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Paper 20
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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD.,
Petitioner,

v.

ACORN SEMI, LLC,
Patent Owner.

IPR2020-01282
Patent 10,090,395 B2

Before BRIAN J. McNAMARA, JOHN R. KENNY, and AARON W. MOORE, *Administrative Patent Judges.*

KENNY, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314, 37 C.F.R. § 42.4

I. INTRODUCTION

Samsung Electronics Co., Ltd. ("Petitioner") filed a Petition, Paper 2 ("Petition" or "Pet."), to institute an *inter partes* review of claims 1–6, 8–12, and 14–28 ("challenged claims") of U.S. Patent No. 10,090,395 B2 ("'395 patent"). Petitioner also filed a Statement on Parallel Petitions. Paper 3 ("Pet. Statement"). Acorn Semi LLC ("Patent Owner") filed a Response to Petitioner's Statement on Parallel Petitions, Paper 8 ("PO Resp. to Pet. Statement"), and a Preliminary Response, Paper 10 ("Prelim. Resp."), contending that the Petition should be denied as to all challenged claims. Pursuant to our authorization, Petitioner filed a Preliminary Reply, Paper 13 ("Prelim. Reply"), and Patent Owner filed a Preliminary Sur-reply, Paper 14 ("Prelim. Sur-reply"). In response to an inquiry by the panel (Paper 17), Petitioner filed a Response to the Board's Order Regarding the Conduct of the Proceeding, in which Petitioner agreed to be bound by a stipulation proposed by the Board. Paper 18 ("Pet. Stip."). Patent Owner filed Comments on Petitioner's Answer to Board's Stipulation Inquiry. Paper 19 ("PO Comments").

We have authority to institute an *inter partes* review under 37 C.F.R. § 42.4(a) and 35 U.S.C. § 314, which provides that an *inter partes* review may not be instituted unless the information presented in the Petition "shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition."

A decision to institute under § 314 may not institute on fewer than all claims challenged in the petition. *SAS Inst., Inc. v. Iancu*, 138 S. Ct. 1348, 1359–60 (2018). In addition, per Board practice, if the Board institutes trial, it will "institute on all grounds in the petition." PTAB Consolidated Trial

Practice Guide, 5–6 (Nov. 2019)[1]; *see also PGS Geophysical AS v. Iancu*, 891 F.3d 1354, 1360 (Fed. Cir. 2018) (interpreting the statute to require "a simple yes-or-no institution choice respecting a petition, embracing all challenges included in the petition").

Having considered the arguments and the associated evidence presented in the Petition and the Preliminary Response, for the reasons described below, we institute an *inter partes* review.

II. REAL PARTIES IN INTEREST

Petitioner identifies itself (Samsung Electronics Co., Ltd.); Samsung Electronics America, Inc.; Samsung Semiconductor, Inc.; and Samsung Austin Semiconductor, LLC as real parties-in-interest. Pet. 2. Patent Owner identifies itself as the sole real party-in-interest. Paper 4, 1.

III. RELATED MATTERS

The Petition states that the '395 patent is asserted in *Acorn Semi, LLC v. Samsung Electronics Co. Ltd.*, Civil Action No. 2:19-cv-347 (E.D. Tex.) ("Acorn Litigation"), and that the complaint was served on October 24, 2019. Pet. 3 (citing Ex. 1158).

Petitioner and Patent Owner identify IPR2020-01207 ("'1207 IPR") as also concerning the '395 patent. Pet. 3; Paper 4, 2. Petitioner and Patent Owner also identify *inter partes* reviews concerning patents related to the '395 patent that may be affected by the outcome of this proceeding. *See* Pet. 3, Paper 4, 2. Petitioner and Patent Owner also identify patents and patent applications that are related to the '395 patent. *See* Pet. 3, Paper 4, 1.

[1] Available at https://www.uspto.gov/TrialPracticeGuideConsolidated.

IV. THE '395 PATENT

The '395 patent "relates to a process for depinning the Fermi level of a semiconductor at a metal-interface layer-semiconductor junction and to devices that employ such a junction." Ex. 1101, 1:32–35. The '395 patent explains that Schottky's theory concerning the ability of a junction to conduct current in one direction more favorably than in the other direction, i.e., the rectifying behavior of a metal/semiconductor junction (e.g., an aluminum/silicon junction) depends upon a barrier at the surface of the contact between the metal and the semiconductor. *Id.* at 1:52–64. Because the barrier height at the metal/semiconductor interface determines the electrical properties of the junction, controlling the barrier height is an important goal. *Id.* at 3:10–21.

The '395 patent further explains that Schottky's theory postulates the height of the barrier, as measured by the potential necessary for an electron to pass from the metal to the semiconductor, is the difference between the work function of the metal (i.e., the energy required to free an electron at the Fermi level (the highest occupied energy state of the metal at T=0)) and the electron affinity of the semiconductor (i.e., the difference between the energy of a free electron and the conduction band of the semiconductor); but experimental results indicate a weaker variation of the barrier height with the work function than implied by this model. Ex. 1101, 1:55–2:9. To explain the discrepancy between the predicted and observed behavior, Bardeen introduced the concept of semiconductor surface states, i.e., energy states within the bandgap between the valence and conduction bands at the edge of the semiconductor crystal that arise from incomplete covalent bonds, impurities, and other effects of termination. *Id.* at 2:10–24, Fig. 1 (showing dangling bonds 120). Although Bardeen's model assumes that surface states

are sufficient to pin the Fermi level in the semiconductor at a point between the valence and conduction bands, such that the barrier height should be independent of the metal's work function, in experiments, this condition is observed rarely. *Id.* at 2:25–31.

According to the '395 patent, Tersoff proposed that the Fermi level of a semiconductor is pinned near an effective "gap center" due to metal induced gap states (MIGS), which are energy states in the bandgap of the semiconductor that become populated with metal. Ex. 1101, 2:41–47. Thus, the wave functions of electrons in the metal do not terminate abruptly at the surface of the metal, but decay in proportion to the distance from the surface, extending inside the semiconductor. *Id.* at 2:50–54.

> To maintain the sum rule on the density of states in the semiconductor, electrons near the surface occupy energy states in the gap derived from the valence band such that the density of states in the valence band is reduced. To maintain charge neutrality, the highest occupied state (which defines the Fermi level of the semiconductor) will then lie at the crossover point from states derived from the valence band to those derived from the conduction band. This crossover occurs at the branch point of the band structure.

Id. at 2:54–63. The '395 patent also notes one further surface effect on diode characteristics is inhomogeneity, i.e., "if factors affecting the barrier height (e.g., density of surface states) vary across the plane of the junction, the resulting properties of the junction are found not to be a linear combination of the properties of the different regions." *Id.* at 3:2–6.

According to the '395 patent, "a classic metal-semiconductor junction is characterized by a Schottky barrier, the properties of which (e.g., barrier height) depend on surface states, MIGS and inhomogeneities." Ex. 1101, 3:6–9. "Before one can tune the barrier height, however, one must depin the

Fermi level of the semiconductor." *Id.* at 3:16–18. The '395 patent seeks to depin the Fermi level of the semiconductor while still permitting substantial current flow between the metal and the semiconductor. *Id.* at 3:18–21. The '395 patent describes depinning the Fermi level as follows:

> By depinning the Fermi level, the present inventors mean a condition wherein all, or substantially all, dangling bonds that may otherwise be present at the semiconductor surface have been terminated, and the effect of MIGS has been overcome, or at least reduced, by displacing the semiconductor a sufficient distance from the metal.

Id. at 3:36–41. The '395 patent achieves this goal using thin interface layers disposed between a metal and a silicon based semiconductor to form a "metal-interface layer-semiconductor junction" with minimum specific contact resistances. *Id.* at 3:25–29. "The interface layer thickness corresponding to this minimum specific contact resistance will vary depending on the materials used." *Id.* at 3:29–36. That thickness, however, "allows for depinning the Fermi level of the semiconductor while still permitting current to flow between the metal and semiconductor when the junction is appropriately biased." *Id.* "Minimum specific contact resistances of less than or equal to approximately 10 Ω-μm^2 or even less than or equal to approximately 1Ω-μm^2 may be achieved for such junctions in accordance with the present invention." *Id.* at 3:42–45. Such low contact resistances are achieved by selecting a metal with a work function near the conduction band of the semiconductor for n-type semiconductors, or a work function near the valence band for p-type semiconductors. *Id.* at 5:30–34.

Figure 8 of the '395 patent is reproduced below:

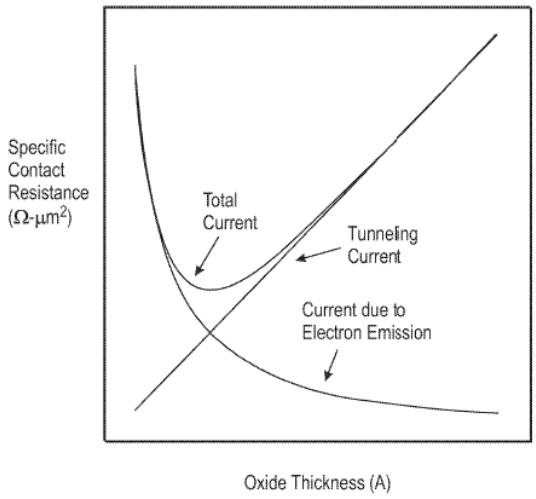


Figure 8 of the '395 patent

Figure 8 above is a graph of interface specific contact resistance versus interface thickness for a structure where the work function of the metal is the same as the electron affinity of the semiconductor, such that the Fermi level of the metal lines up with the conduction band of the semiconductor. Ex. 1101, 14:42–48. According to the '395 patent, Figure 8 shows that, at large thicknesses, the interface layer poses significant resistance to current, but as the interface layer thickness decreases, resistance falls due to increased tunneling current. *Id.* at 14:48–51. However, at some point, as the interface layer gets thinner, the effect of MIGS increasingly pulls the Fermi level of the metal down towards the mid-gap of the semiconductor, creating a Schottky barrier and increasing resistance. *Id.* at 14:51–55. Thus, there is an optimum thickness where the resistance is at a minimum and the effect of MIGS has been reduced to depin the metal and lower the Schottky barrier, but the layer is sufficiently thin to allow significant current across the interface layer, such that specific contact resistances of less than or equal to

approximately 2500 Ω-m^2, 1000 Ω-m^2, 100 Ω-m^2, 50 Ω-m^2, 10 Ω-m^2, or less than 1 Ω-m^2 reportedly can be achieved. *Id.* at 14:56–65.

