

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

HANWHA SOLUTIONS CORPORATION,
Petitioner,

v.

MAXEON SOLAR PTE. LTD.,
Patent Owner.

IPR2024-01199
Patent 8,878,053 B2

Before JO-ANNE M. KOKOSKI, JEFFREY W. ABRAHAM, and
AVELYN M. ROSS, *Administrative Patent Judges*.

ROSS, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

Hanwha Solutions Corporation (“Petitioner”) filed a Petition (Paper 3, “Pet.”) requesting an *inter partes* review of claims 1–20 of U.S. Patent No. 8,878,053 B2 (Ex. 1001, “the ’053 patent” or “challenged patent”). Maxeon Solar Pte. Ltd. (“Patent Owner”) filed a Preliminary Response to the Petition. Paper 9 (“Prelim. Resp.”). With Board authorization, Petitioner filed a Preliminary Reply (“Prelim. Reply,” Paper 10), and Patent Owner filed a Preliminary Sur-reply (“Prelim. Sur-reply,” Paper 11).

We have authority to determine whether to institute an *inter partes* review. 35 U.S.C. § 314 (2012); 37 C.F.R. § 42.4(a). The standard for instituting an *inter partes* review is set forth in 35 U.S.C. § 314(a), which provides that an *inter partes* review may not be instituted “unless the Director determines . . . there is a reasonable likelihood that the petitioner would prevail with respect to at least [one] of the claims challenged in the petition.”

For the reasons set forth below, upon considering the Petition, Preliminary Response, Reply, Sur-reply, and evidence of record, we determine that Petitioner has established a reasonable likelihood of prevailing with respect to at least one challenged claim. Accordingly, we grant the Petition and institute an *inter partes* review.

A. *Real Parties-in-Interest*

Petitioner identifies itself as the real parties-in-interest. Pet. 2. Patent Owner identifies itself as the real party-in-interest. Paper 6, 2.

B. *Related Proceedings*

The parties identify the following legal proceedings as involving the ’053 patent:

Maxeon Solar Pte. Ltd. v. Canadian Solar Inc. 2-24-cv-00210
(E.D. Texas) (“Canadian Solar”)
Maxeon Solar Pte. Ltd. v. Hanwha Solutions Corp., 2-24-cv-
00262 (E.D. Texas) (“parallel litigation”)
Maxeon Solar Pte. Ltd. v. REC Solar Holdings AS, 2-24-cv-
00260 (E.D. Texas)
Pet. 2–3; Paper 6, 2.

Patent Owner further identifies IPR2024-01040 (U.S. Patent No.
8,878,053) as a related matter. Paper 6, 2.

C. The ’053 patent

The ’053 patent, titled “Front Contact Solar Cell with Formed Emitter,” issued on November 4, 2014. Ex. 1001, codes (45), (54). The ’053 patent discloses “structures for a relatively efficient and cost-effective front contact solar cell and processes for manufacturing [the] same.” Ex. 1001, 1:47–49. The ’053 patent explains that a solar cell includes P-type and N-type diffusion regions that form a junction, and metal contacts that allow an external circuit to be coupled to and powered by the solar cell. *Id.* at 1:26–29. In a backside solar cell, both the diffusion regions and the metal contacts coupled to them are on the backside of the solar cell. *Id.* at 1:32–36. In a front contact solar cell, at least one of the metal contacts is on the front side of the solar cell, which is the side that faces the sun to collect solar radiation. *Id.* at 1:37–41. The ’053 patent shows one embodiment of its solar cell in Figure 1, reproduced below.

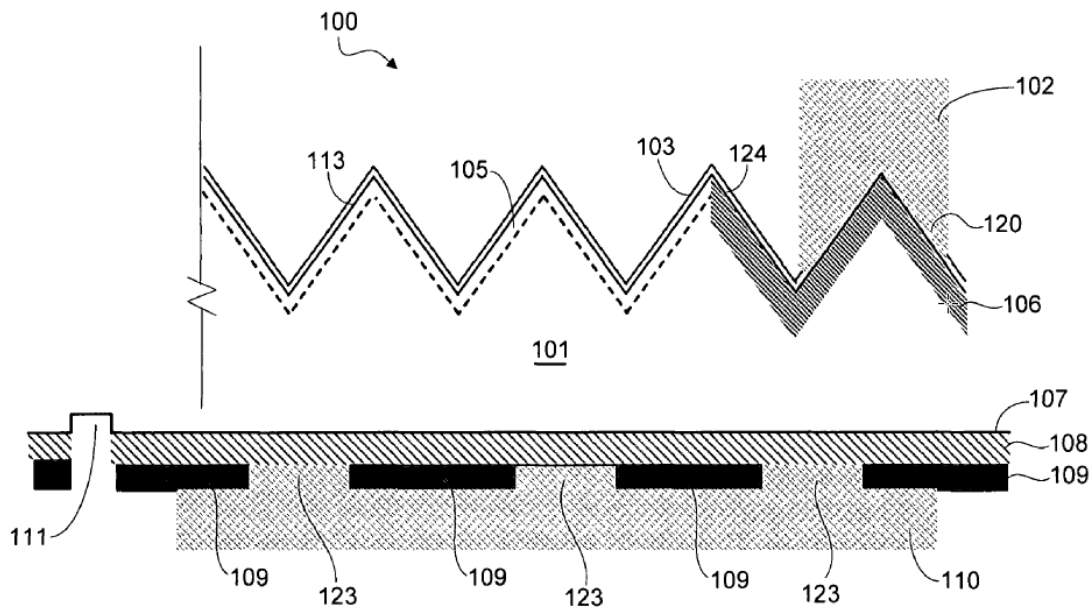


Figure 1 shows a cross-section of a front contact solar cell 100 having metal contact 102 on its front side, which faces the sun during normal operation, and metal contact 110 on its backside. Ex. 1001, 2:29–34. Solar cell 100 also includes N-type silicon substrate 101, tunnel oxide layer 107, polysilicon emitter 108, silicon dioxide layer 109, contact holes 123, and edge isolation trench 111. *Id.* at 2:35–39, 2:64–65, 3:6–3:9, 3:30–33. The front side of silicon substrate 101 is randomly textured (labeled as 113) and includes N-type doped regions 105 and 106, contact hole 120, and passivating oxide layer 124. *Id.* at 2:43–45, 2:59–64.

D. Illustrative Claim

Petitioner challenges claims 1–20 of the '053 patent. Independent claims 9 and 16 are representative of the challenged claims and are reproduced below with Petitioner's annotations¹:

¹ For convenience, we adopt Petitioner's annotated claim format.

[9.a] A method of fabricating a solar cell comprising:

[9.b] forming a layer of polysilicon over a back surface of a silicon substrate;

[9.c] forming a first dopant source layer over the layer of polysilicon;

[9.d] diffusing dopants from the first dopant source layer to the layer of polysilicon to form a backside junction with the silicon substrate;

[9.e] diffusing dopants into a front surface of the silicon substrate, the front surface of the silicon substrate facing the sun during normal operation; and

[9.f] forming a metal contact on the front surface of the silicon substrate, wherein the metal contact is electrically coupled to the silicon substrate.

Ex. 1001, 6:52–67.

[16.a] A method of fabricating a solar cell comprising:

[16.b] forming an oxide layer over a back surface of a silicon substrate;

[16.c] forming a layer of polysilicon over the oxide layer;

[16.d] diffusing dopants into the layer of polysilicon to form a backside junction with the silicon substrate;

[16.e] diffusing dopants into a front surface of the silicon substrate, the front surface of the silicon substrate facing the sun during normal operation; and

[16.f] forming a metal contact on the front surface of the silicon substrate, wherein the metal contact is electrically coupled to the silicon substrate.

Id. at 7:19–8:6.

E. The Asserted Unpatentability Challenges

Petitioner asserts that claims 9–20 would have been unpatentable based on the following grounds:

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
9–12, 14, 16–20	103	Froitzheim, ² Gan ³
1–20	103	Froitzheim, Gan, Smith ⁴
9–20	103	Li, ⁵ Gan, Smith

Pet. 6. Petitioner also relies on declaration testimony of Dr. Zachary Holman (Ex. 1003).

II. ANALYSIS

A. Principles of Law

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) (2012) (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 the patent owner. *See Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800

² EP 1732142 A1, published Dec. 13, 2006 (Ex. 1004, “Froitzheim”).

³ J.Y. Gan et al., *Polysilicon Emitters for Silicon Concentrator Solar Cells*, The Conference Record of the Twenty First IEEE Photovoltaic Specialists Conference–1990, Vol. 1, pp. 245–250 (Ex. 1005, “Gan”).

⁴ US Patent No. 6,998,288 B1, issued Feb. 14, 2006 (Ex. 1007, “Smith”).

⁵ CN 1949545 A, published April 18, 2007 (Ex. 1008 (translation), “Li”).

F.3d 1375, 1378 (Fed. Cir. 2015) (discussing the burden of proof in *inter partes* review).

