

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD.,
Petitioner

v.

ACORN SEMI, LLC,
Patent Owner.

IPR2020-01206
Patent 9,905,691 B2

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

McNAMARA, *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 1–4, 6, 8, 10–13, 15–20, 22, and 25–30 (the “challenged claims”) of U.S. Patent No. 9,905,691 B2 (“the ’691 patent”). 35 U.S.C. § 311. Petitioner also filed a Statement on Parallel Petitions. Paper 4 (“Pet. Statement”). Acorn Semi LLC (“Patent Owner”) filed a Response to Petitioner’s Statement on Parallel Petitions, Paper 10 (“PO Resp. to Pet. Statement”), and a Preliminary Response, Paper 11 (“Prelim. Resp.”), contending that the Petition should be denied as to all challenged claims. Pursuant to our authorization, Petitioner filed a Preliminary Reply, Paper 15 (“Pet. Reply”), and Patent Owner filed a Preliminary Sur-reply, Paper 16 (“PO Surreply”). 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 jurisdiction 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); *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, the Preliminary Response, the Preliminary Reply, and the Preliminary Surreply, for the reasons described below, we institute *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. 3. Patent Owner identifies itself as the sole real party-in-interest. Paper 5, 1.

III. RELATED MATTERS

The Petition states that the '691 patent is asserted in the following litigation: *Acorn Semi, LLC v. Samsung Electronics Co. Ltd.*, Civil Action No. 2:19-cv-347 (E.D. Tex.) (“the Acorn Litigation”), and asserts the complaint was served on October 24, 2019. Pet. 3 (citing Ex. 1032).

Patent Owner identifies IPR2020-01279 as also concerning the '691 patent. Paper 5, 2.

Petitioner and Patent Owner identify petitions for *inter partes* review concerning the following patents related to the '691 patent that have been asserted in the Acorn Litigation and may be affected by the outcome of this proceeding:

U.S. Patent No. 7,084,423 (IPR2020-01182);

U.S. Patent No. 8,766,336 (IPR2020-01204 and IPR2020-01264);

U.S. Patent No. 9,209,261 (IPR2020-01183);

U.S. Patent No. 9,461,167 (IPR2020-01205 and IPR2020-01241); and

U.S. Patent No. 10,090,395(IPR2020-01207 and IPR2020-01282).
Pet. 4, Paper 5, 2.

Petitioner identifies “the following patent and applications that purport to claim the benefit of the priority of the filing date of the ’691 patent:”

Patent or Application No.	Filing Date
U.S. Patent No. 9,812,542	August 30, 2016
U.S. Patent No. 10,388,748	October 9, 2018
U.S. Patent No. 10,090,395	January 23, 2018
U.S. Patent No. 10,186,592	May 16, 2018
U.S. Patent App. No. 16/506,022 ¹	July 9, 2019

Pet. 4. In addition, Patent Owner identifies the following related patent applications:

- U.S. Patent Appl. No. 15/418,360, filed Jan. 27, 2017;
- U.S. Patent Appl. No. 15/929,592, filed May 12, 2020;
- U.S. Patent Appl. No. 15/929,593, filed May 12, 2020;
- U.S. Patent Appl. No. 16/847,878, filed Apr. 14, 2020.

Paper 5, 1.

IV. THE ’691 PATENT

The ’691 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. 1001, 1:27–29. The ’691 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

¹ Also identified as a related application by Patent Owner, Paper 5,1

contact between the metal and the semiconductor. *Id.* at 1:33–48. As 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 3:4–10.

The '691 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 barrier height with work function than implied by this model. *Id.* at 1:49–2:3.

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 2:4–18, Fig. 1 (showing dangling bonds that may be responsible for surface states that trap electrical charges). 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 2:19–25.

Further, according to the '691 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. *Id.* at 2:35–44. 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 2:44–48.

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 2:48–56. The '691 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 2:63–67.

According to the '691 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.” *Id.* at 2:67–3:3. “Before one can tune the barrier height, however, one must depin the Fermi level of the semiconductor.” *Id.* at 3:10–12. The '691 patent seeks to depin the Fermi level of the semiconductor while still permitting substantial current flow between the metal and the semiconductor. *Id.* at 3:12–15. The '691 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 3:30–35. The '691 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” whose thickness varies with a corresponding minimum specific contact resistance, which depends on the materials used and allows for depinning the Fermi level while permitting current to flow when the junction is appropriately biased. *Id.* at 3:19–30; *see also id.* at 12:59–14:17, 14:29–52, Figs. 6, 8. “Minimum specific contact resistances of less than or equal to approximately $10 \Omega\text{-}\mu\text{m}^2$ or even less than or equal to approximately $1\Omega\text{-}\mu\text{m}^2$ may be achieved for such junctions in accordance with the present invention.” *Id.* at 3:36–39. 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 5:19–23.

Figure 8 of the '691 patent is reproduced below.

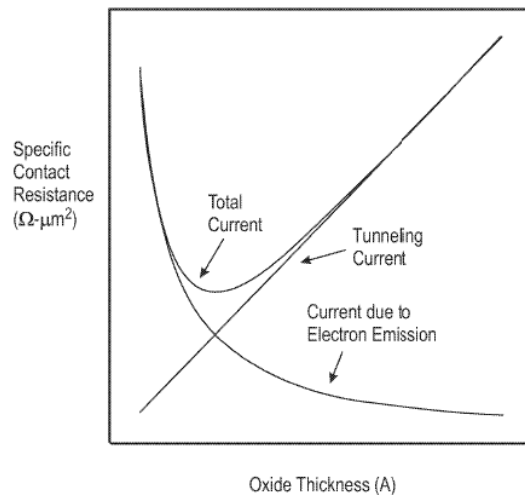


Figure 8 of the '691 patent

Figure 8 of the '691 patent 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. *Id.* at 14:29–35. According to the '691 patent, Figure 8 shows that at large thicknesses, the interface layer poses significant resistance to current, but as interface layer thickness decreases, resistance falls due to increased tunneling current. *Id.* at 14:29–38. 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 14:38–42. 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 $2500 \Omega\text{-m}^2$, $1000 \Omega\text{-m}^2$, $100 \Omega\text{-m}^2$, $50 \Omega\text{-m}^2$, $10 \Omega\text{-m}^2$, or less than $1 \Omega\text{-m}^2$ can be achieved. *Id.* at 14:45–52

In one embodiment, the interface layer 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, the specific contact resistance of the electrical device is less than $10 \Omega\text{-}\mu\text{m}^2$. *Id.* at 3:40–53; *see also* 10:43–54. In another embodiment, the interface layer is made up 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) and while heating the semiconductor in a vacuum chamber. *Id.* at 3:44–61.

