

Case IPR2024-00535
U.S. Patent No. 9,724,802

Petitioner's Notice of Appeal

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Samsung Electronics Co., Ltd.,
Samsung Electronics America, Inc.,
Samsung Semiconductor, Inc., and
Samsung Austin Semiconductor, LLC.,
Petitioner

v.

Chien-Min Sung,
Patent Owner

Case IPR2024-00535

U.S. Patent No. 9,724,802

**PETITIONER SAMSUNG'S
NOTICE OF APPEAL**

Mail Stop Patent Board
Patent Trial and Appeal Board
U.S. Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

Pursuant to 35 U.S.C. §§ 141, 142, and 319, and in accordance with 37 C.F.R. §§ 90.2 and 90.3, Petitioner Samsung Electronics Co., Ltd., Samsung Electronics America, Inc., Samsung Semiconductor, Inc., and Samsung Austin Semiconductor, LLC (collectively, “Samsung” or “Petitioner”) hereby appeals to the United States Court of Appeals for the Federal Circuit from the Final Written Decision of the Patent Trial and Appeal Board (“Board”) entered on September 17, 2025 in IPR2024-00535 (Paper No. 41) (“Final Written Decision”), and from all underlying findings, determinations, rulings, opinions, orders, and decisions regarding the above-captioned *inter partes* review (Case IPR2024-00535) of U.S. Patent No. 9,724,802 (the “’802 Patent”) that implicate the Board’s findings as to claims 10 and 11 of the ’802 Patent. Patent Owner filed a Request for Director Review on October 17, 2025, which was denied by the Director on January 12, 2026. Patent Owner filed its Notice of Appeal on March 13, 2026. Hence, this Notice of Appeal is being timely filed on March 16, 2026.

In accordance with 37 C.F.R. § 90.2(a)(3)(ii), Samsung states that the issues on appeal include, but are not limited to: the Board’s determination that claims 10 and 11 of the ’802 Patent have not been shown to be unpatentable; the Board’s consideration of the expert testimony, prior art, and other evidence in the record; and the Board’s factual findings, conclusions of law, or other determinations supporting

or related to those issues, as well as all other issues decided adversely to Samsung in any orders, decisions, rulings, and opinions.

In accordance with Fed. Cir. R. 15 and its Practice Note, Petitioner attaches to this Notice of Appeal a copy of the Final Written Decision referenced above from which review is sought as Attachment A. This Notice of Appeal is being e-filed with the Clerk of the United States Court of Appeals for the Federal Circuit, along with payment of the required docketing fees. In addition, a copy of this Notice of Appeal is being filed simultaneously with the Patent Trial and Appeal Board and with the Director of the United States Patent and Trademark Office.

Dated: March 16, 2026

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CERTIFICATE OF FILING

The undersigned certifies that on March 16, 2026, in addition to filing the foregoing electronically through P-TACTS, a copy of this Notice of Appeal was by sent via electronic mail to the following address for filing with the Director of the United States Patent and Trademark Office:

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The undersigned also certifies that on March 16, 2026, a copy of this Notice of Appeal was caused to be filed electronically through the United States Court of Appeals for the Federal Circuit's CM/ECF system.

Dated: March 16, 2026

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.6(e), the undersigned certifies that on March 16, 2026, a complete copy of Petitioner's Notice of Appeal was served on counsel of record for the Patent Owner by filing the documents through P-TACTS and by sending via electronic mail to the following addresses:

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ATTACHMENT A

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD.,
SAMSUNG ELECTRONICS AMERICA, INC.,
SAMSUNG SEMICONDUCTOR, INC., and
SAMSUNG AUSTIN SEMICONDUCTOR, LLC,
Petitioner,

v.

CHIEN-MIN SUNG,
Patent Owner.

IPR2024-00535
Patent 9,724,802 B2

Before BARRY L. GROSSMAN, GEORGE R. HOSKINS, and
FRANCES L. IPPOLITO, *Administrative Patent Judges*.

HOSKINS, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining Some Challenged Claims Unpatentable
35 U.S.C. § 318(a)

ORDER
Denying Patent Owner's Motion to Exclude
37 C.F.R. § 42.64(c)

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I. INTRODUCTION

Petitioner Samsung¹ filed a Petition (Paper 5, “Pet.”) pursuant to 35 U.S.C. §§ 311–319 to institute an *inter partes* review of U.S. Patent No. 9,724,802 B2 (Ex. 1001, “the ’802 patent”), claims 1–21. We issued an Institution Decision (Paper 14, “Inst. Dec.”) instituting the petitioned review.

Patent Owner Chien-Min Sung² then filed a Patent Owner Response (Paper 17, “PO Resp.”) to the Petition. Petitioner filed a Reply (Paper 23, “Pet. Reply”). Patent Owner filed a Sur-reply (Paper 25, “PO Sur-reply”).

Patent Owner filed a Motion to Exclude Evidence (Paper 30). Petitioner filed an Opposition (Paper 31). Patent Owner filed a Reply (Paper 32).

An oral hearing was held on June 20, 2025 (Paper 40, “Tr.”).

This Decision is a final written decision under 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73 as to the patentability of claims 1–21 of the ’802 patent. We deny Patent Owner’s Motion to Exclude Evidence. We determine Petitioner has shown claims 1–9 and 12–21 are unpatentable, but has not shown claims 10 and 11 are unpatentable.

¹ Petitioner is a group of four entities: Samsung Electronics Co., Ltd.; Samsung Electronics America, Inc.; Samsung Semiconductor, Inc.; and Samsung Austin Semiconductor, LLC. See Pet. 1.

² We refer to “Dr. Sung” when discussing actions he has taken personally, or “Patent Owner” when discussing actions taken by counsel on his behalf.

II. BACKGROUND

A. *Real Parties-in-Interest and Related Proceedings*

Petitioner identifies itself (i.e., the four Samsung entities identified above) as its real party-in-interest. *See* Pet. 1. Patent Owner identifies himself as his real party-in-interest. *See* Paper 18, 1.

The parties identify three district court litigations involving the '802 patent. *See* Pet. 1; Paper 18, 1. The first is *Sung v. Kinik Co.*, No. 1:20-cv-00247 (D. Del.) (“the Kinik Litigation”), which has been terminated. The second is *Sung v. Samsung Electronics Co. Ltd., et al.*, No. 4:23-cv-00752 (E.D. Tex.), which is pending. The third is *Sung v. Texas Instruments, Inc.*, No. 4:23-cv-00753 (E.D. Tex.), which is pending.

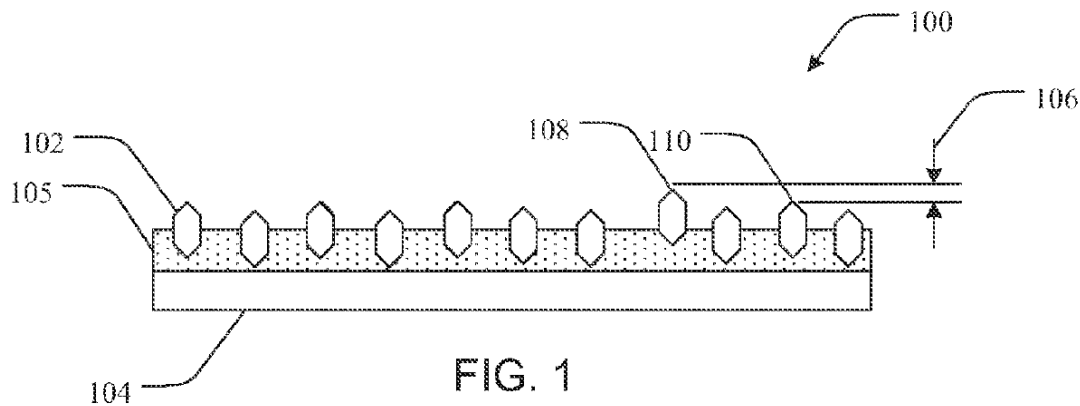
The '802 patent also was challenged in *Kinik Co. v. Sung*, IPR2021-00638 (PTAB) (“the Kinik IPR”), which was terminated due to settlement prior to a decision on institution.

B. *The '802 Patent Specification*

The '802 patent concerns a “pad dresser” — a disk that is rotated and pressed against a polishing pad to “condition” the pad, “by removing dirt and debris . . . as well as opening up asperities in the pad surface to capture and hold chemical slurry during a polishing procedure” using the pad. Ex. 1001, codes (54) and (57), 4:10–12, 9:23–30, 9:50–54; *see also* Ex. 1002 ¶¶ 38–43 (Petitioner’s proffered expert witness explaining how pad dressers are used). The pad dresser has superabrasive particles secured to a substrate, to cut into the polishing pad and thereby open up asperities. Ex. 1001, 1:58–65, 2:18–21, 9:50–58. The polishing pad in turn is rotated and pressed against a silicon wafer, applying an abrasive slurry, to generate a very flat

and smooth surface on the wafer in a Chemical Mechanical Polishing (CMP) process. *Id.* at 1:40–54, 9:23–30.

Figure 1 of the '802 patent is reproduced below.



'802 Patent, Figure 1.

Figure 1 is a schematic side view of CMP pad dresser 100, including a monolayer of superabrasive particles 102 coupled to support substrate 104 with binding material 105. *See id.* at 3:35–37, 18:26–29. Particles 102 may be diamond grits. *See id.* at 4:13–38, 18:43–51.

“Each superabrasive particle in the monolayer protrudes to a protrusion distance from the support substrate,” and “[t]he difference in protrusion distance 106 between the highest protruding tip 108 and the next highest protruding tip 110 . . . is described as the protrusion difference.” *Id.* at 18:29–35; *see also id.* at 14:28–41 (discussing the term “protrusion difference”). “In one aspect,” difference 106 “is less than or equal to about 50 microns,” and “the difference in protrusion distance between the highest 1% of the protruding tips . . . is within about 80 microns or less.” *Id.* at 2:36–42, 14:34–35, 14:50–61, 17:50–62, 18:35–36.

Further, the particle tips may “align along a designated profile,” which “can include any geometric configuration that can be useful in dressing a CMP pad,” such as “a plane, a slope, a curved shape, a dome shape, and the

like.” *Id.* at 1:65–2:1, 2:12–17, 17:5–15; *see also id.* at 6:21–28 (defining “profile” to mean “a predetermined contour above a support substrate to which a plurality of superabrasive particles or other cutting elements are intended to align”). In one exemplary embodiment, the particle tips “align along [the] designated profile with a tip variation of from about 5 microns to about 100 microns.” *Id.* at 1:65–2:2, 11:49–52; *see also id.* at 10:63–11:45 (discussing “leveled tips” as being “compared against the designated profile to determine the variance, or degree of ‘leveling’ achieved,” wherein “some level of deviation may occur [as] a result of the design or manufacturing process”), 17:8–15 (substantially the same).

C. The ’802 Patent Claims

The ’802 patent includes twenty-one claims, all of which are challenged here. *See* Ex. 1001, 27:54–29:15; Pet. 5–6. Claim 1 is the sole independent claim, and it recites, adding Petitioner’s identifiers [1Pre] through [1F] and line breaks in the “monolayer” limitation:

1. [1Pre] A CMP pad dresser, comprising:
 - [1A] a rigid support substrate; and
 - [1B] a monolayer of a plurality of superabrasive particles coupled to the support substrate,
 - [1C] wherein each superabrasive particle in the monolayer extends away from the support substrate to a protrusion distance,
 - [1D] wherein a tip of each of the plurality of superabrasive particles aligns along a designated profile with a tip variation of from about 5 microns to about 100 microns, and

[1E] wherein the difference in protrusion distance between the highest protruding tip and the second highest protruding tip of the monolayer of superabrasive particles is less than or equal to about 50 microns, and

[1F] the difference in protrusion distance between the highest 1% of the protruding tips of the monolayer of superabrasive particles are within about 80 microns or less.

Ex. 1001, 27:55–28:4.

D. Asserted Prior Art

Petitioner relies on the following three references as alleged prior art against all claims of the '802 patent. *See* Pet. 3–4.

Name	Reference	Exhibit No.
Tsai	M.Y. Tsai, P.H. Li, & J.C. Sung, <i>Organic Diamond Disk Versus Brazed Diamond Disk for Dressing a Chemical-Mechanical Polishing Pad</i> , <u>Diamond & Related Materials</u> (Vol. 23, Pgs. 144–149) (2012)	1004
Sung '026	US 2007/0060026 A1	1005
Sung '146	US 2012/0302146 A1	1029

Patent Owner argues Tsai, Sung '026, and Sung '146 are not prior art against claims 1–7 and 13–21. *See infra* Section III.D. However, we conclude Tsai, Sung '026, and Sung '146 are each prior art against all claims of the '802 patent. *See id.*

E. Asserted Grounds

Petitioner asserts the following three grounds of unpatentability. *See* Pet. 5–6.

35 U.S.C. § ³	Reference(s)	Claims Challenged
102 / 103	Tsai	1–5, 13, 15, 19–21
103	Tsai, Sung ’026	1–3, 6–14, 16–18
103	Sung ’146, Sung ’026	1–7, 13–21

F. Testimonial Evidence

Petitioner relies on the proffered expert witness testimony of Stanley Shanfield, Ph.D. (Exhibits 1002 and 2004). Patent Owner relies on the proffered expert witness testimony of Ming-Yi Tsai, Ph.D. (Exhibits 1052–1055 and 2011⁴), the lead author of the “Tsai” reference cited by Petitioner. *See* Ex. 2011 ¶ 18 (“I am the lead author of [Tsai].”).

Petitioner attacks the credibility of Dr. Tsai, alleging that he does not understand the law, he was not diligent, and he has a bias favoring Dr. Sung. *See* Pet. Reply 27–29; PO Sur-reply 23–25. In reaching our Decision, we have not discounted the weight given to Dr. Tsai’s testimony based on these allegations, because Petitioner prevails as to all claims except claims 10

³ Amendments to 35 U.S.C. §§ 102 and 103 enacted by the Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (“AIA”) took effect on March 16, 2013. The ’802 patent issued from an application filed in October 2014, asserting priority as a continuation-in-part of several applications filed before March 16, 2013. *See* Ex. 1001, codes (22), (60), and (63), 1:4–38. For reasons provided below in Section III.D, we apply the AIA versions of §§ 102 and 103 here.

⁴ Dr. Tsai’s Declaration (Exhibit 2011) embodies a paragraph numbering error, beginning with ¶¶ 1–8 (pages 1–2) and then re-starting with ¶¶ 1–81 (pages 3–32). We believe this error resulted in at least some of Patent Owner’s citations to the Declaration to go awry. In our Decision, we try to remain true to the actual paragraph numbers in the Declaration.

and 11, and Petitioner’s shortcoming as to those claims does not involve weighing competing expert witness testimony.

III. PETITIONER’S GROUNDS OF UNPATENTABILITY

A. *Legal Standards*

1. *Petitioner’s Burden*

“In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”)). This burden of persuasion never shifts to the patent owner. *See Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015). The petitioner must prove unpatentability by a preponderance of the evidence. *See* 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d).

2. *Filing Date Priority*⁵

The ’802 patent is entitled to priority to the filing date of an earlier-filed U.S. application if, among other requirements, the earlier application discloses the claimed invention “in the manner provided by

⁵ We use the term “filing date priority” for consistency with Papers filed in this proceeding. *But see* 35 U.S.C. § 100(i)(1)(B) (distinguishing between “a right of priority” per § 119 and “benefit of an earlier filing date” per § 120); *Technology Licensing Corp. v. Videotek, Inc.*, 545 F.3d 1316, 1324 n.5 (Fed. Cir. 2008) (discussing same distinction).

[35 U.S.C.] section 112(a).” 35 U.S.C. § 120.⁶ Thus, the earlier application must provide written description support under 35 U.S.C. § 112(a) for the claimed subject matter in the ’802 patent. *See Tronzo v. Biomet, Inc.*, 156 F.3d 1154, 1158 (Fed. Cir. 1998).

“To satisfy the written description requirement, a patent’s specification must ‘reasonably convey[] to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date.’” *Novartis Pharms. Corp. v. Accord Healthcare, Inc.*, 38 F.4th 1013, 1016 (Fed. Cir. 2022) (citing *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc)). The written description “test requires an objective inquiry into the four corners of the specification from the perspective of a person of ordinary skill in the art.” *Ariad*, 598 F.3d at 1351.

3. Anticipation

A patent claim is unpatentable as anticipated under 35 U.S.C. § 102 “if each and every limitation is found either expressly or inherently in a single prior art reference.” *WhitServe, LLC v. Computer Packages, Inc.*, 694 F.3d 10, 21 (Fed. Cir. 2012) (quoting *Celeritas Techs., Ltd. v. Rockwell Int’l Corp.*, 150 F.3d 1354, 1361 (Fed. Cir. 1998)). An anticipatory reference must further “disclose those elements ‘arranged as in the claim.’” *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1369 (Fed. Cir. 2008)

⁶ The AIA versions of 35 U.S.C. §§ 112 and 120 apply to patents filed on or after September 16, 2012, including the ’802 patent. *See* AIA § 4(c), 4(e) (§ 112 amendment effective Sept. 16, 2012); *id.* §§ 15(b), 15(c) (§ 120 amendment effective Sept. 16, 2011); Ex. 1001, code (22).

