

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MICRON TECHNOLOGY, INC.,
Petitioner,

v.

YANGTZE MEMORY TECHNOLOGIES COMPANY, LTD.,
Patent Owner.

IPR2025-00117
Patent 10,672,711 B2

Before JO-ANNE M. KOKOSKI, KIMBERLY McGRAW, and
MICHAEL T. CYGAN, *Administrative Patent Judges*.

CYGAN, *Administrative Patent Judge*.

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

I. INTRODUCTION

A. *Background and Summary*

Micron Technology, Inc. (“Petitioner”) filed a Petition requesting an *inter partes* review of claims 1–19 of U.S. Patent No. 10,672,711 B2 (Ex. 1001, “the ’711 patent”). Paper 1 (“Pet.”). The Petition is supported by a Declaration from Dr. Sanjay Banerjee. Ex. 1003 (“Banerjee Declaration”). Yangtze Memory Technologies Company, Ltd. (“Patent Owner”) filed a Preliminary Response to the Petition, supported by a Declaration from Dr. Stephen Campbell. Paper 9 (“Prelim. Resp.”); Ex. 2007 (“Campbell Dec.”).

We have authority to determine whether to institute an *inter partes* review. *See* 35 U.S.C. § 314 (2018); 37 C.F.R. § 42.4(a) (2023). 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 . . . there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” For the reasons discussed below, we determine that Petitioner establishes a reasonable likelihood of prevailing with respect to the unpatentability of at least one claim of the ’711 patent. We also determine that the arguments and evidence of record do not support discretionary denial of the Petition under 35 U.S.C. § 314(a). Accordingly, we institute an *inter partes* review of claims 1–19 of the ’711 patent.

B. *Real Parties-in-Interest*

Petitioner identifies itself and its subsidiaries, including Micron Consumer Products Group LLC, as real parties-in-interest. Pet. 6. Patent Owner identifies itself as the real party-in-interest. Paper 4, 1.

C. Related Matters

The parties represent that the '711 patent is involved in *Yangtze Memory Technologies Company, Ltd. v. Micron Technology, Inc. and Micron Consumer Products Group, LLC*, Case No. 3:23-cv-05792-RFL (N.D. Cal., filed November 9, 2023). Paper 4, 1; Pet. 6–7. Petitioner also filed IPRs challenging other patents asserted in the district court case. Pet. 7–8.

D. The '711 Patent

The '711 patent is titled “Word Line Contact Structure for Three-Dimensional Memory Devices and Fabrication Methods Thereof.” Ex. 1001, code (54). The '711 patent issued on June 2, 2020, from Application No. 16/126,947, filed on September 10, 2018, and is a continuation of PCT/CN/2018/101308, filed on August 20, 2018. *Id.* at codes (21), (22), (63). The '711 patent relates to a word line contact structure including a staircase structure having a conductor layer disposed over a dielectric layer, with a barrier layer disposed over a portion of the conductive layer on each step of the staircase. *Id.* at code (57).

E. Illustrative Claim

Claim 1 is illustrative, and recites as follows:¹

[1.PRE] A semiconductor structure, comprising:

[1.A] a staircase structure comprising a plurality of steps, wherein each step comprises a gate stack disposed over a dielectric layer, the gate stack comprising a high-k dielectric layer and a conductive layer;

[1.B] a barrier layer disposed over a portion of the gate stack of the each step;

¹ Bracketed organization added as per the Petition.

- [1.C] an etch-stop layer disposed on the barrier layer;
[1.D] an insulating layer disposed on the etch-stop layer;
and
[1.E] a plurality of conductive structures formed in the insulating layer, wherein each conductive structure is formed on the conductive layer of the each step.

Ex. 1001, 15:2–12.

F. Evidence

Petitioner relies on the following patent and non-patent document evidence:

Name	Document	Exhibit
Kim et al. “Kim”	US 2012/0070944 A1	1005
Park et al. “Park”	KR 10-2015-0051841	1006
Fang	US 2019/0067306 A1	1007

G. Prior Art and Asserted Grounds

Petitioner asserts that claims 1–19 would have been unpatentable on the following grounds:

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1–9, 11–16, 18, 19	103 ²	Kim ³

² We apply AIA 35 U.S.C. § 103 to the ’711 patent because it was filed after, and never claimed the benefit of an effective filing date before, March 16, 2013. Ex. 1001, codes (22), (63); Pet. 6.