Obviousness is a question of law based on underlying determinations of fact. *Graham v. John Deere Co.*, 383 U.S. 1, 17 (1966); *Richardson-Vicks, Inc. v. Upjohn Co.*, 122 F.3d 1476, 1479 (Fed. Cir. 1997). A claim is unpatentable as obvious, under 35 U.S.C. § 103, if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time of the invention to a person having ordinary skill in the art. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). 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.⁶ *Graham*, 383 U.S. at 17–18. Consideration of the *Graham* factors “helps inform the ultimate obviousness determination.” *Apple Inc. v. Samsung Elecs. Co.*, 839 F.3d 1034, 1048 (Fed. Cir. 2016) (en banc), *cert. denied*, 138 S. Ct. 420 (2017). Subsumed within the *Graham* factors are the requirements that all claim limitations be found in the prior art references and that the skilled artisan would have had a reasonable expectation of success in combining the prior art references to achieve the claimed invention. *Pfizer, Inc. v. Apotex, Inc.*, 480 F.3d 1348, 1361 (Fed. Cir. 2007). “Obviousness does not require absolute predictability of success . . . all that is required is a reasonable expectation of success.” *In re O’Farrell*, 853 F.2d 894, 903–04 (Fed. Cir. 1988) (citations omitted). But, a

⁶ At this time, neither Petitioner nor Patent Owner address objective indicia of nonobviousness.

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).

We analyze the challenges presented in the Petition in accordance with the above-stated principles.

B. Level of Ordinary Skill in the Art

We review the grounds of unpatentability in view of the understanding of a person of ordinary skill in the art at the time of the invention. *Graham*, 383 U.S. at 17.

Petitioner contends that a person of ordinary skill in the art had (i) an advanced degree in electrical engineering, mechanical engineering, applied physics, chemistry, materials science, or a related discipline and (ii) at least one year of experience designing, developing, or researching the design and/or manufacture of solar cells or related technologies. Alternatively, a POSITA would have had (i) a bachelor’s degree in the aforementioned disciplines and (ii) at least two years of experience designing, developing, or researching the design and/or manufacture of solar cells or related technologies. Less work experience may be compensated by a higher level of education, and vice versa. Pet. 16 (citing Ex. 1003 ¶¶ 36–41).

Patent Owner also states that “[f]or purposes of this Preliminary Response, [Patent Owner] applies [Petitioner’s] level of ordinary skill.” Prelim. Resp. 6.

In light of the record before us, and for purposes of this Decision, we adopt Petitioner’s proposal regarding the level of ordinary skill in the art. Based on our review of the ’053 patent and the prior art of record, we determine that the definition offered by Petitioner comports with the qualifications a person would have needed to understand the ’053 patent and

the prior art. We will make any final determination pertaining to the level of ordinary skill in the art, however, on the full trial record.

C. Claim Construction

We construe claim terms according to the standard set forth in *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–17 (Fed. Cir. 2005) (en banc); 37 C.F.R. § 42.100(b). Under *Phillips*, we give claim terms “their ordinary and customary meaning.” *Phillips*, 415 F.3d at 1312. “[T]he ordinary and customary meaning of a claim term is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention.” *Id.* at 1313. “Importantly, the person of ordinary skill in the art is deemed to read the claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification.” *Id.*

Petitioner contends that “[t]he claims should be given their plain and ordinary meaning to resolve the issues in this proceeding.” Pet. 17 (citing Ex. 1003 ¶¶ 102–105).

Patent Owner does not address claim construction at this time. *See generally* Prelim. Resp.

For purposes of this Decision, we need not expressly construe any claim terms. *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”); *see also Nidec Motor Corp. v. Zhongshan Broad Ocean*

Motor Co., 868 F.3d 1013, 1017 (Fed. Cir. 2017) (citing *Vivid Techs.* in the context of an *inter partes* review).

*D. Discretion Under 35 U.S.C. § 314(a)*⁷

We have discretion to deny a petition for *inter partes* review under § 314(a). *See* 35 U.S.C. § 314(a) (stating “[t]he Director may not authorize an *inter partes* review to be instituted unless”); *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.”); *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1367 (Fed. Cir. 2016) (“First of all, the PTO is permitted, but never compelled, to institute an [inter partes review] proceeding.” (citing 35 U.S.C. § 314(a))). “[E]vents in other proceedings related to the same patent, either at the Office, in district courts, or the ITC,” may favor “denying a petition even though some claims meet the threshold standards for institution under 35 U.S.C. §§ 314(a).” Consolidated Trial Practice Guide (“Practice Guide”)⁸ at 58 n.2 (citing *NHK Spring Co., Ltd. v. Intri-Plex Techs., Inc.*, IPR2018-00752, Paper 8 at 11–21 (PTAB Sept. 12, 2018) (precedential) (footnote omitted)). In weighing whether to exercise discretion, we balance, *inter alia*, the following factors:

1. whether the court granted a stay or evidence exists that one may be granted if a proceeding is instituted;

⁷ Petitioner also preemptively argues that the Board “should *not* deny institution based on Section 325(d) because none of the obviousness combinations or references relied on here were presented during the 053 prosecution.” Pet. 17–18. Because Patent Owner does not address the applicability of § 325(d) (*see generally* Prelim. Resp.), we do not consider whether § 325(d) applies.

⁸ Available at <https://www.uspto.gov/TrialPracticeGuideConsolidated>.

2. proximity of the court's trial date to the Board's projected statutory deadline for a final written decision;
3. investment in the parallel proceeding by the court and the parties;
4. overlap between issues raised in the petition and in the parallel proceeding;
5. whether the petitioner and the defendant in the parallel proceeding are the same party; and
6. other circumstances that impact the Board's exercise of discretion, including the merits.

Apple Inc. v. Fintiv, IPR2020-00019, Paper 11 at 6 (PTAB Mar. 20, 2020).

"These factors relate to whether efficiency, fairness, and the merits support the exercise of authority to deny institution in view of an earlier trial date in the parallel proceeding." *Id.* In evaluating these factors, we take "a holistic view of whether efficiency and integrity of the system are best served by denying or instituting review." *Id.* (citing Practice Guide 58).

Patent Owner argues the Board should exercise its discretion and deny the Petition under 35 U.S.C. § 314(a). Prelim. Resp. 27.

We address the application of the *Fintiv* factors below.

1. *whether the court granted a stay or evidence exists that one may be granted if a proceeding is instituted*

The first *Fintiv* factor requires consideration of whether the district court has stayed or will stay the proceeding pending *inter partes* review. "A district court stay of the litigation pending resolution of the PTAB trial allays concerns about inefficiency and duplication of efforts." *See Fintiv*, Paper 11 at 6. Where a stay has been entered, we weigh this factor strongly against exercising discretion to deny instituting review. *Id.*

As of the date of the Preliminary Response, neither party filed a motion to stay. Prelim. Resp. 28. Petitioner represents that it “intends to request a stay after institution, and Judge Gilstrap often grants such requests where institution predates *Markman* and the IPR is likely to simplify the issues in the district court.” Prelim. Reply 1. Petitioner explains that “[b]oth circumstances apply here.” *Id.* Petitioner’s recently updated Mandatory Disclosures indicate that it filed a motion to stay the parallel litigation on February 7, 2025. Paper 15, 4.

Patent Owner asserts that “the result of any . . . motion is pure speculation. And where IPRs are instituted for less than all asserted patents, Judge Gilstrap regularly denies a stay, increasing the speculative nature of Petitioner’s assertion.” Prelim. Sur-reply 1. Patent Owner urges the Board to “decline to infer . . . how the District Court would rule” on any such motion to stay. *Id.*; Prelim. Resp. 28.

We agree with Patent Owner and decline to speculate on how Judge Gilstrap may rule on a petitioner’s motion for a stay. Accordingly, we determine that *Fintiv* factor 1 is neutral.

2. *proximity of the court’s trial date to the Board’s projected statutory deadline for a final written decision*

Under the second *Fintiv* factor, “[i]f the [district] court’s trial date is earlier than the projected statutory deadline, the Board generally has weighed this fact in favor of exercising authority to deny institution.” *See Fintiv*, Paper 11 at 9.

Patent Owner argues that trial for the parallel district court litigation is scheduled for May 4, 2026, but, “trial in the *Canadian Solar* proceeding is scheduled for January 26, 2026, more than a month prior to the Board’s projected statutory deadline here.” Prelim. Resp. 29. Patent Owner asserts

that the timeline of the *Canadian Solar* trial favors denial of institution in this case. *Id.*

Petitioner contends that the final written decision in this *inter partes* review is “more than two months **before** trial.” Prelim. Reply 2. Petitioner argues that Patent Owner’s reliance on the *Canadian Solar* trial date is misplaced because the instant Petition includes references and grounds not present in *Canadian Solar* and therefore that trial “will **not** address the non-overlapping grounds presented” here. *Id.*

The Guidance Memorandum⁹ states that “[t]he PTAB will weigh this factor against exercising discretion to deny institution under *Fintiv* if the median time-to-trial is . . . after the projected statutory deadline for the PTAB’s final written decision.” Guidance Memorandum at 9. Because the evidence demonstrates that the companion trial date of May 4, 2026, supported by the median time-to-trial data, is more than two months after projected deadline for the Final Written Decision in this proceeding, we determine that *Fintiv* factor 2 weighs against exercising our authority to deny institution.