(quoting *Connell v. Sears, Roebuck & Co.*, 722 F.2d 1542, 1548 (Fed. Cir. 1983)).

4. Obviousness

A patent claim is unpatentable under 35 U.S.C. § 103 if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. *See 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, if made available in the record, which has not happened here. *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

B. Level of Ordinary Skill in the Art and Patent Owner’s Motion to Exclude Dr. Shanfield’s Testimony

The parties dispute the formulation of a person of ordinary skill in the art (“POSITA”) pertaining to the ’802 patent and, relatedly, whether Petitioner’s proffered expert witness Dr. Shanfield is qualified to testify from the perspective of a POSITA.

1. Person of Ordinary Skill in the Art Pertaining to the ’802 Patent

The level of ordinary skill in the art is “a prism or lens” through which we view the prior art and the claimed invention. *Okajima v. Bourdeau*, 261 F.3d 1350, 1354–55 (Fed. Cir. 2001) (citing *Al-Site Corp. v. VSI Int’l*,

Inc., 174 F.3d 1308, 1324 (Fed. Cir. 1999)). “This reference point prevents . . . factfinders from using their own insight or, worse yet, hindsight, to gauge obviousness.” *Id.* at 1355. “The person of ordinary skill in the art is a hypothetical person who is presumed to know the relevant prior art” at the time of the invention. *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995).

In determining the level of ordinary skill in the art, we may consider various factors, including: “(1) the educational level of the inventor; (2) type of problems encountered in the art; (3) prior art solutions to those problems; (4) rapidity with which innovations are made; (5) sophistication of the technology; and (6) educational level of active workers in the field.” *Best Med. Int’l, Inc. v. Elekta Inc.*, 46 F.4th 1346, 1353 (Fed. Cir. 2022) (citations omitted). “The patent’s purpose can also be informative.” *Id.*

Petitioner contends a POSITA pertaining to the ’802 patent “would have had . . . at least a bachelor’s degree in an engineering related field, such as material science, mechanical engineering, electrical engineering, or physics, and a minimum of two to three years of *experience in the field of integrated circuit processing and fabrication techniques*.” Pet. 23 (emphasis added); Ex. 1002 ¶¶ 21–23, 78–80. Further: “A higher level of education or specific skill might make up for less experience, and vice versa.” Pet. 23; Ex. 1002 ¶ 79.

Patent Owner does not dispute the educational component of Petitioner’s POSITA formulation. *See* PO Resp. 5. Concerning the experience component, Patent Owner contends a POSITA “would have at least two years of *experience in developing CMP technology including experience with the design and development of CMP pad dressers*.” *Id.*

(emphasis added); Ex. 2011 ¶¶ 13–17. Patent Owner further asserts “Dr. Shanfield is not qualified as a POSITA because he lacks such experience,” having only “worked with CMP systems” without designing and developing pad dressers. PO Resp. 5 (citing Ex. 1002 ¶¶ 3–5, App. A).

Petitioner replies that Patent Owner and Dr. Tsai “articulate[] no objective rationale why the requisite experience must be so limited” to designing and developing CMP technology including CMP pad dressers. Pet. Reply 3 (citing Ex. 2011 ¶¶ 13–17). Petitioner cites Dinh-Ngoc⁷ and Nabeya⁸, two references at issue during prosecution of the ’802 patent, as “explain[ing] how CMP technology is relevant in the field of integrated circuit processing and fabrication, supporting Petitioner’s broader definition of POSITA.” *Id.* at 3–4 (citing Ex. 1003, 126–131, 205; Ex. 1010 ¶ 5; Ex. 1056 ¶ 2). Petitioner further attacks Dr. Tsai’s credibility concerning the POSITA experience component, based on Dr. Tsai’s alleged “indecisiveness” concerning the POSITA educational component. *See id.* at 2–3 (citing Ex. 1052, 107:18–25, 109:2–14).

Patent Owner responds that Petitioner’s POSITA formulation is overly broad, because under it “even Patent Owner’s lead counsel of record (who has used and operated numerous CMP equipment . . .) would qualify as a [POSITA].” PO Sur-reply 1–2, 22.

Upon consideration, we firstly adopt Petitioner’s contention that a POSITA pertaining to the ’802 patent would have had at least a bachelor’s degree in an engineering related field such as material science, mechanical engineering, electrical engineering, or physics. As noted above, that

⁷ Ex. 1010 (US 2010/0248595 A1).

⁸ Ex. 1056 (US 2004/0048557 A1).

contention is not disputed by Patent Owner. Therefore, we need not delve into the line of questioning posed to Dr. Tsai during his deposition in IPR2024-00533 on this undisputed issue. *See* Ex. 1052, 107:18–25, 109:2–14.

We secondly conclude a POSITA would have had at least two years of experience designing and/or developing CMP technology per Patent Owner’s formulation, but we reject Patent Owner’s additional contention that this experience must include designing and/or developing *pad dressers* specifically. The ’802 patent claims are directed to the structure of a pad dresser, not to a method of making a pad dresser. *See* Ex. 1001, 27:55–29:15. According to the ’802 patent specification, the claimed pad dresser structure is designed to condition a polishing pad so the pad may be used to attain “high performance levels” when “manufactur[ing] smooth and even-surface silicon wafers” during a CMP process. *Id.* at 1:40–54 (Background of the Invention); *see also id.* at 1:55–3:23 (Summary of the Invention), 9:23–64 (describing “The Invention”). Thus, the ’802 patent’s invention focuses on optimizing a pad dresser structure to achieve desired results in a CMP process, not on how to manufacture a pad dresser.

Further, because of that focus, we reject Petitioner’s POSITA formulation requiring “experience in the field of integrated circuit processing and fabrication techniques” (Pet. 23) as too generic in the context of the ’802 patent’s claimed invention. We also conclude, in view of the ’802 patent disclosures discussed above, that Dr. Tsai’s opinion that ordinary skill requires experience with manufacturing pad dressers (*see* Ex. 2011 ¶ 16) is too conclusory and lacking in evidentiary support to be

persuasive. *See Best Med. v. Elekta*, 46 F.4th at 1353 (“The patent’s purpose can also be informative.”).

We acknowledge that the ’802 patent specification discusses how “[t]raditional CMP pad dresser manufacturing methods . . . contain significant variation in tip height across the surface of the dresser” caused by “warping of the dresser support” during manufacture, which “can be particularly problematic with brazing techniques.” *Id.* at 9:36–49. However, the ’802 patent further provides that “[a] variety of techniques can be utilized to maintain tip leveling” in “[t]he present CMP pad dressers,” and “any such technique is considered to be within the present scope.” *Id.* at 10:63–11:2, 20:1–6. Furthermore, we reiterate that the claims of the ’802 patent are not limited to any particular method of manufacture, as Patent Owner’s counsel pointed out during oral argument. *See* Tr. 59:15–60:13, 64:15–65:19 (arguing the claims are not limited to a reverse casting process of manufacture).

Thus, we conclude a POSITA pertaining to the ’802 patent would have had at least a bachelor’s degree in an engineering related field such as material science, mechanical engineering, electrical engineering, or physics, and at least two years of experience designing and/or developing CMP technology. Further, a higher level of education or specific skill might make up for less experience, and vice versa.

2. *Patent Owner’s Motion to Exclude Dr. Shanfield’s Declaration*

Patent Owner has moved to exclude Dr. Shanfield’s declaration testimony (Exhibit 1002) from evidence. *See* Paper 30, 1–7. Patent Owner asserts Dr. Shanfield lacks “qualification in offering his opinions in

chemical-mechanical planarization (CMP) pad conditioning” including the requisite “expertise and experience to qualify as a POSITA.” *Id.* at 1–2. Patent Owner particularly asserts “Dr. Shanfield’s only experience is working in a lab that used ‘semiconductor-grade CMP systems’; he does not identify any experience in designing, manufacturing, or testing CMP pad conditioners.” *Id.* at 3, 4 (citing Ex. 1002 ¶ 5, App. A; Ex. 2004, 91:23–92:10, 93:10–20; Ex. 2011 ¶ 16).

Petitioner argues Patent Owner’s Motion to Exclude should be denied because it relies on Patent Owner’s POSITA formulation, which we have partially rejected above in Section III.B.1. *See* Paper 31, 2–3, 7–9. Petitioner further contends “Dr. Shanfield’s qualifications are more than sufficient” because an expert witness “need not be a person of ordinary skill in the art, but rather [must be] ‘qualified in the pertinent art.’” Paper 31, 4, 6 (citing PTAB Consolidated Trial Practice Guide (Nov. 2019) (“Practice Guide”)⁹, 34; Fed. R. Evid. 702; *A.C. Dispensing Equip., Inc. v. Prince Castle LLC*, IPR2014-00511, Paper 33 at 9–11 (PTAB Aug. 4, 2015) (citing *Sundance, Inc. v. DeMonte Fabricating Ltd.*, 550 F.3d 1356, 1363–64 (Fed. Cir. 2008); *SEB S.A. v. Montgomery Ward & Co.*, 594 F.3d 1360, 1372–73 (Fed. Cir. 2010); *Mytee Prods., Inc. v. Harris Rsch., Inc.*, 439 Fed. App’x 882, 886–87 (Fed. Cir. 2011)).

Petitioner alleges Dr. Shanfield has “extensive experience in integrated circuit processing and manufacturing” spanning over nearly 40 years. *Id.* at 4 (citing Ex. 1002 ¶¶ 2–12, App. A). Petitioner further asserts Dr. Shanfield: (1) “is personally familiar with the design of CMP

⁹ Available at <https://www.uspto.gov/TrialPracticeGuideConsolidated>.

equipment”; (2) “has personally worked with CMP pad dressers”; (3) “was personally involved in the manufacture of CMP pad dressers”; and (4) “has particularized knowledge about both the use and design of CMP pad dressers.” *Id.* at 5–6 (citing Ex. 1002 ¶¶ 2–12, App. A; Ex. 2004, 18:5–12, 19:8–12, 19:8–20:9).

Patent Owner disputes Petitioner’s descriptions of Dr. Shanfield’s experience, and particularly contends he lacks any experience in “**CMP pad conditioning**” even if he has experience “using CMP pads.” Paper 32, 2 (citing Ex. 1002 ¶¶ 2–12, App. A).

The Federal Circuit has held: “To offer expert testimony from the perspective of a skilled artisan in a patent case — like for claim construction, validity, or infringement — a witness must at least have ordinary skill in the art.”¹⁰ *Kyocera Senco Indus. Tools Inc. v. Int’l Trade Commission*, 22 F.4th 1369, 1375–77 (Fed. Cir. 2022); *see also Osseo Imaging, LLC v. Planmeca USA Inc.*, 116 F.4th 1335, 1340–41 (Fed. Cir. 2024) (holding the proffered expert does not need to acquire the requisite ordinary skill experience prior to the time of the patent’s invention).

We determine Dr. Shanfield has sufficient education and experience to qualify as a person of ordinary skill in the art pertaining to the

¹⁰ Petitioner cites the Practice Guide’s statements that there is “no requirement of a perfect match between the expert’s experience and the relevant field” and “[a] person may not need to be a person of ordinary skill in the art in order to testify as an expert under Rule 702, but rather must be ‘qualified in the pertinent art.’” Practice Guide, 34 (citing *SEB v. Montgomery Ward*, 594 F.3d at 1373; *Sundance v. DeMonte*, 550 F.3d at 1363–64). To the extent there is any tension between the Practice Guide (issued in 2019) and the *Kyocera* holding (issued in 2022), we apply the latter here.

'802 patent. Dr. Shanfield's Ph.D. in physics satisfies the educational prerequisite of at least a bachelor's degree in an engineering related field such as physics. *See* Ex. 1002 ¶ 2, App. A (pg. 121). Furthermore, his advanced degree (Ph.D. in physics) versus ordinary skill (a bachelor's degree in an engineering related field) provides considerable leeway when turning to the experiential component for ordinary skill. Nonetheless, Dr. Shanfield also has at least two years of experience with designing and developing CMP technology per the experience prerequisite, as follows.

Dr. Shanfield worked at Raytheon Corporation for over 10 years, during which he "worked directly with engineers in the selection, installation, and optimization of several chemo-mechanical polishing systems (CMP), including analysis of operational maintenance and performance monitoring," and he "directly participated in establishing the required metrology (optical thickness monitoring) for maintaining polishing uniformity standards." Ex. 1002 ¶ 3. He later joined Draper Laboratory in 2003, where he currently is the Division Leader of Advanced Hardware Development. *See id.* ¶ 5. During Dr. Shanfield's time at Draper, the laboratory "acquired several semiconductor-grade CMP systems for the purpose of fabricating multi-chip modules and for planarization operations in MEMS devices," and he was "involved in their operation and optimization." *Id.*

When asked during a deposition whether he is "an expert in CMP equipment design," Dr. Shanfield stated he is "very familiar with the design of CMP equipment" because he has "seen many systems" and "installed or supervised the installation of systems." Ex. 2004, 17:22–19:3. He testified he has "designed apparatus that worked with CMP equipment" although he

has not “designed the CMP equipment itself.” *Id.* at 18:13–19. As an example of being “involved in the manufacture of CMP pad dressers” specifically, Dr. Shanfield stated that during his time at Raytheon, he worked with other professionals “to use the CMP system to process MEMS, M-E-M-S, devices” which “needed a certain kind of planarization process [that] required constant conditioning,” so the team “had to try to fabricate something that would provide conditioning that would last longer.” *Id.* at 19:4–20:9.

Thus, we conclude Dr. Shanfield qualifies as a POSITA pertaining to the ’802 patent per the POSITA formulation we have adopted above, based on his advanced degree of education and his relevant experience designing and/or developing CMP technology. As a result, we deny Patent Owner’s Motion to Exclude Dr. Shanfield’s declaration testimony (Exhibit 1002).

C. *Claim Construction*

We interpret the ’802 patent claims “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). This “includ[es] construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art.” *Id.*

The parties agree that the ’802 patent provides several lexicographic definitions of terms recited in the claims. *See* Pet. 23–26; PO Resp. 5–6; *Thorner v. Sony Computer Ent. Am. LLC*, 669 F.3d 1362, 1365–66 (Fed. Cir. 2012) (“a patentee sets out a definition and acts as his own lexicographer” by “clearly set[ting] forth a definition of the disputed claim term’ other than

its plain and ordinary meaning” and “‘clearly express[ing] an intent’ to redefine the term”).

Specifically, the ’802 patent provides “DEFINITIONS” such that “[i]n describing and claiming the present invention, the following terminology will be used.” Ex. 1001, 4:4–9. The defined terms recited in claim 1 include “about” (*id.* at 8:29–36), “comprising” (*id.* at 8:37–41), “particle” (*id.* at 4:33–38), “profile” (*id.* at 6:21–28), “substrate” (*id.* at 7:59–8:8), “superabrasive” (*id.* at 4:13–32), and “tip” (*id.* at 5:9–17). The ’802 patent also defines the term “protrusion” found in claim 1, albeit outside of the “DEFINITIONS” section. *See id.* at 16:24–26. The ’802 patent further defines the term “working superabrasive particles” found in claims 6–12. *See id.* at 4:46–59. It also discusses the term “predetermined pattern” found in claims 20 and 21. *See id.* at 21:46–22:13. We identify and apply these definitions and discussions below in our analysis of Petitioner’s patentability challenges.

Apart from the foregoing terms, and based on the arguments and evidence presented, we determine no explicit construction is needed to resolve the parties’ controversy. *See Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) (“The Board is required to construe ‘only those terms . . . that are in controversy, and only to the extent necessary to resolve the controversy.’”) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

D. Filing Date Priority of the '802 Patent Claims

1. Introduction — Burdens of Production and Persuasion

Petitioner bears the burden of persuasion concerning the filing date priority of the '802 patent claims. This is part of Petitioner's overall burden of proving unpatentability by a preponderance of the evidence. *See* 35 U.S.C. § 316(e). For example, the Federal Circuit has held an IPR petitioner bears the burden of persuasion to prove that an asserted reference is prior art because it is entitled to the filing date of its parent provisional application, and "that burden never shifts to the patentee." *Dynamic Drinkware*, 800 F.3d at 1378–79. The present case concerns the different issue of whether the '802 patent claims have priority to a parent application's filing date preceding Petitioner's asserted references (Tsai, Sung '026, and Sung '146). Nonetheless, both issues ultimately determine whether a petitioner's asserted references are prior art to the challenged patent, and in that context *Dynamic Drinkware* held 35 U.S.C. § 316(e) places the burden of persuasion on the petitioner.

Thus, we disagree with Petitioner's contention that Patent Owner bears a "burden of production *and proof*" concerning the filing date priority of the '802 patent claims. Pet. Reply 4 (emphasis added). Petitioner particularly asserts that "[f]or a patent's claims to be entitled to an earlier priority date, the patentee must *demonstrate* that the claims meet the requirements of 35 U.S.C. § 120" and "claims in a patent or patent application are not entitled to priority under § 120 at least until the patent owner *proves* entitlement." *Id.* at 6–7 (quoting *Natural Alternatives Int'l, Inc. v. Iancu*, 904 F.3d 1375, 1380 (Fed. Cir. 2018) (citing *PowerOasis, Inc. v. T-Mobile USA, Inc.*, 522 F.3d 1299, 1305–06 (Fed. Cir. 2008))). During

oral argument, Petitioner’s counsel maintained that the *Natural Alternatives* / *PowerOasis* line of case law places a burden of persuasion on Patent Owner “to actually prove entitlement of an earlier priority date under § 120 if they want to actually get an earlier priority date.” Tr. 15:24–16:22.