In one embodiment, an electrical device has an interface layer that may be a monolayer or several monolayers of passivating material (e.g., a nitride, oxide, oxynitride, arsenide, hydride and/or fluoride) and may include a separation oxide layer. Ex. 1101, 3:46–59. The specific contact resistance for this electrical device is reported to be less than 10 Ω-μm^2. *Id.* at 3:52–53. In another embodiment, the interface layer consists of a passivation layer fabricated by exposing the semiconductor to nitrogenous material (e.g., ammonia (NH_3), nitrogen (N_2) or unbound gaseous nitrogen (N) generated from a plasma process). *Id.* at 3:60–64. Another embodiment uses an interface layer of passivating material disposed between the surface of a semiconductor and a conductor, in which the interface layer is of a sufficient thickness to reduce the effect of MIGs in the semiconductor and passivates the semiconductor but, because the thickness of the interface layer is chosen to provide minimum, or near minimum, specific contact resistance for the junction, significant current may flow between the conductor and the semiconductor. *Id.* at 4:1–14.

In other embodiments, the interface layer is configured to allow a Fermi level of the conductor to (i) align with a conduction band of the semiconductor, (ii) align with a valence band of the semiconductor, and (iii) to be independent of the Fermi level of the semiconductor, allowing current to flow between the conductor and the semiconductor when the junction is biased because the thickness of the interface layer corresponds to a minimum or near minimum contact resistance for the junction. Ex. 1101, 4:15–26. Specific contact resistances of less than or equal to approximately

2500 Ω-m^2, 1000 Ω-m^2, 100 Ω-m^2, 50 Ω-m^2, 10 Ω-m^2, or less than 1 Ω-m^2 reportedly can be achieved. *Id.* at 4:27–30.

V. CLAIMS

As mentioned, Petitioner challenges claims 1–6, 8–12, and 14–28, of which claims 1, 17, and 23 are independent. Claim 1 reads:

> 1. An electrical junction, comprising a region in a semiconductor substrate, a metal electrical contact to said region, and an interface layer between said region and said metal electrical contact, said region being electrically connected to said metal electrical contact through said interface layer and said interface layer comprising a metal oxide and a semiconductor oxide, and being in contact with said region in the semiconductor substrate and said metal electrical contact.

VI. ASSERTED GROUNDS

Petitioner asserts that the challenged claims would have been unpatentable based on the following grounds:

Ground	Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1	1–3, 8–10	102(b)	Goodnick[2]
2	4	103(a)	Goodnick, Jammy[3]
3	5	103(a)	Goodnick
4	1, 11, 12, 15, 23–25, 28	103(a)	Goodnick, Taubenblatt 1982[4]
5	14, 17–19, 22	103(a)	Goodnick, Jammy, Taubenblatt 1982

[2] S.M. Goodnick et al., *Effects of a thin SiO_2 layer on the formation of metal-silicon contacts*, 18 J. VAC. SCI. & TECH. 949 (Apr. 1981) (Ex. 1121).
[3] U.S. Patent No. 6,724,088 (Ex. 1122).
[4] M.A. Taubenblatt and C.R. Helms, *Silicide and Schottky barrier formation in the Ti-Si and the Ti-SiO_x-Si systems*, 58 J. APPLIED PHYS. 6308 (1982) (Ex. 1123).

Ground	Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
6	6	103(a)	Jammy, Taubenblatt 1982, Chang[5]
7	16, 26, 27	103(a)	Goodnick, Taubenblatt 1982, Kim[6]
8	20, 21	103(a)	Jammy, Taubenblatt 1982, Kim

VII. LEVEL OF ORDINARY SKILL IN THE ART

Petitioner describes a person of ordinary skill as having any of the following combinations of education and experience:

> [i] a Ph.D. in electrical engineering, physics, materials science, or chemical engineering, with two years of practical experience with semiconductor research and design;
>
> [ii] a Master's degree in electrical engineering, physics, materials science, or chemical engineering, with four years of practical experience with semiconductor research and design; or
>
> [iii] a Bachelor's degree in electrical engineering, physics, materials science, or chemical engineering, with six to eight years of practical experience with semiconductor research and design.

Pet. 14 (citing Ex. 1126 ¶¶ 70–71).

The Patent Owner's Preliminary Response does not comment on the level of ordinary skill.

Based on the current record, we are persuaded that Petitioner's description of the level of ordinary skill is appropriate for the subject matter of the '395 patent, and we apply it in this Decision.

[5] C.Y. Chang et al., *Specific contact resistance of metal-semiconductor barriers*, 15 SOLID STATE ELECS. 541 (1971) (Ex. 1124)
[6] U.S. Patent No. 4, 845,050 (Ex. 1125).

VIII. CLAIM CONSTRUCTION

For petitions filed after November 13, 2018, we interpret claim terms using "the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b)." 37 C.F.R. § 42.100(b) (2019). In this context, claim terms "are generally given their ordinary and customary meaning" as understood by a person of ordinary skill in the art in question at the time of the invention. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (citations omitted) (en banc). "In determining the meaning of the disputed claim limitation, we look principally to the intrinsic evidence of record, examining the claim language itself, the written description, and the prosecution history, if in evidence." *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 469 F.3d 1005, 1014 (Fed. Cir. 2006) (citing *Phillips*, 415 F.3d at 1312–17). Extrinsic evidence is "less significant than the intrinsic record in determining 'the legally operative meaning of claim language.'" *Phillips*, 415 F.3d at 1317 (citations omitted).

Any special definition for a claim term must be set forth in the specification with reasonable clarity, deliberateness, and precision. *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994).

We construe only those claim terms that require analysis to determine whether to institute *inter partes* review. *See Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (holding that "only those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy").

A. Depin a Fermi Level of the Metal Electrical Contact in the Vicinity of the Junction

Petitioner proposes that the phrase "depin a Fermi level of the metal electrical contact in the vicinity of the junction," recited in claim 5, should

be construed as "passivate the semiconductor surface and reduce the effects of metal-induced gap states in the semiconductor." Pet. 15. According to Petitioner, "[t]he specification consistently describes that depinning a Fermi level involves passivating the semiconductor surface and reducing the effects of metal-induced gap states in the semiconductor." *Id.* In the Preliminary Response, Patent Owner supports this construction. Prelim. Resp. 44 ("In the Acorn patents, depinning the Fermi level requires two things: (1) passivating the semiconductor surface by satisfying dangling bonds and (2) reducing the effects of MIGs."). The Specification also supports Petitioner's proposed construction by providing the following definition for the phrase "depinning the Fermi level":

> By depinning the Fermi level, the present inventors mean a condition wherein all, or substantially all, dangling bonds that may otherwise be present at the semiconductor surface have been terminated, and the effect of MIGS has been overcome, or at least reduced, by displacing the semiconductor a sufficient distance from the metal.

Ex. 1101, 3:36–41.

In view of this definition in the Specification and the parties' general agreement regarding this proposed construction, we construe the phrase "depin a Fermi level of the metal electrical contact in the vicinity of the junction" as "passivate the semiconductor surface and reduce the effects of metal-induced gap states in the semiconductor."

B. Specific Contact Resistivity

Petitioner argues that the term "specific contact resistivity," recited in claims 5 and 6, should be construed as interchangeable with the term "specific contact resistivity." Pet. 16–17. Petitioner asserts that the Specification of the '395 patent and the claims of the '395 patent use those

terms interchangeably. *Id.* at 16 (citing Ex. 1101, 3:25–29, 3:42–45, 3:52–53, 4:22–30). Petitioner further asserts that the art commonly used those terms interchangeably. *Id.* at 16–17 (citing Ex. 1134, 2; Ex. 1126 ¶¶ 74–76). In the Preliminary Response, Patent Owner does not respond to this proposed construction.

Upon review of the record, we construe the terms "specific contact resistivity" and "specific contact resistance" to be interchangeable.

C. An Interface Layer Comprising a Metal Oxide and a Semiconductor Oxide

Patent Owner argues that, in the related litigation, Petitioner and Patent Owner agreed to construe the phrase an "interface layer comprising a metal oxide and a semiconductor oxide" as "said interface layer comprising a layer of a metal oxide and a *distinct* layer of a semiconductor oxide." Prelim. Resp. 35 (citing Ex. 2009). Patent Owner asserts that the district court adopted that construction. *Id.* (citing Ex. 2053, 27). The record supports Patent Owner's arguments. *See* Ex. 2009; Ex. 2053, 27. No party argues that we should construe the phrase differently than the district court. Thus, we construe "an interface layer comprising a metal oxide and a semiconductor oxide" as "said interface layer comprising a layer of a metal oxide and a distinct layer of a semiconductor oxide."

IX. ANALYSIS

"In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable." *Harmonic Inc. v. Avid Tech., Inc*., 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring inter partes review petitions to identify "with particularity . . . the evidence that supports the grounds for the challenge to each claim")). This burden of persuasion never

shifts to Patent Owner. *See Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (discussing the burden of proof in *inter partes* review).