We acknowledge Patent Owner’s arguments relating to the *Canadian Solar* trial date but are not persuaded by them.¹⁰ Petitioner in the instant *inter partes* review is not a party in the *Canadian Solar* litigation. Further,

⁹ The Interim Procedure is available under the “Guidance Memorandum” heading on the “Resources and guidance” page for the Patent Trial and Appeal Board, located at <https://www.uspto.gov/patents/ptab/resources>.

¹⁰ We note that the Board instituted trial in the companion *inter partes* review to the *Canadian Solar* litigation. *See Canadian Solar Inc. et al. v. Maxeon Solar Pte. Ltd.*, IPR2024-01040, Paper 13 (PTAB Jan. 14, 2025). The final written decision in IPR2024-01040 will issue before the *Canadian Solar* trial date of January 26, 2026.

unlike the *TCO AS*¹¹ proceeding cited by Patent Owner, the *Canadian Solar* litigation will not resolve all issues in the instant *inter partes* review as there is not complete overlap of claims or issues.

Accordingly, factor 2 weighs against exercising our authority to deny institution.

3. *investment in the parallel proceeding by the court and the parties*

Under this factor, we first consider Petitioner’s timing in filing the Petition. If a petitioner, “faced with the prospect of a looming trial date, waits until the district court trial has progressed significantly before filing a petition,” that decision “may impose unfair costs to a patent owner.” *Fintiv*, Paper 11 at 11. On the other hand, “[i]f the evidence shows that the petitioner filed the petition expeditiously, such as promptly after becoming aware of the claims being asserted, this fact has weighed against exercising the authority to deny institution.” *Id.* We then consider “the amount and type of work already completed in the parallel litigation by the [district] court and the parties at the time of the institution decision. Specifically, if at the time of the institution decision, the district court has issued substantive orders related to the patent at issue in the petition, this fact favors denial.” *See Fintiv*, Paper 11 at 9–10 (footnote omitted). Thus, the more advanced the parallel proceeding, the less likely we are to institute an *inter partes* review. *Id.* at 10.

¹¹ *TCO AS v. NCS Multistage Inc.*, PGR2020-00077, Paper 16 at 11–12 (PTAB Feb. 18, 2021) (“Petitioner does not dispute that the trial in the Nine litigation will address the invalidity challenges that are presented in the Petition.”).

Petitioner argues that it “diligently filed its petition fewer than four months after Maxeon filed its complaint—before receiving Maxeon’s infringement contentions and entry of a scheduling order—and the district court has not issued any substantive orders relating to the [challenged patent].” Prelim. Reply 3. According to Petitioner, the *Markman* hearing is scheduled for November 2025, fact discovery closes in November 2025, expert discovery concludes in January 2026, and dispositive motions are scheduled to be briefed in February 2026—long after institution. *Id.* Petitioner further contends that “none of the completed or ongoing work identified by [Patent Owner] . . . relates to invalidity” and Patent Owner’s reliance on the *Canadian Solar* litigation “is again inapposite because the [Canadian Solar] trial will not ‘involve[] the same . . . arguments’ as [Petitioner’s] petition.” *Id.*

Patent Owner states that the district court proceeding “is in its early stages but the parties have already been substantially engaged prior to [Petitioner’s] answer/response deadline.” Prelim. Resp. 30. For example, Patent Owner contends that Petitioner “sought early dismissal of one of the named defendants,” a motion to transfer venue has been filed, limited discovery on the issue of venue has been granted, and Patent Owner has served its infringement contentions. *Id.* Patent Owner contends that in *Sand Revolution*,¹² “*Fintiv* factor 3 did not weigh against exercising discretion to deny institution despite the fact that ‘fact discovery [was] still ongoing, expert reports [were] not yet due, and substantive motion practice [was] yet to come.’” Prelim. Sur-reply 3. In addition, Patent Owner alleges that

¹² See, e.g., *Sand Revolution II, LLC v. Cont’l Intermodal Grp. – Trucking LLC*, IPR2019-01393, Paper 24 at 10-11 (P.T.A.B. June 16, 2020).

discovery is proceeding in the *Canadian Solar* litigation. Prelim. Resp. 31. Patent Owner argues that the *Canadian Solar* litigation is relevant because “there is significant overlap in the asserted grounds.” Prelim. Sur-reply 3. Thus, Patent Owner reasons that this factor favors denial of institution or is neutral. *Id.*; Prelim. Resp. 30–31.

We disagree with Patent Owner. In *Sand Revolution*, the Board considered facts including that the parties exchanged infringement and invalidity contentions, the district court decided a motion to dismiss, conducted a *Markman* hearing and entered a related order, and determined that “the parties have not invested substantially in the merits of the invalidity position.” *Sand Revolution*, Paper 24 at 10. The Board explained that aside from the “*Markman* Order, much of the district court’s investment relates to ancillary matters untethered to the validity issue itself” and determined that “this factor *weighs only marginally, if at all*, in favor of exercising discretion to deny institution.” *Id.* at 10–11 (emphasis added). Here, the *Markman* hearing is not scheduled to occur until November 2025. And although the parties have invested some resources, none of the ongoing work identified relates to invalidity and much work remains to be done in the district court case. The district court litigation appears to be in an early stage, there is no evidence that the district court has issued any substantive orders related to the ’053 patent or the prior art set forth in the Petition, and there is evidence that Petitioner filed its Petition expeditiously. Prelim. Reply 1–2; *see Fintiv*, Paper 11 at 9–11. On this record, we are also not persuaded that the status of the *Canadian Solar* litigation is relevant to our determination here. Thus, we determine that *Fintiv* factor 3 weighs strongly against exercising our authority to deny institution.

4. *overlap between issues raised in the petition and in the parallel proceeding*

The fourth *Fintiv* factor requires consideration of “inefficiency and the possibility of conflicting decisions.” *See Fintiv*, Paper 11 at 12. Therefore, “if the petition includes the same or substantially the same claims, grounds, arguments, and evidence, as presented in the parallel proceeding, this fact has favored denial.” *Id.* (footnote omitted). The *Fintiv* panel acknowledged that “the degree of overlap is highly fact dependent” and encouraged the parties to “indicate whether all or some of the claims challenged in the petition are also at issue in [the] district court.” *Id.* at 13. This concern, however, may be mitigated where a petitioner agrees not to pursue in the parallel district court litigation the grounds advanced in the petition. *Sand Revolution*, Paper 24 at 11. The breadth of the stipulation affects the weight given in the discretionary denial analysis. For example, a petitioner stipulating not to pursue the “same grounds” presented in a petition only *marginally* favors not exercising our discretion to deny institution whereas a petitioner stipulating not to pursue “any ground raised or that could have been raised” weighs *strongly* in favor of not exercising discretionary denial. *Id.* at 11–12; *Sotera Wireless, Inc. v. Masimo Corp.*, IPR2020-01019, Paper 12 at 18–19 (PTAB December 1, 2020) (precedential as to § II.A) (“*Sotera*”).

Petitioner contends this *inter partes* review “include[s] claims that do **not** overlap with the claims asserted in [Patent Owner’s] complaint and infringement contentions” in the parallel litigation. Prelim. Reply 4. Petitioner further argues that Patent Owner’s “reliance on [Petitioner’s] invalidity counterclaim to show alleged overlap is premature and not

informative of the identity of issues because [Petitioner's] invalidity contentions are not due for nearly two months. *Id.*

Patent Owner argues that even though invalidity contentions have not been submitted, “all asserted references have been identified by [Petitioner] in its counterclaim for invalidity” in the parallel litigation. Prelim. Resp. 32. Furthermore, Patent Owner contends that there is “significant overlap with the asserted ground here and those presented in the *Canadian Solar* district court proceeding and the co-pending IPR filed by Canadian Solar.” *Id.*; Prelim. Sur-reply 4. Patent Owner explains that the fact there is not complete overlap of claims is not dispositive. Prelim. Sur-reply. 4 (citing *Samsung Display Co., Ltd. v. Pictiva Displays Int’l Ltd.*, IPR2024-00855, Paper 12 at 10–11 (PTAB Nov. 19, 2024)). According to Patent Owner, “substantially the same substantive issues apply to both the asserted claims 9, 12, 14–20 and unasserted claims 1–8, 10, 11, and 13” because Petitioner incorporates the analysis for claim 9 when discussing claim 1. *Id.* Lastly, Patent Owner asserts that Petitioner “could have, but did not, provide any stipulation here, *Sotera* or otherwise.” Prelim. Resp. 32; Prelim. Sur-reply 3.