Another embodiment uses an interface layer of passivating material disposed between the surface of a semiconductor and a conductor in which the interface is of 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 3:62–4:8. 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. *Id.* at 4:8–18. Specific contact resistances of less than or equal to approximately $2500 \Omega\text{-m}^2$, $1000 \Omega\text{-m}^2$, $100 \Omega\text{-m}^2$, $50 \Omega\text{-m}^2$, $10 \Omega\text{-m}^2$, or less than $1 \Omega\text{-m}^2$ reportedly can be achieved. *Id.* at 4:19–22, 14:45–52.

V. ILLUSTRATIVE CLAIM

Independent claim 1, reproduced below to include the subject matter of a certificate of correction issued on May 15, 2018 (Ex. 1001, 21), and including claim element designations (i) through (vii) used in the Petition, is representative of the subject matter of the '691 patent:

1. (i) A structure, comprising
- (ii) a semiconductor region in a substrate,
- (iii) a metal electrical contact to said semiconductor region,
- (iv) a metal oxide layer,

- (v) a passivating dielectric tunnel barrier layer between said semiconductor region and said metal electrical contact,
- (vi) said semiconductor region being electrically connected to said metal electrical contact through said passivating dielectric tunnel barrier layer and said metal oxide layer,
- (vii) wherein said passivating dielectric tunnel barrier layer comprises a semiconductor oxide.

VI. ASSERTED GROUND

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

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1–4, 6, 8, 10–13, 15–20, 22, and 25–30 ²	102	Grupp ³

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. 12–13 (citing Ex. 1016, Declaration of Dr. E. Fred

² Claim 30 was disclaimed on October 14, 2020 and is no longer before us. See Ex. 2004.

³ U.S. Patent No. 7,176,483 B2, issued Feb. 13, 2007 (Ex. 1015).

Schubert (“Schubert Decl.”) ¶¶ 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 to the subject matter of the ’691 patent and we apply it in this Decision.

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. Specific Contact Resistivity

Petitioner notes that the term “specific contact resistivity” appears in challenged claims 18 and 25–29, but is not used in the ’691 patent Specification. Pet. 14. According to Petitioner, because the terms “specific contact resistance” and “specific contact resistivity” generally are used interchangeably, a person of ordinary skill in the art would have understood the term “specific contact resistivity” in claims 18 and 25–29 to refer to “specific contact resistance.” *Id.* at 14–15 (citing Ex. 1016, Schubert Decl. ¶¶ 74–76). Patent Owner does not respond explicitly to Petitioner’s assertion and does not propose any claim constructions.

In consideration of the above, for purposes of this Decision we construe the terms “specific contact resistivity” and “specific contact resistance” to be interchangeable.

IX. ANALYSIS

A. Introduction

“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))).

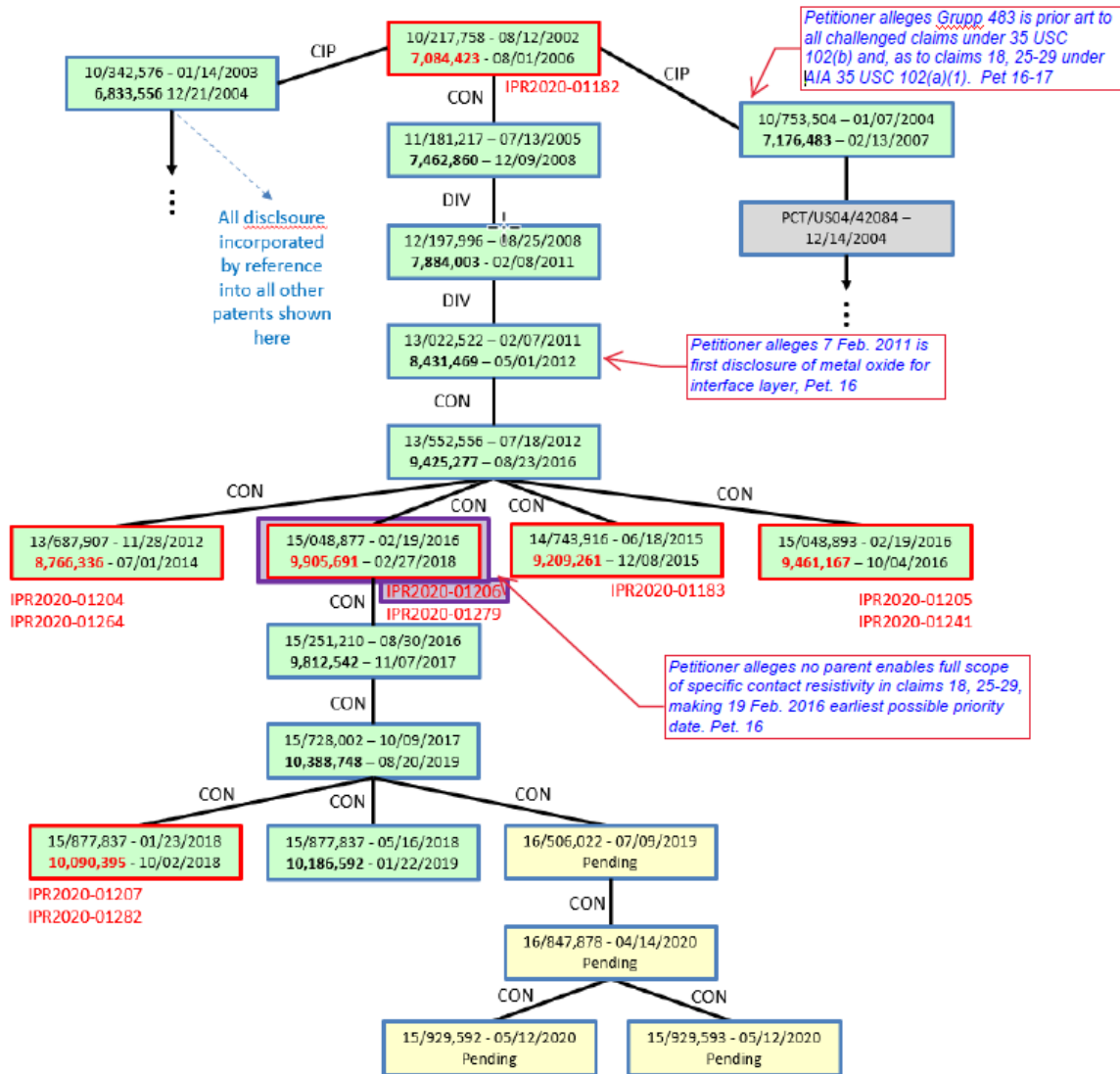
Additionally, under the principles of inherency, if the prior art necessarily functions in accordance with, or includes, the claimed limitations, it anticipates. *MEHL/Biophile Int’l Corp. v. Milgraum*, 192 F.3d 1362, 1365 (Fed. Cir. 1999) (citation omitted); *In re Cruciferous Sprout Litig.*, 301 F.3d 1343, 1349–50 (Fed. Cir. 2002).