Petitioner’s reading of *PowerOasis* was rejected by the Federal Circuit in *Technology Licensing, supra*, where a party asserting patent invalidity in district court was “not alone in reading *PowerOasis* to have modified the traditional burdens rule so that the patentee has the burden of persuasion to prove [the challenged patent] was entitled to the earlier filing date” predating the challenger’s asserted prior art references. 545 F.3d at 1328–29. The Court held:

Carefully read . . . *PowerOasis* says nothing more than, and should be understood to say, that once a challenger (the alleged infringer) has introduced sufficient evidence to put at issue whether there is prior art alleged to anticipate the claims being asserted, prior art that is dated earlier than the apparent effective date of the asserted patent claim, *the patentee has the burden of going forward with evidence and argument to the contrary*.

Id. (emphasis added). Thus, as in *Dynamic Drinkware*, the “challenger has the burden of persuasion to show” invalidity / unpatentability, and “[t]hat ultimate burden never shifts” to the patent owner. *Id.* at 1329.

At the same time, “when a patent owner attempts to antedate an asserted prior art reference [in an IPR proceeding], the patent owner assumes a temporary burden of production” which “cannot be met without some combination of citing the relevant record evidence with specificity and explaining the significance of the produced material in briefs.” *Parus Holdings, Inc. v. Google LLC*, 70 F.4th 1365, 1371 (Fed. Cir. 2023); see

also Dynamic Drinkware, 800 F.3d at 1378–80 (discussing shifting burdens of production between the parties when determining whether an asserted reference is prior art in an IPR dispute); *Technology Licensing*, 545 F.3d at 1326–28 (discussing shifting burdens of production between the parties when determining whether a challenged patent is entitled to an earlier priority filing date in district court litigation).

Here, Patent Owner satisfied his burden of production in the Patent Owner Response. *See* PO Resp. 6–35 (opposing Pet. 11–23). That distinguishes this case from the *Natural Alternatives* decision cited by Petitioner. *See Natural Alternatives*, 904 F.3d at 1379–81; *Technology Licensing*, 545 F.3d at 1328–29.

Therefore, we consider the arguments and evidence presented by both parties, to determine whether Petitioner has satisfied its burden of persuasion to establish by a preponderance of the evidence that the '802 patent claims are not entitled to a priority filing date that precedes Petitioner's asserted references (i.e., Tsai, Sung '026, and Sung '146). We consider the '802 patent claims in two groups: claims 1–7 and 13–21; then claims 8–12.

2. *Claims 1–7 and 13–21*

The parties dispute the filing date priority of claims 1–7 and 13–21.

Petitioner argues claim 1 is entitled only to the '802 patent's actual filing date of October 3, 2014. *See* Pet. 12–23; Ex. 1002 ¶¶ 58–77. If that is correct, then Tsai, Sung '026, and Sung '146 are prior art against claim 1 and its dependent claims 2–7 and 13–21 per 35 U.S.C. § 102(a)(1). *See* Pet. 3–4.

Patent Owner argues claims 1–7 and 13–21 are entitled to priority to the filing dates of three different parent applications. *See* PO Resp. 1, 6–31, 33–35. Two of those parent applications predate Tsai, Sung ’026, and Sung ’146, and the third predates Tsai and Sung ’146 but not Sung ’026.

We consider whether claim 1 of the ’802 patent is entitled to priority to any one of Patent Owner’s cited parent applications. For reasons that follow, we agree with Petitioner’s argument that claim 1 is entitled only to the ’802 patent’s actual filing date.

(a) *Dr. Sung’s Declaration in the Kinik Litigation*

Dr. Sung has testified, in a Declaration prepared for the Kinik Litigation “with the knowledge that willful false statements and the like so made are publishable by fine or imprisonment,” that “this new subject matter . . . claimed in the ’802 Patent . . . is not disclosed in any of the patents or patent applications to which the ’802 Patent claims priority.” Ex. 1011 ¶¶ 17–18, 24. This testimony attempted to carve the ’802 patent out of Dr. Sung’s joint venture with Kinik, on the basis that the ’802 patent “only claims priority to [its actual filing date of] October 3, 2014” after “the joint venture ended on October 28, 2013.” Ex. 1012 (Order Denying Stay), 1–2; *see also* Ex. 1059 (Patent Owner’s Brief Opposing Kinik’s Motion to Stay), 2–3, 6 (“During this period, **after** expiration of the JV agreements, Dr. Sung invented the subject matter that forms the basis of the . . . ’802 patent[.]”). Dr. Sung’s testimony was at least partially successful, as the District Court denied Kinik’s motion to stay the Kinik Litigation pending resolution of the parties’ contractual disputes being litigated in Taiwan. *See* Ex. 1012.

Petitioner argues Dr. Sung’s Declaration “disclaimed any claim to an earlier filing date” than the ’802 patent’s actual filing date for all claims of the ’802 patent. Pet. 16; *see id.* at 16–20 (citing Ex. 1011 ¶¶ 17–24; Ex. 1012, 2).

Patent Owner responds that Dr. Sung’s Declaration “did **not** disclaim ‘all earlier priority dates’” for all claims of the ’802 patent. PO Resp. 32. Patent Owner asserts Dr. Sung’s Declaration was limited to claims 8–12, and did not apply to claim 1. *See id.* at 31–32 (“Dr. Sung’s statement that the ’802 Patent contained ‘new subject matter’ is consistent with the disclosures of the ’802 Patent [directed to claims 8–12] and the nature of it being a CIP.”) (citing Ex. 1001, 2:55–3:9, 13:58–14:15); *id.* at 33 (“In sum . . .”); Tr. 66:25–71:14. Patent Owner also argues the District Court’s Order Denying Stay in the Kinik Litigation did not “affirm a single priority date for all claims of the ’802 Patent based on Dr. Sung’s declaration,” and instead it “expressly found that ‘there is a **possibility** of the infrequent posture that ***the alleged infringer will be the one arguing for the earlier priority date,***’ . . . leaving the door open for an ‘earlier priority date.’” PO Resp. 32 (citing Ex. 1012, 2). Patent Owner adds that the Order Denying Stay “***did not adjudicate the substance of the priority claim at issue here.***” *Id.*

Petitioner replies that Patent Owner’s foregoing arguments mischaracterize Dr. Sung’s Declaration. *See* Pet. Reply 14 (citing Inst. Dec. 33; Ex. 1011 ¶¶ 11, 14–23; Ex. 1012, 2). Petitioner asserts Dr. Sung’s counsel in the Kinik Litigation “submitted a declaration that included ‘detailed redline[s] showing all new subject matter [in the ’802 Patent] not disclosed or claimed in the Parent Patents,’” which supports Petitioner’s

position here. *Id.* at 14–15 (citing Ex. 1059, 7–8, 10–12, 22, 24; Ex. 1060 ¶¶ 3–6, 9, 10, Exs. 1–4, 7–8).

Patent Owner replies that Dr. Sung’s Declaration “never represented . . . that claims 1–7 and 13–21 are **not** entitled to earlier priority dates.” PO Sur-reply 11–12. Patent Owner asserts Petitioner’s arguments addressing Dr. Sung’s Declaration “seem to suggest that all claims in the ’802 patent are entitled to only a single priority date” which “is not legally sound.” *Id.* at 12 (citation omitted). As to the declaration of Dr. Sung’s counsel in the Kinik Litigation, Patent Owner argues it “merely provides a redline comparison of the specifications of the ’802 patent and several related patents,” which “is, at most, a textual exercise but otherwise does not speak to whether Patent Owner disclaimed priority as a legal matter.” *Id.* at 12–13 (citing *Hologic, Inc. v. Smith & Nephew, Inc.*, 884 F.3d 1357, 1364 (Fed. Cir. 2018)).

We conclude that Patent Owner’s reading of Dr. Sung’s Declaration as being limited to claims 8–12 of the ’802 patent flies in the face of the statements made in the Declaration, and deliberately ignores the reason why the Declaration was proffered in the Kinik Litigation. As to the statements made, the Declaration unambiguously avers that Dr. Sung “invented the subject matter that forms the basis of . . . the ’802 Patent” after the Kinik joint venture terminated, and that “this new subject matter . . . claimed in the ’802 Patent . . . is not disclosed in any of the patents or patent applications to which the ’802 Patent claims priority.” Ex. 1011 ¶¶ 17–18. The term “new” in the Declaration refers to postdating the termination of the Kinik joint venture, not to parsing between different priority filing dates for different claims as Patent Owner now would have it. *See id.*

Further, the Declaration's reference to the subject matter claimed in the '802 patent must have included at least claim 1, because claim 1 is the sole independent claim in the patent. *See* Ex. 1001, 27:54–29:15. Indeed, the Declaration did not address different claims of the '802 patent in any fashion, such as differentiating between claim 1 and its dependent claims 8–12 as Patent Owner now argues. *See* Ex. 1011 ¶¶ 17–21. And finally, the Declaration did not state merely that the '802 patent “contained ‘new subject matter’” as Patent Owner presently characterizes it. PO Resp. 32.

As to the purpose for proffering the Declaration in the Kinik Litigation, Patent Owner successfully relied on the testimony to argue the District Court should deny Kinik's motion to stay the litigation “because the [’802 patent] cannot be the subject of the joint venture.” Ex. 1012, 2; *see* Ex. 1059, 2–3, 6. That purpose was achieved after the District Court “sought clarification” as to Patent Owner's position on priority, upon which “Plaintiff [Dr. Sung] has clearly stated that he only claims priority to October 3, 2014” and “Plaintiff [Dr. Sung] claims a priority date of October 3, 2014; no earlier.” Ex. 1012, 2 & n.4; *see also id.* at 5 (denying Kinik's motion to stay).

It is true, as Patent Owner points out, that the District Court did not make any determinations as to the filing date priority for the '802 patent claims. *See id.* at 2 & n.4. Nonetheless, Dr. Sung unambiguously testified that the subject matter claimed in the '802 patent is not disclosed in any of its parent applications preceding the joint venture's termination in October 2013. *See* Ex. 1011 ¶¶ 17–18. That includes all three of the parent applications presently at issue in this proceeding, which were filed in September 2005, November 2006, and May 2011. *See* Ex. 1001, code (60)

(App. No. 61/489,074); *id.* at code (63) (App. Nos. 11/223,786 and 11/560,817). If claim 1 of the '802 patent is indeed entitled to filing date priority to any one of those three dates as Patent Owner now argues before the Board, then it would seem that at least claim 1 of the '802 patent should have been subject to the joint venture with Kinik, contrary to Patent Owner's representations to the District Court. See Ex. 1012, 1–2 & n.4; Ex. 1059, 2–3, 6.

Patent Owner's Motion to Exclude Evidence objects to Petitioner's filing of Exhibits 1059 and 1060 with the Petitioner Reply, on the basis that "[t]here is no reason why Petitioner[] could not have submitted these exhibits with the Petition" so they were "filed belatedly without proper authorization under 37 C.F.R. § 42.123(b)." Paper 30, 12. We are not persuaded, for two reasons. First, this is not an *evidentiary* issue that can be raised via a Motion to Exclude Evidence. Second, Petitioner's submission of Exhibits 1059 and 1060 was not improper. A petitioner "may submit rebuttal evidence in support of its reply." Practice Guide, 73 (citing *Belden Inc. v. Berk-Tek LLC*, 805 F.3d 1064, 1077–78 (Fed. Cir. 2015)); see Pet. Reply 13. That is what occurred here, where Petitioner filed Exhibits 1059 and 1060 to bolster Petitioner's reading of Dr. Sung's Declaration as set forth in the Petition (see Pet. 16–20), after Patent Owner disputed that reading in the Patent Owner Response. Exhibits 1059 and 1060 were not required to make out a *prima facie* case of unpatentability. See Practice Guide 73; *Belden*, 805 F.3d at 1078–79.

Patent Owner's Motion to Exclude also seeks to exclude Exhibits 1059 and 1060 from evidence as lacking relevancy, and as being needlessly cumulative of Exhibit 1011. See Paper 30, 11–12 (citing Pet. Reply 14;

Fed. R. Evid. 401, 402); Paper 31, 10–12; Paper 32, 5. We disagree. As discussed at length above, Exhibits 1059 and 1060 are relevant to Patent Owner’s assertions in this proceeding concerning the filing date priority of the ’802 patent claims. Thus, we deny Patent Owner’s Motion to Exclude Exhibits 1059 and 1060.

We now turn to the merits of the parties’ disputes as to whether claim 1 of the ’802 patent has written description support in the three parent applications cited by Patent Owner. We bear in mind that Dr. Sung testified in the Kinik Litigation that claim 1 is not disclosed in any of the ’802 patent’s parent applications to oppose Kinik’s motion to stay, yet now Patent Owner argues claim 1 has written description support in three of those parent applications to oppose Petitioner’s reliance on Tsai, Sung ’026, and Sung ’146 as prior art.

(b) U.S. Patent Application No. 11/560,817

The ’802 patent was filed as a continuation-in-part of U.S. Patent Application No. 11/560,817 (“the ’817 Application”) through intermediary applications. See Ex. 1001, code (63), 1:4–38. The ’817 Application is found in the record as Exhibit 2001. See PO Resp. i (Table of Exhibits), 8. We conclude the ’817 Application does not provide written description support for limitations [1E] and [1F] of claim 1 of the ’802 patent.

(i) The ’817 Application Does Not Support Limitation [1E]

Petitioner argues the ’817 Application does not provide written description support for limitation [1E], which recites “the difference in protrusion distance between the highest protruding tip and the second highest protruding tip of the monolayer of superabrasive particles is less than

or equal to about 50 microns.” Ex. 1001, 27:64–67; *see* Pet. 20–22 (blue highlights); Ex. 1002 ¶¶ 70–74, 77. We agree, for the following reasons.

Patent Owner’s Reliance on Arguments for Limitation [1D]

Patent Owner’s argument for why the ’817 Application supports limitation [1E] firstly refers back to Patent Owner’s argument for limitation [1D]. *See* PO Resp. 11 (Third Column, “*See* Limitation 1[D].”). However, Patent Owner does not explain any relationship between the two limitations [1D] and [1E] to justify Patent Owner’s argument for the former applying to the latter. *See id.* We do not discern such a relationship from the plain language of the claim.

Also, we have reviewed the ’817 Application disclosures cited by Patent Owner as supporting limitation [1D]. *See id.* at 10 (citing Ex. 2001, 13:5–10, 14:10–16). They state most pertinently that “a majority of the plurality of cutting elements is arranged such that the tips vary from the designated profile by from about 1 micron to about 150 microns.” Ex. 2001, 14:14–16; *see* PO Resp. 15; Ex. 2011 ¶ 58. That does not demonstrate possession of limitation [1E], for at least two reasons.

First, it refers to a *majority* of the tips (that is, more than half of them), without specifying that the two highest tips per limitation [1E] must be part of the majority rather than the minority that may deviate from the designated profile by less than about 1 micron or more than about 150 microns.

Second, even if the two highest tips are part of the majority group, that still does not demonstrate possession of limitation [1E] as we discuss next.

Tip Variation from Designated Profile

Patent Owner next argues Petitioner has “construed ‘designated profile’ and ‘tip variation’ therefrom as the ‘average protrusion distance of the diamond tips.’” PO Resp. 11 (citing Pet. 36–38). Patent Owner disagrees with Petitioner’s position, but asserts that if it is adopted, then the ’817 Application demonstrates possession of limitation [1E]. *See id.* (citing Ex. 2001, 14:14–15:4).

Patent Owner and Dr. Tsai cite the ’817 Application’s disclosure that “the plurality of cutting elements are arranged such that their tips vary from the designated profile by” various ranges, including about 5–150 microns, about 5–100 microns, about 10–75 microns, about 10–50 microns, about 50–150 microns, about 20–100 microns, about 20–50 microns, about 20–40 microns, less than about 20 microns, less than about 10 microns, less than about 5 microns, and less than about 1 micron. Ex. 2001, 14:6–15:6; *see* PO Resp. 11, 15; Ex. 2011 ¶ 58.

Dr. Tsai explains that although “these disclosures relate to variation from a designated profile,” a POSITA nonetheless “would know that the claimed difference in protrusion distance of ‘less than or equal to about 50 microns’ between the highest and second highest tips are supported by” these disclosures. Ex. 2011 ¶¶ 58–59; *see* PO Resp. 15. “This is because any two tips that vary from a reference point (whether it is the designated profile or another vantage point) would necessarily yield a height difference between those two tips.” Ex. 2011 ¶ 60; *see* PO Resp. 16. Further according to Dr. Tsai, the ’817 Application’s repeated reference to “*the plurality of cutting elements*” (Ex. 2001, 14:16–15:6 (emphasis added))

necessarily includes the cutting elements with the two highest tips. See Ex. 2011 ¶¶ 63–64; PO Resp. 17–18.