While some overlap of issues may exist, complete overlap does not exist and resolution of the companion trial will not address the non-overlapping claims or grounds. Furthermore, that Petitioner did not provide any stipulation is not determinative here as a stipulation is not required. *Fintiv*, Paper 11 at 13 (“the degree of overlap is highly fact dependent”); Guidance Memorandum 7. Accordingly, we determine that *Fintiv* factor 4 weighs slightly against exercising our authority to deny institution.

5. *whether the petitioner and the defendant in the parallel proceeding are the same party*

According to the fifth *Fintiv* factor, “[i]f a petitioner is unrelated to a defendant in an earlier [district] court proceeding, the Board has weighed this fact against exercising discretion to deny institution.” *See Fintiv*, Paper 11 at 13–14.

When the petitioner and the defendant in the parallel proceeding are the same, this tends to support discretionary denial. *See Sotera* at 19. Based on the present record, we consider *Fintiv* factor 5 to favor discretionary denial.

6. *other circumstances that impact the Board’s exercise of discretion, including the merits*

Lastly, “all the relevant circumstances,” including the merits, are considered in assessing whether to exercise discretion to deny institution of *inter partes* review. *Fintiv*, Paper 11 at 14. “[A]ll the relevant circumstances” may include the merits of Petitioner’s underlying challenges. *Id.* at 14–15.

For example, if the merits of a ground raised in the petition seem particularly strong on the preliminary record, this fact has favored institution. In such cases, the institution of a trial may serve the interest of overall system efficiency and integrity because it allows the proceeding to continue in the event that the parallel proceeding settles or fails to resolve the patentability question presented in the PTAB proceeding.

Id. (footnotes omitted).

The Director has instructed “PTAB panels to only consider compelling merits if they first determined that *Fintiv* factors 1–5 favored a discretionary denial.” *CommScope Techs. LLC v. Dali Wireless, Inc.*, IPR2022-01242, Paper 23 at 4–5 (PTAB Feb. 27, 2023) (decision on

Director review) (precedential). Here, we determine that *Fintiv* factor 1 is neutral, factors 2 through 4 all weigh against exercising our discretion to deny institution, and factor 5 weighs in favor of discretionary denial. Accordingly, when considered in combination, *Fintiv* factors 1–5 do not favor discretionary denial, and we do not consider the question of compelling merits.

7. *summary*

We consider the above factors and take “a holistic view of whether efficiency and integrity of the system are best served by denying or instituting review.” *Fintiv*, Paper 11 at 6; Guidance Memorandum. On this record, after weighing all of the factors and taking a holistic view, we determine that the facts presented weigh against exercising our discretion to deny institution under 35 U.S.C. § 314(a).

E. Challenges Based on Froitzheim and Gan

Petitioner alleges that claims 9–12, 14, and 16–20 of the ’053 patent would have been obvious over the combination of Froitzheim and Gan. Pet. 5–6, 24–50. In addition, Petitioner contends that claims 1–20 of the ’053 patent would have been obvious over the combination of Froitzheim and Gan in further view of Smith. Pet. 5–6, 50–72.

1. *Overview of Froitzheim (Ex. 1004)*

Froitzheim is directed to solar cells and a method of manufacturing solar cells that addresses light induced degradation of boron doped base layers in solar cells. Ex. 1004 ¶¶ 1, 3. Froitzheim discloses a solar cell comprising an Si layer of n-type bulk doping having a front side and a rear side, a non-alloyed p-type doped region at the rear side of the body layer and forming a p/n-junction with the rear side, a rear side contact in electrical

connection with the p-type doped region, and a front side contact in electrical connection with the n-type silicon body layer. *Id.* at ¶ 10. According to Froitzheim, “the use of n-type Si as [the] body layer overcomes the degradation problem of conventional solar cells with a boron doped body layer.” Ex. 1004 ¶ 13. Froitzheim also teaches that “etching can be used to texture the surface in order to improve the geometry of incidence of light in order to prevent reflection.” *Id.* at ¶ 39.

2. *Overview of Gan (Ex. 1005)*

Gan is directed to a study of polysilicon emitters with a thermally grown interfacial oxide layer. Ex. 1005, 245. Gan explains that the oxide is not thermally stable, and “tends to break up during high temperature anneals,” which has a “direct impact on both majority and minority carrier transport in the polysilicon emitter.” *Id.* Gan was interested in the performance of polysilicon emitters “when only a small fraction of the interfacial oxide is broken,” and determined that “the cell performance can be improved” under certain circumstances. *Id.* Gan concluded that polysilicon emitters with improved performance “can be obtained with a very small fraction of interfacial oxide breakup,” and that “polysilicon emitters with these qualities can be quite useful for silicon concentrator solar cells.” *Id.* at 249.

3. *Overview of Smith (1007)*

Smith relates to methods and apparatus for fabricating solar cells. Ex. 1007, 1:21–23; 2:16–17. More specifically, Smith discloses a series of in-situ steps to drive dopants into the substrate of the solar cell being fabricated, resulting in the simplification of the fabrication process. *Id.* at 3:40–4:2. At baseline, Smith teaches the use of atmospheric pressure

chemical vapor deposition (“APCVD”) to deposit boron-doped silicon dioxide 104 on the back side of wafer 102, which again, is an N-type FZ silicon wafer that serves as the substrate of the solar cell. *Id.* at 2:32–35, 2:44–55. APCVD is also used to deposit undoped silicon dioxide 106 over the boron-doped silicon dioxide 104, which in combination, advantageously allows for one-sided deposition. *Id.* 2:53–60. Smith also discloses, as illustrated in Fig. 5, a phosphorous-doped silicon dioxide 501 which is deposited over the sample of Fig. 5. *Id.* at 3:19–20. Again, undoped silicon dioxide 502 is deposited over the phosphorous-doped silicon dioxide. *Id.* at 3:20–21.

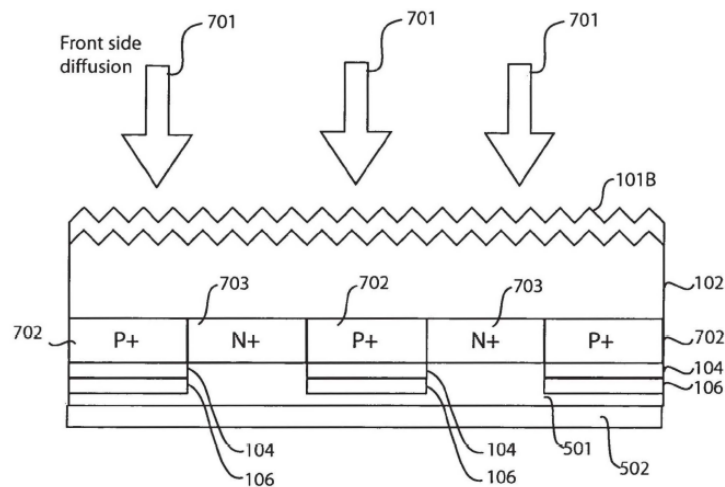


FIG. 7

Figure 7 illustrates a method of fabricating a solar cell through in-situ steps. *Id.* at 1:65–67, 3:40–4:11, Fig. 7. In the present embodiment of Figure 7, in-situ steps are performed in a furnace heated to about 1000°C. *Id.* at 3:40–44. There are two in-situ steps disclosed in Smith. *Id.* at 3:40–4:2. Step one starts with the loading of wafer 102 into the wafer processing tool and heating the wafer 102 for one hour in the furnace to diffuse dopants from boron-doped silicon dioxide 104 and phosphorous-doped silicon dioxide 501

into wafer 102. *Id.* at 3:40–46. This results in the formation of P⁺ regions 702 and N⁺ regions 703 in wafer 102. *Id.* at 3:47–49. In the second in-situ step, the furnace is decreased to 750°C with an atmosphere containing phosphorus oxychloride, then increased to about 975°C with an atmosphere containing oxygen to diffuse phosphorus as an N-type dopant into wafer 102 from its front side and to grow a thin layer of silicon dioxide on both sides of wafer 102. *Id.* at 3: 56–61. The thin layer of silicon dioxide 101B “advantageously leads to better passivation of the front side and back side surfaces of wafer 102.” *Id.* 3:63–66.