Anticipation is a question of fact, as is the question of what a prior art reference teaches. *In re NTP, Inc.*, 654 F.3d 1279, 1297 (Fed. Cir. 2011). "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. Inc., v. Union Oil Co.*, 814 F.2d 628, 631 (Fed. Cir. 1987); *see also Finisar Corp. v. DirecTV Group, Inc.*, 523 F.3d 1323, 1334 (Fed. Cir. 2008) (to anticipate a patent claim under 35 U.S.C. § 102, "a single prior art reference must expressly or inherently disclose each claim limitation"). Moreover, "[b]ecause the hallmark of anticipation is prior invention, the prior art reference—in order to anticipate under 35 U.S.C. § 102—must not only disclose all elements of the claim within the four corners of the document, but must also disclose those elements 'arranged as in the claim.'" *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)).

Whether a reference anticipates is assessed from the perspective of an ordinarily skilled artisan. *See Dayco Prods., Inc. v. Total Containment, Inc.*, 329 F.3d 1358, 1368 (Fed. Cir. 2003) ("'[T]he dispositive question regarding anticipation [i]s whether one skilled in the art would reasonably understand or infer from the [prior art reference's] teaching' that every claim element was disclosed in that single reference." (quoting *In re Baxter Travenol Labs.*, 952 F.2d 388, 390 (Fed. Cir. 1991))).

Additionally, under the principles of inherency, if the prior art necessarily functions in accordance with, or includes, the claimed

limitations, it anticipates. *MEHL/Biophile Int'l Corp. v. Milgraum*, 192 F.3d 1362, 1365 (Fed. Cir. 1999) (citation omitted); *In re Cruciferous Sprout Litig.*, 301 F.3d 1343, 1349–50 (Fed. Cir. 2002).

As set forth in 35 U.S.C. § 103(a),

> [a] patent may not be obtained . . . 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.

The question of obviousness is resolved on the basis of underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) objective evidence of nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). Additionally, the obviousness inquiry typically requires an analysis of "whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007) (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) (requiring "articulated reasoning with some rational underpinning to support the legal conclusion of obviousness")); *see In re Warsaw Orthopedic, Inc.*, 832 F.3d 1327, 1333 (Fed. Cir. 2016) (citing *DyStar Textilfarben GmbH & Co. Deutschland KG v. C. H. Patrick Co.*, 464 F.3d 1356, 1360 (Fed. Cir. 2006)).

An obviousness analysis "need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ." *KSR*, 550 U.S. at 418; *accord In re Translogic Tech., Inc.*, 504 F.3d 1249, 1259 (Fed. Cir. 2007). Petitioner cannot satisfy its burden of proving obviousness by employing "mere conclusory

statements." *In re Magnum Oil Tools Int'l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016). Instead, Petitioner must articulate a reason why a person of ordinary skill in the art would have combined the prior art references. *In re NuVasive*, 842 F.3d 1376, 1382 (Fed. Cir. 2016).

A reason to combine or modify the prior art may be found explicitly or implicitly in market forces; design incentives; the "interrelated teachings of multiple patents"; "any need or problem known in the field of endeavor at the time of invention and addressed by the patent"; and the background knowledge, creativity, and common sense of the person of ordinary skill. *Perfect Web Techs., Inc. v. InfoUSA, Inc.*, 587 F.3d 1324, 1328–29 (Fed. Cir. 2009) (quoting *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418–21 (2007)).

Before determining whether a claim is obvious in light of the prior art, we consider any relevant evidence of secondary considerations of non-obviousness. *See Graham*, 383 U.S. at 17. Notwithstanding what the teachings of the prior art would have suggested to one of ordinary skill in the art at the time of the invention, the totality of the evidence submitted, including objective evidence of non-obviousness, may lead to a conclusion that the challenged claims would not have been obvious to one of ordinary skill. *In re Piasecki*, 745 F.2d 1468, 1471–72 (Fed. Cir. 1984).

We analyze the asserted grounds of unpatentability in accordance with these principles to determine whether Petitioner has met its burden to establish a reasonable likelihood of success at trial.

A. Ground 1: Asserted Anticipation by Goodnick

Petitioner asserts that Goodnick anticipates claims 1–3 and 8–10. Pet. 9.

1. Goodnick

Goodnick concerns experiments "to observe the influence of thin SiO_2 layers on the chemical formation of metal-silicon contacts." Ex. 1121, 1.[7] According to Goodnick, a thick interfacial oxide at a metal-silicon interface suppresses current, thereby reducing rectifying characteristics. *Id.* A sufficiently thin oxide, however, may sustain considerable current via tunneling and may reduce the density of interface states by satisfying dangling bonds. *Id.* Goodnick discloses that, as a result, with a sufficiently thin oxide:

> the Fermi level at the surface may become unpinned and the barrier height is more directly determined by the metal work function. In addition, a thin interfacial layer may act as a barrier to the chemical reaction and interdiffusion that characterizes the intimate metal silicon contact. Thus, the presence of a thin oxide at the interface acts as a passivating influence, both from an electronic and a chemical standpoint.

Id.

Goodnick investigated three metals (aluminum, platinum, and gold) and grew SiO_2 at 700 degrees Celsius to approximately 30Å. Ex. 1121, 1. Goodnick reports that the 30Å thermally grown SiO_2 appeared as a complete barrier to the formation of platinum silicide and less of a barrier to the Au-Si reaction, where "widespread dissolution of the SiO_2 layer and reaction between the Au and Si appeared to occur." *Id.* at 5. "Al partially reduces the thin SiO_2 layer to form Al_2O_3 and free Si. This reaction appeared to be self-limiting, with SiO_2 still present at the interface, even after heating at 400°C." *Id.* Goodnick concludes:

> a thermally grown SiO_2 layer appears effective in preventing or retarding the widespread interdiffusion of elemental Si.

[7] For this exhibit, we cite the page numbers added by Petitioner.

> However, chemically etched surfaces react readily with the metal overlayer even though a thin native oxide grows prior to deposition. The different chemical nature of room temperature air grown oxides of Si is suggested as an explanation of these results.

Id.

2. Claim 1

a. An electrical junction

Petitioner asserts that, if the preamble of claim 1 is limiting, Goodnick discloses it by describing an Al–Al_2O_3–SiO_2–Si contact structure. Pet. 21. Petitioner further asserts that the Specification of the '395 patent uses the terms "contact" and "junction" interchangeably. *Id.* Patent Owner presents no counterargument regarding the preamble of claim 1. We determine that Petitioner's showing regarding the preamble of claim 1 is sufficient.[8]

b. a region in a semiconductor substrate

Petitioner argues that Goodnick discloses "a region in a semiconductor substrate" by describing a silicon substrate. Pet. 22. Patent Owner presents no counterargument regarding this limitation, and we determine that Petitioner's showing for this limitation is sufficient.

c. a metal electrical contact to said region

Petitioner asserts that Goodnick discloses "a metal electrical contact to said region" by describing the "chemical formulation of metal-silicon contacts" and by describing aluminum as an example of a metal electrical contact. Pet. 22. Patent Owner presents no counterarguments regarding this limitation, and we determine that Petitioner's showing for this limitation is sufficient.

[8] For this reason, we do not need to determine whether the preamble of claim 1 is limiting.

d. an interface layer between said region and said metal electrical contact

Petitioner asserts that Goodnick discloses "an interface layer between said region and said metal electrical contact" by describing a process that produces an Al_2O_3–SiO_2 interface layer between the silicon substrate and the aluminum. Pet. 22. Patent Owner presents no counterargument regarding this limitation, and we determine that Petitioner's showing for this limitation is sufficient.

e. said region being electrically connected to said metal electrical contact through said interface layer

Petitioner asserts that Goodnick discloses "said region being electrically connected to said metal electrical contact through said interface layer" by characterizing its Al–Al_2O_3–SiO_2–Si contact as a "metal-silicon contact" and by describing that its interfacial oxide layers are thin while indicating that "an oxide layer that is sufficiently thin may sustain considerable current via tunneling." Pet. 23. Patent Owner presents no counterargument regarding this limitation, and we determine that Petitioner's showing for this limitation is sufficient.

f. said interface layer comprising a metal oxide and a semiconductor oxide

Petitioner asserts that Goodnick discloses this limitation by describing that the results from the experiments indicated that SiO_2 and Al_2O_3 existed simultaneously at the interface, probably resulting from diffusion barrier formed by the Al_2O_3 layer to the transport of Al to the SiO_2 layer. Pet. 23. Petitioner proposes the schematic depiction of the involved metallization process and the resulting contact shown below:

Petitioner's Depiction of Goodnick's Metallization Process

Id. at 18 (citing Ex. 1121, 1–2, 5; Ex. 1126. ¶¶ 80–86). As illustrated above, Petitioner contends that after metallization, the contact has a distinct metal contact layer of Al and a metal oxide layer, Al_2O_3. Petitioner's depiction is illustrative and is not reproduced from Goodnick.

Patent Owner argues that Goodnick does not disclose distinct metal oxide and semiconductor oxide layers. In support of this argument, cites the Declaration of Dr. Stephen Goodnick (Ex. 2043), who authored the Goodnick reference. Dr. Goodnick declares that Petitioner and Dr. Schubert have "misinterpreted key aspects of my paper." Ex. 2043 ¶ 5.

We must determine what an ordinarily skilled artisan would have understood from the Goodnick reference. Dr. Schubert contends that such an artisan would have understood that the Goodnick reference discloses the layered structure shown above. *See* Ex. 1119, Ex. 1126 ¶¶ 79–85 (at ¶ 82 quoting Goodnick's description of Figure 8(b) that "[i]n contrast to the air exposed sample, an Al_2O_3 layer exists at the Al-SiO_2-Si interface"). Dr. Goodnick indicates that an ordinarily skilled artisan would not have understood his paper to mean there is a layer of Al_2O_3 on top of a layer of SiO_2, but rather only that Al_2O_3 and SiO_2 were found together in the interface region between the aluminum and the semiconductor. *See* Ex. 2043 ¶¶ 32–40.

