Like the defendant in *Ecolochem*, Samsung failed to provide any admissible evidence linking the two disparate portions of Hillman's specification. It was Samsung's burden to do so by clear and convincing evidence. *See Ecolochem*, 227 F.3d at 1369. As the non-moving party, AMD is entitled to the factual inference that these two disparate disclosures are not linked. *Anderson*, 477 U.S. at 254.

Finally, Samsung's Preliminary Invalidity Contentions did not cite column 3 as the source of any allegedly invalidating disclosures. *See* Appendix A1 to Samsung's Preliminary Invalidity

Contentions (Zimmerman Decl. Ex. 4). Samsung was required to do so under Patent L.R. 3-3(c) (requiring party asserting invalidity to identify where "specifically" each element is found in the prior art). This Court has rejected invalidity defenses not properly disclosed in Invalidity Contentions. *See, e.g, ACCO Brands, Inc.*, 592 F. Supp. 2d at 1215 (rejecting invalidity theory not presented in Preliminary Invalidity Contentions). This is a separate ground to refuse Samsung's new invalidity theory.

Samsung failed to show that the disclosure of Hillman's column 3 expressly or inherently discloses each and every limitation of any asserted Iacoponi claim. Samsung failed to provide evidence that Hillman's column 3 is linked to the process described in column 15. Even if it could show that linkage, Samsung failed to show that the combination of columns 3 and 15 discloses each and every limitation of the asserted Iacoponi claims. For each of these reasons, Samsung's Motion for Summary Judgment of anticipation must be denied.

VI. SAMSUNG FAILED TO PROVE OBVIOUSNESS

Samsung has failed to set forth any admissible evidence to support Samsung's contention that Hillman '912 renders obvious the claims of the '592 patent. For example, Samsung offered no evidence sufficient to allow the Court to determine the relevant level of skill in the art, no evidence regarding the motivation to combine Hillman '912 with features from the prior art, and no evidence regarding any motivation to combine the various disclosures within the Hillman reference itself. Furthermore, Samsung failed to disclose its obviousness defense as required by the Patent Local Rules. Any one of these reasons would be sufficient to deny Samsung's Motion.

A. Samsung has never properly disclosed an obviousness argument.

Samsung should be barred from moving for summary judgment on a defense that Samsung has not previously disclosed to AMD. In particular, Samsung failed to properly disclose an obviousness defense in its Preliminary Invalidity Contentions. Having failed to properly disclose this defense, this Court should bar Samsung's attempt to spring this new argument on AMD in summary judgment.

Samsung's entire obviousness theory based on Hillman is contained in one solitary sentence from the Hillman '912 chart attached to Samsung's Preliminary Invalidity Contentions:

> All asserted claims are anticipated by the Hillman '912 patent and/or are rendered obvious by it, either alone or in combination with other prior art described below and/or listed in Section I of Defendants' and Counterclaimants' Preliminary Invalidity Contentions and/or through modifications described below.

See Appendix A1 to Samsung's Preliminary Invalidity Contentions (Zimmerman Decl. Ex. 4). Samsung's Preliminary Invalidity Contentions list more than 50 alleged prior art references that Samsung contends are relevant to the Iacoponi '592 patent. *See* Samsung's Preliminary Invalidity Contentions at 3-6 (Zimmerman Decl. Ex. 5). Samsung's disclosure fails to supply even the most basic details about Samsung's obviousness theory. For example, the Patent Local Rules specifically require Samsung to identify the motivation to combine. *See* Patent L.R. 3-3(b). Samsung's chart for the Hillman '912 reference is silent regarding specific support of any alleged motivation to combine Hillman '912 with any of Samsung's other references.

This Court has rejected invalidity defenses not properly disclosed in Invalidity Contentions. *See, e.g, ACCO Brands, Inc.*, 592 F. Supp. 2d at 1215 (rejecting invalidity theory not presented in Preliminary Invalidity Contentions). Because Samsung did not adequately disclose this theory in its Preliminary Invalidity Contentions, Samsung should not be allowed to argue it in a motion for summary judgment.

B. Samsung failed to provide admissible evidence in support of any of the facts underlying obviousness.

Samsung failed to support its obviousness defense with any admissible evidence. Samsung's expert declaration does not mention obviousness. Absent is any evidence regarding motivation to combine, the level of ordinary skill in the art, or even the source of any missing features. *See* Thomas Decl. Having failed to support its Motion with evidence, Samsung has not met its initial burden as the moving party to "present evidence that, if uncontroverted at trial, would entitle it to prevail on that issue." *See Monolithic Power Sys., Inc.*, 476 F. Supp. 2d at 1149. Samsung's Motion should be denied based on Samsung's failure to establish a prima facie case of obviousness. *Id.* at 1154 (denying motion for summary judgment of invalidity where moving party did not establish a prima facie case of unpatentability).