³ Petitioner styles this ground and the Park ground as also being based on “a POSITA’s [Person of Ordinary Skill In The Art] knowledge.” Pet. 11. However, an *inter partes* review may be requested “only on the basis of prior art consisting of patents or printed publications,” although it may “rely on evidence beyond prior art documents.” 35 U.S.C. § 311(b); *Qualcomm Inc. v. Apple, Inc.*, 24 F.4th 1367, 1374–75 (Fed. Cir. 2022). Patent Owner does not raise a § 311(b) challenge.

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
10, 17	103	Kim, Fang
1–6, 8, 9, 11–16, 18, 19	103	Park
7, 10, 15, 17	103	Park, Fang

II. ANALYSIS

A. *Legal Standards*

A claim is unpatentable 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 the invention was made to a person having ordinary skill in the art [to which said subject matter pertains].” *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 non-obviousness.⁴ *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

B. *Level of Ordinary Skill in the Art*

Petitioner asserts that a person of ordinary skill in the art (“POSITA”) at the critical time “would have had a bachelor of science degree in electrical engineering or a similar discipline, along with 2-3 years of professional experience working with (*e.g.*, researching, designing, or teaching) monolithic 3D structures and NAND flash memory devices, or an equivalent level of skill, knowledge, and experience (*e.g.*, an advanced degree may replace some of the professional experience).” Pet. 27 (citing Ex. 1003 ¶ 42). Petitioner further asserts that a POSITA “would have been aware of

⁴ Neither party presents evidence or arguments regarding objective evidence of non-obviousness. Pet. 103; Prelim. Resp.

and generally knowledgeable about 3D NAND's structure, its component parts, how it operates, and how it is controlled.” *Id.* Patent Owner does not provide any such assessment in its Preliminary Response. Prelim. Resp. 8. For purposes of this Decision, we adopt Petitioner's proposed level of ordinary skill, as it appears to be consistent with the specification of the '711 patent and the prior art of record.

C. Claim Construction

In an *inter partes* review, we construe a patent claim “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). Under this standard, the words of a claim generally are given their “ordinary and customary meaning,” which is the meaning the term would have to a person of ordinary skill at the time of the invention, in the context of the entire patent including the specification. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (en banc).

Neither party proposes any express claim construction at this stage of the proceeding. Pet. 26; Prelim. Resp. 8. Based on the record before us, we determine that no claim term requires express construction for purposes of this Decision.

D. Obviousness over Kim

Petitioner asserts that claims 1–9, 11–16, 18, and 19 are unpatentable under 35 U.S.C. § 103 as obvious over Kim in view of the knowledge of a person of ordinary skill in the art. Pet. 32–62. Patent Owner argues against this assertion. Prelim. Resp. 9–26.

Upon consideration of Petitioner's explanations and the totality of evidence in this current record, we are persuaded that Petitioner

demonstrates a reasonable likelihood of prevailing in showing that at least one claim is unpatentable under 35 U.S.C. § 103.

1. Kim

Kim is titled “Methods of Manufacturing Three Dimensional Semiconductor Devices.” Ex. 1005, code (54). Kim relates to providing a semiconductor substrate including a peripheral region, having a peripheral structure, and a cell array region, having a cell structure thicker than the peripheral structure. *Id.* at code (57). Both structures are covered by an interlayer dielectric, on which is formed a polishing stop layer. *Id.* The interlayer dielectric is planarized using the polishing stop layer as a planarization stop. *Id.*