Figure 8(a) of Goodnick shows "[p]eak to peak Auger sputter profile on room temperature oxidized Si, unheated" and Figure 8(b) of Goodnick shows "[p]eak to peak Auger sputter profile of Al on 30 Å of SiO_2, unheated." Ex. 1121, 5. Responding to Petitioner's assertions concerning the case where 30Å of SiO_2 was first placed on the silicon before depositing the aluminum, Dr. Goodnick refers to Figure 8(b) of his paper, on which the X-axis is sputter time. Ex. 2043 ¶¶ 32–34. Dr. Goodnick states that, in the period between 0 and 5 minutes, the high levels of Al_2O_3 represent its presence on the top surface of the aluminum, the high level of aluminum between 10 min and 30 minutes corresponds to the aluminum deposition, the high level of silicon after 50 minutes corresponds to the silicon substrate, and the high levels of aluminum and silicon between 30 and 50 minutes is the aluminum-silicon interface. *Id.* ¶ 33. According to Dr. Goodnick, Figure 8(b) shows that Al_2O_3 and SiO_2 were present at the aluminum silicon interface, but "it cannot be determined where Al_2O_3 is present with respect to SiO_2." *Id.* Dr. Goodnick asserts that the presence of a peak in the Al_2O_3 curve at about 40 minutes and the "O" curve (representing SiO_2) between 35 and 40 minutes and the fact that both curves have the same general shape "means that both compounds were found in the same relative quantities in the interface region." *Id.* ¶ 34. According to Dr. Goodnick, "[a] POSITA understanding this data would not conclude that there is a layer of Al_2O_3 on top of a layer of SiO_2 as Samsung claims . . . only that both Al_2O_3 and SiO_2 were found together in the interface region between the aluminum and the silicon." *Id.*

Nevertheless, comparing Figures 8a and 8b, the Goodnick reference expressly states:

> Figure 8(a) shows the peak-to-peak profile of an unheated sample with an air grown oxide. It appears that Si has diffused into the Al and collected at the Al_2O_3-Al interface at the surface. No buildup of Al_2O_3 is seen at the Al-Si interface. Figure 8(b) is a profile of an unheated sample with 30Å SiO_2 at the interface. *In contrast to the air exposed sample, an Al_2O_3 layer exists at the Al-SiO_2-Si interface.* This is suggestive of the reduction reaction seen previously, with the presence of SiO_2 necessary for formation of Al_2O_3. Heat treatment of samples resulted in little change in the profiles with the exception of greater concentration of Si at the surface of the unoxidized samples.

Ex. 1121, 5 (emphasis added). It is unclear from this text why a person of ordinary skill would not have understood Goodnick to mean the layers shown in the Petition's depiction of the metallization process exist. Pet. 18.

Goodnick further states that, even at elevated temperatures, the reaction is self-limiting "probably [as] a result of the *diffusion barrier formed by the Al_2O_3 layer* to the transport of Al to the SiO_2 layer." Ex. 1121, 5 (emphasis added). Dr. Goodnick now states that "[t]his statement was a speculation based on the fact that both SiO_2 and Al_2O_3 were still present at the interface, whereas thermodynamically it was expected that Al would completely reduce SiO_2 to Al_2O_3 and free Si." Ex. 2043 ¶ 39. It is unclear from the language in Goodnick whether, in that reference, Dr. Goodnick was speculating about the possibility that other phenomena could explain the self-limiting nature of the reaction or the existence of an Al_2O_3 layer. In any case, given that the Goodnick reference expressly refers to a layer of Al_2O_3 more the once, on this record, we determine that Petitioner has set forth sufficient evidence for institution that the Goodnick reference discloses a layer of Al_2O_3 by at least raising a triable issue as to what an ordinarily skilled artisan would have understood from Goodnick concerning distinct SiO_2 and Al_2O_3 layers. Based on Goodnick's specific mention of an

Al_2O_3 layer, Petitioner has demonstrated a reasonable likelihood that it will prevail on this issue. Thus, we determine that Petitioner's showing for this limitation is sufficient.

g. being in contact with said region in the semiconductor substrate and said metal electrical contact

Petitioner asserts that Goodnick discloses this limitation by describing evaporating aluminum onto a SiO_2 layer grown on a silicon substrate. Pet. 24. Patent Owner presents no counterarguments regarding this limitation, and we determine that Petitioner's showing for this limitation is sufficient.

h. Summary

Petitioner has provided a sufficient showing for all limitations of claim 1. Thus, we determine that Petitioner has demonstrated a reasonable likelihood of establishing that Goodnick anticipates claim 1.

3. Claims 2–3 and 8–10

Petitioner sets forth how Goodnick purportedly discloses all limitations that claims 2–3 and 8–10 add to claim 1. Pet. 24–26. Patent Owner presents no counterarguments regarding those additional limitations. After reviewing the record, we determine that Petitioner has demonstrated a reasonable likelihood of establishing that Goodnick anticipates claims 2–3 and 8–10.

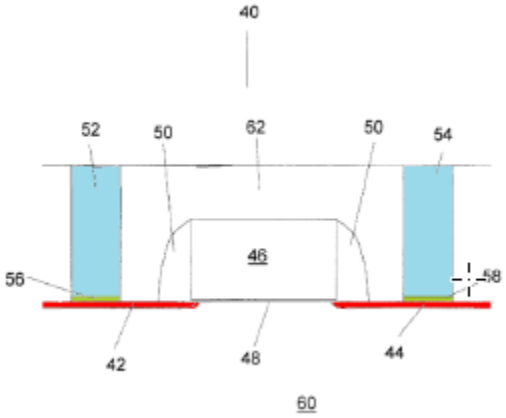
B. Ground 2: Asserted Obviousness over Goodnick and Jammy

Petitioner asserts that claim 4 would have been obvious over Goodnick and Jammy. Pet. 9.

1. Jammy

Jammy generally describes a MOSFET (metal oxide semiconductor field effect transistor) that incorporates a quantum conductive barrier

between a conductive stud and a semiconductor substrate. Ex. 1122, 2:42–53; 3:16–22. Figure 1 of Jammy, with color annotations added by Petitioner, is reproduced below:



Pet. 20. Figure 1 above shows MOSFET 40 in substrate 60. Ex. 1122, 3:9–11, 4:9–11. In Figure 1, conductive studs 52 and 54, quantum barrier layers 56 and 58, and shallow source /drain diffusions 42 and 44 are highlighted. Pet. 20; Ex. 1122, 3:11–18. Jammy discloses that "[p]referred quantum conductive materials are inorganic oxides or nitrides, more preferably silicon nitride compounds selected from the group consisting of silicon nitride or silicon oxynitride." Ex. 1122, 3:51–54. Jammy also discloses that "studs 52 and 54 would typically be made of tungsten or a doped polycrystalline silicon." *Id.* at 4:32–33.

Jammy states that its "invention is not limited to any specific device configuration . . . , however, the structures of the invention are preferably incorporated into a MOSFET or other transistor devices." Ex. 1122, 4:1–4. Jammy identifies Cote (Ex. 1135) as disclosing relevant transistor structures and incorporates Cote by reference. *Id.* at 4:5–8. Cote discloses that "titanium, titanium nitride, tungsten, or other appropriate metallurgy" can be used to form a diffusion contact stud. Ex. 1135, 8:24–28.

2. Claim 4

Petitioner sets forth its evidence and arguments that the combination of Goodnick and Jammy teach or suggest every element of claim 4 and provides reasons why an ordinarily skilled artisan would combine the teachings of those references. Pet. 27–29. In response, Patent Owner relies on the argument it presented for claim 1, that Goodnick does not disclose distinct metal oxide and semiconductor oxide layers. Prelim. Resp. 35–43. In addition, for this and for all other obviousness grounds, Patent Owner argues Petitioner failed to account for objective evidence of nonobviousness. Prelim. Resp. 60–63. We address Patent Owner's argument about objective evidence of nonobviousness below.

a. Objective Indicia of Nonobviousness

Patent Owner argues that, for all of the asserted obviousness challenges, Petitioner fails to account for objective evidence of nonobviousness. In particular, Patent Owner argues that in 2004 and 2006 the inventors published two papers (Ex. 2045 and 2046, "the Acorn Papers") describing their invention and that these "seminal papers" have been cited in professional literature over 130 and 140 times, respectively. Prelim. Resp. 62. Patent Owner further contends that researchers working for Petitioner cited at least one of the Acorn Papers in a 2017 abstract of an article (Ex. 2047), but the citation was removed in the article's final publication in 2018 (Ex. 2048). *Id.* at 62–63. According to Patent Owner, other references cited in the published article (Ex. 2049, 1; Ex. 2050, 1; and Ex. 2051, 1) credit the inventors' 2006 article with inserting a thin interfacial layer between the metal and semiconductor to alleviate Fermi level pinning attributed to metal induced gap states and to reduce the penetration of MIGS as first proposed by the inventors for Si MOSFETS. According to Patent

Owner, "[e]ven at this preliminary stage, [it is evident that] objective indicia put a [heavy] thumb on the non-obviousness side of the scale, further showing that the petition's challenges are not reasonably likely to prevail." Prelim. Resp. 62–63.

Objective criteria constitute independent evidence of non-obviousness. *Mintz v. Dietz & Watson, Inc.*, 679 F.3d 1372, 1378 (Fed. Cir. 2012). The totality of the evidence submitted, including objective evidence of nonobviousness, may lead to a conclusion that the challenged claims would not have been obvious to one with ordinary skill in the art. *In re Piasecki*, 745 F.2d 1468, 1471–1472 (Fed. Cir. 1984). Secondary considerations may include any of the following: long-felt but unsolved needs, failure of others, unexpected results, commercial success, copying, licensing, and praise. "In order to accord substantial weight to secondary considerations in an obviousness analysis, the evidence of secondary considerations must have a nexus to the claims, i.e., there must be a legally and factually sufficient connection between the evidence and the patented invention." *Fox Factory, Inc. v. SRAM, LLC*, 944 F.3d 1366, 1373 (Fed. Cir. 2019) (internal quotations omitted).