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.

B. Priority Issue

Petitioner contends the challenged claims are not entitled to any priority date before February 7, 2011, rendering Grupp '483, which is a member of the family of patents that includes the '691 patent, prior art to the '691 patent. Pet. 15–17.

A chart provided in the Patent Owner Preliminary Response showing a partial view of the family tree including the '691 patent and further annotated with italicized text boxes that identify some of Petitioner's contentions is provided below.



Partial Family of Patent Including '691 Patent

Prelim. Resp. 8. Petitioner contends that the patentee did not describe the genus of the “metal oxide layer” as recited in the claims of the ’691 patent until the patentee filed the claims of U.S. application 13/022,522 (“the ’522 application”) on February 7, 2011. Pet. 16 (citing Ex. 1010, 48; Ex. 1016, Schubert Decl. ¶¶ 89–90). Petitioner further contends that, in no priority application did the patentee enable the full scope of the recitation in claims 18 and 25–29 of a specific contact resistivity less than $1\Omega\text{-m}^2$. Thus,

according to Petitioner, the priority date of the '691 patent is no earlier than its filing date, i.e., February 19, 2016. *Id.*

Patent Owner disputes Petitioner's contentions: (i) that the priority applications filed before 2011 (pre-2011 priority applications) do not support the recited metal-oxide layer and (ii) that none of the priority applications support the recited specific contact resistance range. *Id.* Thus, according to Patent Owner, the priority date of the '691 patent is August 1, 2006 (the filing date of the '473 patent), and Grupp '413 is not prior art to the '691 patent.

C. Grupp '483's Disclosure of the Limitations of Claim 1

Petitioner contends that Grupp '483 discloses each of the limitations of claim 1. Pet. 26–32. Patent Owner does not dispute Petitioner's assertion that Grupp '483 discloses all of the limitations of claim 1, but, as discussed above, Patent Owner asserts that Grupp '483 cannot be applied as a prior art reference because the '691 patent is entitled to priority over Grupp '483 based on U.S. Patent No. 7,084,423 ("the '423 patent) filed on August 12, 2002. Prelim. Resp. 37.

D. Further Contention

Patent Owner also contends that Petitioner's assertion of Grupp '483 is improper under 35 U.S.C. § 311(b) because it is "fundamentally an assertion of unpatentability under 35 U.S.C. § 112. ¶ 1, not 35 U.S.C. §102." *Id.* at 32. Petitioner disagrees.

E. Anticipation

As discussed below, we find that Petitioner has sufficiently shown that Grupp '483 is prior art to the '691 patent and thus anticipates the challenged claims. In particular, on this preliminary record, Petitioner's argument that the pre-2011 priority applications do not describe the genus of

the recited metal oxide layer is persuasive. For that reason, in this Decision, we do not need to address the parties' arguments regarding whether the priority applications enable the recited specific contact resistance range.

1. *Metal Oxide Interface Layer*

Petitioner notes that every claim of the '691 patent recites a metal oxide interface layer. Pet 18. According to Petitioner, the first time any of the applications "arguably disclosed a generic 'metal oxide' interface layer is in the originally filed claims of U.S. Patent App. No. 13/022,522 filed on February 7, 2011." *Id.* (citing Ex. 1010, 48 [see claims 15, 16]; Ex. 1016, Schubert Decl. ¶¶ 89–91). Petitioner acknowledges that earlier applications described a "possible example of a metal oxide interface layer" in the form of a TiO₂ spacer layer. *Id.* (citing Ex. 1001, 14:45–52; Ex. 1016, Schubert Decl. ¶ 90; see, e.g., Ex. 1002 ¶¶ 82–85). According to Petitioner, however, the disclosed TiO₂ spacer layer fails to describe the genus of the recited metal oxide interface layer even though that same description anticipates the challenged claims.

Referring to limitation (iv) of claim 1 ("a metal oxide layer") Petitioner argues that Grupp '483 anticipates claim 1 because, among other things, it discloses a separation layer that can be an oxide (Pet. 29 (citing Ex. 1015, 11:35–38 ("in some cases [such] passivation layers are combined with separation layers (e.g., made of an oxide) to complete the interface layer")) and the separation can be a spacer layer of TiO₂ (*id.* (citing Ex. 1015, 18:65–67 ("[s]pacer layers may be used with lower barriers (e.g., TiO₂ has a barrier of less than 1eV))). Thus, according to Petitioner, "Grupp '483 discloses an interface layer that includes a metal oxide layer; titanium dioxide." *Id.* (citing Ex. 1016, Schubert Decl. ¶¶ 116–117). At the same time, Petitioner argues that Grupp '483 can be applied as a reference because the exact same

language in the pre-2011 priority applications fails to provide a written description of the genus of the recited “metal oxide layer.” Pet. 18–19. *See, e.g., Yeda Research and Dev. V. Abbot GmbH & Co. KG*, 837 F.3d 1341, 1344–45 (Fed. Cir 2016).