4. *Analysis of Claim 9*

Petitioner alleges that the combination of Froitzheim and Gan renders claim 9 of the '053 patent obvious. Pet. 36–44. According to Petitioner, Froitzheim describes a method of fabricating a rear junction solar cell that includes “arranging [i.e., *forming*] a non-alloyed p-type doped region at the rear side [i.e., *back surface*] of an n-type Silicon body layer [i.e., *silicon substrate*].” *Id.* at 36–37 (citing Ex. 1004 ¶¶ 11, 22, 24–26, 33, 38–48, Fig. 1, Abstr.; Ex. 1003 ¶¶ 146–151). Petitioner states that “Gan teaches *forming a layer of polysilicon* by a ‘[p]olysilicon deposition’ step” and that “Gan also teaches replacing a diffused emitter (as in Froitzheim) with a P-type polysilicon emitter.” *Id.* at 37–38 (citing Ex. 1005, 245–246; Ex. 1003 ¶¶ 155–151). Petitioner alleges that the combination of Froitzheim and Gan describes forming a dopant source over the layer of silicon. *Id.* at 38 (citing Ex. 1004 ¶¶ 22, 40–41, Fig. 3; Ex. 1005, 246, 248; Ex. 1003 ¶¶ 153–156). In addition, Petitioner contends that “[t]he combination of Froitzheim and Gan teaches *diffusing dopants from the first dopant source layer to the layer of polysilicon to form a backside junction with the silicon substrate*” because

“Froitzheim teaches manufacturing an emitter that *forms a backside junction with the silicon substrate*” and “*diffusing dopants from a first dopant source layer* onto the back of the n-doped silicon wafer (i.e., *substrate*)” and “Gan teaches driving-in dopants from *a first dopant source layer to the layer of polysilicon.*” Pet. 39–41 (citing Ex. 1004 ¶¶ 10–13, 24–16, 33, 41–42, Fig. 1, Fig. 3, Abstr.; Ex. 1005, 246; Ex. 1003 ¶¶ 157–162). Petitioner also asserts that “Froitzheim teaches diffusing phosphorous, a well-known dopant, into the sun-facing, front surface of the silicon substrate (N-type silicon layer) to form N+ regions.” *Id.* at 42 (citing Ex. 1004, Fig. 3; Ex. 1003 ¶ 165); *see* Ex. 1004 ¶¶ 24, 32–33, 43–44, Fig. 1, Fig. 3; Ex. 1003 ¶¶ 163–165. And lastly, Petitioner states that Froitzheim forms metal contacts on the front surface of the substrate that are coupled to the substrate. *Id.* at 42–43 (citing Ex. 1004 ¶¶ 15–18, 20, 22, 49, Fig. 3; Ex. 1003 ¶¶ 166–169; Ex. 1045, 234–239).

According to Petitioner, Froitzheim and Gan are analogous art because “[b]oth are in the same field as the Challenged Claims (fabricating solar cells) and are reasonably pertinent to solving the problems addressed in the Challenged Claims (increasing efficiency) with the same types of solutions (optimizing solar cell fabrication and resulting configuration).” Pet. 25–26 (citing Ex. 1005, 245–246; Ex. 1003 ¶ 123); *see also id.* at 51 (arguing Smith is analogous art for similar reasons). Petitioner alleges that a person of ordinary skill in the art would have had reason to combine the teachings of Froitzheim and Gan by “implementing manufacturing steps to incorporate Gan’s oxide layer and polysilicon emitter in Froitzheim’s solar cell to obtain a more efficient solar cell.” Pet. 26. Specifically, Petitioner contends that “Gan teaches that a solar cell’s ‘performance can be improved

if [a] diffused-emitter [(like Froitzheim’s diffused-emitter)] is replaced with [a] polysilicon emitter.” *Id.* at 26 (citing Ex. 1003 ¶ 124) (emphasis omitted). According to Petitioner, Gan “observes that the combination of a polysilicon emitter and oxide layer structure had lower recombination and contact resistance as compared to diffused-emitters,” and therefore solar cell efficiency is improved which is “quite useful for silicon solar cells.” *Id.* at 27–29 (citing Ex. 1005, 245–246, 248–249, Fig. 6; Ex. 1003 ¶¶ 127–128, 131). Petitioner explains that Gan states its teachings are applicable to p-type emitters and silicon substrates as well as backside PN junctions like Froitzheim. *Id.* at 30 (citing Ex. 1005, 249). Therefore, a person of ordinary skill in the art “would have understood that replacing Froitzheim’s diffused emitter with a polysilicon emitter and oxide layer structure as taught by Gan was simply applying a known technique to a similar device ready for improvement to yield predictable results.” *Id.* (citing Ex. 1005 ¶¶ 246, 248–249; Ex. 1003 ¶¶ 130–132).

Additionally, Petitioner contends that the ordinarily skilled artisan would have had reason to combine Froitzheim and Gan because: (1) both “teach fabricating similar and compatible solar cells” (*id.* at 31 (citing Ex. 1004 ¶¶ 10–11, 42; Ex. 1005, 246; Ex. 1003 ¶ 135)); (2) including the polysilicon emitter and oxide structure of Gan in Froitzheim would have been a “simpl[e] substitut[ion of] one known element for another to obtain predictable results” (*id.* at 32 (citing Ex. 1005, 246; Ex. 1006 ¶¶ 26–27; Ex. 1004 ¶ 30; Ex. 1015, 2:50–53; Ex. 1003 ¶ 136)); (3) “implementing a polysilicon emitter and oxide structure in Froitzheim was a simple design choice” (*id.* at 33 (citing Ex. 1003 ¶ 137)); and (4) “numerous prior art references similarly teach the benefits of using an oxide layer with a

polysilicon emitter” (*id.* (citing Ex. 1006 ¶¶ 16, 22; Ex. 1034; Ex. 1046, 1125; Ex. 1023, 3:61–64; Ex. 1042 ¶ 46; Ex. 1039, 463; Ex. 1003 ¶¶ 138–141)).

Petitioner asserts that a reasonable expectation of success exists in the combination of Froitzheim and Gan. *Id.* at 34. In particular, Petitioner states that a person of skill in the art would have known how to replace the diffused emitter in Froitzheim with the polysilicon emitter and oxide layer described in Gan using known methods. For example, Petitioner contends that a person of ordinary skill in the art

would have understood that instead of diffusing boron into the substrate’s back side as taught by Froitzheim, a POSITA would instead follow the manufacturing technique taught by Gan. That is, a POSITA would have grown an interfacial oxide layer on the substrate’s back side, created a polysilicon layer over the oxide layer on the substrate’s back side, and then doped the polysilicon layer instead of the substrate to form the polysilicon emitter.

Id. at 34–35 (citing Ex. 1005, 246; Ex. 1003 ¶ 142; Ex. 1006 ¶ 22; Ex. 1046, Abstr., 1121). Petitioner explains that because both Froitzheim and Gan describe a “thermal drive-in diffusion process and overlapping ranges” a person of ordinary skill in the art “would have thus appreciated the references have compatible manufacturing steps.” *Id.* at 34 (citing Ex. 1004 ¶ 42; Ex. 1005, 246; Ex. 1003 ¶ 143).

Patent Owner, at this time, does not challenge many of Petitioner’s allegations regarding the teachings of Froitzheim and Gan. *See generally* Prelim. Resp. Instead, Patent Owner argues that Petitioner

(1) fails to establish why a [person of ordinary skill in the art] would have applied art relating to a concentrator solar cell (i.e., Gan) to Froitzheim’s conventional solar cell, and (2) fails to establish that a [person of ordinary skill in the art] would have had a reasonable expectation that Gan’s polysilicon emitter and

oxide layers could be successfully incorporated into Froitzheim's conventional solar cell in the manner proposed.

Prelim. Resp. 9.

On this preliminary record, Petitioner's unchallenged arguments and evidence are sufficient for purposes of institution. We address Patent Owner's arguments below.

a) Whether Petitioner has shown a reason to combine Froitzheim and Gan

Patent Owner contends that Petitioner fails to show that a person of ordinary skill in the art would have had reason to combine the teachings of Froitzheim and Gan because Petitioner's position rests on a purported mischaracterization of "Gan as 'broadly suggest[ing] that its polysilicon emitter and oxide layer structure are generally 'useful for silicon solar cells.''" Prelim. Resp. 10. Patent Owner asserts that Gan's teachings are limited to "concentrator solar cells" and not solar cells generally or "conventional solar cells," taught by Froitzheim. *Id.* at 10–16. Patent Owner explains that "the structure of Gan's "concentrator" solar cells differs significantly from "conventional" solar cells (i.e., Froitzheim)" and "instead of explaining *why* the structure of a concentrator solar cell is in any way applicable to Froitzheim's conventional solar cell structure," Petitioner and its declarant "rely[] only on the same single sentence of Gan, that 'a person of ordinary skill in the art would have understood that Gan's teachings are equally relevant for non-concentrator solar cells.'" *Id.* (citing Ex. 1005, 249; Ex. 1003 ¶ 131). Patent Owner alleges that a person of ordinary skill in the art would not have had reason to combine Gan's teachings with Froitzheim which addresses conventional solar cells. Prelim. Resp. 10. According to Patent Owner, a person of ordinary skill in the art "reading Gan as a whole"

and in context, would not have understood that its teachings are generally applicable to all solar cells because “Gan concludes that ‘[from] the cell modeling, polysilicon emitters with these qualities can be quite useful for *silicon concentrator solar cells*.’” *Id.* at 13 (citing Ex. 1005, 249).