Patent Owner provides a chart indicating that the '395 patent, filed on January 23, 2018 and issued on October 2, 2018, is a member of a large patent family stemming from an application filed on August 12, 2002 that issued on Aug 1, 2006. Prelim. Resp. 8. On the current record, Patent Owner's reference to scientific papers published in 2004 and 2006 does not establish a clear nexus to the subject matter specifically claimed in the '395 patent. Therefore, on the current record, we are not persuaded by Patent Owner's arguments concerning objective evidence of nonobviousness.

b. Conclusion

We determine that Petitioner has demonstrated a reasonable likelihood of establishing that claim 4 would have been obvious over Goodnick and Jammy.

C. Ground 3: Asserted Obviousness over Goodnick

Petitioner asserts that claim 5 would have been obvious over Goodnick. Pet. 9. Patent Owner disagrees, arguing that Goodnick does not teach or suggest "said interface layer has a thickness sufficient to depin a Fermi level of the metal electrical contact in a vicinity of the junction," as recited in claim 5. Prelim. Resp. 44. In particular, Patent Owner asserts that Goodnick does not teach or suggest "reducing the effects of metal-induced gap states in the semiconductor," as required by our construction for "depin a Fermi level of the metal electrical contact in a vicinity of the junction." *Id.* at 44–46.

Petitioner disagrees, arguing that Goodnick's Al_2O_3–SiO_2 layer would have reduced the effect of metal-induced gap states. Pet. 31. According to Petitioner, Goodnick's Al_2O_3–SiO_2 interfacial oxide layer would have reduced the probability of an aluminum electron's wave function penetrating from the aluminum through the interface layer and into the semiconductor—which penetration is the cause of metal-induced gap states—to less than 1 in 703 million. *Id.* (citing Ex. 1126 ¶¶ 163–179). Petitioner asserts that would have reduced, if not substantially eliminated, the effects of metal-induced gap states in the semiconductor. *Id.* Petitioner further asserts that it was known in the art that interfacial oxide layers reduce the influence of metal electron wave functions on states in the semiconductor. *Id.* (citing Ex. 1127, 3; Ex. 1128, 1; Ex. 1126 ¶¶ 180–182).

In response, Patent Owner acknowledges that Goodnick describes unpinning of a Fermi level, but argues that Goodnick did not use the term unpinning or depinning in the same way as the inventors of the '395 patent. Prelim. Resp. 44–45. In particular, Patent Owner asserts that Goodnick does not use the term "unpinning" to mean reducing the effects of metal-induced gap states. *Id.* Patent Owner cites declaration testimony by Dr. Goodnick that represents: "[w]hen I stated [in my paper] that 'the Fermi level at the surface may become unpinned . . . ,' I was referring only to the fact that the dangling bonds in the silicon are passivated by the oxide layer." Ex. 2043 ¶ 46 (cited by Prelim. Resp. 44). Patent Owner argues that the Goodnick paper confirms that Dr. Goodnick was using the term "unpinning" in that paper only to refer to satisfying dangling bonds. Prelim. Resp. 45. Patent Owner further argues that, as a result, Petitioner must prove inherency, which it has not done. *Id.* Patent Owner further contends that Petitioner cannot rely on expert testimony to fill in gaps in Goodnick. *Id.* at 45–46.

We determine that Petitioner has sufficiently shown that Goodnick's Al_2O_3–SiO_2 layer would have reduced the effect of metal-induced gap states in its semiconductor. Petitioner has set forth evidence that an ordinarily skilled artisan would have expected that layer to reduce the effect of metal-induced gap states and set forth calculations that indicate that effect would have occurred. Pet. 31 (citing Ex. 1126 ¶¶ 163–182, Ex. 1127, 3; Ex. 1128, 1). Patent Owner has not substantively addressed this evidence or given us a specific reason to discount it. Prelim. Resp. 44–46. The mere fact that the author of Goodnick may not have intentionally intended to use the term "unpinning" to refer to the reduction of the effect of metal-induced gap states in a semiconductor does not, by itself, demonstrate error in

Petitioner's showing that an ordinarily skilled artisan would have recognized that reduction from that paper.

We determine that Petitioner has demonstrated a reasonable likelihood of establishing that claim 5 would have been obvious over Goodnick.

D. Ground 4: Asserted Obviousness over Goodnick and Taubenblatt 1982

Petitioner asserts that claims 1, 11, 12, 15, 23–25, and 28 would have been obvious over Goodnick and Taubenblatt 1982. Pet. 10.

1. Taubenblatt 1982

Noting the importance of silicides as Schottky barriers, ohmic contacts, and low resistivity interconnects in integrated circuits, Taubenblatt 1982 states that "[m]any silicides are commonly formed by the deposition of a metal layer on silicon via e-beam evaporation, chemical vapor deposition, or sputtering, and the reaction of the metal layer with the underlying silicon at 400-600°C." Ex. 1123, 1.[9] The purpose of Taubenblatt 1982 was "to characterize silicide formation for the Ti-Si system under ultrahigh vacuum (UHV) conditions with the controlled addition of surface oxides." *Id.* Taubenblatt 1982's "results show that the presence of SiO_2 at the Si surface, prior to Ti deposition, has a significant effect on the reaction of Ti and Si and that the thickness of the SiO_2 layer is especially important in determining the reaction end products." *Id.* at 8. According to Taubenblatt 1982:

> in the manufacture of circuit elements employing titanium disilicide, Ti will react through a thin silicon dioxide layer with the SiO_2 remaining at the surface. But in the reaction of Ti with a thicker SiO_2 layer, Ti oxide forms, which can act as a diffusion

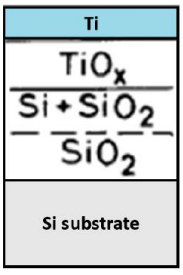
[9] We cite to the pages added by Petitioner for this exhibit.

> barrier to prevent further reduction of the oxide by unreacted Ti metal or in the formation of silicide.

Id.

2. Proposed Combination of Goodnick and Taubenblatt 1982

Petitioner argues that Goodnick discloses an interface layer that includes a metal oxide layer (aluminum oxide (Al_2O_3)), but acknowledges that Goodnick does not expressly describe an interface layer that includes titanium dioxide, as recited in claims 11 and 23, or a metal electrical contact that includes titanium, as recited in claims 15 and 24. Pet. 34. Petitioner asserts, however, that, because Taubenblatt 1982 teaches (i) depositing titanium on a layer of SiO_2 thicker than 20 Å (2 nm) and (ii) that annealing at temperatures between 700ºC–900ºC forms a TiO_x–SiO_2 interface layer, an ordinarily skilled artisan would have understood that by depositing titanium on Goodnick's 30 Å (3 nm) thick layer of thermally grown SiO_2, "all that would have taken to form a TiO_x–SiO_2 interface layer is annealing at 700C–900C, as described in Taubenblatt 1982." *Id.* at 36 (citing Ex. 1123, 7–8, Ex. 1126 ¶ 203). Petitioner contends that the combined teachings of Goodnick and Taubenblatt 1982 would have resulted in the structure shown below.



Pet. 36–37(citing Ex. 1121, 1–2; Ex. 1123, 7–8; Ex. 1126 ¶ 204). The structure postulated by Petitioner includes a SiO_2 layer on top of a silicon

substrate, a Si+SiO_2 layer over the SiO_2 layer, a TiO_x layer on top of the Si+SiO_2 layer, and a Ti layer over the TiO_x layer. *Id.* at 37.

3. Motivation to Combine

According to Petitioner, an ordinarily skilled artisan would have provided Goodnick with an interface layer that includes both titanium oxide and silicon dioxide "because that interface layer would have been expected to reduce the specific contact resistivity of that junction." Pet. 37 (citing Ex. 1126 ¶¶ 205–206). Petitioner argues it was known that a SiO_2 interface layer grown on silicon would passivate the surface of the silicon and "[t]hat passivation would have reduced the barrier height of a titanium to n-type silicon junction, such as the junction between Taubenblatt [1982's] titanium [and] Goodnick's n-type source drain/drain silicon substrate." *Id.* at 37–38 (citing Ex. 1121, 1–2; Ex. 1123, 3; Ex. 1126 ¶ 207). Petitioner further asserts that, for a junction between titanium and n-type silicon with a SiO_2 interface layer, the SiO_2 interface layer reduces the barrier height more than 0.1 eV" and that "reducing the barrier height of a junction reduces its specific contact resistivity." *Id.* at 38 (citing Ex. 1123, 3; Ex. 1124, 5–6[10]; Ex. 1126 ¶ 207).

Patent Owner argues that, although Taubenblatt 1982 "reports the results of several experiments depositing titanium on silicon under various conditions" "nothing in Goodnick suggests any reason to study titanium." Prelim. Resp. 46. Noting Petitioner's argument that the motivating justification seems to be reducing contact resistivity, Patent Owner asserts that "Goodnick never mentions resistivity." *Id.* Acknowledging that Taubenblatt 1982 "mentions resistivity in passing once in his introduction,"

[10] We cite to the page numbers added by Petitioner for this exhibit.

Patent Owner argues that neither Goodnick nor Taubenblatt 1982 is concerned with building a low resistivity junction; instead both references report on studies of basic material interactions, with both researchers performing experiments with different materials. *Id.* at 46–47.