As a first example of how the foregoing disclosures demonstrate possession of the two highest tips differing in protrusion distance by less than or equal to about 50 microns, Dr. Tsai combines the '817 Application's disclosure of all tips varying from a designated profile by from about 20–50 microns (see Ex. 2001, 14:24–26) with Dr. Shanfield's testimony that the designated profile may be a *planar* profile. See Ex. 2011 ¶ 61 (citing Ex. 2008 ¶ 115); PO Resp. 16. Dr. Tsai concludes that, in this example, the difference in protrusion distance between the two highest protruding tips “would at least be between about 0 microns (e.g., where they both have the same height of about 20 microns) and about 50 microns (e.g., where one tip perfectly aligns with the designated profile and the other is above/below the designated profile by about 50 microns).” Ex. 2011 ¶ 61; see PO Resp. 16.

As a second example, Dr. Tsai combines the '817 Application's disclosure of all tips varying from a designated profile by less than about 20 microns (see Ex. 2001, 14:27–30) with Dr. Shanfield's testimony that the designated profile may be a *planar* profile. See Ex. 2011 ¶¶ 61–62 (citing Ex. 2008 ¶ 115); PO Resp. 16–17. Dr. Tsai concludes that, in this example, the difference in protrusion distance between the two highest protruding tips “would at least be between about 0 micron (e.g., where they both have the same height of about 20 microns) and about 40 microns (e.g., where one tip is below/above the designated profile by about 20 microns and the other is above/below the designated profile by about 20 microns).” Ex. 2011 ¶ 62; see PO Resp. 16–17.

Dr. Tsai expounded on his declaration testimony during his deposition, under re-direct examination by Patent Owner's counsel. *See* PO Sur-reply 2–6 (citing Ex. 1055, 181:10–12, 182:9–12, 182:17–183:16, 185:22–24; Ex. 2017); Ex. 1055, 5 (pages 146–190 of the deposition transcript reflect examination by Patent Owner's counsel). Dr. Tsai testified that “[i]t’s obvious for ’817, the range is from 1 micron to 150 micron, so 50 micron is in this range.” Ex. 1055, 180:1–181:22; *see also* PO Sur-reply 3 (citing Ex. 1055, 181:10–12); Ex. 2001, 14:14–16 (“a majority of the plurality of cutting elements is arranged such that the tips vary from the designated profile by from about 1 micron to about 150 microns”).

Dr. Tsai prepared a hand-drawn illustration (Exhibit 2017) in which the highest tip (HT) is 150 microns above the substrate and the second highest tip (SHT) is 50 microns below the highest tip, and wherein the “designated profile” (DP) of claim 1 is defined as a planar profile at the highest tip (HT). *See* Ex. 2017; Ex. 1055, 181:1–182:14; *see also* PO Sur-reply 2–3, 5 (citing Ex. 1055, 182:9–12). Patent Owner asserts Dr. Tsai’s illustration demonstrates that the second highest tip (SHT) must be “in the range of less than or equal to about 50 microns” away from the highest tip per limitation [1E], because “a designated profile of ‘about 1 microns to about 150 microns’ must include a HT of 150 microns and a SHT of 100 microns.” PO Sur-reply 2, 5–6.

We are persuaded by Petitioner’s reply that the ’817 Application does not demonstrate possession of limitation [1E], despite the foregoing testimony from Dr. Tsai. *See* Pet. Reply 11–12.

First, the '817 Application disclosures cited by Patent Owner concern various *ranges for particle tips to vary from a designated planar profile*, whereas limitation [1E] is directed to *the two highest tips differing in protrusion distance by less than or equal to about 50 microns*. Thus, we find no express disclosure in the '817 Application demonstrating possession of limitation [1E].

Second: “[U]nder a narrow set of circumstances, the written description requirement may be satisfied without an explicit disclosure if the claimed features are necessarily inherent in what is expressly described.” *Nuvo Pharms. (Ireland) Designated Activity Co. v. Dr. Reddy’s Lab’ys. Inc.*, 923 F.3d 1368, 1382–83 (Fed. Cir. 2019); *see also PowerOasis*, 522 F.3d at 1306–07 (“[T]he written description [must] actually or inherently disclose the claim element.”). An inherent disclosure may be found only if it “is necessarily present” in the reference, and “may not be established by probabilities or possibilities.” *In re Montgomery*, 677 F.3d 1375, 1379–80 (Fed. Cir. 2012). The fact that a certain characteristic may be, but is not necessarily, present in the prior art is not sufficient to establish the inherency of that characteristic. *Cont’l Can Co. USA, Inc. v. Monsanto Co.*, 948 F.2d 1264, 1268–69 (Fed. Cir. 1991).

We do not find an inherent disclosure in the '817 Application demonstrating possession of the upper end of the range specified in limitation [1E] — that is, the two highest tips differing in protrusion distance by about 50 microns. It does not follow from Dr. Tsai’s first example, citing the '817 Application’s disclosure that all tips can vary from a designated planar profile by from about 20–50 microns, that the two highest tips necessarily differ in protrusion distance by about 50 microns. Specifically,

although it may be *possible* for those two things to occur at once as Dr. Tsai posits (see Ex. 2011 ¶ 61), it is not *necessarily* so. Indeed, according to Dr. Tsai's testimony, it is equally possible for the two highest tips to differ in protrusion distance by about 0 microns while still having all tips fall within about 20–50 microns from a designated planar profile. See *id.*

It similarly does not follow from Dr. Tsai's second example, citing the '817 Application's disclosure that all tips can vary from a designated planar profile by less than about 20 microns, that the two highest tips necessarily differ in protrusion distance by about 50 microns. Indeed, Dr. Tsai acknowledges that in this example, the maximum difference in protrusion distance between the two highest tips is only about 40 microns, much less than the claimed maximum of about 50 microns. See Ex. 2011 ¶ 62.

Dr. Tsai's deposition testimony fares no better. He cites no disclosures in the '817 Application that the separation between the highest tip (HT) and the second highest tip (SHT) might be 50 microns, as illustrated in his drawing. See Ex. 2017; Ex. 1055, 180:1–183:16. Dr. Tsai appears to have chosen this separation distance on the sole basis that limitation [1E] specifies 50 microns as the upper end of the claimed range. But, similarly to Dr. Tsai's first example in his declaration, it does not follow from the '817 Application's disclosure that all tips can vary from a designated planar profile by from about 1–150 microns, that the two highest tips necessarily differ in protrusion difference by about 50 microns. Although it may be *possible* for those two things to occur at once, it is not *necessarily* so.

Indeed, the present case is analogous to *In re Fisher*, 427 F.2d 833 (CCPA 1970). In *Fisher*, the specification demonstrated possession of products having potencies from about 1.11 to 2.30 International Units, and

the claim recited “at least 1 International Unit.” *Id.* at 835 (claim 4), 839. The Court held the patent applicant had “not enabled the preparation of ACTHs having potencies much greater than 2.3, and the claim recitations of potency of ‘at least 1’ render the claims insufficiently supported under the first paragraph of 35 U.S.C. § 112.” *Id.* at 1108. Here too, the ’817 Application does not demonstrate possession of the upper end of the range recited in limitation [1E].

The present case also is analogous to *General Hospital Corp. v. Sienna Biopharms., Inc.*, 888 F.3d 1368 (Fed. Cir 2018). In *General Hospital*, the Court held that “[t]he disclosure of a broad range of values does not by itself provide written description support for a particular value within that range,” and “[i]nstead, where a specification discloses a broad range of values and a value within that range is claimed, the disclosure must allow one skilled in the art to ‘immediately discern the limitation at issue in the claims.’” *Id.* at 1372 (quoting *Purdue Pharma L.P. v. Faulding Inc.*, 230 F.3d 1320, 1323 (Fed. Cir. 2000)). The ’817 Application also discloses a broad range of values for all tips to vary from a designated planar profile, which does not allow a person of ordinary skill in the art to immediately discern possession of the two highest tips differing in protrusion distance by about 50 microns.

Indivior UK Limited v. Dr. Reddy’s Lab ’ys. S.A., 18 F.4th 1323 (Fed. Cir 2021) is also instructive. In *Indivior*, the Court determined that a claim directed to a film comprising “about 40 wt % to about 60 wt % of a water-soluble polymeric matrix” did not have written description support in a specification that did not expressly claim that range, did not state either of the two end values (40% and 60%), and did not disclose the range

(40–60%). *Id.* at 1325 (claim 1), 1327–30 (discussing claim 1). In particular: “In the case of a claimed range, a skilled artisan must be able to reasonably discern a disclosure of that range” in the specification at issue.¹¹ *Id.* at 1328. We conclude Dr. Tsai’s testimony here does not establish a POSITA could reasonably discern a disclosure of limitation [1E] in the ’817 Application for the reasons provided above.

The *Indivior* decision also considered a narrower claim directed to a film comprising “about 48.2 wt % to about 58.6 wt % of the water-soluble polymeric matrix,” and concluded that it also did not have written description support in the specification at issue, even though the specification provided examples of films having the two end point values of the range (48.2% and 58.6%). *See id.* at 1325 (claim 7), 1329–30 (discussing claim 7). The Court concluded that finding written description support on those facts would “amount[] to cobbling together numbers after the fact” whereas “[a] written description sufficient to satisfy the requirement of the law requires a statement of an invention, not an invitation to go on a hunting expedition to patch together after the fact a synthetic definition of an invention.” *Id.* at 1329. We conclude Dr. Tsai’s testimony corresponds to a hunting expedition that conflicts with the *Indivior* decision for the reasons provided above.

¹¹ The *Indivior* decision was a 2–1 panel decision, over a vigorous dissent. However, the principal disagreement between the majority and dissenting opinions was whether the disclosure of *specific numerical percentages* in the specification might demonstrate possession of the *range of percentages*. In this respect, the facts of the case before us present an easier issue to decide, because the ’817 Application does not expressly address the subject matter of limitation [1E] at all, only by implication per Patent Owner’s arguments.

Third, Dr. Tsai further testifies about alleged “protrusion distances” being disclosed in the ’817 Application in various ranges. *See* Ex. 2011 ¶ 62 (citing Ex. 2001, 13:5–8). This testimony is not supported by the cited passage in the ’817 Application, which states only that “[i]t may also be beneficial for the cutting elements to protrude from the solidified organic material layer to a predetermined height or series of heights that is/are along a designated profile” and “[n]umerous configurations for designated profiles are possible.” Ex. 2001, 13:5–8. There is nothing there about a numerical difference in protrusion distance between tips as Dr. Tsai would have it.

Fourth, Patent Owner suggests that, if we accept Petitioner’s argument for how Tsai discloses limitations [1D] and [1E], then we must apply the same theory to find the ’817 Application demonstrates possession of limitation [1E]. *See* PO Resp. 18 (citing Pet. 37–38; Inst. Dec. 64). We disagree. There is “a subtle distinction between a written description adequate to *support* a claim under § 112 and a written description sufficient to *anticipate* its subject matter under § 102(b).” *Vas-Cath Inc. v. Mahurkar*, 935 F.2d 1555, 1562 (Fed. Cir 1991) (cited at Pet. 22 n.8). For example: “[T]he description of a single embodiment of broadly claimed subject matter constitutes a description of the invention for anticipation purposes . . . , whereas the same information in a specification might not alone be enough to provide a description of that invention for purposes of adequate disclosure.” *Id.* (quoting *In re Lukach*, 442 F.2d 967, 970 (CCPA 1971)); *see also Indivior*, 14 F.4th at 1325–30 (concluding that “the polymer weight percentage limitations, added to the claims by amendment, do not have written description support in the ’571 application as filed,” but the claims

nonetheless “were anticipated by . . . the . . . publication of the ’571 application”).

As discussed below in Section III.E.2(c), we find Tsai discloses a pad dresser in which *all* of the tips fall within a height distribution envelope that is 19.8 microns wide, from which it necessarily follows that *the two highest tips* differ in protrusion distance by less than or equal to 19.8 microns thereby satisfying the “less than or equal to about 50 microns” range of limitation [1E]. *See, e.g., Ineos USA LLC v. Berry Plastics Corp.*, 783 F.3d 865, 869 (Fed. Cir. 2015) (“When a patent claims a range, as in this case, that range is anticipated by a prior art reference if the reference discloses a point within the range.”).

As Patent Owner correctly points out, applying that same analysis to Dr. Tsai’s first example of the ’817 Application’s disclosure (i.e., all tips varying from a designated planar profile by from about 20–50 microns) might support a finding of *anticipation* by a publication of the ’817 Application per 35 U.S.C. § 102. However, for all the reasons provided above, the ’817 Application nonetheless does not *support* limitation [1E] per 35 U.S.C. § 112, as reflected by the decisions in *Vas-Cath*, *General Hospital*, and *Indivior*.

Conclusion Regarding Limitation [1E]

We conclude Petitioner has shown by a preponderance of the evidence that the ’817 Application does not provide written description support for limitation [1E].

(ii) *The '817 Application Does Not Support Limitation [1F]*

Petitioner argues the '817 Application does not provide written description support for limitation [1F], which recites “the difference in protrusion distance between the highest 1% of the protruding tips of the monolayer of superabrasive particles are within about 80 microns or less.” Ex. 1001, 28:1–4; see Pet. 20–22 (orange highlights); Ex. 1002 ¶¶ 70–74, 77. We agree, for the following reasons.

Patent Owner's Reliance on Arguments for Limitation [1E]

Patent Owner's argument for why the '817 Application supports limitation [1F] firstly refers back to Patent Owner's argument for limitation [1E]. See PO Resp. 13 (Third Column, “See Limitation [1E].”). However, Patent Owner does not explain any relationship between the two limitations [1E] and [1F] to justify Patent Owner's argument for the former applying to the latter. See *id.* We do not discern such a relationship from the plain language of the claim. Moreover, Patent Owner's arguments for limitation [1E] are unavailing, as discussed above in Section III.D.2(b)(i).

Tip Variation from Designated Profile

Patent Owner and Dr. Tsai cite, as demonstrating possession of limitation [1F], the '817 Application's disclosure that “the plurality of cutting elements are arranged such that their tips vary from the designated profile by from about 5 microns to about 100 microns,” or “from about 10 microns to about 75 microns,” or “from about 10 microns to about 50 microns.” Ex. 2001, 14:16–21; see PO Resp. 13 (citing Ex. 2001, 14:14–21), 18–19 (citing Ex. 2001, 14:16–21); Ex. 2011 ¶¶ 65–67.

Dr. Tsai explains this disclosure “references ‘the plurality of cutting elements,’ which covers all of the tips, including the highest 1%.” Ex. 2011 ¶¶ 66–67 (citing Ex. 1002 ¶ 142); *see* PO Resp. 18–19. Dr. Tsai then concludes: “[F]or the same reasons discussed above with respect to claim limitation [1E], information about [how] tips vary from the designated profile would provide information on a height difference between those two tips.” Ex. 2011 ¶ 66; *see* PO Resp. 18–19. Thus, as an example of how the ’817 Application demonstrates possession of the highest 1% of tips differing in protrusion distance within about 80 microns or less, Dr. Tsai testifies that:

[A]ny two tips that “vary from the designated profile by from about 5 microns . . . to about 75 microns” would mean that their height difference would at least be between about 0 micron (e.g., where they both have the same height of about 5 microns) and about 80 microns (e.g., where one tip is below/above the designated profile by about 5 microns and the other is above/below the designated profile by about 75 microns).

Ex. 2011 ¶ 66; *see* PO Resp. 19.

Dr. Tsai expounded on his declaration testimony during his deposition, under re-direct examination by Patent Owner’s counsel. *See* PO Sur-reply 6–8 (citing Ex. 1055, 183:22–184:6, 185:11–19, 185:25–186:6; Ex. 2018). Dr. Tsai testified that “[t]he range here [in the ’817 Application] says from zero to 100 micron.” Ex. 1055, 183:22–184:1; *see* PO Sur-reply 6; *but see* Ex. 2001, 14:16–21 (disclosing ranges of 1–150 microns and 5–100 microns, but not 0–100 microns). Dr. Tsai correspondingly prepared a hand-drawn illustration (Exhibit 2018) in which the highest tip is 100 microns above the substrate with several other tips being within an 80 micron envelope below the highest tip, and wherein the “designated profile” of claim 1 is defined as a planar profile at the highest

tip. See Ex. 2018; Ex. 1055, 183:22–184:6, 185:11–186:6; PO Sur-reply 6–7. Patent Owner asserts Dr. Tsai’s illustration shows how the ’817 Application demonstrates possession of the highest 1% of tips differing in protrusion distance within about 80 microns or less. See PO Sur-reply 6–8.

We are persuaded by Petitioner’s reply that the ’817 Application does not demonstrate possession of limitation [1F], despite the foregoing testimony from Dr. Tsai, for basically the same reasons provided above in relation to limitation [1E]. See Pet. Reply 11–12; *supra* Section III.D.2(b)(i).