Noting that compliance with the written description requirement requires that “the application relied upon *reasonably* conveys to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date” and “does not demand . . . that the specification recite the claim invention *in hac verba*,” Patent Owner contends that Grupp ’483 cannot be applied as a reference because Petitioner has not shown the ’423 patent (Ex. 1002), filed before the application that led to the issuance of Grupp ’483, fails to meet this standard. Prelim. Resp. 46–47 (quoting *Ariad Pharm.* 598 F.3d at 1351 (emphasis added by Patent Owner) and Manual of Patent Examining Procedure (MPEP) § 2163.02).

Quoting *Ariad*, 598 F.3d at 1352, Patent Owner notes that “factors for evaluating the adequacy of the disclosure, include existing knowledge in the particular field, the extent and content of the prior art, the maturity of the science or technology, and the predictability of the aspect at issue.” *Id.* at 47. According to Patent Owner, the mention of TiO₂ is an adequate written description for purposes of establishing priority to antedate Grupp ’483 for the following related reasons:

First, Patent Owner asserts that the disclosure of the species is sufficient to support the genus because the Specification of the pre-2011 priority applications disclose titanium as an exemplary metal for the metal-layer-semiconductor junction and explains that, unlike the prior art, “which limited the choices of available contact metal to those that form silicides, the invention allows one to control the height of the Schottky barrier “simply by

choice of metal used.” Prelim. Resp. 47–48 (citing Ex. 1001, 12:48–49, 14:6–8, 15:15–17, 16:10–16, Figs. 7a-7d (referring to a “metal” generically and citing 3:16–20, 4:62–66, 6:41–54, and 10:28–32 for the same proposition)). Patent Owner further argues a person of ordinary skill would recognize from the Specification that “the inventors possessed the notion of using as a separation layer an oxide of whatever metal is used in the junction” based on the disclosure of 22 different metals, the importance of choosing any desired metal based on its work function, and the disclosure of an oxide separation layer on the metal side of the interface layer for further reducing the MIGS and the specific TiO₂ example. *Id.* at 48–49 (citing *Hynix Semiconductor Inc. v. Rambus Inc.*, 645 F.3d 1336, 1352 (Fed. Cir. 2011), for the proposition that disclosure of a single species can support an entire genus).

Second, Patent Owner argues that TiO₂ is not the only disclosure of oxides for a separation layer—because the Specification discloses the separation “may be an oxide,” a person of ordinary skill would understand oxide layers on the metal side of the interface layer “would naturally include metal oxides.” *Id.* at 49 (citing Ex. 1002, ’423 patent, 10:49–50). Patent Owner argues that, even if a separation layer “made of oxide” is considered more general than “made of a metal oxide,” the inventor is entitled to claim the broader genus of all chemical oxides, i.e., because “the specification discloses both (1) a species (TiO₂) within a sub-genus (metal oxides) and (2) a broader genus (all chemical oxides) that encompass the sub-genus in question (metal oxides).” *Id.* at 51–52.

Third, Patent Owner argues a person of ordinary skill would have known that all metals form oxides and recognized that, based on their electronic structure, the 22 exemplary metals in the Specification encompass

12 of 18 chemical groups, of which the majority of the elements (18 of 21) are metalloids, non-metals, or noble gases. *Id.* at 49–52.

Fourth, according to Patent Owner, a person of ordinary skill would have considered only metal oxides because only metal oxides and metalloid oxides are solid at room temperatures. As to metalloid oxides, Patent Owner argues that the Specification discloses oxides of silicon, which is a metalloid, as passivation layers, not separation layers, and that the remaining metalloid oxides are too obscure for a person of ordinary skill to consider, in the absence of their being identified specifically. *Id.* at 50.

Petitioner notes that the only metal oxide interface layer disclosed in the pre-2011 priority application is made of TiO₂ and argues the mention of TiO₂ does not disclose the genus of metal oxides for such layers. Pet. 18–20. According to Petitioner, the relevant question is whether the pre-2011 priority applications’ statements that spacer layers may be used with lower barriers, e.g., TiO₂’s barrier of less than 1 eV, is sufficient to provide a written description of the entire genus of metal oxide layers. *Id.* at 19 (citing Ex. 1001, 14:45–52). Petitioner contends that the earlier descriptions fail to provide an adequate written description of the genus of metal oxides because “some metal oxides present considerably higher barriers than the ‘barrier of less than 1eV’ ascribed to TiO₂.” *Id.* at 19–20 (discussing hafnium oxide and zirconium oxide as having barriers to aluminum, identified in the ’691 patent as a low function metal, of 2eV and 2.43 eV, respectively, and higher barriers to metals with high work functions, citing Ex. 1001, 13:58–67, 14:45–52; Ex. 1019 ¶¶ 94–95). The Petition further contends that U.S. Patent 6,833,556, filed in 2003 and incorporated by reference in the ’691 patent, describes a generic metal oxide and four example metal oxides (zinc oxide, aluminum oxide, zirconium oxide, and hafnium oxide), but not as an

interface layer through which current flows. Pet. 18. Petitioner contends that, instead, the '556 patent describes a metal oxide layer as a way to insulate a transistor's gate from its channel such that no current flows between the gate and the channel. Pet. 18 (citing Ex. 1005, 7:60–8:22; Ex. 1001, 14:45–52; Ex. 1016, Schubert Decl. ¶ 91).

Petitioner further notes that allegations in Patent Owner's district court pleadings that the claimed interface layer was unpredictable and that the use of any interface layer was counterintuitive undercuts Patent Owner's assertions in this proceeding that the Specification's mention of TiO₂ is an adequate written description of the genus of metal oxides as a spacer layer in the interface layer. Pet. 20–21 (citing Ex. 1031 ¶¶ 6, 48; Ex. 1016, Schubert Decl. ¶ 96; *In re Curtis*, 354 F.3d 1347, 1358 (Fed. Cir. 2004)).