Instead of providing admissible evidence, Samsung cites the *non-precedential* opinion in

Tokyo Keiso Co., Ltd. v. SMC Corp., 2008-1045, 2008-1112, 2009 WL 59769 (Fed. Cir. Jan. 9, 2009), for the unremarkable notion that a single prior art reference can render claims obvious. *See* Samsung's Motion at 11. Unlike Samsung's Motion, the defendant in *Tokyo Keiso* supported its motion for summary judgment with admissible evidence on the fact questions underlying obviousness. *See, e.g., Tokyo Keiso Co., Ltd. v. SMC Corp.*, 533 F. Supp. 2d 1047, 1055 (C.D. Cal. 2007) (relying on Lynnworth declaration to support findings of facts underlying obviousness); *see also* Declaration of Lawrence C. Lynnworth in Support of SMC's Motion for Summary Judgment of Invalidity (Obviousness) (Zimmerman Decl. Ex. 7). This is critical because, while it is ultimately a legal conclusion, obviousness must be decided based on underlying facts. *Eolas Techs. Inc.*, 399 F.3d at 1332.

In *KSR*, the Supreme Court noted that the relevant factual inquiries were performed based on evidence and stipulations provided by the parties during summary judgment briefing. *See KSR*, 550 U.S. at 412-413 (noting that parties provided evidence of and stipulations regarding the level of ordinary skill in the art). While *KSR* eliminated the rigid application of the "teaching-suggestion-motivation" test, it did not eliminate the requirement that the party asserting obviousness establish the underlying facts by clear and convincing evidence.

KSR explained that summary judgment of obviousness is appropriate where there is no material dispute regarding: (1) the scope of the claims; (2) the level of ordinary skill in the art; and (3) the content of the prior art. *See KSR*, 550 U.S. at 427. It does not appear that there is any material dispute about the scope of the asserted claims. There is no way to know whether there is a dispute about the level of ordinary skill in the art because Samsung has failed to provide any admissible evidence to establish that fact. Even if the level of skill and scope of the '592 claims are not in dispute, summary judgment is inappropriate because there is a material dispute regarding the scope of Hillman's content. Samsung says that Hillman discloses the step of exposing titanium silicide to nitrogen ionized in a plasma. *See* Samsung's Motion at 10-11 (arguing that Iacoponi is obvious because Hillman "is identical to the asserted claims.") AMD disagrees—for at least the reasons described in Section V.A.2 above, Hillman is certainly not "identical to the asserted claims." *See also* Glew Decl. ¶¶24, 36-41, 44-62. This material dispute

regarding the scope of Hillman's content demonstrates that Samsung has not met its burden of establishing the facts underlying obviousness by clear and convincing evidence.

In addition, Samsung provided no admissible evidence that would assist the Court in evaluating any motivation to combine Hillman with itself (or any other reference) that supplies the missing elements. While *KSR* found that a "rigid" application of the teaching-suggestion-motivation test was inappropriate, it nevertheless posed the following "proper" question:

> The proper question to have asked was whether [one] of ordinary skill, facing the wide range of needs created by developments in the field of endeavor, would have seen a benefit to upgrading [the prior art] with [the missing feature].

KSR, 550 U.S. at 424. Samsung provided no evidence of the needs created by developments in the field. Samsung provided no evidence about whether one of skill would have seen a benefit to upgrading Hillman's process with the missing features. Samsung did not even identify what feature is missing from Hillman. The facts required to perform this inquiry are utterly absent from Samsung's Motion and supporting declarations. Without such evidence, Samsung has not established facts that "would entitle it to prevail on that issue." *See Monolithic Power Sys., Inc.*, 476 F. Supp. 2d at 1149.

Samsung bears the burden of establishing all facts to support its obviousness defense by clear and convincing evidence. *Ashland Oil v. Delta Resins & Refractories*, 776 F.2d 281, 292 (Fed. Cir. 1985) (citations omitted). Having failed to do prove *any* of the facts underlying obviousness, much less establishing such facts by clear and convincing evidence, Samsung's Motion must be denied.

CONCLUSION

Samsung failed to show that Hillman '912 expressly or inherently discloses each and every limitation of the '592 patent. Samsung did not offer any admissible evidence in support of its motion for summary judgment of obviousness. In both cases, Samsung failed to meet its burden of establishing invalidity by clear and convincing evidence. Therefore, AMD respectfully requests that this Court deny Samsung's Motion.

DATED: April 17, 2009

ROBINS, KAPLAN, MILLER & CIRESI L.L.P.

By: _____
William H. Manning (*pro hac vice*)
Jacob S. Zimmerman (*pro hac vice*)

ATTORNEYS FOR PLAINTIFFS ADVANCED MICRO DEVICES, INC. AND ATI TECHNOLOGIES, ULC