First, the ’817 Application disclosures cited by Patent Owner concern various *ranges for particle tips to vary from a designated planar profile*, whereas limitation [1F] is directed to *the highest 1% of tips differing in protrusion distance within about 80 microns or less*. Thus, we find no express disclosure in the ’817 Application demonstrating possession of limitation [1F]. Dr. Tsai essentially agreed on cross-examination. See Ex. 1055, 105:9–25 (“Q. Does [Ex. 2001, 14:16–21] tell you anything about the highest 1 percent of the protruding tips? A. Not from the text. Q. Is there anything else in there that would inform you about the highest 1 percent of the protruding tips? A. From the text, no.”).

Second, we do not find an inherent disclosure in the ’817 Application demonstrating possession of the upper end of the range specified in limitation [1F] — that is, the highest 1% of tips differing in protrusion distance within about 80 microns. It does not follow, from the ’817 Application’s disclosure of tip variations from a designated profile by about 5–100 microns or any other specified range, that the highest 1% of tips will differ in protrusion distance within about 80 microns. Specifically,

although it may be *possible* for those two things to occur at once as Dr. Tsai posits (see Ex. 2011 ¶ 66), it is not *necessarily* so. Indeed, according to Dr. Tsai’s testimony, it is equally possible for the highest 1% of tips to differ in protrusion distance by about 0 microns while still having all tips fall within the variously specified ranges around a designated profile. *See id.*

Dr. Tsai’s deposition testimony fares no better. He cites no disclosures in the ’817 Application that the separation between the highest tip and any other tip(s) might be 80 microns, as illustrated in his drawing. *See* Ex. 2018; Ex. 1055, 183:22–184:6, 185:11–186:6. Dr. Tsai appears to have chosen this separation distance on the sole basis that limitation [1F] specifies 80 microns as the upper end of the claimed range. But, it does not follow from the ’817 Application’s disclosure that the tips can vary from a designated planar profile by about 5–100 microns (for example), that the highest 1% of tips differ in protrusion distance within about 80 microns. Although it may be *possible* for those two things to occur at once, it is not *necessarily* so.

And, the present case is somewhat analogous to the *Fisher*, *General Hospital*, and *Indivior* decisions discussed above in Section III.D.2(b)(i).

Conclusion Regarding Limitation [1F]

We conclude Petitioner has shown by a preponderance of the evidence that the ’817 Application does not provide written description support for limitation [1F].

(c) *U.S. Patent Application No. 11/223,786*

The ’802 patent was filed as a continuation-in-part of U.S. Patent Application No. 11/223,786 (“the ’786 Application”) through intermediary

applications. See Ex. 1001, code (63), 1:4–38. The ’786 Application is found in the record as Exhibit 2009. See PO Resp. i (Table of Exhibits), 8. We conclude the ’786 Application does not provide written description support for limitations [1E] and [1F] of claim 1 of the ’802 patent.

(i) *The ’786 Application Does Not Support Limitation [1E]*

Petitioner argues the ’786 Application does not provide written description support for limitation [1E], which recites “the difference in protrusion distance between the highest protruding tip and the second highest protruding tip of the monolayer of superabrasive particles is less than or equal to about 50 microns.” Ex. 1001, 27:64–67; see Pet. 20–22 (blue highlights); Ex. 1002 ¶¶ 70–74, 77. We agree, for the following reasons.

Tip Variation from Designated Profile

Patent Owner argues Petitioner has “construed ‘designated profile’ and ‘tip variation’ as the ‘average protrusion distance of the diamond tips.’” PO Resp. 12 (citing Pet. 36–38). Patent Owner disagrees with Petitioner’s position, but asserts that if it is adopted, then the ’786 Application demonstrates possession of limitation [1E]. See *id.* at 12–13 (citing Ex. 2009, 13:3–4, 13:12–14, 13:34–14:1, 20:20–22, claims 12, 13, 14, 17, 21–33, 41, 42, 53).

Patent Owner and Dr. Tsai cite the ’786 Application’s disclosure that “the plurality of superabrasive particles are arranged such that their tips vary from the designated profile by” various ranges, including about 5–100 microns, about 10–75 microns, about 10–50 microns, about 50–150 microns, about 20–100 microns, about 20–50 microns, about 20–40 microns, less than about 20 microns, less than about 10 microns, less than about 5 microns, and

less than about 1 micron.¹² Ex. 2009, 12:20–13:14; see PO Resp. 12–13, 21; Ex. 2011 ¶ 70.

Dr. Tsai explains that although these disclosures relate to variation from a designated profile, they still demonstrate possession of limitation [1E] “for the same reason[s] that” similar disclosures in the ’817 Application allegedly do so, as discussed above in Section III.D.2(b)(i). Ex. 2011 ¶ 71; see PO Resp. 21–22. Dr. Tsai’s additional deposition testimony on this point is also the same as discussed above. See PO Sur-reply 8 (“Dr. Tsai testified that these opinions applied equally to [the ’786 Application] such that [the ’786 Application] provides written support for the ’802 patent based on the same reasoning as [the ’817 Application].”) (citing Ex. 1055, 186:13–17).

We are persuaded by Petitioner’s reply that the ’786 Application does not demonstrate possession of limitation [1E], despite the foregoing testimony from Dr. Tsai, for the same reasons provided above in relation to limitation [1E] and the ’817 Application. See Pet. Reply 13; *supra* Section III.D.2(b)(i).

¹² Patent Owner and Dr. Tsai also cite the ’786 Application’s disclosure that “a majority of the plurality of superabrasive particles are arranged such that their tips vary from the designated profile by from about 1 micron to about 150 microns.” Ex. 2009, 12:22–24 (emphasis added); see PO Resp. 21; Ex. 2011 ¶ 70. However, as discussed above in Section III.D.2(b)(i) concerning a similar disclosure in the ’817 Application, the reference to a majority of the tips (that is, more than half of them) is not related to the two highest tips per limitation [1E].

Particle Height Variance from a Predetermined Height

Patent Owner also cites the '786 Application's disclosure that "each" of the particles, which necessarily includes the two highest particles per limitation [1E], "may protrude to a predetermined height" that may be "greater than about 20 microns" with "variation from the predetermined height . . . from about 1 micron to about 20 microns." Ex. 2009, 19:9–18, 33 (claims 31 and 32); *see* PO Resp. 11 (citing Ex. 2009, 19:10–12, 19:15–18), 12 (citing Ex. 2009, claim 32).

We are persuaded by Petitioner's reply that the '786 Application does not demonstrate possession of limitation [1E], for basically the same reasons provided above in relation to limitation [1E] and the '817 Application. *See* Reply Br. 13; *supra* Section III.D.2(b)(i).

First, the '786 Application disclosures cited by Patent Owner concern *a range (about 1–20 microns) for the particle height to vary from a predetermined height*, which is basically the same concept as the '817 Application's disclosure of *particle tip variance from a designated planar profile*.¹³ By contrast, limitation [1E] is directed to *the two highest tips differing in protrusion distance by less than or equal to about 50 microns*. Thus, we find no express disclosure in the '786 Application demonstrating possession of limitation [1E].

Second, we do not find an inherent disclosure in the '786 Application demonstrating possession of the upper end of the range specified in limitation [1E] — that is, the two highest tips differing in protrusion distance

¹³ This views the '786 Application most favorably to Patent Owner's position, whereby the "predetermined height" is the same for all particles, rather than being different for different particles. *See* Ex. 2009, 19:9–18.

by about 50 microns. It does not follow from the '786 Application's disclosure of particle heights varying from a predetermined height by about 1–20 microns that the two highest tips necessarily differ in protrusion distance by about 50 microns. Indeed, given the disclosed envelope of 1–20 microns, the maximum difference in protrusion distance between the two highest tips is only about 40 microns, much less than the claimed maximum of about 50 microns. And, the present case is somewhat analogous to the *Fisher*, *General Hospital*, and *Indivior* decisions discussed above in Section III.D.2(b)(i).

Maximum Particle Tip Height

Patent Owner further cites the '786 Application's disclosure that "a majority of the plurality of superabrasive particles" have tips that "protrude to less than about 40 microns," or "less than about 30 microns," or "about 20 microns," as demonstrating possession of limitation [1E]. Ex. 2009, 31 (claims 13–15); see PO Resp. 11 (citing Ex. 2009, claims 12–15), 23 (citing Ex. 2009, 3:25–33).

We are persuaded by Petitioner's reply that the '786 Application does not demonstrate possession of limitation [1E]. See Reply Br. 13.

First, the cited disclosures refer to a *majority* of the particle tips (that is, more than half of them), without specifying that the two highest tips per limitation [1E] must be part of the majority rather than the minority that may have tips above the specified maximums of about 40, 30, or 20 microns. Moreover, even if the two highest tips are part of the majority group, that still does not demonstrate possession of limitation [1E], as follows.

Second, the '786 Application disclosures cited by Patent Owner concern *a maximum height (about 40, 30, or 20 microns) for the particle tips*, whereas limitation [1E] is directed to *the two highest tips differing in protrusion distance by less than or equal to about 50 microns*. Thus, we find no express disclosure in the '786 Application demonstrating possession of limitation [1E].

Third, we do not find an inherent disclosure in the '786 Application demonstrating possession of the upper end of the range specified in limitation [1E] — that is, the two highest tips differing in protrusion distance by about 50 microns. It does not follow from the '786 Application's disclosure of various maximum particle tip heights that the two highest tips necessarily differ in protrusion distance by about 50 microns. Indeed, given that the largest maximum height is about 40 microns, the maximum difference in protrusion distance between the two highest tips is only about 40 microns, much less than the claimed maximum of about 50 microns. And, the present case is somewhat analogous to the *Fisher*, *General Hospital*, and *Indivior* decisions discussed above in Section III.D.2(b)(i).

Particle Size

Patent Owner moreover relies on the combination of claims 12, 17, and 41 in the '786 Application as demonstrating possession of limitation [1E]. See PO Resp. 11–12. Those claims recite:

12. The method of claim 7, wherein a majority of the plurality of superabrasive particles are arranged such that their tips vary from the designated profile to less than about 10% of the average size of the superabrasive particles.

17. The method of claim 1, wherein the plurality of superabrasive particle[s] are from about 30 microns to about 500 microns in size.
41. The tool of claim 31, wherein the plurality of superabrasive particles are arranged such that their tips protrude to about 10% of the average size of the superabrasive particles.

Ex. 2009, 31, 34. Patent Owner emphasizes that claim 17 provides “the plurality of superabrasive particles are from ***about 30 microns to about 500 microns in size.***” PO Resp. 11. Patent Owner then asserts claims 12, 17, and 41 together reflect that “the difference in protrusion distance between the highest and the second highest tip . . . can be between about 3 microns to about 50 microns (‘10%’ of ‘about 30 microns’ to ‘10%’ of ‘about 500 microns’[]).” *Id.* at 11–12.

Dr. Tsai similarly cites the ’786 Application’s specification disclosures supporting claims 12, 17, and 41 to conclude “a POSITA would understand [from the ’786 Application] that the tips could vary from about 0 micron (e.g., where the tips have the same size) to about 50 microns (e.g., 10% of 500 microns) with respect to the designated profile.” Ex. 2011 ¶ 72 (citing Ex. 2009, 13:12–14, 13:34–14:4); PO Resp. 22. Dr. Tsai further testifies that “this range would necessarily cover the difference in protrusion distance between the two highest tips” per limitation [1E], “e.g., where the highest tip is 50 microns above the designated profile and the second highest tip is of the same height as the designated profile (i.e., about 0 micron)” thereby “yield[ing] ‘less than or equal to about 50 microns’ in their difference in protrusion distance.” Ex. 2011 ¶ 72; *see* PO Resp. 22.

We are persuaded by Petitioner’s reply that the ’786 Application does not demonstrate possession of limitation [1E], despite the foregoing testimony from Dr. Tsai. *See* Pet. Reply 13.

First, none of the ’786 Application disclosures cited by Patent Owner and Dr. Tsai are directed to *the two highest tips differing in protrusion distance by less than or equal to about 50 microns* per limitation [1E], as demonstrated by the mathematical combinations of disparate disclosures summarized above. Thus, we find no express disclosure in the ’786 Application demonstrating possession of limitation [1E].

Second, we do not find an inherent disclosure in the ’786 Application demonstrating possession of the upper end of the range specified in limitation [1E] — that is, the two highest tips differing in protrusion distance by about 50 microns. Specifically, although it may be *possible* for limitation [1E] to be satisfied by Patent Owner’s and Dr. Tsai’s mathematical combinations of ’786 Application disclosures, it is not *necessarily* so. Indeed, according to Dr. Tsai’s testimony, it is equally possible for the two highest tips to differ in protrusion distance by about 0 microns per his mathematical calculations. *See* Ex. 2011 ¶ 72.

Third, the present case is somewhat analogous to *Indivior, supra*. We conclude Patent Owner’s and Dr. Tsai’s mathematical combinations of ’786 Application disclosures “amount[] to cobbling together numbers after the fact,” whereas “[a] written description sufficient to satisfy the requirement of the law requires a statement of an invention, not an invitation to go on a hunting expedition to patch together after the fact a synthetic definition of an invention.” *Indivior*, 18 F.4th at 1329. In other words, a POSITA would not have been able to “reasonably discern” a disclosure in

the '786 Application that the two highest tips differ in protrusion distance by about 50 microns. *Id.* at 1328.

Particle Cutting Depth

Patent Owner and Dr. Tsai further rely on the '786 Application's disclosure that "particle tip height must be precisely leveled in order to uniformly dress the pad," such that traditional pad dressers having "particle tip height variations of more than 50 μm . . . would render a dresser useless if it were required to dress a CMP pad and achieve a uniform asperity depth of 20 μm or less." Ex. 2009, 2:19–24; see PO Resp. 11, 22–23; Ex. 2011 ¶ 73. Dr. Tsai combines that with the '786 Application's description of its invention wherein "the predetermined height may produce a cutting depth of less than about 20 microns" or "from about 1 micron to about 20 microns." Ex. 2009, 11:5–10; see Ex. 2011 ¶¶ 73–74; PO Resp. 11, 23. Dr. Tsai concludes these disclosures signify to a POSITA "that in order to achieve these cutting depths, the variation in particle heights across the pad dresser could not exceed about 50 microns." Ex. 2011 ¶¶ 73–75; see PO Resp. 23. Then, because "the total variation in particle heights cannot . . . exceed 50 microns, it [allegedly] follows that the variation in particle heights between the highest and second highest tip also cannot exceed 50 microns." Ex. 2011 ¶ 75; see PO Resp. 23.

We are persuaded by Petitioner's reply that the '786 Application does not demonstrate possession of limitation [1E], despite the foregoing testimony from Dr. Tsai. See Pet. Reply 13.

In particular, we do not find an express or inherent disclosure of the upper end of the range specified in limitation [1E] — that is, the two highest

tips differing in protrusion distance by about 50 microns. The '786 Application's discussion of "particle tip height variations of more than 50 μm " refers to *the entire collection of particle tips* on a pad dresser falling within a 50 μm envelope. Ex. 2009, 2:19–24. Limitation [1E], by contrast, refers to *the two highest tips* differing in protrusion distance by about 50 microns. If the entire collection of particle tips are within a 50 μm envelope, then the only way for the two highest tips to differ by about 50 μm is for the highest tip to be at the very top of the envelope, with the second highest tip and all of the other tips being at the very bottom of the envelope; otherwise, one of those other tips would be the second highest tip. A POSITA would not take such a strained view of the '786 Application's disclosure to "reasonably discern" possession of limitation [1E]. *Indivior*, 18 F.4th at 1328.

Spacer Layer

Patent Owner also cites the '786 Application's disclosures concerning a "spacer layer" used to manufacture a pad dresser as demonstrating possession of limitation [1E]. See PO Resp. 11 (citing Ex. 2009, 23:16–19, 24:12–16, 27:1–4). However, we do not discern and Patent Owner does not explain (*see id.*) any sort of rational relationship between the cited spacer layer disclosures and whether the two highest tips of the manufactured pad dresser differ in protrusion distance by less than or equal to about 50 microns.

Petitioner's Arguments in IPR2024-00534

Patent Owner finally asserts Petitioner's argument here that the '786 Application does not demonstrate possession of limitation [1E] is

undermined by Petitioner’s arguments in IPR2024-00534. *See* PO Resp. 19–20.

Specifically, in IPR2024-00534, Petitioner has argued Sung ’026 (the USPTO’s publication of the ’786 Application) anticipates claim 1 of U.S. Patent No. 9,138,862 B2 (“the ’862 patent”). *See* PO Resp. 19–20 (citing Ex. 2012¹⁴, 30–36). Accordingly, Petitioner argues there that Sung ’026 discloses the two highest particle tips differing in protrusion distance by “less than or equal to **about 10 microns**” per claim 1 of the ’862 patent, which Patent Owner asserts “is substantially identical” to limitation [1E] of the ’802 patent at issue here except the recited maximum difference is “**50 microns**” rather than 10 microns. *Id.*

Patent Owner argues Petitioner’s contention that Sung ’026 anticipates claim 1 of the ’862 patent because “Sung ’026 teaches that tip-to-designated profile variation is less than 1 micron for each of the superabrasive particles” applies equally to the “**broader**” range of limitation [1E] at issue here. *Id.* at 20 (citing Ex. 2012, 32). Patent Owner concludes Petitioner therefore “has **waived any argument** that ’802 element [1E] here is not supported by” the ’786 Application / Sung ’026. *Id.* Patent Owner similarly suggests that, if we accept Petitioner’s argument for how Sung ’026 anticipates claim 1 of the ’862 patent, then we must apply the same theory to find the ’786 Application demonstrates possession of limitation [1E] at issue here. *See id.* at 20 n.3.