As additional support, Patent Owner contends that *another* Gan reference—the Gan Thesis¹³—“confirms that the authors of Gan were focused on improvements specific to concentrator solar cells (that is, without regard to conventional solar cells).” *Id.* at 14 (citing Ex. 2003, 1). Patent Owner argues that the “Gan Thesis thus confirms that Gan’s suggested replacement of a diffused emitter with a polysilicon emitter layer and an oxide layer is confined to the problem of addressing emitter recombination in concentrator solar cells, which are distinct in both structure and challenges from ‘conventional’ solar cells.” *Id.* at 15 (citing Ex. 2003, 1, 10; Ex. 1003 ¶ 131). Patent Owner reasons that because neither Petitioner nor its declarant explain why Gan’s teachings would apply to non-concentrator solar cell structures, their assertions are conclusory and insufficient to meet Petitioner’s burden of showing why a person of ordinary skill in the art would have had reason to combine the teachings of Froitzheim and Gan. *Id.* at 15–16.

On this record, we disagree and determine that Petitioner has established a reasonable likelihood that a skilled artisan would have modified Froitzheim in view of Gan’s teachings. Petitioner may rely on Gan for all that it teaches to show obviousness, which is “consistent with the

¹³ Jon-Yiew Gan, Polysilicon Emitters for Silicon Concentrator Solar Cells (July, 1990) (Ph.D. dissertation, Stanford University) (Ex. 2003, “the Gan Thesis”).

longstanding principle that the prior art must be considered for all its teachings, not selectively.” *Henny Penny Corp. v. Frymaster LLC*, 938 F.3d. 1324, 1332 (Fed. Cir. 2019). Here, Gan appears to broadly suggest that replacing a diffused-emitter with a polysilicon emitter improves solar cell performance. For example, Gan states that “[t]he cell performance can be improved if the diffused-emitter is replaced with the polysilicon emitter, of which the J_o is less than $4.5 \times 10^{-13} \text{ A/cm}^2$ and the p_c is low enough.” Ex. 1005, 245. Patent Owner does not direct us to anything in Gan that suggests its teachings are inapplicable to conventional solar cells. *See generally* Prelim. Resp. In contrast, Gan’s introduction states that “[p]olysilicon emitters, because of their important applications in high speed bipolar transistors, have been widely studied,” which indicates broad applicability. Ex. 1005, 245. Further, Dr. Holman testifies that “although Gan references a concentrator solar cell—a category of solar cells that uses lenses, mirrors, and other components to focus (i.e., concentrate) sunlight on a cell (Ex.1016-Komp, 56–58)—a person of ordinary skill in the art would have understood that Gan’s teachings are equally applicable to non-concentrator solar cells.” Ex. 1003 ¶ 131. Dr. Holman further declares that Gan’s “polysilicon emitter and oxide layer structure is ‘useful for silicon solar cells’” and “[p]ersons of ordinary skill in the art frequently looked at various solar cell designs and related technologies when evaluating how to improve a solar cell’s efficiency, which is exactly what Gan did when evaluating how to improve a cell’s design.” *Id.* Thus, Petitioner’s showing is sufficient at this stage of the proceeding.

In addition, Patent Owner contends that Petitioner’s replacement of a diffused emitter with a polysilicon emitter layer and an oxide layer is

contradicted *by another* Gan reference—the Gan Thesis. As an initial matter, Patent Owner has not made a sufficient showing, much less even alleged, that the Gan Thesis was publicly available at the time of invention. A person of ordinary skill in the art is presumed to know the teachings of “all the prior art in the field of his endeavor” at the time the invention was made. *Airbus S.A.S. v. Firepass Corporation*, 941 F.3d 1374, 1380 (Fed. Circ. 2019) (quoting *In re Wood*, 599 F.2d 1032, 1036 (CCPA 1979)). A reference is considered publicly accessible only if it was “disseminated or otherwise made available to the extent that persons interested and ordinarily skilled in the subject matter or art exercising reasonable diligence, can locate it.” *Kyocera Wireless Corp. v. Int’l Trade Comm’n*, 545 F.3d 1340, 1350 (Fed. Cir. 2008) (quoting *SRI Int’l, Inc. v. Internet Sec. Sys. Inc.*, 511 F.3d 1186, 1194 (Fed. Cir. 2008)). At best, Patent Owner presents some evidence that the Gan Thesis may be publicly available but no evidence to suggest *when* the Gan Thesis became publicly available.

For example, the Gan Thesis states that it was “submitted to the Department of Materials Science and Engineering and the Committee on Graduate Studies of Stanford University in partial fulfillment of the requirements for the degree of Doctor of Philosophy,” and bears a date of “July 1990.” Ex. 2003, 5. The Gan Thesis also bears a copyright notice “Copyright 1990, by Jon-Yiew Gan.” *Id.* at 6. The Gan Thesis also suggests that it has been reproduced by University Microfilms International (UMI) and has an “order number 9108821.” *Id.* at 1, 3. The copyright date of 1990 suggests that the document existed as of 1990, but does not indicate when the document became accessible to persons of ordinary skill in the art.

This is because a copyright notice *may* be evidence of publication¹⁴, but generally such a notice does not “establish when a document was publicly accessible under patent law.” *Stryker Corp. v. Karl Storz Endoscopy-Am., Inc.*, IPR2015-00677, Paper 15 at 18–19 (PTAB Sept. 2, 2015); *see also Microsoft Corp. v. Corel Software, LLC*, IPR2016-01083, Paper 14 at 13–14 (PTAB Dec. 1, 2016) (“The copyright notice, alone, however, sheds virtually no light on whether the document was publicly accessible as of that date, therefore additional evidence is typically necessary to support a showing of public accessibility.”). Furthermore, reproduction by UMI, without more, does not indicate when the Gan Thesis was received, published, or made accessible to the public.

Further, even assuming that the Gan Thesis would have been known to the skilled artisan at the time of invention, the Gan Thesis similarly suggests broad applicability of polysilicon emitters to conventional solar cells. For example, the Gan Thesis states that “it appears that the cell efficiency can be increased more than one absolute percentage by eliminating the emitter recombination” and “[i]n order to do this, the emitter saturation current density (J_o), which characterizes the dopant-diffused region recombination, of both n- and p- type emitters has to be kept around 2×10^{-14} A/cm².” Ex. 2003, Abstr. But, according to the Gan Thesis, “such low J_o cannot be obtained by the diffused emitters formed in the single-crystal silicon. Polysilicon emitters, n-type in particular, have been reported to have very low J_o ($\sim 1 \times 10^{-14}$ A/cm²); therefore, they can be a very useful

¹⁴ “Whenever a work protected under this title is published in the United States . . . a notice of copyright . . . *may* be placed on publicly distributed copies from which the work can be visually perceived.” 17 U.S.C. § 401(a) (emphasis added).

substitute for the diffused emitters for high efficiency solar cells.” *Id.* The Gan Thesis then states that additional issues need to be taken into account for use in silicon *concentrator* solar cells. *Id.* Thus, the Gan Thesis indicates that the usefulness of polysilicon emitters is not limited to concentrator solar cells.

Therefore, on this record, we are persuaded that Petitioner’s showing that the skilled artisan would have had reason to combine the teachings of Froitzheim and Gan as suggested is sufficient for purposes of institution.

b) Whether Petitioner has shown a reasonable expectation of success in the combination of Froitzheim and Gan

Patent Owner also argues that Petitioner “fails to establish that a [person of ordinary skill in the art] would have had a reasonable expectation that such a modification would be successful.” Prelim. Resp. 17. Patent Owner contends that Petitioner’s “assertions that ‘the manufacturing technique taught by Gan was ‘well-known and routine’ and ‘a known, successful technique’ run counter to the nature of Gan’s study and are expressly contradicted by the authors of Gan.” *Id.* at 18. Indeed, Patent Owner asserts that “rather than being ‘well-known and routine,’ the formation of Gan’s oxide layer is *unpredictable*” because “the chemical or thermal oxide layer ‘is not thermally stable’ and ‘tends to break up during high temperature anneals,’ which affects ‘the specific contact resistivity’ p_c and ‘the emitter saturation current density’” J_o . *Id.* (citing Ex. 1005, 245, 247, Fig. 2). Patent Owner further contends that the Gan Thesis confirms that “the oxide layer is highly experimental and prone to unpredictability.” *Id.* For example, Patent Owner states that the “Gan Thesis explains that ‘[a]lthough a thermally grown interfacial oxide seems essential for a

polysilicon emitter to have both low J_o and p_c , the breakup process is still *difficult to control*. On several occasions, we have encountered *reproducibility problems.*” *Id.* (citing Ex. 2003, 107). Thus, Patent Owner reasons that Petitioner failed to carry its burden of showing that a person of ordinary skill in the art would have had a reasonable expectation of success in the combination of Froitzheim and Gan. *Id.* at 20.