Patent Owner further argues that because the bulk resistivity of titanium is sixteen times greater than that of aluminum, a person of ordinary skill would not have had reason to use titanium to lower resistivity. Prelim. Resp. 47 (citing Ex. 2052, 4, 6). Patent Owner also asserts an ordinarily skilled artisan would have recognized titanium as a poor choice for the involved contacts because of the difference between the thermal coefficients of titanium and silicon. *Id.* at 48. Patent Owner quotes Kim (Ex. 1125) that:

> Pure titanium, however, is not suitable for contacts as direct contact between titanium and silicon has shown poor reproducibility due to the large difference in the linear thermal coefficient of expansions of titanium and silicon (the linear coefficient of expansion of titanium being three times the linear coefficient of expansion of silicon).

Ex. 1125, 1:24–30 (quoted by Preliminary Resp. 48).

Although Petitioner provides evidence that an interface layer can reduce resistivity, the evidence cited by Petitioner does not appear to support its assertion that a person of ordinary skill would have substituted Taubenblatt 1982's titanium for Goodnick's aluminum. Petitioner has not provided a sufficient analysis demonstrating that an ordinarily skilled artisan would view titanium as a preferable substitute for Goodnick's aluminum, and the art of record sets forth reasons why an ordinarily skilled artisan would not want to make that substitution. *See* Ex. 1125, 1:24–30; Ex. 2052, 4, 6.

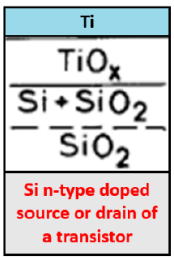
Thus, we determine Petitioner has not demonstrated a reasonable likelihood that claims 1, 11, 12, 15, 23–25, and 28 would have been obvious over Goodnick and Taubenblatt 1982.[11]

E. Ground 5: Asserted Obviousness over Goodnick, Jammy, and Taubenblatt 1982

Petitioner argues that claims 14, 17–19, and 22 would have been obvious over Goodnick, Jammy, and Taubenblatt 1982. Pet. 10.

1. Proposed Combination of Goodnick, Jammy, and Taubenblatt 1982

Petitioner proposes that an ordinarily skilled artisan would have (i) grown a 30 Å SiO_2 layer as taught in Goodnick on Jammy's n-type doped source or drain of a transistor in a silicon substrate, (ii) deposited Taubenblatt 1982's titanium on that 30 Å SiO_2 layer instead of Goodnick's aluminum; and (iii) annealed the resulting structure at 700ºC–900ºC as taught by Taubenblatt 1982. Pet. 49. According to Petitioner, this combination would have yielded the following structure:



Pet. 51.

[11] As discussed in Section IX.A., we determined that Petitioner had demonstrated a reasonable likelihood of establishing that claim 1 would have been anticipated by Goodnick. Petitioner, however, does not argue that claim 1 would have been obvious over Goodnick alone, and, to the extent Petitioner is relying on the combination of Goodnick with Taubenblatt 1982 to render claim 1 obvious, Petitioner has not demonstrated a reasonable likelihood of proving that an ordinarily skilled artisan would have been motivated to make that combination.

2. Motivation to Combine Goodnick, Jammy, Taubenblatt 1982

Petitioner asserts that an ordinarily skilled artisan would have combined Goodnick and Taubenblatt 1982 to make a Ti–TiO_x–Si+SO_2–SiO2–Si contact to reduce specific contact resistivity for the reasons expressed for Ground 4. Pet. 49. Petitioner further argues that, in addition, an ordinarily skilled artisan would have substituted Jammy's n-type silicon substrate for Goodnick's n-type silicon substrate because (i) that substitution would not have materially altered the Ti–TiO_x–Si+SO_2–SiO2–Si contact formed by combining Goodnick and Taubenblatt 1982 and (ii) it would be desirable for Jammy's structure to have a contact with low specific contact resistivity. *Id.*

As discussed in Section IX.D. for Ground 4, we determined that Petitioner has not set forth sufficient evidence that an ordinarily skilled would have been motivated to combine Goodnick and Taubenblatt 1982 to reduce specific contact resistivity. Thus, Petitioner has not sufficiently shown that an ordinarily skilled artisan would have made the proposed combination of Goodnick, Jammy, and Taubenblatt 1982 for this ground. Therefore, Petitioner has not demonstrated a reasonable likelihood of establishing that claims 14, 17–19, and 22 would have been obvious over Goodnick, Jammy, and Taubenblatt 1982.

F. Ground 6: Asserted Obviousness over Goodnick Jammy, Taubenblatt 1982, and Chang

Petitioner asserts that claim 6 would have been obvious over the combination of Jammy, Taubenblatt 1982, and Chang. Pet. 10.

1. Chang

Chang addresses the specific contact resistance of metal-semiconductor barriers. Ex. 1124, 1. Chang discloses that the specific

contact resistance at zero bias, R_c, is important as a measure of the ohmic or rectifying behavior of a metal-semiconductor barrier under operating conditions, and Chang calculates R_c for metal-Si and metal-GaAs barriers on p-type and n-type samples. *Id.* According to Chang, R_c decreases exponentially with increasing temperatures and with decreasing barrier height. *Id.* Chang also states that, for higher dopings where tunneling dominates, R_c decreases rapidly with increased doping. *Id.*

2. Proposed Combination of Goodnick, Jammy, Taubenblatt 1982, and Chang and Motivation for the Combination

Petitioner relies on its arguments for Ground 5 that an ordinarily skilled artisan would have combined Goodnick, Jammy, and Taubenblatt 1982 to produce a Ti–TiO_x–Si+SO_2–SiO2–Si structure. Pet. 57. Petitioner further argues that an ordinarily skilled art would have been motivated by Chang to provide a specific contact resistivity in that structure of less than 10 Ω-μm^2. *Id.*

As set forth in Section IX.E., we determined that Petitioner has not set forth sufficient evidence that an ordinarily skilled artisan would have been motivated to combine Goodnick, Jammy, and Taubenblatt 1982 to produce a Ti–TiO_x–Si+SO_2–SiO2–Si structure. Thus, Petitioner has not set forth a sufficient evidence of a motivation for its proposed combination of Goodnick, Jammy, Taubenblatt 1982, and Chang for this ground. Accordingly, Petitioner has not demonstrated a reasonable likelihood of establishing that claim 6 would have been obvious over the combination of Goodnick, Jammy, Taubenblatt 1982, and Chang.

G. Ground 7: Asserted Obviousness over Goodnick, Taubenblatt 1982, and Kim

Petitioner argues that claims 16, 26, and 27 would have been obvious over the combination of Goodnick, Taubenblatt 1982, and Kim. Pet. 10.

1. Kim

Kim is directed to a method of making molybdenum/titanium-tungsten or tungsten/titanium-tungsten ohmic contacts to silicon. Ex. 1125, 1:2–3. Kim generally describes a low resistance contact between a titanium-tungsten alloy and silicon. *Id.* at 4:59–5:4. The titanium in the tungsten-titanium alloy is believed to reduce native silicon dioxide present on the silicon to form silicon and titanium dioxide, which reduces the interface resistance. *Id.* at 4:63–5:4. Kim describes achieving a specific contact resistance from 8 to 15 Ω-μm^2 for a junction between that alloy and n-type doped silicon. *Id.* at 5:27–30.

2. Proposed Combination of Goodnick, Taubenblatt 1982, and Kim and Motivation to Combine

Petitioner relies on its arguments for Ground 4 that an ordinarily skilled artisan would have been motivated to combine Goodnick and Taubenblatt 1982 in the manner proposed for Ground 4. Pet. 61. Petitioner further argues that an ordinarily skilled artisan would have been motivated to substitute Kim's titanium tungsten alloy for Taubenblatt 1982's titanium. *Id.* at 62.

As set forth in Section IX.D., we determined that Petitioner has not set forth sufficient evidence that an ordinarily skilled artisan would have been motivated to combine Goodnick and Taubenblatt 1982 in the manner Petitioner proposes. Thus, Petitioner has not set forth sufficient evidence of a motivation to combine Goodnick, Taubenblatt 1982, and Kim for this ground.[12] Accordingly, Petitioner has not demonstrated a reasonable

[12] Claim 16 depends on claim 1. We determined that Petitioner had demonstrated a reasonable likelihood of establishing that claim 1 was anticipated by Goodnick. Petitioner's showing for claim 16 nevertheless depends on the combination of Goodnick and Taubenblatt 1982 because, for

likelihood of establishing that claims 16, 26, and 27 would have been obvious over Goodnick, Taubenblatt 1982, and Kim.

H. Ground 8: Asserted Obviousness over Goodnick, Jammy, Taubenblatt 1982, and Kim

Petitioner argues that claims 20 and 21 would have been obvious over Goodnick, Jammy, Taubenblatt 1982, and Kim. Pet. 5. For this ground, Petitioner relies on its argument for Ground 5 that an ordinarily skilled artisan would have been motivated to combine Goodnick, Jammy, and Taubenblatt 1982 in the manner proposed for Ground 5. Pet. 64. In addition, Petitioner argues that an ordinarily skilled artisan would have been motivated to substitute Kim's titanium tungsten alloy for Taubenblatt 1982's titanium. *Id.*

As set forth in Section IX.E., we determined that Petitioner did not set forth sufficient evidence that an ordinarily skilled artisan would have been motivated to combine Goodnick, Jammy, and Taubenblatt 1982 in the manner Petitioner proposed for Ground 5. Thus, Petitioner has not set forth sufficient evidence of a motivation to combine Goodnick, Jammy, Taubenblatt 1982, and Kim for this ground. Therefore, Petitioner has not demonstrated a reasonable likelihood of establishing that claims 20 and 21 would have been obvious over Goodnick, Jammy, Taubenblatt 1982, and Kim.

X. EXERCISE OF DISCRETION

Patent Owner argues that we should exercise our discretion to deny institution in view of the Acorn Litigation and in view of the parallel petition filed in the '1207 IPR.

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this ground, Petitioner proposes substituting Kim's titanium tungsten alloy for Taubenblatt 1982's titanium.