Petitioner replies that there is no inconsistency between its arguments here and in IPR2024-00534, because the disclosure of the ’786 Application /

¹⁴ Exhibit 2012 is the petition from IPR2024-00534.

Sung '026 cited by Petitioner in the other case “represents just one species [i.e., tips varying from a designated profile by less than about 1 micron] within the more broadly claimed genus.” Pet. Reply 13–14 (citing *Vas-Cath*, 935 F.2d at 1562).

As noted above in Section III.D.2(b)(i), there is a subtle distinction between a written description adequate to *support* a claim under 35 U.S.C. § 112 and a written description sufficient to *anticipate* the claim under 35 U.S.C. § 102(b), such that a single reference can fail to provide written description support and yet still anticipate. *See Vas-Cath*, 935 F.2d at 1562; *Indivior*, 14 F.4th at 1325–30. Therefore, even if the '786 Application / Sung '026 discloses a pad dresser in which the two highest protruding tips differ in protrusion distance by less than or equal to about 10 microns per claim 1 of the '862 patent, that does not necessarily mean that the '786 Application demonstrates possession of the two highest protruding tips differing in protrusion distance by less than or equal to about 50 microns per limitation [1E] of the '802 patent. We conclude, for all the reasons provided above, that the '786 Application does not support limitation [1E] per 35 U.S.C. § 112, as reflected by the decisions in *Vas-Cath*, *General Hospital*, and *Indivior*.

Conclusion Regarding Limitation [1E]

We conclude Petitioner has shown by a preponderance of the evidence that the '786 Application does not provide written description support for limitation [1E].

(ii) *The '786 Application Does Not Support Limitation [1F]*

Petitioner argues the '786 Application does not provide written description support for limitation [1F], which recites “the difference in protrusion distance between the highest 1% of the protruding tips of the monolayer of superabrasive particles are within about 80 microns or less.” Ex. 1001, 28:1–4; *see* Pet. 20–22 (orange highlights); Ex. 1002 ¶¶ 70–74, 77. We agree, for the following reasons.

Patent Owner's Reliance on Arguments for Limitation [1E]

Patent Owner's argument for why the '786 Application supports limitation [1F] firstly refers back to Patent Owner's argument for limitation [1E]. *See* PO Resp. 13 (Second Column, “*See* Limitation 1[E].”). However, Patent Owner does not explain any relationship between the two limitations [1E] and [1F] to justify Patent Owner's argument for the former applying to the latter. *See id.* We do not discern such a relationship from the plain language of the claim. Moreover, although Patent Owner's arguments for limitation [1E] briefly refer to limitation [1F] (*see id.* at 11 (“or between the highest 1%”)), Patent Owner's arguments are unavailing as discussed above in Section III.D.2(c)(i).

Tip Variation from Designated Profile

Patent Owner also relies on Petitioner's “construction of ‘designated profile’ to mean the ‘average protrusion distance of the diamond tips.’” PO Resp. 14 (citing Pet. 36–38). Patent Owner asserts that, based on that position, the '786 Application discloses limitation [1F]'s recitation that the highest 1% of particle tips are within about 80 microns or less. *See id.* at 14 (citing Ex. 2009, 12:20–25).

Patent Owner and Dr. Tsai cite the '786 Application's disclosure that "the plurality of superabrasive particles are arranged such that their tips vary from the designated profile by" various ranges, including about 5–100 microns, about 10–75 microns, and about 10–50 microns. Ex. 2009, 12:15–30; see PO Resp. 14, 25; Ex. 2011 ¶ 76. Dr. Tsai explains this disclosure refers to "the *plurality* of superabrasive particles" which "would necessarily encompass *all* tips" including the highest 1% of tips per limitation [1F]. Ex. 2011 ¶ 79 (citing Ex. 1002 ¶ 142); see PO Resp. 26.

Dr. Tsai explains that although these disclosures relate to variation from a designated profile, they still demonstrate possession of limitation [1F] "for the same reason[s] that" similar disclosures in the '817 Application allegedly do so, as discussed above in Section III.D.2(b)(ii). Ex. 2011 ¶¶ 77–79; see PO Resp. 25–26.

We are persuaded by Petitioner's reply that the '786 Application does not demonstrate possession of limitation [1F], despite the foregoing testimony from Dr. Tsai, for the same reasons provided above in relation to limitation [1F] and the '817 Application. See Pet. Reply 13; *supra* Section III.D.2(b)(ii).

Particle Height Variance from a Predetermined Height

Patent Owner further cites the '786 Application's disclosure that "each" of the particles, which necessarily includes the highest 1% of the particles per limitation [1F], "may protrude to a predetermined height" that may be "greater than about 20 microns" with "variation from the predetermined height . . . from about 1 micron to about 20 microns." Ex. 2009, 19:9–18; see PO Resp. 13 (citing Ex. 2009, 9:12–18).

We are persuaded by Petitioner's reply that the '786 Application does not demonstrate possession of limitation [1F], for basically the same reasons provided above in relation to limitation [1E]. See Reply Br. 13; *supra* Section III.D.2(c)(i).

First, the '786 Application disclosures cited by Patent Owner concern *a range (about 1–20 microns) for the particle height to vary from a predetermined height*, which is basically the same concept as the '817 Application's disclosure of *particle tip variance from a designated planar profile*. By contrast, limitation [1F] is directed to *the highest 1% of tips differing in protrusion distance within about 80 microns or less*. Thus, we find no express disclosure in the '786 Application demonstrating possession of limitation [1F].

Second, we do not find an inherent disclosure in the '786 Application demonstrating possession of the upper end of the range specified in limitation [1F] — that is, the highest 1% of tips differing in protrusion distance within about 80 microns. It does not follow from the '786 Application's disclosure of particle heights varying from a predetermined height by about 1–20 microns that the highest 1% of tips necessarily differ in protrusion difference by about 80 microns. Indeed, given the disclosed envelope of 1–20 microns, the maximum difference in protrusion distance among the highest 1% of tips is only about 40 microns, much less than the claimed maximum of about 80 microns. And, the present case is somewhat analogous to the *Fisher*, *General Hospital*, and *Indivior* decisions discussed above in Section III.D.2(b)(i).

Particle Cutting Depth

Patent Owner and Dr. Tsai moreover rely on the '786 Application's disclosure that "particle tip height must be precisely leveled in order to uniformly dress the pad," such that traditional pad dressers having "particle tip height variations of more than 50 μm . . . would render a dresser useless if it were required to dress a CMP pad and achieve a uniform asperity depth of 20 μm or less." Ex. 2009, 2:19–24; see PO Resp. 26; Ex. 2011 ¶ 80. Dr. Tsai concludes that disclosure teaches "the variation in particle heights across the pad dresser could not exceed about 50 microns." Ex. 2011 ¶ 80; see PO Resp. 26–27. Dr. Tsai then combines that alleged teaching with the '786 Application's description of its invention wherein "the predetermined height may produce a cutting depth of less than about 20 microns" or "from about 1 micron to about 20 microns." Ex. 2009, 11:5–10; see Ex. 2011 ¶ 80; PO Resp. 26–27. Dr. Tsai concludes these disclosures signify to a POSITA "that the highest 1% of protruding tips are within 80 microns or less (e.g., 20 microns + 50 microns = 70 microns)." Ex. 2011 ¶ 81; see PO Resp. 26–27.

We are persuaded by Petitioner's reply that the '786 Application does not demonstrate possession of limitation [1F], despite the foregoing testimony from Dr. Tsai. See Pet. Reply 13.

In particular, we do not find an express or inherent disclosure of the upper end of the range specified in limitation [1F] — that is, the highest 1% of tips differing in protrusion distance within about 80 microns. The '786 Application's discussion of "particle tip height variations of more than 50 μm " refers to *the entire collection of particle tips* on a pad dresser falling within a 50 μm envelope. Ex. 2009, 2:19–24. The entire collection of

particle tips falling within a 50 µm envelope per the '786 Application bears no relationship to whether the highest 1% of tips differ in protrusion distance within about 80 microns. Even Dr. Tsai's posited example of a 70 micron envelope is much less than the claimed maximum of 80 microns.

Petitioner's Arguments in IPR2024-00534

Patent Owner finally asserts Petitioner's argument here that the '786 Application does not demonstrate possession of limitation [1F] is undermined by Petitioner's arguments in IPR2024-00534. *See* PO Resp. 24–25.

Specifically, in IPR2024-00534, Petitioner has argued Sung '026 (the USPTO's publication of the '786 Application) anticipates claim 1 of the '862 patent. *See* PO Resp. 24 (citing Ex. 2012, 33). Accordingly, Petitioner argues there that Sung '026 discloses “the difference in protrusion distance between the **highest 10 protruding tips** of the monolayer of superabrasive particles are [sic] within **about 20 microns or less**” per claim 1 of the '862 patent, which Patent Owner asserts is “a **narrower** range of protrusion distances” than recited in limitation [1F] of the '802 patent (i.e., the **highest 1%** of tips have protrusion distances within **about 80 microns or less**. *Id.*

Patent Owner argues Petitioner's contention that Sung '026 anticipates claim 1 of the '862 patent “because the tip-to-tip variation for **each** of the superabrasive diamond particles is less than 2 microns” applies equally to the “highest 1% of the protruding tips” of limitation [1F] at issue here. *Id.* (citing Ex. 2012, 34). Patent Owner concludes Petitioner therefore “has **waived any argument** that '802 element [1F] is not supported by” the '786 Application / Sung '026. *Id.* at 24–25.

Petitioner replies that there is no inconsistency between its arguments here and in IPR2024-00534, because the disclosure of the '786 Application / Sung '026 cited by Petitioner in the other case “represents just one species [i.e., tips varying from a designated profile by less than about 1 micron] within the more broadly claimed genus.” Pet. Reply 13–14 (citing *Vas-Cath*, 935 F.2d at 1562).

As noted above in Section III.D.2(b)(i), there is a subtle distinction between a written description adequate to *support* a claim under 35 U.S.C. § 112 and a written description sufficient to *anticipate* the claim under 35 U.S.C. § 102(b), such that a single reference can fail to provide written description support and yet still anticipate. See *Vas-Cath*, 935 F.2d at 1562; *Indivior*, 14 F.4th at 1325–30. Therefore, even if the '786 Application / Sung '026 discloses a pad dresser in which all of the tips differ in protrusion distance by about 2 microns or less, that does not necessarily mean that the '786 Application demonstrates possession of the highest 1% of tips being within about 80 microns or less per limitation [1F] of the '802 patent. We conclude, for all the reasons provided above, that the '786 Application does not support limitation [1F] per 35 U.S.C. § 112, as reflected by the decisions in *Vas-Cath*, *General Hospital*, and *Indivior*.

Conclusion Regarding Limitation [1F]

We conclude Petitioner has shown by a preponderance of the evidence that the '786 Application does not provide written description support for limitation [1F].

(d) *U.S. Provisional Application No. 61/489,074*

The '802 patent asserts priority to U.S. Provisional Application No. 61/489,074 (“the '074 Provisional”) through intermediary continuation-in-part applications. *See* Ex. 1001, codes (60) and (63), 1:4–38. The '074 Provisional is found in the record as Exhibit 2002. *See* PO Resp. i (Table of Contents), 8.

We conclude the '074 Provisional does not provide written description support for limitation [1D], which recites “a tip of each of the plurality of superabrasive particles aligns along a designated profile with a tip variation of from about 5 microns to about 100 microns.” Ex. 1001, 27:61–64; *see* Pet. 20–22 (green highlights); Ex. 1002 ¶¶ 70–74, 77.

Patent Owner cites disclosures in the '074 Provisional as supporting limitation [1D]. *See* PO Resp. 10 (citing Ex. 2002, 13:4–9). Patent Owner also asserts Petitioner has “construed ‘designated profile’ and tip variation therefrom as the ‘average protrusion distance of the diamond tips,’” which Patent Owner argues leads to the '074 Provisional disclosing the claimed range of limitation [1D]. *Id.* (citing Pet. 36–38; Ex. 2002, 23:5–11). Dr. Tsai does not provide testimony in support of these arguments. *See id.*; Ex. 2011 ¶¶ 56–81 (Dr. Tsai’s testimony concerning the '802 patent’s priority filing date).

The '074 Provisional disclosures cited by Patent Owner state the “superabrasive particles can be arranged such that corresponding superabrasive particles across the metal support layer are in substantial alignment, as is shown in FIG. 2,” or the particles “can be arranged in a substantially similar distribution, but may or may not be substantially

aligned with one another across the metal support layer.” Ex. 2002, 13:4–9.

They also state:

[A] CMP pad dresser can include a plurality of superabrasive particles arranged as a working surface, where the difference in protrusion distance between the highest protruding tip and the next highest protruding tip of the first monolayer of superabrasive particles is less than or equal to about 20 microns, and where the difference in protrusion distance between the highest 1% of the protruding tips of the first monolayer of superabrasive particles, excluding the highest protruding tip, are within about 80 microns.

Id. at 23:5–11.

There is nothing in the foregoing disclosures that addresses whether each particle tip aligns along a designated profile with a tip variation of from about 5 microns to about 100 microns per limitation [1D]. Therefore, we conclude Petitioner has shown by a preponderance of the evidence that the ’074 Provisional does not provide written description support for limitation [1D].

Indeed, Dr. Sung’s Declaration in the Kinik Litigation addressed the ’862 patent, which issued from one of the intervening applications between the ’074 Provisional and the ’802 patent. See Ex. 1018 (the ’862 patent), codes (60) and (63); Ex. 1001, codes (60) & (63); Ex. 1011 ¶¶ 19–21. Dr. Sung testified that the ’862 patent does not “disclose the claimed subject matter of the ’802 Patent,” specifically because it does not disclose “a designated profile with a tip variation associated with the superabrasive particles or a tip variation at, for example, about 100 microns.” Ex. 1011 ¶¶ 19–21. This is consistent with our conclusion above that the ’074 Provisional does not support limitation [1D].

(e) *Copending Application Requirement*

In the Institution Decision, we found neither the '817 Application nor the '786 Application was copending with the application that issued as the '802 patent. *See* Inst. Dec. 48. Patent Owner does not dispute that finding. *See* PO Resp. 33–35 (asserting only that “none of the applications in the chain between [the '817 Application], [the '786 Application], and the '802 patent either issued as a patent or was abandoned prior to the filing of *the successive CIP* in the chain” (emphasis added)); PO Sur-reply 10–11 (same).

Therefore, as we noted in the Institution Decision: “[P]riority to one of those [two] parent applications additionally requires one or more intervening applications to create ‘a continuous chain of copending applications *each of which satisfies the requirements of § 112 with respect to the subject matter presently claimed*’ in the '802 patent.” Inst. Dec. 48 (emphasis added) (citing *Hollmer v. Harari*, 681 F.3d 1351, 1355 (Fed. Cir. 2012)). Further: “‘[I]f any application in the priority chain fails to make the requisite disclosure of subject matter, the later-filed application is not entitled to the benefit of the filing date of applications preceding the break in the priority chain.’” *Id.* (emphasis added). We “encourage[d] both parties to address whether there are the requisite intervening application(s) per *Hollmer* and related case law.” *Id.* at 48–49.

In particular, we found U.S. Patent Application No. 13/797,704 (“the '704 Application”) was the only intervening application leading from the '817 Application and the '786 Application to the '802 patent that was ever copending with the '802 patent. *Id.* at 49. Patent Owner does not dispute that finding. *See* PO Resp. 33–35. Nor does Patent Owner address

Dr. Sung’s Declaration in the Kinik Litigation, where he testified that the ’704 Application does not “disclose the claimed subject matter of the ’802 Patent.” Inst. Dec. 49 (quoting Ex. 1011 ¶ 22); see PO Resp. 33–35; Tr. 73:1–25.

Patent Owner makes no effort to establish that the ’704 Application provides written description support for claim 1 of the ’802 patent, despite this issue being raised in the Petition (see Pet. 17–18) and in the Institution Decision as discussed above. See PO Resp. 33–35; PO Sur-reply 9–11. Patent Owner instead distinguishes *Hollmer* as limited to its holding, which focused on whether intervening applications sufficiently incorporated an alleged parent application by reference. See PO Resp. 34; see also *Hollmer*, 681 F.3d at 1355 (stating “the Board had to determine whether the intervening ’838 and ’768 applications sufficiently incorporated the ’579 application by reference”). Patent Owner’s argument is unavailing because it overlooks that the Court in *Hollmer* decided the issue presented there by requiring each application in the chain to include the incorporation by reference, lest it be new matter, which is the rule we raised in the Institution Decision as discussed above. See *id.* at 1355–56; *id.* at 1357 (“[T]he issue before us is whether these intervening applications *maintain continuity* between the ’566 and ’880 applications *by disclosing* the ’579 application” (emphases added)).