We are persuaded, on this record, that Petitioner has adequately shown a reasonable expectation of success in its proffered combination of Froitzheim and Gan. Petitioner explains that the combination of Froitzheim and Gan simply replaces one emitter for the polysilicon emitter of Gan.

Pet. 34. According to Petitioner, a person of ordinary skill in the art

would have also readily understood how to replace a diffused emitter with a polysilicon emitter and oxide layer [and] would have understood that instead of diffusing boron into the substrate’s back side as taught by Froitzheim, a [person of ordinary skill in the art] would instead follow the manufacturing technique taught by Gan.

Id. (citing Ex. 1005, 246). Petitioner explains that the Gan processes are well-known and routine, and Dr. Holman states that “modifying Froitzheim in view of Gan simply involves using Gan’s known technique of a polysilicon emitter and oxide layer with Froitzheim’s known solar cell to improve Froitzheim’s solar cell in a similar way.” *Id.* at 35 (citing Ex. 1003 ¶ 144). For example, Petitioner directs our attention to “multiple instances” in which oxide layers and polysilicon emitters have been implemented. *Id.* (citing Ex. 1005, 246; Ex. 1006 ¶ 22; Ex. 1046, Abstr., 1121; Ex. 1003 ¶ 145). Furthermore, Gan’s statement that “cell performance can be improved if the diffused-emitter is replaced with the polysilicon emitter” and “polysilicon emitters . . . with a very small fraction of interfacial oxide

breakup” suggest an expectation of some success. Ex. 1005, 245, 249. Thus, we are persuaded that Petitioner has demonstrated sufficiently, for purposes of institution, that a person of ordinary skill in the art would have had an expectation of success in combining Froitzheim and Gan.

Patent Owner’s additional arguments that Petitioner’s contentions are expressly contradicted by the Gan Thesis, at this time, are similarly unpersuasive.¹⁵ Prelim. Resp. 13. Patent Owner’s arguments that “the breakup process is still *difficult to control*” and “*reproducibility problems*” exist (*id.* at 18–19) appears to advocate for a heightened standard for success. However, under the proper inquiry, “obviousness cannot be avoided by a showing of some degree of unpredictability in the art so long as there was a reasonable probability of success.” *Pfizer, Inc. v. Apotex, Inc.*, 480 F.3d 1348, 1364 (Fed. Cir. 2007). Furthermore, though the Gan Thesis acknowledges inconsistent oxide growth during “ramp-up” and “stand-by” periods, the Gan thesis also explains that “it is possible that the thin-oxide growth can be improved by performing the oxidation at lower temperatures such that the oxidation rate can be controlled more precisely.” Ex. 1005, 112. Finally, Patent Owner’s argument relies on the Gan Thesis, *not* Gan itself. Prelim. Resp. 18–19 (citing Ex. 2003).

Accordingly, we are persuaded that Petitioner has shown sufficiently at this stage of the proceeding that an ordinarily skilled artisan would have had a reasonable expectation of success in the combination of Froitzheim and Gan.

¹⁵ Patent Owner again presents arguments based on the Gan Thesis. We note, however, that Patent Owner fails to demonstrate the teachings of the Gan Thesis were publicly available to a person of ordinary skill in the art at the time of the invention.

5. *Remaining Claims 1–8 and 10–20*

Petitioner asserts that claims 10–12, 14, and 16–20 would have been obvious over the combination of Froitzheim and Gan and that that claims 1–8 and 10–20 would have been obvious over the combination of Froitzheim and Gan with Smith. Pet. 4, 42–57. Patent Owner does not separately address remaining claims 1–8 and 10–20 beyond what is argued for independent claim 9. *See generally* Prelim. Resp.¹⁶ Having determined that Petitioner satisfies the threshold showing under 35 U.S.C. § 314(a) for institution of trial with respect to at least one challenged claim of the '053 patent, we order that trial shall proceed on all claims and all challenged grounds. *SAS Institute Inc. v. Iancu*, 584 U.S. 357, 360–361 (2018).

F. *Challenges Based on Li, Gan, and Smith*

Petitioner alleges that claims 9–20 of the '053 patent would have been obvious over the combination of Li, Gan, and Smith. Pet. 6–7, 73–88.

1. *Overview of Li (Ex. 1008)*

Li is directed to “crystalline silicon solar cell with novel structure.” Ex. 1008, Title. Li explains that its purpose “is to overcome the disadvantages of existing cell structures so as to obtain a crystalline silicon solar cell having an emitting region on a back surface with a high conversion efficiency and a simple manufacturing process.” *Id.* at 4. One embodiment of Li, Figure 1, is reproduced below.

¹⁶ Patent Owner does not directly address the teachings of Smith and instead asserts that Smith does not address the failures of the Froitzheim and Gan combination. Prelim. Resp. 9 n.3.

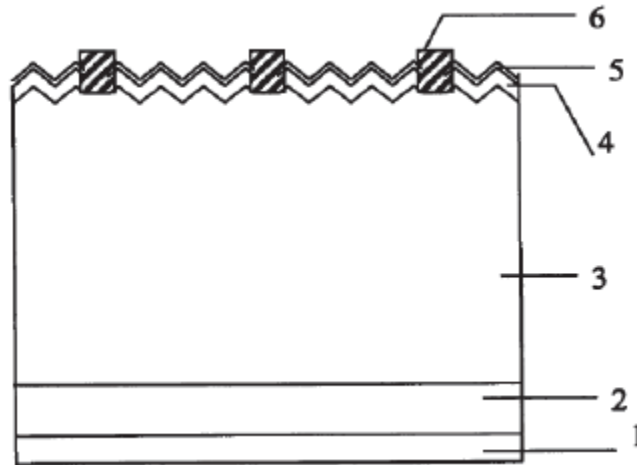


Figure 1 is a schematic diagram of a solar cell with a novel structure. *Id.* at 4. Figure 1 depicts “(1) back electrode; (2) silicon thin film prepared by a deposition method; (3) N-type crystalline silicon; (4) highly doped N+ layer; (5) anti-reflection layer; [and] (6) positive electrode.” *Id.* According to Li, “[b]y adopting the cell structure of the present invention, cell efficiency can reach 20% or above.” *Id.* Li states that “the silicon thin film deposited on the back surface of the silicon wafer, whether it is amorphous silicon, microcrystalline silicon, or nanocrystalline silicon, can achieve a passivation effect on the back surface, thereby improving the cell efficiency.” *Id.*

2. Analysis of Claim 9

Petitioner alleges that the combination of Li, Gan, and Smith renders claim 9 of the '053 patent obvious. Pet. 73–82. Petitioner contends that Li “teaches a method of manufacturing a solar cell.” Pet. 76 (citing Ex. 1008, 4, Abstr., claims 1–6, Fig. 1; Ex. 1003 ¶ 298, ¶ 290 (stating Gan and Smith also teach the preamble)). Petitioner asserts that “Li teaches depositing (i.e., *forming*) ‘[a] layer of silicon thin film [2] [i.e., a *layer of silicon*] . . . on a back surface of N-type monocrystalline silicon [i.e., *silicon substrate*] to form an emitting region,” “Gan teaches *forming a layer of polysilicon*,” and

a person of ordinary skill in the art would have had reason to modify Li to replace the silicon thin film with the polysilicon emitter of Gan. *Id.* at 77 (citing Ex. 1008, 4, Abstr., claims 1, 3, and 5, Fig. 1; Ex. 1005, 245–249; Ex. 1003 ¶¶ 291–293). Petitioner states that “Li teaches that ‘[a] layer of [P-type] silicon thin film is deposited on a back surface of N-type monocrystalline silicon to form an emitting region’” and “Gan and Smith both teach forming a dopant source layer.” *Id.* at 78 (citing Ex. 1008, 4; Ex. 1005, 246, 248; Ex. 1007, 1:43–3:55, Fig. 2; Ex. 1003 ¶¶ 217–220, 294–296). According to Petitioner, the combination of Li, Gan, and Smith teaches “diffusing dopants from the first dopant source layer to the layer of polysilicon to form a backside junction with the silicon substrate” because “Li teaches forming a backside junction between a layer of silicon and a silicon substrate” and Gan “teaches diffusing dopants from a first dopant source layer to a layer of polysilicon.” *Id.* at 79–80 (citing Ex. 1008, 3, Fig. 1; Ex. 1005, 246; Ex. 1003 ¶¶ 297–300). Petitioner also asserts that both Li and Smith teach “diffusing dopants into a front surface of the silicon substrate,” as claimed. *Id.* at 80–81 (citing Ex. 1008, 4, Abstr., Fig. 1, claims 1–3; Ex. 1005, 246, 248; Ex. 1007, 1:43–3:61, Fig. 2, Fig. 7, claims 1–2, 4, 8–9, 12, 14–19; Ex. 1003 ¶¶ 221–225, 301–304). And lastly, Petitioner states “Li’s solar cell includes a front ‘electrode’” electrically coupled to the silicon substrate and that the electrodes are metal. *Id.* at 81–82 (citing Ex. 1008, 3, 4, Fig. 1; Ex. 1003 ¶¶ 305–309; Ex. 1005, 246; Ex. 1007, 1:20–35, 1:44–57, 2:4–3:10).