A. Discretion Under 35 U.S.C. 314(a)

Institution is discretionary. *See* 35 U.S.C. §§ 314(a) (authorizing, but not requiring, institution); *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2140 (2016) ("[T]he agency's decision to deny a petition is a matter committed to the Patent Office's discretion."). Several precedential and informative Board decisions guide our exercise of that discretion. *See NHK Spring Co. v. IntriPlex Techs., Inc*., IPR2018-00752, Paper 8 (PTAB Sept. 12, 2018) (precedential) ("*NHK Spring*"); *Apple Inc. v. Fintiv, Inc*., IPR2020-00019, Paper 11 (PTAB Mar. 20, 2020) (precedential) ("*Fintiv I*"); *Sand Revolution II, LLC v. Continental Intermodal Group – Trucking LLC*, IPR2019-01393, Paper 24 (PTAB June 16, 2020) (informative) (applying *Fintiv I* factors in light of ongoing, parallel district court litigation and instituting trial); *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 15 (PTAB May 13, 2020) (informative) (denying institution in light of an ongoing, parallel district court proceeding) ("*Fintiv II*").

Patent Owner argues that we should exercise our discretion to not institute trial due to the Acorn Litigation. Prelim. Resp. 1.

In *NHK Spring*, the Board considered the advanced state of a parallel district court proceeding as a factor favoring denial of institution, and in *Fintiv I*, the Board identified a non-exclusive list of factors to consider when applying *NHK Spring*. *See NHK Spring*, 11–18; *Fintiv I*, 5–16. We consider those factors below.

1. Whether the Court Granted a Stay or Evidence Exists that One May Be Granted if a Proceeding Is Instituted.

The Petition indicates that Petitioner would "be promptly moving to stay the Acorn Litigation," which is before Judge Gilstrap, and that "[a]lthough [Judge Gilstrap] infrequently grants pre-institution motions to

stay, [he] nonetheless invites defendants to renew their motions to stay once the Board institutes trial." Pet. 68. Petitioner argues that Judge Gilstrap "grants stays even at advanced stages." *Id.* (citing *Image Processing Techs. LLC v. Samsung Elecs. Co., Ltd.*, Case No. 2:16-cv-505-JRG, 2017 WL 10185855 (E.D. Tex. Feb. 17, 2017)). After the Petition was filed, Judge Gilstrap denied Petitioner's motion to stay, but granted leave to refile after the IPR institution decisions issue. *See* Ex. 2010.

Patent Owner argues that the stay factor "strongly favors denial in this case, as the court has already denied the petitioner's motion for a stay and is highly unlikely to enter a stay after the decisions on institution." Prelim. Resp. 16–17. Patent Owner points out that "the court made clear that it would not entertain a renewed motion to stay until after decisions on institution had been rendered in all ten of the IPRs." *Id*. at 17 (emphasis omitted). Patent Owner also argues that the *Image Processing* case is an "outlier," and that Judge Gilstrap has since denied such motions in other cases.[13] *See id*. at 17–19. Patent Owner asserts that a complete review of the court's stay jurisprudence in similar circumstances shows that it would "be shocking for the court to grant a stay even if IPR trials are instituted against all six . . . patents" and that "if trial is instituted against only a subset of the six . . . patents, then the likelihood of a stay would be extremely low." *Id*. at 18–19.

[13] *Intellectual Ventures I LLC v. T Mobile USA, Inc.*, No. 2:17-CV-00577-JRG (E.D. Tex. Dec. 13, 2018) (Ex. 2013); *Oyster Optics, LLC v. Infinera Corp.*, No. 2:19-CV-00257-JRG (E.D. Tex. July 17, 2020) (Ex. 2014); *Solas OLED Ltd. v. Samsung Display Co.*, No. 2:19-CV-00152-JRG (E.D. Tex. July 17, 2020) (Ex. 2015).

Petitioner's Preliminary Reply reiterates its position that this factor "favors institution because Judge Gilstrap will likely stay the litigation upon institution," and cites another decision granting a renewed motion, *Seven Networks, LLC v. Apple Inc.*, No. 2:19-cv-00115, Dkt. 312 (E.D. Tex. Sept. 22, 2020) (Exhibit 1036). *See* Prelim. Reply 1.

Patent Owner responds that "[n]othing in the terse *Seven [Networks]* opinion signals that [Judge Gilstrap] would do the same in this case." Prelim. Sur-reply 1.

We consider this factor to be neutral. It appears that Judge Gilstrap is willing stay after IPR institutions in some cases, but not others, depending on the particular circumstances of a given case. We cannot reasonably speculate how Judge Gilstrap may choose to manage his docket when it comes to the Acorn Litigation, particularly where the pandemic has caused such disruption. *See Sand Revolution II*, at 7 ("In the absence of specific evidence, we will not attempt to predict how the district court in the related district court litigation will proceed because the court may determine whether or not to stay any individual case, including the related one, based on a variety of circumstances and facts beyond our control and to which the Board is not privy.").

2. Proximity of the Court's Trial Date to the Board's Projected Statutory Deadline for a Final Written Decision.

The Petition argues that "[a]lthough the Acorn Litigation trial date is scheduled for April 2021 . . . , jury trial dates—to say nothing of dates for post-trial briefing—are inherently subject to change." Pet. 68.

The Preliminary Response argues that the trial date factor "strongly supports denial, as the court trial is scheduled to begin over ten months before the final written decision would be due in this case." Prelim. Resp.

20. According to Patent Owner, [i]n comparable cases of such a far-advanced related litigation, the Board has routinely found that this factor favors discretionary denial." *Id*. at 21. Patent Owner contends that "there is no evidence to suggest that the . . . Eastern District of Texas changes its trial dates in general, let alone in this case" and that "the court has a standing order 'to keep cases moving' despite the COVID-19 pandemic, characterizing trial dates as 'firm' notwithstanding the pandemic." *Id*. at 22 (citing Ex. 2016, 3).

Petitioner responds that "the April 5, 2021 trial date is not 'firm'" because "Judge Gilstrap currently has nineteen trials scheduled to begin on April 5, 2021, including four trials in which Samsung is a defendant," and "the Acorn Litigation is number 9 in priority." Prelim. Reply 1–2 (emphasis omitted). Petitioner further argues that "the ongoing pandemic continues to disrupt trials in the Eastern District of Texas—increasing the probability that the Acorn Litigation trial date will change" and that "Judge Gilstrap recently continued all trials scheduled to begin between now and March 1, 2021, which will in turn likely delay the Acorn Litigation." *Id*. at 3 (citing *Solas OLED Ltd. v. Samsung Display Co., Ltd., et al.*, No. 2:19-cv-00152, Dkt. No. 302 (E.D. Tex. Nov. 20, 2020) (Ex. 1039)).

Patent Owner responds that "the reply presents no evidence—instead, just speculation—that the trial in this case will not begin as scheduled" and that a panel in *Google v. AGIS Software Dev*., IPR2020-00870, Paper 16 at 11 (Nov. 25, 2020), recently concluded that the April 5, 2021 trial date for the corresponding litigation in that case weighed in favor of denial. *See* Prelim. Sur-reply 1–2. Patent Owner also argues that the "reply states that the court has continued all trials scheduled before March 1, 2020[,] [b]ut, the court has not delayed or rescheduled the trial in this case." *Id*. at 2. Patent

Owner further asserts that, "even assuming arguendo that the court trial is delayed a few months while coronavirus vaccines are rolled out, the court trial will still finish well before the IPR trials." *Id*. at 3.

We find this factor favors denial, but also find that the number of other cases that are also scheduled to start trial on April 5, 2021 and the fact that the pandemic has forced the district court to continue all in-person jury trials scheduled to begin during December, January, and February, introduce some uncertainty and, thus, prevent this factor from weighing strongly against institution.

3. Investment in the Parallel Proceeding by the Court and the Parties.

Regarding the timing of the IPRs, the Petition argues that Patent Owner "identified only one representative claim for each of six patents in its October 2019 complaint, including only one claim of the '395 Patent," that Patent Owner "served its infringement contentions—which collectively span 108 claims across those six patents, including 24 previously unidentified claims of the '395 Patent," and that "Petitioner promptly filed this petition" . . . after receiving those infringement contentions. Pet. 69 (emphasis omitted).

Patent Owner argues that by the time the institution decision is due "the parties and the court will have invested significant time and energy in the case to complete" (a) infringement and invalidity contentions; (b) claim construction discovery, briefing, and argument; (c) fact discovery; (d) expert reports; (e) expert discovery; (f) dispositive motions and responses; (g) *Daubert* motions and responses; (h) pre-trial disclosures, and (i) motions in limine. Prelim. Resp. 24 (citing Ex. 2008). Patent Owner argues that "[w]hen [a] litigation has completed the same or similar major milestones,

the Board has found that [this factor] strongly favors denial." *Id*. at 24–25 (citing cases). Patent Owner also argues that "the petitioner waited over eight months after filing of the complaint to file its IPR petitions." *Id*. at 26.

We recognize that much work has been done by the parties in the Acorn Litigation. However, we also find, as a countervailing consideration, that Petitioner acted diligently in filing this and the other IPRs. The record reflects that Patent Owner did not identify the full set of claims being asserted in the Acorn Litigation until March 9, 2020 (*see* Exs. 1160–1161), and that Petitioner filed this Petition, and nine others, in less than four months. We, therefore, consider this factor to only slightly favor denial.

4. Overlap Between Issues Raised in the Petition and in the Parallel Proceeding.

The Petition acknowledges an overlap of claims and invalidity arguments with the litigation, but argues that instituting trial would make it possible for Judge Gilstrap to stay, that it was likely that Patent Owner would drop claims before trial, "leaving the Board as the only tribunal to assess those claims," and that "if the Board institutes trial here, Petitioner will promptly cease asserting Jammy, Goodnick, Taubenblatt 1982, Chang, and Kim as prior art references to the challenged claims in the Acorn Litigation." Pet. 70.