We conclude, on the record presented, that the ’704 Application does not provide written description support for claim 1 of the ’802 patent. See Pet. 17–18 (citing Ex. 1011 ¶¶ 22–23). In particular, Dr. Sung testified in the Kinik Litigation that the ’704 Application does not “disclose the claimed subject matter of the ’802 Patent.” Ex. 1011 ¶¶ 22–23. As discussed above

in Section III.D.2(a), Dr. Sung’s reference to “the claimed subject matter of the ’802 Patent” must have included at least claim 1 of the ’802 patent.

Patent Owner’s position that Dr. Sung must have been referring instead to a dependent claim such as claim 8 (see Tr. 66:25–71:14, 73:1–25) is belied by the plain language of the Kinik Declaration. See Ex. 1011 ¶¶ 22–23.

Thus, we conclude that even if the ’817 Application or the ’786 Application supports claim 1 of the ’802 patent, claim 1 still is not entitled to priority to the filing date of those applications because the priority chain was broken at the ’704 Application.

(f) *The Kinik IPR*

Petitioner argues the Kinik IPR (IPR2021-00638) supports Petitioner’s position that claim 1 of the ’802 patent is not entitled to priority to any of the ’802 patent’s parent applications. See Pet. 22–23. Petitioner asserts the Kinik IPR petition challenged the ’802 patent “based on the fact that ‘Sung expressly disclaimed all claim of priority to the Parent Patents’” in the Kinik Litigation, which Patent Owner did not dispute in the Kinik IPR preliminary response. *Id.* (citing IPR2021-00638, Papers 1, 6, 8, and 9).

Patent Owner responds that the Kinik IPR preliminary response did not waive any priority to the ’802 patent’s parent applications, because it “did **not** address the merits of Kinik’s invalidity arguments at all” and it was not necessary to do so. PO Resp. 33 (citing Ex. 2003; 37 C.F.R. § 42.107).

We agree with Patent Owner that the Kinik IPR does not aid Petitioner here. Even if the Kinik IPR petition was premised on Dr. Sung’s Declaration from the Kinik Litigation disclaiming any priority filing date for the ’802 patent as Petitioner alleges, there is no indication in the record

presented here that Patent Owner conceded that point in the preliminary response. Further, IPR2021-00638 was terminated prior to a decision on institution being entered. See Pet. 23.

(g) Prosecution History of the '802 Patent

In the Petition, Petitioner addresses the applicability of the '802 patent prosecution history to the filing date priority of the '802 patent claims. See Pet. 12–15. Patent Owner's sole response is that the Petition "acknowledge[s] that during prosecution, the Applicant amended claim 1 to include" limitation [1D] "and argued that '**this claim limitation is fully supported in the '817 application.**'" PO Resp. 7 (citing Pet. 14).

Even if Patent Owner's reading of the Petition is accurate, our present Decision concludes claim 1 does not have filing date priority to the '817 Application because that application does not demonstrate possession of limitations [1E] and [1F]. We need not and we do not decide whether the '817 Application demonstrates possession of limitation [1D]. Therefore, we do not discuss the '802 patent prosecution history any further here.

(h) Conclusion Regarding Filing Date Priority of Claims 1–7 and 13–21

For all of the foregoing reasons, we conclude claim 1 of the '802 patent is not entitled to filing date priority to any one of the '817 Application, the '786 Application, or the '074 Provisional. Therefore, claim 1 and its dependent claims 2–7 and 13–21 are entitled only to the '802 patent's actual filing date of October 3, 2014.

3. *Claims 8–12*

The parties agree that the filing date priority of claims 8–12 is the '802 patent's actual filing date of October 3, 2014, albeit for different reasons. Petitioner's reason is that the parent claim 1 is entitled only to the '802 patent's actual filing date. *See* Pet. 3 n.1, 12–23; Ex. 1002 ¶¶ 58–77. Patent Owner's reason is that claims 8–12 “recite new subject matter unique to the '802 Patent” versus its parent applications, “namely, the specific **numbers** of ‘working superabrasive particles.’” PO Resp. 31–32 (citing Ex. 1001, 2:55–3:9, 13:58–14:15). We conclude, regardless of which party's reasoning is applied, that claims 8–12 of the '802 patent are not entitled to any filing date priority earlier than October 3, 2014.

4. *Conclusion Regarding Filing Date Priority of the '802 Patent Claims*

We conclude claims 1–21 of the '802 patent are not entitled to any filing date priority earlier than October 3, 2014. As a result, Tsai, Sung '026, and Sung '146 are each prior art against those claims.

E. Ground One — Anticipation by or Obviousness over Tsai

Petitioner asserts claims 1–5, 13, 15, and 19–21 of the '802 patent are unpatentable as anticipated by Tsai, or alternatively as having been obvious over Tsai. *See* Pet. 5–6, 27–56. Patent Owner disagrees. *See* PO Resp. 1–2, 4, 35–48.

For reasons that follow, we determine Petitioner has demonstrated that claims 1, 4, 5, 13, 15, and 19–21 are unpatentable as anticipated by Tsai, and that claims 2 and 3 are unpatentable as having been obvious over Tsai. First, we summarize the disclosure of Tsai, then we consider the parties' opposing contentions concerning the challenged claims.

1. *Summary of Tsai*

Tsai is a research article co-authored by Dr. Tsai, Dr. Sung, and one other individual. *See* Ex. 1004, pg. 1; Ex. 2011 ¶ 18 (Dr. Tsai stating he is “the lead author” of the Tsai article); PO Resp. 4 (stating “Tsai . . . was co-authored by Patent Owner Dr. Sung”). However, Patent Owner asserts “the research and drafting of [the Tsai] article were undertaken ***without Patent Owner’s participation or knowledge***,” and “Dr. Tsai only named Dr. Sung as a co-author as a typical Taiwanese cultural way of thanking Kinik for providing funding and equipment for his research.” PO Sur-reply 17 (citing Ex. 1055, 44:4–17, 53:18–23, 193:22–194:9, 195:1–196:3).

Tsai compares organic diamond disks (ODDs) versus conventional brazed diamond disks (BDDs) used as CMP pad conditioners. *See* Ex. 1004, pg. 1 (Title and Abstract). BDDs utilize “braze-bonded diamond grits” whereas ODDs utilize “polymer-bonded diamond grits.” *Id.* (Abstract, lines 2–6).

Tsai’s ODDs are manufactured by “level[ing] [the diamond grits] on the surface of a mold” and then “reverse casting” a polymer substrate on to the grits and removing the mold. *Id.* at pg. 1 (Abstract, lines 6–8); *see id.* at pg. 2 (Fig. 2), pg. 3 (Fig. 3), 3:10–4:1, 5:19–6:20. By contrast, in BDDs, the diamond grits are brazed on to a metal substrate, and they “are not leveled to the same height.” *Id.* at pg. 1 (Abstract, lines 3–4); *see id.* at pg. 2 (Fig. 1), 4:8–5:18. Dr. Tsai found “[t]he diamond tips of the ODD are leveled to less than 15 μm ,” whereas “[d]iamond leveling (height distribution of the diamond grits) for the BDD is . . . greater than 50 μm .” *Id.* at pg. 1 (Abstract, lines 9–11); *see id.* at pg. 4 (Fig. 6), 8:19–24.

2. Claim 1

Petitioner provides arguments and evidence in support of contending claim 1 is unpatentable as anticipated by Tsai, or alternatively as having been obvious over Tsai, including supporting testimony from Dr. Shanfield. *See* Pet. 27–45; Ex. 1002 ¶¶ 81–86, 106–146. Patent Owner opposes, including supporting testimony from Dr. Tsai. *See* PO Resp. 1–2, 4, 35–45; Ex. 2011 ¶¶ 18–36.

We conclude Petitioner has demonstrated by a preponderance of the evidence that claim 1 is unpatentable as anticipated by Tsai.

(a) [1Pre], [1A], [1B], and [1C] — *Petitioner’s Unopposed Contentions*

Petitioner argues Tsai discloses, as recited in the preamble [1Pre] (assuming it is limiting) and limitations [1A], [1B], and [1C], a CMP pad dresser comprising a rigid support substrate coupled to a monolayer of superabrasive particles, wherein each particle extends away from the substrate to a protrusion distance. *See* Pet. 29–35; Ex. 1002 ¶¶ 107–126. We conclude this argument, which Patent Owner does not oppose, is supported by a preponderance of the evidence as follows.

Tsai provides a pad dresser (i.e., a “pad conditioner”) consisting of an organic diamond disk (ODD) utilized in a “chemical-mechanical polishing (CMP)” process. Ex. 1004, pg. 1 (Abstract). An exemplary ODD is illustrated in Figure 3, reproduced below (on the next page).

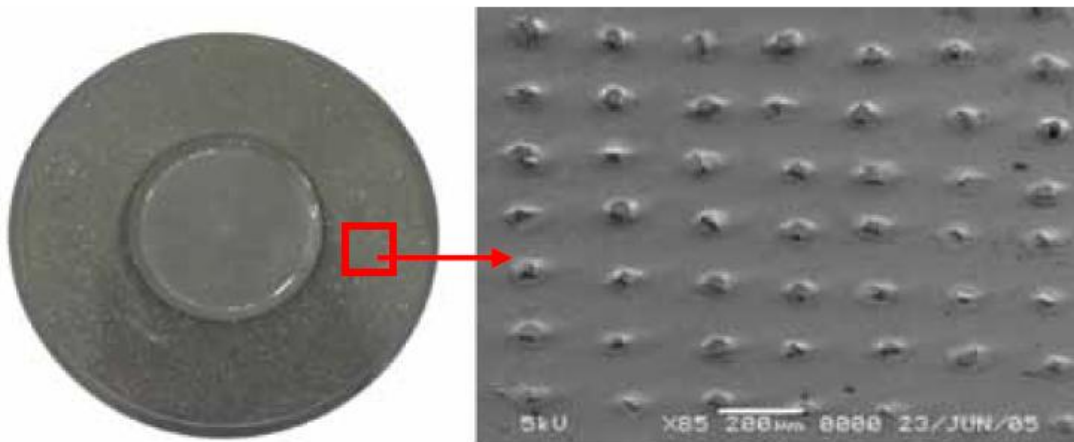
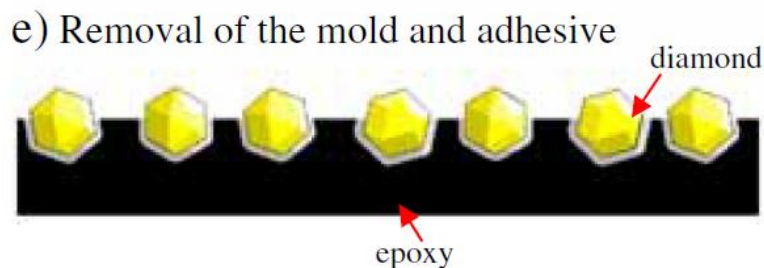


Fig. 3. Outer appearance of the organic diamond disk. Note that each diamond is covered with nickel.

Tsai, Figure 3 (Excerpt).

Id. at pg. 3. The excerpt of Figure 3 shown above depicts the outer appearance of a Tsai ODD (at left) and a magnified view of a portion of the Tsai ODD (at right) showing diamond particles on the ODD. *Id.* at pg. 3 (Fig. 3 caption), 6:18–20.

Tsai's Figure 2(e) is reproduced below.



Tsai, Figure 2(e).

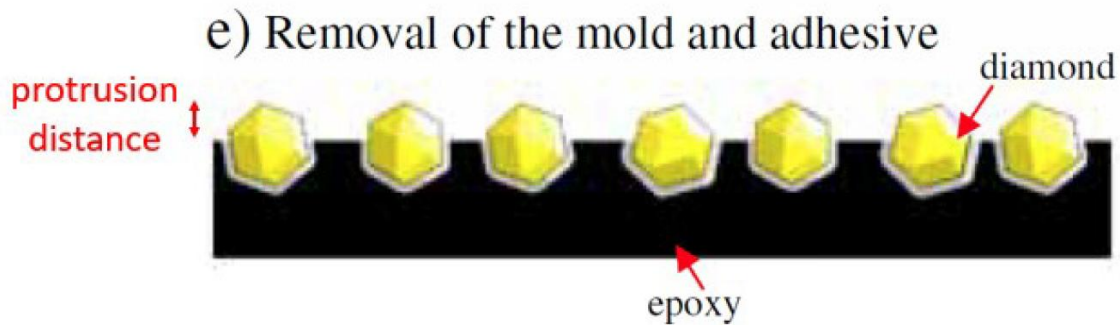
Id. at pg. 2. Figure 2(e) is a schematic side view of a portion of a Tsai ODD, including a polymer substrate comprising an organic matrix (e.g. epoxy) (colored black), diamond grits (colored yellow), and an electroplated nickel layer bonding the diamond grits to the substrate. *Id.* at 5:19–6:10.

The Tsai ODD's polymer substrate (colored black above) is a “rigid support substrate” as recited in claim 1. The '802 patent defines the term “substrate” to mean “a portion of a pad conditioner that supports

superabrasive materials, and to which abrasive materials and/or superabrasive segments that carry abrasive materials may be affixed,” including “relatively hard polymers or other organic materials.” Ex. 1001, 7:59–8:5; *see also id.* at 24:64–25:10 (discussing how a “support substrate” can be formed of various organic materials including “epoxy resins”). “Further, the substrate may include a material that aids in attaching abrasive materials to the substrate,” such as Tsai’s electroplated nickel layer. *Id.* at 8:5–8; Ex. 1004, 5:23–27.

The Tsai ODD’s diamond grits (colored yellow above) are “superabrasive particles” per claim 1. The ’802 patent defines the term “superabrasive” to mean “any crystalline, or polycrystalline material, or mixture of such materials that has a Mohr’s hardness of about 8 or greater.” Ex. 1001, 4:13–16. Further, “[s]uitable superabrasive material examples can include” “diamond” and “polycrystalline diamond (PCD),” which “may be incorporated into various tools in a variety of forms including particles [and] grits.” *Id.* at 4:20–27. The ’802 patent also defines the term “particle” to mean “a particulate form of superabrasive particle,” and states “[s]uch particles may take a variety of shapes.” *Id.* at 4:33–38. We credit Dr. Shanfield’s unopposed testimony that “Tsai’s diamond grits are superabrasive particles” per the ’802 patent’s lexicographic definitions, in part because “[d]iamond has a Mohs hardness of 10.” Ex. 1002 ¶ 117 (citing Ex. 1001, 4:13–16, 4:19–25; Ex. 1007 (“A Dictionary of Weights, Measures, and Units”), 3).

Finally, the Tsai ODD’s diamond grits extend away from the support substrate to a protrusion distance. Petitioner’s supporting annotations to Tsai’s Figure 2(e) are reproduced below (on the next page).



Tsai, Figure 2(e) (As Annotated at Pet. 35).

Figure 2(e) is a schematic side view of a portion of a Tsai ODD, including diamond grits (colored yellow) bonded to an epoxy substrate (colored black), which Dr. Shanfield has annotated to identify how each diamond grit particle extends away from the epoxy by a “protrusion distance” (double-headed red arrow). Pet. 35; Ex. 1002 ¶ 124; Ex. 1004, 5:19–6:5; *see also* Ex. 1001, 16:24–26 (“[F]or the purposes of the [’802 patent] disclosure, the term ‘protrusion’ refers to the height of a particle relative to some reference point.”).

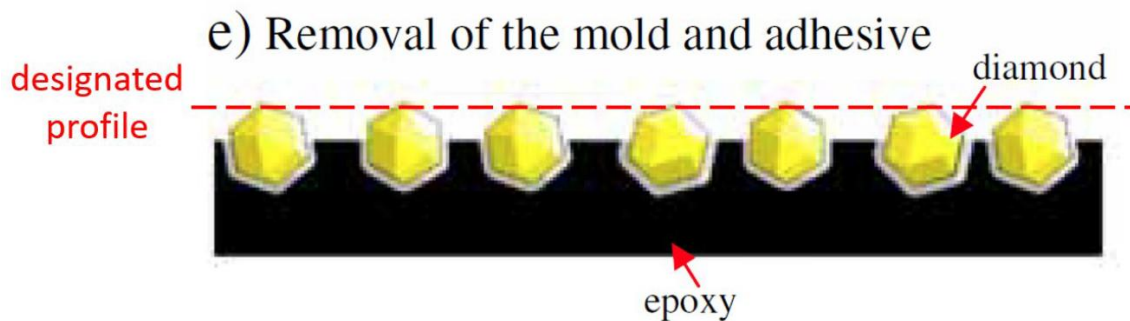
(b) [1D] — “wherein a tip of each of the plurality of superabrasive particles aligns along a designated profile with a tip variation of from about 5 microns to about 100 microns”

Petitioner argues “Tsai discloses and/or renders obvious” that a Tsai ODD’s diamond grit tips align along a designated profile, with a tip variation of from about 5 microns to about 100 microns. Pet. 36. Patent Owner disagrees. *See* PO Resp. 35–43. For the following reasons, we determine a preponderance of the evidence establishes that Tsai discloses limitation [1D].

(i) *Whether Tsai Discloses a Designated Profile for the Particle Tips*

The Petition

Petitioner annotates Tsai's Figure 2(e), as reproduced below, to illustrate Petitioner's contention that Tsai discloses diamond grit tips aligning along a designated profile:



Tsai, Figure 2(e) (As Annotated at Pet. 37).