According to Petitioner, Li is analogous art for the same reasons discussed above—i.e., because “it is in the same field as the Challenged Claims (solar cells) and is reasonably pertinent to solving the problems

addressed in the Challenged Claims (increasing efficiency) with the same types of solutions (optimizing solar cell configuration).” Pet. 73 (citing Section X.A.1; Ex. 1008, 1–4; Ex. 1003 ¶ 279). Petitioner further alleges that the skilled artisan would have had reason to combine the teachings of Li and Gan because the combination “amounts to use of a known technique and feature (Gan’s polysilicon emitter and oxide layer between the PN junction) to improve a similar device (Li’s backside junction solar cell) to achieve goals common to both references and the industry (increasing efficiency).” *Id.* at 73 (citing Sections X.A.1 and X.B.1; Ex. 1008, Fig. 1; Ex. 1005, 245–249; Ex. 1003 ¶¶ 280–281). Petitioner further explains the ordinarily skilled artisan would have had reason to include Smith in combination with Gan and Li because “doing so would improve the efficiency of Li’s cell and simplify the manufacturing process.” *Id.* at 75 (citing Section X.B.1; Ex. 1003 ¶¶ 287–288). Petitioner alleges that a person of ordinary skill in the art would have had a reasonable expectation of success in the combination of Li, Gan, and Smith because “Li teaches fabricating solar cell structures having a backside PN junction with an n-type substrate and p-type emitter to improve a cell’s efficiency,” like Froitzheim, and a person of ordinary skill in the art “would have considered and applied the teachings of Gan and others regarding the benefits of a polysilicon emitter and tunnel oxide layer, as applied to a backside configuration.” Pet. 74 (citing Sections X.A.1 and X.B.1; Ex. 1008, 4; Ex. 1005, 249, 248–249; Ex. 1003 ¶¶ 282–286). Petitioner further alleges that a reasonable expectation of success exists for incorporating “Smith’s manufacturing method for the Li and Gan combination for the reasons discussed in Sections X.A.1 and X.B.1,

including because Li has a similar structure to Froitzheim and Gan.” *Id.* at 75 (citing Sections X.A.1 and X.B.1; Ex. 1003 ¶ 288).

Patent Owner, at this time, does not challenge many of Petitioner’s allegations regarding the teachings of Froitzheim, Gan, and Smith. *See generally* Prelim. Resp. Instead, Patent Owner argues that

- (1) [Petitioner] merely references back to its earlier, flawed discussion of the Froitzheim-Gan combination, and thus similarly fails to provide a motivation to combine Gan with Li or provide a reasonable expectation of success for the combination,
- (2) [Petitioner] also fails to establish that a [person of ordinary skill in the art] would have been motivated to, or had a reasonable expectation of success in, modifying Li to implement Gan’s polysilicon emitter and oxide layers, and
- (3) Smith does not remedy these deficiencies in the Li-Gan combination.

Prelim. Resp. 22.

On this preliminary record, Petitioner’s unchallenged arguments and evidence are sufficient for purposes of institution. We address Patent Owner’s arguments below.

a) Whether Petitioner has shown a reason to combine the teachings of Li, Gan and Smith

Patent Owner contends that “Li, like Froitzheim, is directed to a *conventional* solar cell, whereas Gan’s teachings are directed to remedying problems in solar *concentrator* cells,” and Petitioner’s combination based on “Li, Gan, and Smith fails for at least the same reasons discussed above.”

Prelim. Resp. 22–23.

Patent Owner’s arguments with respect to Li, Gan, and Smith are similar to its arguments for Froitzheim and Gan—which we found unpersuasive in the face of Petitioner’s evidence and testimonial support from Dr. Holman. Therefore, for similar reasons discussed above, we are

also persuaded, on this record, that Petitioner has sufficiently shown a person of ordinary skill in the art would have had a reason to combine the teachings of Li, Gan, and Smith.

b) Whether Petitioner has shown a reason to combine or a reasonable expectation of success in the combination of Li, Gan and Smith

Patent Owner asserts that in addition to the reasons advanced above for the Froitzheim and Gan combination, Petitioner fails to show a reason to combine or a reasonable expectation of success because “[u]nlike Froitzheim, which includes a diffused-emitter layer, Li teaches a silicon, thin-film emitter layer. [Petitioner] fails to articulate why it would have been obvious to a [person of ordinary skill in the art] to replace Li’s silicon, thin-film emitter layer with Gan’s polysilicon emitter layer and an oxide layer.” Prelim. Resp. 24. According to Patent Owner, Gan does not broadly teach adding a polysilicon emitter and oxide layer to improve efficiency; rather, Gan “describes the benefits of *replacing a diffused* emitter with a polysilicon layer and an oxide layer in solar concentrator cells.” *Id.* at 24. Patent Owner argues that Li describes a “deposited emitter” and “the purported benefits of Gan would not extend to Li.” *Id.* at 25. In fact, Patent Owner alleges that “Li discourages such a modification” where it “teaches a single layer of amorphous silicon that achieves the passivation of an oxide layer *without* creating the problems of a doped polycrystalline emitter layer (as in Gan).” *Id.* Patent Owner argues that because Petitioner fails to acknowledge these differences—and instead refers to arguments based on Froitzheim and Gan—Petitioner fails to establish a person of ordinary skill in the art “would have had a reasonable expectation that Li’s silicon, thin-

film emitter layer could be replaced with Gan’s polysilicon emitter and oxide layer structure.” *Id.* at 26.

We are persuaded, on this record, that Petitioner has adequately shown a reasonable expectation of success in the combination of Li, Gan, and Smith. Petitioner relies on its reasoning for the combination of Froitzheim and Gan and additionally asserts that a reasonable expectation of success exists “because Li has a similar structure to Froitzheim and Gan.” Pet. 74–75; Ex. 1003 ¶ 288. Dr. Holman testifies that “the combination of Li’s back-junction solar cell and Gan’s polysilicon emitter and oxide layer simply amounts to using a known structural feature.” Ex. 1003 ¶ 280. Dr. Holman explains that “[s]uch routine solar cell fabrication steps would have been implemented with a reasonable expectation of success for the same reasons . . . explained in Sections XI.A.1 and XI.B.1 . . . including because Li has a similar structure to Froitzheim (back-junction solar cell) and to Gan (deposited emitter) as well as similar manufacturing processes to Froitzheim and Gan, which could be improved by implementing Smith.” *Id.* ¶ 88.

We acknowledge Patent Owner’s argument that Li and Froitzheim are different—that is, Li describes a thin-film emitter and Froitzheim describes a diffused-emitter—and that a person of ordinary skill in the art would have understood that Gan “narrowly describes the benefits of *replacing a diffused* emitter [like Froitzheim, not Li] with a polysilicon emitter layer and oxide layer in solar concentrator cells.” Prelim. Resp. 24. But, Patent Owner does not direct our attention to any language in Gan that its teachings are “limited” and “would not extend to Li.” *Id.* at 25. And, while Patent Owner’s argument that “Li discourages such a modification” as its thin-film emitter “avoid[s] problems that occur upon boron doping (such as the doping

in Gan’s polysilicon emitter layer)” (*id.*) may have some merit, Patent Owner’s arguments raise factual questions best resolved over the course of trial.

Accordingly, on this record, we are persuaded by Petitioner’s arguments and evidence, and determine that Petitioner has demonstrated sufficiently for purposes of this Decision that a person of ordinary skill in the art would have had a reason to combine the teachings of Li, Gan, and Smith, and would have had a reasonable expectation of success in achieving the claimed invention.

3. *Remaining Claims 10–20*

Petitioner asserts that claims 10–20 would have been obvious over the combination of Li, Gan, and Smith. Pet. 6–7, 73–88. Patent Owner does not separately address remaining claims 10–20 beyond what is argued for independent claim 9. *See generally* Prelim. Resp. Having determined that Petitioner satisfies the threshold showing under 35 U.S.C. § 314(a) for institution of trial with respect to at least one challenged claim of the ’053 patent, we order that trial shall proceed on all claims and all challenged grounds. *SAS*, 138 S. Ct. at 1353.

III. CONCLUSION

For the foregoing reasons, we determine that Petitioner has demonstrated a reasonable likelihood that it would prevail with respect to at least one of the claims challenged in the Petition. Accordingly, we institute an *inter partes* review of the ’053 patent.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, pursuant to 35 U.S.C. § 314(a), an *inter partes* review of claims 1–20 of U.S. Patent No. 8,878,053 B2 is instituted with respect to all grounds set forth in the Petition; and

FURTHER ORDERED that, 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, which will commence on the entry date of this Decision.

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Patent 8,878,053 B2

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