We are persuaded that Petitioner has sufficiently shown that the pre-2011 priority applications do not reasonably convey the genus of the recited metal oxide layer. To support a claim to a genus, an application must disclose “either a representative number of species falling within the scope of the genus or structural features common to the members of the genus so that one of skill in the art can ‘visualize or recognize’ the members of the genus.” *Ariad Pharm., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc). Further, “[w]hether the written description requirement for a genus is met by a particular disclosure depends upon the facts.” *AbbVie Deutschland GmbH & Co., KG v. Janssen Biotech, Inc.*, 759 F.3d 1285, 1299 (Fed. Cir. 2014) (citing *Ariad*, 598 F.3d at 1351). Although the pre-2011 priority applications describe the use of a layer for metal-interface layer semiconductor contacts made of TiO₂ (a metal oxide), as discussed below, based on the current record, disclosure of that single metal oxide layer does not constitute a representative number of species falling

with the scope of the recited genus of metal oxide layers, nor does it disclose structural features common to the recited genus such that an ordinarily skilled artisan can immediately recognize the members of the recited genus. *See In re Curtis*, 354 F.3d 1347, 1356 (Fed. Cir. 2004); *Regents of the University of California v. Eli Lilly & Co.*, 119 F.3d 1559, 1568 (Fed. Cir. 1997).⁴

As mentioned, the pre-2011 priority applications expressly describe the use of an interface layer of TiO₂. In particular, these applications disclose that “an interface layer may be disposed between a source and a channel, a channel and a drain, or both of an insulated gate field effect transistor.” *See, e.g.*, Ex. 1004, 15 ¶ 33. These applications further describe that “the present junction can be fabricated with a much thinner interface layer as compared to the thickness of the silicide layer used previously.” *See* Ex. 1008, 37 ¶ 84. Further, the pre-2011 priority applications disclose that “[t]he thinner interface layers of the invention permit higher current across the junction (i.e., lower junction specific contact resistance).” *Id.* These priority applications note that “in making the barrier thinner than a silicide barrier, the tradeoff may be a higher tunnel barrier (e.g., 2 eV for nitride, compared with about half the gap of 0.6 eV for silicide)” and “[s]pacer layers may be used with lower barriers (e.g. TiO₂ has a barrier of less than 1eV).” *Id.* ¶ 85 (emphasis added). This same text (“the priority TiO₂ description”) appears in Grupp ’483, relied upon by Petitioner as an anticipating reference. Ex. 1015, 18:60–67.

⁴ Additional discussion and citation of the pertinent written description case law by the parties could be beneficial.

The priority TiO₂ description does not reasonably convey possession of the recited “metal oxide layer.” The description contains no discussion of using metal oxides generally as spacers in the interface layer. Further, the current record indicates that having a tunnel barrier lower than that of nitride and closer to silicide, like TiO₂, is not a characteristic of or representative of metal oxides as a class. *See* Ex. 1016 ¶¶ 96–98, 104, 105. Dr. Schubert testifies that hafnium oxide and zirconium oxide are metal oxides that have barriers to aluminum (a metal) of 2 eV and 2.43 eV, respectively. *See* Ex. 1029, 4; Ex. 1030, 1; Ex. 1016 ¶ 102. Dr. Schubert further testifies that, for other metals (i.e., those with higher workfunctions than aluminum), hafnium oxide and zirconium oxide would have even higher tunnel barriers. *See* Ex. 1016 ¶ 103. On the current record, this testimony by Dr. Schubert is undisputed. Thus, based on the current record, the disclosure of TiO₂ does not reasonably convey possession of the recited metal oxide layer.⁵

The pre-2011 priority applications incorporate by reference the ’556 patent, which discloses oxides of a metal gate. *See, e.g.*, Ex. 1002, p. 135; Ex. 1005, 7:60–63. That disclosure, however, also does not reasonably convey the possession of the recited metal oxide layer. In particular, in the challenged claims, the recited semiconductor region is electrically connected

⁵ Petitioner also argues that Patent Owner has implicitly indicated that the operability of the recited interface layers is unpredictable. Pet. 20. To the extent that either party wishes to allege that the operability of recited interface layers was or was not predictable, that party should present affirmative evidence setting forth its position on the issue, and not merely rely on an alleged admission of its opponent that the party itself may dispute. Further, to the extent unpredictability is raised as an issue, the parties should address unpredictability in light of the disclosure in the pre-2011 priority applications, including the priority TiO₂ description, rather than unpredictability in the absence of such a disclosure.

to an electrical contact through the metal oxide layer. Claim 1 recites: “said semiconductor region being *electrically connected* to said metal electrical contact *through* said passivating dielectric tunnel barrier layer and *said metal oxide layer.*” Ex. 1001, 18:31–39 (emphasis added). Claim 25, the other independent, challenged claim, recites: “an interface layer disposed between a contact metal and a semiconductor . . . configured to provide a specific contact resistivity between the contact metal and the semiconductor of less than $1\Omega\text{-}\mu\text{m}^2$. Ex. 1001, 20:15–21. As described below, the metal oxide layer in the ’556 patent isolates a transistor’s gate from its channel so no current flows between the gate and the channel. Ex. 1005, 7:60–8:22. Thus, the metal oxide layer described in the ’556 patent is not the conductive, recited metal oxide layer.

Specifically, Figure 2 of the ’556 patent “shows a FET [field effect transistor] having passivated semiconductor junctions from the source to the channel and from the channel to the drain, according to one embodiment of the invention” (Ex. 1005, 4:42–45) and is reproduced below.