2. Analysis of Claim 1

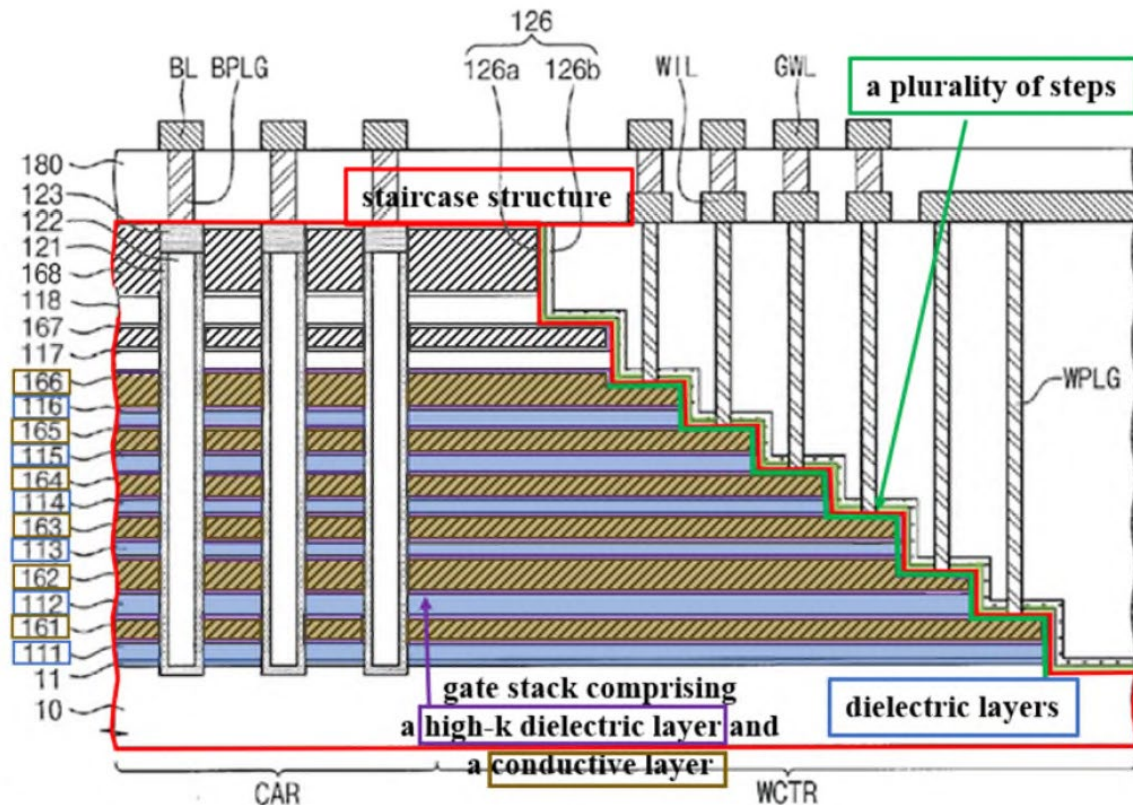
We begin our analysis of Petitioner’s obviousness contentions with Petitioner’s assertions as to claim 1. Patent Owner contests Petitioner’s assertion that Kim in view of the knowledge of the prior art teaches “wherein each step comprises a gate stack disposed over a dielectric layer,” Prelim. Resp. 9. We first focus on this disputed limitation.

[1.PRE] A semiconductor structure, comprising: [1.A] a staircase structure comprising a plurality of steps, wherein each step comprises a gate stack disposed over a dielectric layer, the gate stack comprising a high-k dielectric layer and a conductive layer

To the extent the preamble [1.PRE] is limiting, Petitioner asserts that it is taught by Kim’s description of a 3D semiconductor device. Pet. 35 (citing Ex. 1005, code (57)). Petitioner asserts that Kim’s “stacked layer structure ST having the stepwise structure” teaches a staircase structure comprising a plurality of steps. *Id.* at 36–37 (citing Ex. 1005, Fig. 22A, ¶¶ 8, 185, 211; Ex. 1003 ¶ 87). Petitioner further asserts that each of Kim’s

steps comprises a gate stack comprising high-k dielectric layer (Kim's "blocking insulating layer 150c") and a conductive layer (Kim's "gate electrodes 161–166"). *Id.* at 39–40 (citing Ex. 1005 ¶ 202 ("The formation of the gate electrodes 161 to 168 may include forming a gate conductive layer"), ¶ 200 ("forming a data storing layer 150 and gate electrodes 161 to [166]")); Ex. 1003 ¶ 90. Petitioner further asserts that each gate stack is disposed over a dielectric layer (one of Kim's "insulating layers" 111–116). Pet. 39. Petitioner's assertions are illustrated by an annotated Figure 22A, reproduced below:

Gate-Stack-on-Top Fig. 22A



Id. at 40. Annotated Figure 22A shows a staircase structure (red), a plurality of steps (green), dielectric layers (blue), a gate stack comprising a high-k dielectric layer (violet), and a conductive layer (tan).