Patent Owner dismisses Petitioner's representation that it would drop the instituted grounds from the district court contentions as not a concession because the Board is unlikely to institute both this IPR and the '1207 IPR, so Petitioner will be able to present its alternative invalidity contentions both before the Board and the district court. Prelim. Resp. 27–28. Patent Owner also contends that the representation was "too narrow to be of much value"

because it does not include any ground that could have been raised in this IPR. *See id*. at 28.

Petitioner's Preliminary Reply clarifies that "if the Board institutes review in either IPR2020-01282 or IPR2020-01207, Samsung will promptly cease asserting the prior art references relied upon in *both* petitions in the Acorn Litigation." Preliminary Reply 3–4.

After Petitioner filed its Preliminary Reply, the Board designated as precedential Section II.A of *Sotera Wireless, Inc. v. Masimo Corporation*, IPR2020-01019, Paper 12 (Dec. 1, 2020). In that case, the Board found that a stipulation by Petitioner that it would not pursue in the co-pending litigation "the specific grounds . . . [in] the instituted [*inter partes*] review petition, or on any other ground could be raised under §§ 102 or 103 on the basis of prior art patents or printed publications" was sufficient to "mitigate[] any concerns of duplicative efforts" and "ensure[] that an *inter partes* review is a 'true alternative' to the district court proceeding," and that it accordingly caused this factor to weigh "strongly in favor of not exercising discretion to deny institution." *Id*. at 18–19. We then asked Petitioner if it would agree to such a stipulation and gave Patent Owner an opportunity to submit its own comments. *See* Paper 17. Both parties responded. *See* Pet. Stip.; PO Comments.

Petitioner confirms that it would agree to the stipulation for all ten *inter partes* reviews, as follows:

> In the event one or more of these Petitions is granted on a given patent, Petitioner will not pursue in the Acorn Litigation [i.e., Acorn Semi, LLC v. Samsung Electronics Co. Ltd., Civil Action No. 2:19- cv-347 (E.D. Tex.)] any invalidity ground on that patent that was raised or that could have been reasonably raised in an IPR, i.e., any ground that could be raised under §§ 102 or 103 on the basis of prior art patents or printed publications.

Pet. Stip. 2. Petitioner states that it "will meaningfully abide by this stipulation and promptly notify the District Court about the Board's decisions." *Id*. at 3.

Patent Owner asserts, "inviting this third, revised stipulation is unprecedented, procedurally improper, prejudicial to Acorn, and sets a dangerous precedent that will invite future abusive gamesmanship by petitioners." PO Comments 1. According to Patent Owner, allowing Petitioner to agree to this stipulation "is like allowing the petitioner to place its bet on the race after the horses have made the final turn on the track." *Id*. (emphasis omitted). Patent Owner contends that the stipulation "is informed not only by Acorn's preliminary responses, final expert reports on validity, and very nearly complete expert discovery, but the Board's own telegraphing of how it is handicapping the proceeding." *Id*. Patent Owner characterizes the stipulation as "a midstream change of rules" and as "shenanigans [that] violate due process." *Id*. at 2. Patent Owner argues that "[i]f a procedure like this is followed in other cases, petitioners will initially make no meaningful stipulation in their petitions, evaluate the patent owners' preliminary responses, see how related litigation develops in the interim, wait for the Board to invite broader stipulations, and then decide whether to capitalize on those opportunities." *Id*.

In view of the stipulation, we conclude that, following *Sotera Wireless*, this factor strongly favors institution.

We do not agree with Patent Owner that allowing the stipulation at this point is "procedurally improper" or "sets a dangerous precedent." Patent Owner does not identify any Board procedures or rules that have been violated, and any effect our conduct of this case has on other cases would be minimal, as it would at most be limited to situations in which *Sotera*

Wireless was made precedential both after the petitioner had a chance to address it and before the institution decision. Given this limited window, other petitioners will not be able to "initially make no meaningful stipulation in their petitions, evaluate the . . . preliminary responses, see how related litigation develops . . . , wait for the Board to invite broader stipulations, and then decide whether to capitalize on those opportunities," as Patent Owner argues.

We are also unpersuaded by Patent Owner's arguments regarding prejudice, both procedurally, because we afforded Patent Owner an opportunity to address the issue, and substantively, because Patent Owner's allegations that it stands to be prejudiced are not particularized. Patent Owner does not identify any specific advantage Petitioner obtains by choosing to forego in the district court arguments that are addressed in this proceeding. We also find no due process problem, as Patent Owner has had ample opportunity to make its section 314(a) arguments, including after the stipulation was accepted.

5. Whether the Petitioner and the Defendant in the Parallel Proceeding Are the Same Party.

As Patent Owner observes, "the parties in this IPR and the related litigation are exactly the same." Prelim. Resp. 29. This factor thus favors denial. *See Fintiv I*, Paper 11 at 13–14.

6. Other Circumstances that Impact the Board's Exercise of Discretion, Including the Merits.

The Petition argues that this factor favors institution because "Petitioner has presented well-supported anticipation and obviousness grounds based on Goodnick, Taubenblatt 1982, Jammy, Chang, and Kim." Pet. 71.

Patent Owner contends the Petition has "substantive weaknesses" but that "[e]ven assuming arguendo that the challenges had strong merits, the merits would be insufficient to outweigh the other factors in this case." Prelim. Resp. 30–31. Patent Owner further argues "the fact that the petitioner has filed parallel petitions against the '395 Patent is another reason to deny institution," as is "the relative size and stature of the parties." *Id.* at 30–31. Patent Owner also finds unfairness in the "suspicious" timing of the IPRs, because "Acorn would be forced to prepare and file up to ten IPR responses in the critical weeks before and during the trial in the district court." *Id*. at 31–32. Finally, Patent Owner argues that the limited remaining term of the '395 patent also favors denial, because it means "there is limited public interest in the patent's validity, [and that the] Board's resources [would be] better spent on patents having a longer lifespan and broader public impact." *Id.* at 32.

We weigh this factor as slightly favoring institution. On the current record, some of Petitioner's unpatentability arguments in this case are strong. *See Fintiv I*, Paper 11 at 14–15 ("[I]f the merits of a ground raised in the petition seem particularly strong on the preliminary record, this fact has favored institution."). As set forth above, other unpatentability arguments by Petitioner are not.

As for Patent Owner's other arguments, we do not agree that the filing of the parallel petition favors denial. *See* IPR2020-01207, *Decision, Granting Institution of Inter Partes Review*,[14] Section X.B. We are unable to evaluate Patent Owner's argument regarding the "relative size and stature of

[14] The *Decision Granting Institution of Inter Partes Review* in IPR2020-01207 will issue concurrently with this Decision.

the parties" because the record lacks evidence on that point, although we do note that Patent Owner made the decision to initiate the six-patent Acorn Litigation, to which IPRs would have been a predictable response. We also do not find the timing of the IPR filings to be "suspicious," because it appears to have been driven by Patent Owner's identification of the asserted claims. And the term expiration argument is undercut by the six-year statute of limitations for patent infringement damages. *See* 35 U.S.C. § 286.

7. Conclusion

The above factors are not a scorecard, but instead sketch a landscape that we are to view though a holistic lens. *See Fintiv II*, Paper 11 at 6. After considering all of the factors, we determine that we should not exercise our discretion to deny institution under 35 U.S.C. § 314(a) in view of the Acorn Litigation. Essentially, we conclude that the lack of overlap, due to the stipulation, and the strength of the merits of certain challenges outweigh the somewhat uncertain trial date consideration. Although the parties have invested in the litigation, Petitioner filed this proceeding on a timely basis after learning which of the eighty-four claims were being asserted.

B. Parallel Petitions

As noted above, Petitioner filed two petitions challenging the '395 patent, i.e., this IPR and the '1207 IPR. Pet. Statement 1. The claims challenged by the petitions overlap. In this IPR, Petitioner challenges claims 1–6, 8–12, and 14–28. Pet. 1. In the '1207 IPR, Petitioner challenges claims 1–6, 8–12, and 14–16. '1207 IPR, Paper 2, 1. Petitioner's Statement on Parallel Petitions ranks the petition in this IPR first and the petition in the '1207 IPR second. Pet. Statement 1, 4.[15] Because Petitioner ranks this

[15] Page one of the Petitioner's Statement on Parallel Petitions identifies this IPR as the first ranked petition. Page four of Petitioner's Statement on

Petition first and Patent Owner does not object, we decline to exercise our discretion to deny institution of this proceeding based on the filing of parallel petitions.

XI. CONCLUSION

For the reasons discussed above, we are persuaded that Petitioner has demonstrated a reasonable likelihood that it will succeed on certain asserted grounds of unpatentability set forth in the Petition. We clarify, however, that our analysis is based only the record as it stands now and that we have not made a final determination with respect to the patentability of the challenged claims. Further, the parties are cautioned not to rely at trial on any preliminary findings or determinations in this Decision. For example, if the Patent Owner believes Petitioner has not proven an asserted ground, Patent Owner should set forth its opposition to that asserted ground in the Patent Owner Response. Patent Owner should not rely on a determination in this Decision that the Petitioner has not demonstrated a reasonable likelihood of prevailing on that ground. Similarly, Petitioner should not rely on any finding of a reasonable likelihood of success as proof of unpatentability.

XII. ORDER

It is:

ORDERED that, pursuant to 35 U.S.C. § 314(a) an *inter partes* review of the ’395 Patent is hereby instituted on the asserted grounds set forth in the Petition; and

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Parallel Petitions identifies IPR2020-01279 as the first ranked petition, but that identification is clearly erroneous because the petition in IPR2020-01279 does not challenge the ’395 patent. Paper 4, 2.

FURTHER ORDERED, that pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is given of the institution of a trial, which commences on the entry date of this Decision.

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