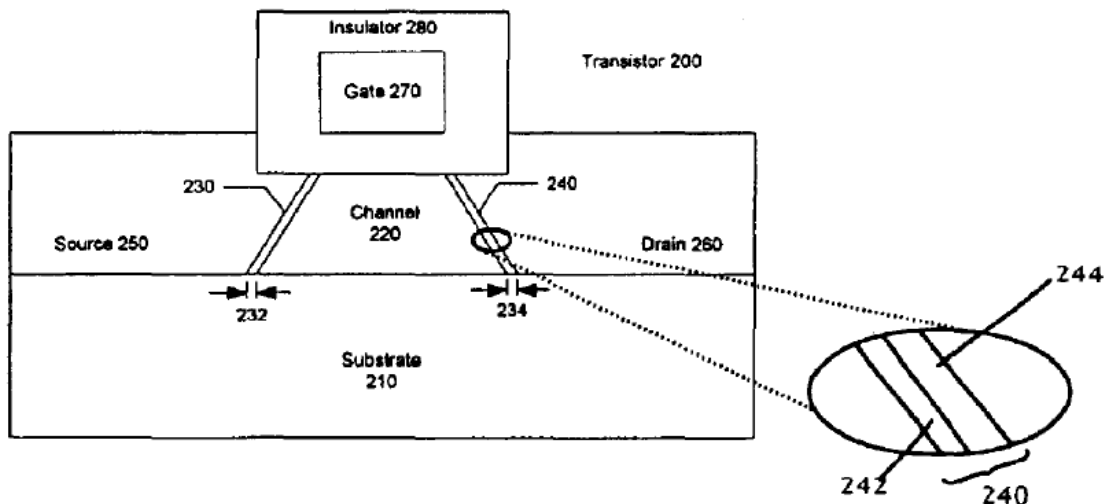


Fig. 2

*Figure 2 of the '556 Patent,
Incorporated by Reference in the Subject '691 Patent*

Ex. 1005, Fig. 2. Figure 2 above depicts interface layers 230, 240 that passivate the surfaces of channel 220 in the source and drain regions and reduce or eliminate the effect of MIGS in those regions by displacing the source/drain away from channel 220. *Id.* at 7:4–12. “The result of introducing interface layers 230 and 240 between the semiconductor channel 220 and the metal source/drain 250/260 is a depinning of the Fermi level of the semiconductor that makes up channel 220.” *Id.* at 4:12–15.

According to the ’556 patent, when the Fermi level is depinned, the Schottky barrier height depends only on the difference of the bulk work functions of the metals and semiconductor in contact at the junction, not the interface, and the reduction of MIGS at the interface between the metal and the dielectric depends on the choice of the interface dielectric because dielectrics have weaker MIGS than semiconductors. *Id.* at 7:16–25.

Insulator 280, which surrounds gate 270, may be made of a dielectric such as an oxide of the metal gate or an oxide of the semiconductor and “is of a sufficient thickness to provide a high resistance between the gate 270 and the channel 220 such that no current flows between the gate 270 and the channel 220.” *Id.* at 7:60–67. Thus, this disclosure in the ’556 patent describes the use of metal oxides to form an insulating layer, which, as discussed above, is not the metal oxide layer recited in the challenged claims.

Having considered the disclosure in the ’556 patent incorporated by reference in the subject ’691 patent, we agree with Petitioner that the discussion of “an oxide of the metal gate” concerns an insulator and does not describe the genus of metal oxides in the context of the interface layer.

Patent Owner’s assertion that a person of ordinary skill would have understood “the inventors possessed the notion of using as a separation layer

an oxide of whatever metal is used in the junction” (Prelim. Resp. 48) is attorney argument not supported by evidence. Patent Owner’s remaining assertions about the inferences that would have been made by a person of ordinary skill fall into the same category.

We are also not persuaded by Patent Owner’s argument that we should not address whether the priority applications for the ’167 patent have written description support for the challenged claims. Prelim. Resp. 33–35. Although the issue of whether challenged claims have written description support in the specification of the challenged patent is beyond the scope of an *inter partes* review (35 U.S.C. § 311), whether a patent is entitled to the benefit of earlier filed applications under 35 U.S.C. §§ 119 or 120 is properly an issue to be addressed in an *inter partes* review. *See Dynamic Drinkware, LLC v. National Graphics, Inc.*, 800 F.3d 1375, 1377–82 (Fed. Cir. 2015). And the benefit of an earlier filed application requires written description support for the challenged claim(s) in the earlier filed application. *Id.* at 1381–1382.

Thus, for purposes of institution, we are persuaded that Petitioner has demonstrated that the ’691 patent is not entitled to priority before the disclosure of a generic metal oxide in the ’522 application, and that Grupp ’483 may be applied as an anticipating reference for purposes of claims limitations drawn to the recited metal oxide layer.

2. *Specific contact resistivity*

Petitioner argues that claims 18 and 25–30 are not entitled to the benefit of any of the priority applications for the ’691 patent because none of those priority applications enable the full range of specific contact resistivity recited or included by dependence by those claims. Pet. 21–26. Petitioner argues the involved limitation—“a specific contact resistivity . . . less than 1

$\Omega\text{-}\mu\text{m}^2$,” has no lower bound. *Id.* at 22. Petitioner argues that this limitation encompasses specific contact resistivities down to and including approximately zero, which Petitioner argues that the challenged patent and priority applications teach cannot be achieved. *Id.* at 22–26.

Patent Owner argues that Petitioner’s arguments are inconsistent: that Petitioner argues that the priority applications do not have an enabling disclosure but at the same time relies on the same disclosure in Grupp ’483 to anticipate the challenged claims. Prelim. Resp. 38. Patent Owner also argues that, despite asserting a lack of enablement, Petitioner has not properly analyzed the *Wands* factors. *Id.* at 41. Further, Patent Owner asserts that zero resistance is physically impossible, so an ordinarily skilled artisan would understand that the recited range has an unspecified lower limit. *Id.* at 41–42. Patent Owner further contends that Figure 8 of the challenged patent provides a lower bound for specific contact resistance, and that the USPTO has recently allowed claims reciting “a specific contact resistivity of less than 1 [or 10] $\Omega\cdot\mu^2$ ” after considering the arguments made in the Petition. *Id.* at 42–45.

Having determined above that Petitioner has sufficiently shown for this stage of the proceeding that the challenged claims of the ’691 patent lack written description support in the pre-2011 priority applications for the recitation of a metal oxide layer, we need not address the parties’ arguments regarding enablement of the recited specific contact resistivity range by the ’691 patent’s priority applications. In light of our preliminary finding of a lack of written description support in the pre-2011 priority applications for the recited metal oxide layer, Grupp ’483 is prior art to the ’691 patent regardless of whether the ’691 patent’s priority applications enable the recited specific contact resistivity range.