Patent Owner argues that Kim's Figure 22A shows "a gate stack 161 to 168 (tan) disposed **below** a dielectric layer 111-118 (purple) -- not a gate stack disposed **over** a dielectric layer" as claimed. Prelim. Resp. 9–10.

Petitioner's assertions are supported by Kim. For example, the bottom-most step has a lower dielectric layer 111 on which the gate stack 161 is disposed. Ex. 1005, Fig. 22A. It is true that the gate stack 161 is also below dielectric layer 112, but that pair is shown to involve two steps, not as corresponding to a single step. Moreover, Patent Owner's alternate manner of viewing the arrangement of layers does not contradict Petitioner's equally valid description. Consequently, we agree that Petitioner has shown Kim to teach or suggest limitations [1.PRE] and [1.A].⁵

[1.B] a barrier layer disposed over a portion of the gate stack of the each step; [1.C] an etch-stop layer disposed on the barrier layer; [1.D] an insulating layer disposed on the etch-stop layer; and [1.E] a plurality of conductive structures formed in the insulating layer, wherein each conductive structure is formed on the conductive layer of the each step.

We further determine that Petitioner has sufficiently shown Kim to teach a first stop layer 126a (barrier layer) disposed over a portion of the gate stack of the each step, a second stop layer 126b (etch stop layer) disposed on the barrier layer, and an interlayer insulating pattern 134 (insulating layer) disposed on the etch stop layer. Pet. 41–44 (citing Ex. 1005, Fig. 22A, ¶¶ 94, 185–187, 193, 201, 213; Ex. 1003 ¶¶ 92–96). We also determine that Petitioner has shown Kim to teach a plurality of word line contact plugs (conductive structures) formed on the gate

⁵ Accordingly, we need not assess Patent Owner's further arguments as to whether the knowledge in the prior art teaches the limitation that we agree, at this stage of the proceeding, exists in Kim. Prelim. Resp. 11-18

electrodes 161–166 (conductive layer) of the each step. *Id.* at 45–47 (citing Ex. 1005, Fig. 22, ¶¶ 173–74, 210–11, Ex. 1003 ¶ 97–99).

3. *Claims 2–19*

Patent Owner does not separately contest the further limitations of challenged claims 2–9, 11–16, 18, and 19. Prelim. Resp. 23. Nor does Patent Owner separately contest the further limitations of challenged claims 10 and 17, for which Petitioner relies on the combined teachings of Kim and Fang. *Id.* at 23–24. We have reviewed Petitioner’s assertions for these claims, and determine that they are supported by the record, including Petitioner’s reasons to combine Kim and Fang. Pet. 47–66. Consequently we determine that Petitioner has shown a reasonable likelihood that it will prevail on its assertions for claims 1–9, 11–16, 18, and 19 over Kim, and its assertions for claims 10 and 17 over the combined teachings of Kim and Fang.

E. Obviousness over Park

Because we determine Petitioner has made a sufficient showing for at least one claim under its Kim-based assertions, we need not evaluate Petitioner’s assertions based on Park. Pet. 66–103. To the extent that this Decision provides guidance for the parties at trial, Patent Owner’s Park-based arguments mirror its Kim-based arguments; i.e., that each step in the gate stack is below, not above, a dielectric layer. As in Kim, Park’s dielectric layers are both above and below its gate stack at each step. *See* Ex. 1006, Fig. 9i; Pet. 30; Prelim. Resp. 24–25. Our analysis relating to Kim thus also applies to Park.

III. DISCRETION UNDER 35 U.S.C. § 314(a)

Patent Owner argues that the Board should exercise its discretion to deny institution under 35 U.S.C. § 314(a) based on the factors set forth in

Apple Inc. v. Fintiv, Inc., IPR2020-00019, Paper 11 at 6 (PTAB Mar. 20, 2020) (precedential). Prelim. Resp. 33. We address each of these factors in turn. We determine that these factors, taken as a whole, do not favor exercising our discretion to deny the Petition.