3. *Stack of Metals*

In light of Patent Owner’s disclaimer of claim 30, we need not address Petitioner’s argument that none of the priority applications for the ’691 patent describe “a stack of metals deposited on the interface layer,” as recited in claim 30. Pet. 21.

X. EXERCISE OF DISCRETION

Patent Owner argues that we should exercise our discretion to deny institution in view of the pending litigation and in view of the parallel petition filed in IPR2020-001279.

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); *see also 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 explained 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. 59. Petitioner argued that Judge Gilstrap “has granted those renewed motions to stay even when the stage of the case has significantly advanced in the interim—even after claim construction has occurred.” *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)). Petitioner’s motion to stay was denied, with leave to refile after the IPR institution decisions. 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. 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.* Patent Owner also argues that the Image Processing case is an “outlier,” and that Judge Gilstrap has since denied such motions in other cases. See *id.* at 16–19. 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 is extremely low.” *Id.* at 18–19.

Petitioner’s Reply reiterates 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* Pet. 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.” PO Surreply 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 on 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 argued that “[w]hile the Acorn Litigation is scheduled for trial in April 2021 . . . , jury trial dates—to say nothing of dates for post-trial briefing—are inherently subject to change.” Pet. 60.

The Preliminary Response argues that the trial date factor “strongly supports denial, as the court trial is scheduled to begin over nine months before the final written decision would be due in this case and over ten months before the last final written decision would be due in this set of IPRs.” Prelim. Resp. 19 (emphasis omitted). 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 (citing three cases). 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.” Pet. Reply 1–2. 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* PO Surreply 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.* Patent Owner further argues 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 trial.” *Id.* at 3.

We find this factor to favor denial of institution. However, we are cognizant of the impact of the court’s trial schedule for April, and the potential impact of the pandemic on the court’s schedule given its continuance of all in-person jury trials scheduled to begin during December, January, and February. These facts introduce some uncertainty to the schedule trial date, 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 argued that Patent Owner “identified only one representative claim for each of six patents in its October 2019 complaint, including only one claim of the ’691 Patent, Claim 25,” that Patent Owner “served its infringement contentions—which collectively span 108 claims across those six patents, including 22

previously unidentified claims of the '691 Patent,” and that “Petitioner promptly filed this petition . . . after receiving those infringement contentions.” Pet. 61 (citing Ex. 1031 ¶¶ 63, 73, 83, 93, 103, 113; Ex. 1034; Ex. 1035).

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; and (g) Daubert motions and responses. Prelim. Resp. 23–24 (citing Ex. 2008). Patent Owner argues that “[w]hen the court has completed similar major milestones, the Board has found that [this factor] strongly favors denial.” *Id.* at 24 (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 District Court. 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 District Court until March 9, 2020 (*see* Exs. 1034–1035), 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 acknowledged an overlap of claims and invalidity arguments with the litigation, but argued 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 them,” and that “if the Board institutes trial here, Petitioner will promptly cease asserting Grupp ’483 (and its pre-grant publication) against the challenged claims in the [TX Litigation].” Pet. 62.

Patent Owner dismissed Petitioner’s representation that it would drop instituted grounds from the district court contentions as “meaningless,” because “petitioner has not represented that it will not pursue invalidity arguments in the district court under 35 U.S.C. § 112, ¶ 1, the true basis for the challenges here.” Prelim. Resp. 27. Patent Owner also contended 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 29–30.

Petitioner’s Reply clarified that “if the Board institutes review in either [IPR2020-01206 or IPR2020-01279, Samsung will promptly cease asserting the prior art references relied upon in both petitions in the [Litigation].” Pet. Reply 3–4.

After Petitioner filed its 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 . . . that was raised or could have been §§ 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 19. We requested information from the parties based on the intervening precedential decision, inquiring whether

Petitioner would agree to such a stipulation and gave Patent Owner an opportunity to submit its own comments. See Paper 19. Both parties responded. See Pet. Stip.; PO Comments.

Petitioner indicated 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 that “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.* 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.*

Patent Owner also argues that “[t]he broader stipulation is still too narrow in -01183, and -01204–01207, all of which assert Acorn’s own Grupp ’483 as alleged prior art under a theory that the challenged claims do not satisfy 35 U.S.C. § 112, ¶ 1 and, therefore, are not entitled to the benefit of their earliest effective filing date, which precedes Grupp ’483.” PO Comments 3. Patent Owner argues that “[t]he issues in -01204–01207 and the litigation are not just overlapping but entirely coextensive” because “[t]he sole challenge in each of those IPRs is based on Grupp ’483.” *Id.*

In view of the stipulation, we conclude that, following *Sotera Wireless*, this factor strongly favors institution. As in *Sotera*, “Petitioner’s stipulation mitigates any concerns of duplicative efforts between the district court and the Board, as well as concerns of potentially conflicting decisions.” *Sotera*, Paper 12 at 19 (citing *Sand Revolution II, LLC v. Cont’l Intermodal Group – Trucking LLC*, IPR2019-01393, Paper 24 (PTAB June 16, 2020) (informative)). “Accordingly, Petitioner’s broad stipulation ensures that an inter partes review is a ‘true alternative’ to the district court proceeding.” *Id.*

We do not agree with Patent Owner that allowing the stipulation at this point is “procedurally improper” or “sets a dangerous precedent.” Rather, Petitioner’s stipulation meaningfully simplifies overlapping issues between the parallel district court proceeding and this proceeding. Furthermore, as a matter of procedure the Board routinely allows briefing from parties in the event of intervening precedential decisions. *See, e.g., Hunting Titan, Inc. v. DynaEnergetics Europe GmbH*, IPR2018-00600,

Paper 67 at 4 (PTAB July 6, 2020) (precedential) (authorizing supplemental briefing from the parties to address an intervening precedential decision by the Court of Appeals for the Federal Circuit). Moreover, 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 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, 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.

We do not consider the Section 112, Paragraph 1 issue to materially change the calculus. Petitioner’s stipulation ensures that our assessment of whether the challenged claims comply with Sections 102 and 103 will not be duplicated in the district court. Further, Patent Owner has not persuasively supported its argument that Petitioner will be able to present the very same

arguments that it presents in this proceeding for priority as 35 U.S.C. § 112, ¶ 1 invalidity contentions in the district court. PO Comments 3.