Fintiv factor 1 asks whether the court has granted a stay, or evidence exists that one may be granted if a proceeding is instituted. *Fintiv*, Paper 11 at 6–7. Patent Owner contends that factor 1 is neutral because, although a temporary stay has been filed in the parallel proceeding for consideration of an opposed motion to stay, that motion is still pending. Prelim. Resp. 33–34. Petitioner also asserts that factor 1 is neutral. Pet. 12–13. However, subsequent to filing its Preliminary Response, Patent Owner notified the Board that the parallel court proceeding has been stayed pending the outcome of the *inter partes* review. Paper 10, 1. The granting of a stay pending *inter partes* review “has weighed strongly against exercising discretion to deny institution.” *Snap, Inc. v. SRK Technology LLC*, IPR2020-00820, Paper 15 at 9 (PTAB October 16, 2019) (precedential). The stay of the parallel proceeding results in factor 1 weighing strongly against exercising discretion to deny institution.

Fintiv factor 2 looks to the proximity of the court’s trial date to the Board’s projected statutory deadline to issue a final written decision. *Fintiv*, Paper 11 at 9. “If the court’s trial date is at or around the same time as the projected statutory deadline . . . the decision whether to institute will likely implicate other factors.” *Id.* Conversely, “[i]f the court’s trial date is earlier than the projected statutory deadline,” this has generally weighed “in favor of exercising authority to deny institution.” *Id.*

Patent Owner argues that this factor either favors denial institution, or is neutral, because trial in the parallel litigation (June 15, 2026) is set to

begin three days after the projected statutory deadline for a Final Written Decision in this proceeding (June 12, 2026). Prelim. Resp. 35. Petitioner asserts that this factor weighs strongly towards institution because IPR proceedings would be completed before the scheduled trial date and that on average, it takes 48.9 months to reach trial in the district court. Pet. 13. However, the parallel court litigation has been stayed pending the outcome of the *inter partes* review, providing weight under Factor 2 against exercising discretion to deny institution. *Snap, Inc.*, Paper 15 at 9. Based on these facts, we determine that factor 2 weighs against exercising discretion to deny institution.

Fintiv factor 3 looks to the investment in the parallel proceeding by the court and the parties at the time of institution. *Fintiv*, Paper 11 at 9. For example, “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.” *Id.* at 9–10. Conversely, if “the district court has not issued orders related to the patent at issue in the petition, this fact weighs against exercising discretion to deny institution.” *Id.* at 10.

Patent Owner lists numerous efforts that the parties have already expended, including exchange and response to interrogatories and requests for production, source code discovery, narrowing of infringement claims, exchanging expert declarations and conducting depositions in connection with claim construction, and filing a Joint Claim Construction and Prehearing Statement. Prelim. Resp. 36–37. Petitioner points only to those activities that were performed prior to the filing of the Petition. Pet. 13. Petitioner further asserts that expeditious filing of the Petition, approximately four months after being served with the relevant complaint, weighs strongly in favor of institution. *Id.* at 13–14.

The parties have expended a non-trivial level of effort in the district court proceeding, exchanging invalidity contentions and completing claim construction briefing. *See, e.g.*, Prelim. Resp. 33–34 (stating the parties have produced over 113,000 pages of documents, have conducted many weeks of code review, and have performed extensive analysis of infringement, validity, damages, claim construction, and issues related to narrowing number of asserted claims). Weighing against exercising discretion to deny institution is Petitioner’s filing of the Petition within four months of the complaint. *See Fintiv*, Paper 11 at 11–12; *Sotera*, Paper 12 at 17. Furthermore, *Fintiv* factor 3 is related to *Fintiv* factors 1 and 2, and because the “investment” factor is related to the “trial date” factor, the stay of the district court proceeding weighs against exercising discretion to deny institution. *See Fintiv*, Paper 11 at 10 (“This investment factor is related to the trial date factor, in that more work completed by the parties and court in the parallel proceeding tends to support the arguments that the parallel proceeding is more advanced, a stay may be less likely, and instituting would lead to duplicative costs.”). On balance, we discern that these facts weigh slightly against exercising discretion to deny institution.

Fintiv factor 4 looks to the overlap between issues raised in the petition and in the parallel proceeding. *Fintiv*, Paper 11 at 12.

In the Petition, Petitioner asserts that overlap is eliminated by its stipulation “that it will not advance, in District Court, any ground asserted in this Petition.” Pet. 14 (citing *Sand Revolution v. Continental Intermodal Group - Trucking LLC*, IPR2019-01393, Paper 24 at 11–12 (PTAB June 16, 2020) (informative)). Patent Owner argues that such a stipulation “runs the risk of significant overlap both in consideration of the same evidence and arguments framed as ‘different grounds’ than the Petition.” Prelim. Resp.

36. Should the parallel court proceedings remain stayed pending the resolution of this *inter partes* review, Petitioner may not assert in the parallel proceeding that any claim challenged in the *inter partes* review is invalid on “any ground that the petitioner raised or reasonably could have raised during that inter partes review.” 35 U.S.C. § 315(c)(2). This potential estoppel further reduces, but does not eliminate, the risk of significant overlap between the assertions in the Petition and those that may be raised in the parallel litigation. This minimized risk of overlap alleviates concerns of inefficiency and the possibility of conflicting decisions. *Fintiv*, Paper 11 at 12. We determine that this factor weighs against exercising discretion to deny institution.

Fintiv factor 5 asks whether the Petitioner and the defendant in the parallel proceeding are the same party. *Fintiv*, Paper 11 at 13–14. Both parties confirm that this is the case. Pet. 14; Prelim. Resp. 37. In consideration of the fact that the parallel District Court proceeding is stayed, and that Petitioner’s stipulation reduces potential overlap between the invalidity contentions and the Petition challenges, we regard the consideration of the fifth *Fintiv* factor as neutral or, at most, weighing slightly in favor of exercising discretion to deny institution. *Snap, Inc.*, Paper 15 at 9.

Fintiv factor 6 looks to whether other circumstances exist that impact the Board’s exercise of discretion, including the merits. *Fintiv*, Paper 11 at 14–15. For example, if the merits “seem particularly strong on the preliminary record, this fact has favored institution,” whereas “if the merits of the grounds raised in the petition are a closer call, then that fact has favored denying institution when other factors favoring denial are present.” *Id.*

The parties disagree on the strength of the merits of the Petition. Pet. 11–12; Prelim. Resp. 38. As detailed above, we determine that the Petitioner meets its burden for institution for all challenged claims. *Supra* § II. As noted, Petitioner’s case is not undermined by any facts or arguments on the current record. *Id.* at §§ II(D)(2), II(E). As such, on this record, the merits are particularly strong, and factor 6 favors institution.

We consider factors 1–6 and determine that together, they indicate that we should not apply our discretion to deny institution. Factor 1 (parallel litigation stayed) weighs strongly against exercising our discretion to deny institution. Factors 2 (stayed trial date for parallel proceeding close to Final Written Decision date), 3 (Petition filed expeditiously yet some effort expended in the parallel proceeding), 4 (narrow stipulation failing to eliminate potential of overlap) and 6 (particularly strong merits) also weigh against exercising our discretion to deny institution. Factor 5 (same parties) is neutral, or at most, weighs slightly in favor of exercising discretion to deny institution. On these facts, we decline to exercise our discretion to deny institution.

IV. CONCLUSION

Based on the arguments in the Petition and the Preliminary Response, and the evidence of record, we determine that Petitioner establishes a reasonable likelihood that it will prevail on its challenge to at least one claim of the ’711 patent. We also determine that the arguments and evidence of record do not support discretionary denial of the Petition under 35 U.S.C. § 314(a). Our determination at this stage of the proceeding is based on the evidentiary record currently before us. This decision to institute trial is not a final decision as to patentability of any claim for which an *inter partes*

review has been instituted. Our final decision will be based on the full record developed during trial.

Accordingly, we institute an *inter partes* review of all the challenged claims on all the challenged grounds:

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1–9, 11–16, 18, 19	103	Kim
10, 17	103	Kim, Fang
1–6, 8, 9, 11–16, 18, 19	103	Park
7, 10, 15, 17	103	Park, Fang

V. ORDER

For the foregoing reasons, it is:

ORDERED that an *inter partes* review is instituted with respect to all of the grounds asserted 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 shall commence on the entry date of this Decision.

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