The dispositive priority issue for this Decision is the substantial evidence of a lack of written description support in the pre-2011 priority applications for the metal oxide layer recited in the challenged claims. *See* Section IX.E. above. Petitioner acknowledges, and Patent Owner does not persuasively dispute, that the written description support for the recited metal oxide layer in the priority applications filed on or after 2011 (and for the challenged patent) is different from the written description support in the pre-2011 applications because the originally filed claims in those applications differ. Pet. 18 (“The first time that the patentee even arguably disclosed a generic “metal oxide” interface layer is in the originally filed claims of U.S. Patent App. No. 13/022,522, filed on February 7, 2011.” (citing Ex. 1010, 48; Ex. 1016, Schubert Decl. ¶ 89.)); Prelim. Resp. 48–52, PO Comments 3–4. Petitioner argues, and Patent Owner does not dispute, that the originally-filed claim in the pre-2011 applications do not recite the claimed metal oxide layer. Pet. 18, Prelim. Resp. 48–52. But neither Petitioner nor Patent Owner has argued that the originally filed claims for the application that issued as the challenged patent lack such a recitation. Pet. 18, Prelim. Resp. 48–52. In fact, originally filed claim 25 for that application expressly recites “a metal oxide separation layer.” Ex. 1014, 63. Thus, based on this preliminary record, the issue of written description support for the recited metal oxide layer in the challenged patent is materially different from the issue of written description support for that recited layer in the pre-2011 priority applications. And this proceeding will only address the latter issue.

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. 30. 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 argued that this factor favors institution because “Petitioner has presented a compelling anticipation ground using Grupp ’483.” Pet. [64].

Patent Owner contends the Petition has “substantive weaknesses” but that “[e]ven assuming *arguendo* that the challenge 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 ’691 Patent is another reason to deny institution,” as is “the relative size and stature of the parties.” *Id.* at 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 ’691 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 favoring institution. On the current record, find that 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.”).

We are not persuaded by Patent Owner’s other arguments. We do not agree that the filing of the parallel petition favors denial. We are also unable to evaluate Patent Owner’s argument regarding the “relative size and stature of 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 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 through 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. We determine that Petitioner’s stipulation has minimized any overlap with the parallel district court litigation such that both the duplication of efforts and the potential for conflicting decisions are minimized. 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. Accordingly, we conclude that the minimization of overlap and the strength of the merits outweigh the upcoming trial date. As such, we decline to exercise discretion to deny *inter partes* review.

B. Parallel Petitions

Petitioner filed two petitions challenging the '691 patent, i.e., IPR2020-01206 (the “Grupp’483 Petition”) and IPR2020-01279 (the “Goodnick Petition”). Both Petitions challenge the same claims, i.e., claims 1–4, 6, 8, 10–13, 15–20, 22, and 25–29. Petitioner prioritizes IPR2020-01206, if we institute on only one Petition. Pet. Statement 4. Petitioner emphasizes that the “[b]oth petitions address the challenged claims under different priority dates.” *Id.* at 3. Petitioner notes that the Grupp ’483 Petition asserts anticipation on the basis that “Grupp ’483 is prior art to the challenged claims under their correct priority date,” while the Goodnick Petition “relies on references that qualify as prior art even under [Patent Owner’s] alleged August 12, 2002 priority date.” *Id.*

Patent Owner contends that “Grupp ’483 is not asserted as prior art under § 102(a) or § 102(e), but under § 102(b). The two sets of challenges in the two petitions here are simply two different sets of § 102(b) references – not circumstances that justify parallel petitions.” PO Resp. to Pet. Statement 3. Patent Owner argues that, under the Consolidated Trial Practice Guide and cases applying it, parallel petitions may be warranted where the patent owner can, but is unwilling, to simplify issues and reduce the need for petitioner to rely on alternative positions, e.g. by stipulating as to date of invention or the priority date of a reference or other matters. *Id.* Patent Owner states in this case, there is “no stipulation [Patent Owner] could possibly make that would reduce the number of issues without being tantamount to an admission that the claims are in violation of 35 U.S.C. § 112, ¶ 1.” *Id.* at 3–4. Thus, Patent Owner argues Petitioner is not entitled to two bites at the '691 patent. *Id.* at 4.

We do not agree with Patent Owner that the only circumstances that can justify the existence of two petitions is a situation where Patent Owner can, but chooses not to, file a stipulation to simplify issues. Here, the parties dispute the priority date for the challenged patent, and such a dispute can also justify two petitions. Consolidated Trial Practice Guide 59. We have determined that for purposes of institution, Petitioner has demonstrated that the '691 patent is not entitled to priority before the disclosure of a generic metal oxide in the '522 application, and that Grupp '483 may be applied as an anticipating reference for purposes of claims limitations drawn to the recited metal oxide layer. *See* Section IX.E.1. On the other hand, the challenge advanced by Petitioner in the Goodnick IPR does not depend on priority and asserts different prior art. Thus, in this particular case, we are persuaded the challenges are sufficiently different and premised on different priority positions that it is appropriate to allow parallel petitions, so the issues can be addressed separately.

XI. CONCLUSION

For the reasons discussed above, we are persuaded that Petitioner has demonstrated a reasonable likelihood that it will succeed on the asserted ground of unpatentability set forth in the Petition.

XII. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, pursuant to 35 U.S.C. § 314(a) an *inter partes* review of the '691 Patent is hereby instituted, commencing on the entry date of this Order, and pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial.

FURTHER ORDERED that the trial is authorized on the asserted ground set forth in the Petition, and

FURTHER ORDERED that the trial will be conducted in accordance with a corresponding Scheduling Order. In the event that an initial conference call has been requested or scheduled, the parties are directed to the Office Trial Practice Guide, 77 Fed. Reg. 48756, 48765–66 (Aug. 14, 2012), for guidance in preparing for the initial conference call, and should come prepared to discuss any proposed changes to the scheduling order entered herewith and any motions the parties anticipate filing during the trial.

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Patent 9,905,691 B2

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