Figure 2(e) is a schematic side view of a portion of a Tsai ODD, including diamond grits (colored yellow) bonded to an epoxy substrate (colored black), which Dr. Shanfield has annotated to identify the alleged “designated profile” (dotted red line) of the diamond grit tips. See Pet. 37; Ex. 1002 ¶ 131.

Petitioner asserts and Dr. Shanfield testifies that “Tsai explains that it designates a *flat contour* above the epoxy resin to which each of the tips of the diamond particles is intended to align.” Pet. 36–37 (emphasis added) (citing Ex. 1004, Figs. 2(e) and 5(b), 5:23–24, 6:8–10, 8:14–16, 8:22–24); Ex. 1002 ¶¶ 131–132. Thus, Petitioner’s and Dr. Shanfield’s identified “designated profile” in Figure 2(e) above correspondingly shows “a flat contour can be designated above the epoxy resin substrate to which the tips of the diamond particles are intended to align (*e.g.*, the average protrusion distance of the diamond tips) and leveled,” wherein “some tips can protrude

above or below that flat ‘designated profile.’” Pet. 37 (citing Ex. 1001, 5:9–12, 6:21–25); Ex. 1002 ¶¶ 128–129, 131–132.

The Patent Owner Response

Patent Owner argues and Dr. Tsai testifies that “[t]here is no explicit disclosure of a ‘profile’ or ‘designated profile,’ let alone of ‘a tip of each of the plurality of superabrasive particles [that] aligns along a designated profile’ **anywhere** in Tsai.” PO Resp. 36; Ex. 2011 ¶¶ 20–33. Patent Owner asserts Dr. Shanfield’s annotated dotted red line in Figure 2(e) of Tsai “cannot substitute for the absence of this element.” PO Resp. 36.

In support, Dr. Tsai testifies that Dr. Shanfield “misunderstands . . . what is meant by the terms ‘leveling’ and ‘leveled’ in [Tsai].” Ex. 2011 ¶ 21; *see* PO Resp. 36. Dr. Tsai similarly concludes we erred in the Institution Decision in finding Tsai discloses “diamond grits ‘leveled to the same height.’” Ex. 2011 ¶ 22 (citing Inst. Dec. 41 [sic 58]); *see* PO Resp. 36; Inst. Dec. 58 (“[W]e find . . . Tsai intends for its ODD diamond grit tips to be ‘leveled to the same height.’”) (citing Ex. 1004, Abstract (lines 3–11)). Dr. Tsai asserts Tsai instead “says that ‘[a]lthough conventional diamond conditioners [i.e., BDDs] consist of regularly distributed diamond grits, the grit tips are **not** leveled to the same height.’” Ex. 2011 ¶ 22 (citing Ex. 1004, Abstract (lines 3–4)); *see* PO Resp. 36–37. According to Dr. Tsai, “the leveling described in Tsai refers to reducing overall tip variation between the tip heights” and “the object of levelling is to reduce the variation but not to eliminate it entirely.” Ex. 2011 ¶¶ 23–25 (citing Ex. 1004, Abstract, 6:8–10); *see* PO Resp. 37–38. Stated another way: “Tsai is concerned with reducing the overall variation in diamond tip height, not

with causing the diamond tips to arrange along a specific profile or contour.”
Ex. 2011 ¶ 31.

Dr. Tsai further testifies that “Figure 2 of Tsai does not represent the actual distribution of tip heights,” as it was intended merely to “illustrate the steps in the process of reverse casting” an ODD, and Figure 2 was not drawn to scale. Ex. 2011 ¶¶ 26–28 (citing Ex. 1004, Figs. 1–2, 8:19–22); see PO Resp. 38–39. Dr. Tsai therefore asserts Dr. Shanfield errs in relying on Figure 2 as showing “grits with the *same* heights” and “reflect[ing] the actual height variation of the diamond tips.” Ex. 2011 ¶ 28; see PO Resp. 39. “The actual variation in tip heights between a BDD and an ODD is shown in Figures 5 and 6 of Tsai” according to Dr. Tsai, demonstrating there is “height variation in the diamond tips of the ODD.” Ex. 2011 ¶¶ 29, 33 (citing Ex. 1004, Fig. 6, 8:19–24); see PO Resp. 39–40, 41.

Dr. Tsai finally disputes Dr. Shanfield’s definition of the designated profile in Tsai as the *average* tip height, because “the average tip height indicated in Fig. 6 [by a purple square] does *not* represent a target against which the levelled tips of the ODD were intended to align.” Ex. 2011 ¶ 32 (citing Ex. 1002 ¶ 133); see PO Resp. 40. Instead, “[t]hat average was calculated *after* the reverse casting process was complete, based on measurements taken of the tip heights of the finished ODD,” as opposed to “predetermined in advance as a level or contour at which the diamond tips would align.” Ex. 2011 ¶ 32; see PO Resp. 40–41.

Petitioner’s Reply

Petitioner replies that Dr. Tsai’s credibility was undermined during his deposition, when he allegedly “could not even precisely articulate what the

term [‘designated profile’] means in the context of the ’802 Patent.” Pet. Reply 19. In particular, Petitioner argues Dr. Tsai initially defined the “designated profile” of the ’802 patent as referring either to the height of the highest tip or to the substrate surface. *See id.* at 19–20 (citing Ex. 1055, 14:11–16; Ex. 1048 (Dr. Tsai’s hand-drawn illustration)). Petitioner argues “Dr. Tsai altered his testimony” during re-direct examination, and testified “that ‘designated profile’ refers only to the highest protruding tip in the context of the ’802 Patent — and the substrate is only applicable to Tsai.” *Id.* at 20–21 (citing Ex. 1055, 150:19–151:14; Ex. 1068 (Dr. Tsai’s hand-drawn illustration)).

Further according to Petitioner, Dr. Tsai’s attempts to define “designated profile” as referring either to the height of the highest tip or to the substrate surface are inaccurate. *See id.* at 19. In support, Petitioner asserts Dr. Tsai failed to apply the ’802 patent’s lexicographic definition of the term “profile.” *See id.* at 21 (citing Ex. 1055, 15:17–16:2).

Petitioner moreover argues Dr. Tsai further altered his opinion during re-direct examination, from “there is ***no designated profile in Tsai***” (PO Resp. 36 (citing Ex. 2011 ¶¶ 31, 33)) to “a designated profile does indeed exist in Tsai” at the substrate surface. Pet. Reply 22–23 (citing Ex. 1055, 156:13–19; Ex. 1069 (Dr. Tsai’s hand-drawn illustration)). Petitioner disputes whether Tsai’s substrate surface can correspond to a “designated profile” per the ’802 patent, because Dr. Tsai and Dr. Sung did not collaborate concerning Dr. Sung’s “designated profile” concept. *See id.* at 23–24 (citing Ex. 1055, 52:11–14, 170:25–171:2, 196:5–8).

Patent Owner's Sur-reply

Patent Owner replies that “Dr. Tsai, the author of the Tsai article (Ex. 1004), is unequivocal that his experiment as reflected in this article does not disclose or use the claimed ‘designated profile’ . . . because in Dr. Tsai’s experiment, he measured the tip height using a baseline along which the **substrate** aligns.” PO Sur-reply 14. Patent Owner asserts “[t]his critical difference between the claimed designated profile and the ‘baseline’ used in Dr. Tsai’s experiment” is illustrated in Exhibits 2013 and 2014, where Dr. Tsai identifies the “designated profile” of the ’802 patent as “align[ing] with the tips” and identifies “the baseline” of Tsai as the support substrate. *Id.* at 14–16 (citing Ex. 1055, 151:4–14, 152:1–153:10, 153:22–25, 154:2–17, 155:5–156:19, 158:15–18).

Patent Owner also argues it is undisputed that “the research and drafting of [Dr. Tsai’s] article were undertaken **without Patent Owner [Dr. Sung]’s participation or knowledge**,” which supports Patent Owner’s position that the Tsai article does not reflect Dr. Sung’s “designated profile” concept. *Id.* at 17 (citing Pet. Reply 13; Ex. 1055, 44:7–17, 53:18–23, 193:22–194:9, 195:1–196:3).

Patent Owner moreover asserts “the actual results are unequivocal that the tips were not equal in height” in a Tsai ODD, as demonstrated by “an ‘error bar’ [in Figure 6] that reflects the statistical differences in tip height.” *Id.* at 18 (citing Ex. 1055, 75:6–9, 76:6–7, 164:7–166:9).

Patent Owner's Motion to Exclude Dr. Shanfield's Testimony

Patent Owner also moves to exclude Dr. Shanfield’s testimony concerning whether Tsai discloses a “designated profile” per claim 1, as

relying “on *guesswork*” rather than “reliable principles and methods.” Paper 30, 7. Patent Owner asserts “Dr. Shanfield purported to determine,” based on the partial representation of a portion of an ODD in Tsai’s Figure 2(e), “whether a particular arrangement of diamonds across a substrate has a designated profile, such as a flat profile.” *Id.* at 8 (citing Ex. 1002 ¶¶ 127–138, 139–146). Patent Owner asserts Tsai’s Figure 2(e) was not “drawn to scale.” *Id.* at 8–9.

Petitioner responds that “a ‘motion to exclude is not a vehicle for addressing the weight to be given evidence.’” Paper 31, 2 (citing Practice Guide, 79). Petitioner also asserts “Dr. Shanfield cited multiple disclosures in Tsai . . . and explained why these disclosures supported his opinion.” *Id.* at 9–10 (citing Ex. 1002 ¶¶ 127–138, 139–146; Ex. 1004, Figs. 2(e) and 6, 2:14–17, 2:19–22, 5:23–24, 6:8–10, 8:14–16, 8:22–24).

Patent Owner replies that “if Dr. Shanfield truly believed that Tsai provides an objective basis for his opinions even after they were contradicted by the author of that reference,” then Petitioner “could have submitted his rebuttal declaration.” Paper 32, 4–5. Further: “That none was submitted speaks volumes regarding . . . the soundness of [Dr. Shanfield’s] opinions.” *Id.* at 5.

Analysis and Conclusion

We find Tsai discloses a “designated profile” for its ODD diamond grit tips, as follows.

First, the ’802 patent defines the term “tip” to mean “a portion of a cutting element or particle that protrudes the greatest distance from the support substrate.” Ex. 1001, 5:9–17. The ’802 patent also defines the term

“profile” to mean “a *predetermined contour* above a support substrate to which a plurality of superabrasive particles or other cutting elements are *intended to align*.” *Id.* at 6:21–25 (emphasis added). Further: “Examples of such profiles may include, without limitation, *flat or planar profiles*.” *Id.* at 6:25–28 (emphasis added).

Second, applying those lexicographic definitions, we find Tsai intends for its ODD diamond grit tips to be “leveled to the same height” — that is, as contemplated by the ’802 patent, to form a flat or planar profile.

Ex. 1004, pg. 1 (Abstract, lines 3–11); Ex. 1001, 6:25–28. For example, Tsai states that in conventional BBDs “the tips of the diamond grits are not leveled to the same height,” which disadvantageously means that “less than 10% of the diamond grits are engaged in cutting the polishing pad” and “[t]he rest of the grits remain unused on the disk.” Ex. 1004, 2:10–17. The Tsai ODD, by contrast, “remarkably improves the leveling of diamond tips” such that “[t]he better-leveled ODD has more cutters that can dress the pad, and thus, they share an equal dressing load.” *Id.* at 3:7–10, 8:9–26, 11:16–18; *see also id.* at 6:8–10 (stating “the diamond tips [of the ODD] can be leveled by compressing the disk with a flat plate to reduce the variation in the heights of the diamond tips”). We thus agree with Dr. Shanfield’s testimony that Tsai’s “designated profile” is “a *flat profile* . . . to which each of the tips of the [diamond grits] *should align*,” despite Tsai’s recognition that “[s]ome tips may protrude above or below (*i.e.*, vary from) the designated profile.” Ex. 1002 ¶¶ 131–132 (emphases added).

Indeed, the ’802 patent specification confirms the claimed “designated profile” can correspond to “*substantially leveled* tips across the working surface of the finished CMP pad dresser,” wherein “the term ‘leveling’ with

respect to superabrasive particles can refer to *superabrasive particles that are leveled with respect to a planar profile*,” although “there may be some height deviation between cutting elements that occur[s] due to limitations inherent in the manufacturing process.” Ex. 1001, 10:63–11:11 (emphases added), 13:1–13.

We have no doubt, as Dr. Tsai testifies, that he did not think that he would actually achieve a *perfectly* flat contour of diamond grit tips, particularly when assessed at the micron level discussed in the Tsai article and claimed in the ’802 patent. Nonetheless, from the collection of disclosures in the Tsai article summarized above, we find that the intent of the study reported in Tsai was to level the diamond grit tips to the same height as closely as the authors could achieve within cost constraints.

Dr. Tsai conceded as much on cross-examination. He was asked about Tsai’s description of an earlier advanced diamond disk (ADD) as containing “diamond grits with equal heights” achieved with “a major disadvantage” in its “manufacturing cost,” and of the ODD as “remarkably improv[ing] the leveling of diamond tips and markedly reduc[ing] the CMP cost.” Ex. 1004, 3:1–10; see Ex. 1055, 39:18–40:17. Dr. Tsai testified: “That was what we *intend to try* [with the Tsai ODD], using different approaches to, first of all, reducing the cost and *also to minimizing the differences of the tip heights to try to make them into equal height*.” Ex. 1055, 40:18–21 (emphasis added). That is all that is required by the “designated profile” claim term, as discussed above.

Thus, the fact that the illustration in Tsai’s Figure 2(e) does not represent the actual distribution of tip heights in the Tsai ODD, and the fact that the “error bar” in Tsai’s Figure 6 indicates all the tips do not have the

same height, do not detract from finding Tsai discloses a “designated profile” of a flat contour of leveled tips.

Further, we disagree with Patent Owner’s characterization of Petitioner’s argument as relying on Tsai’s Figure 2(e) being drawn to scale or otherwise demonstrating the actual height variation of the diamond grit tips in the Tsai ODD. Instead, Petitioner utilized Figure 2(e) to illustrate the contention that Tsai’s entire disclosure, read as a whole, indicates the Tsai ODD has a “designated profile” as a flat contour of leveled diamond grit tips. *See* Pet. 36–37; Ex. 1002 ¶¶ 131–132.

Third, we are persuaded by Dr. Tsai’s testimony that Tsai does not reflect any significance to the average diamond grit tip height reported in Figure 6 as defining a designated profile, such as Tsai’s desired flat contour of leveled tips. *See* Ex. 2011 ¶ 32; Ex. 1004, 8:19–26 (describing Fig. 6). Nonetheless, as discussed above, the Tsai ODD has a designated profile as a flat contour of leveled tips. Further, claim 1 does not define or otherwise constrain how the “designated profile” must be assigned in relation to the pad dresser. *See, e.g.*, Ex. 1001, 27:61–64 (limitation [1D]). Thus, on the record presented, we conclude the breadth of claim 1 in this regard allows Petitioner and Dr. Shanfield to assign the desired flat contour of leveled tips at the average diamond grit tip height in the Tsai ODD.¹⁵

¹⁵ During oral argument, Patent Owner’s counsel suggested the claimed “designated profile” must be defined to include the “highest tip.” *See* Tr. 61:22–62:6, 64:4–14, 75:1–14, 81:6–83:13; *see also id.* at 120:12–121:4 (Petitioner’s reply). However, this argument was not raised in the Patent Owner Response, so it is waived. *See* Inst. Dec. 78; Paper 15, 10; Paper 29, 4–5. This argument also is not supported by the claim language (*see* Ex. 1001, 27:61–64) or the specification disclosure cited by Patent Owner which defines “tip” not “designated profile” (*see id.* at 11:42–45).

Fourth, Dr. Tsai’s testimony about how the “designated contour” claim term might or might not be applied to Tsai is not persuasive, for three reasons. (A) As just discussed, the breadth of claim 1 allows Petitioner and Dr. Shanfield to assign the desired flat contour of leveled tips at the average diamond grit tip height in the Tsai ODD, even if other applications might assign that contour at the highest tip height as Dr. Tsai posits. (B) To the extent Dr. Tsai relies on the Tsai ODD’s support substrate as the “designated profile,” this mis-applies the ’802 patent’s lexicographic definition of “profile” as “a predetermined contour *above a support substrate*.” Ex. 1001, 6:21–25 (emphasis added). (C) This testimony was not offered until Dr. Tsai’s deposition, and exceeds the scope of his initial declaration testimony. *See, e.g.*, Ex. 2011 ¶¶ 18–36.

Fifth, we deny Patent Owner’s Motion to Exclude Dr. Shanfield’s testimony concerning whether Tsai discloses a “designated profile” per claim 1, set forth in Exhibit 1002 at ¶¶ 127–146. As discussed above, we conclude Dr. Shanfield’s testimony is amply supported by Tsai’s disclosure, and Dr. Shanfield did not rely on Tsai’s Figure 2(e) being drawn to scale or otherwise demonstrating the actual height variation of the diamond grit tips in the Tsai ODD.

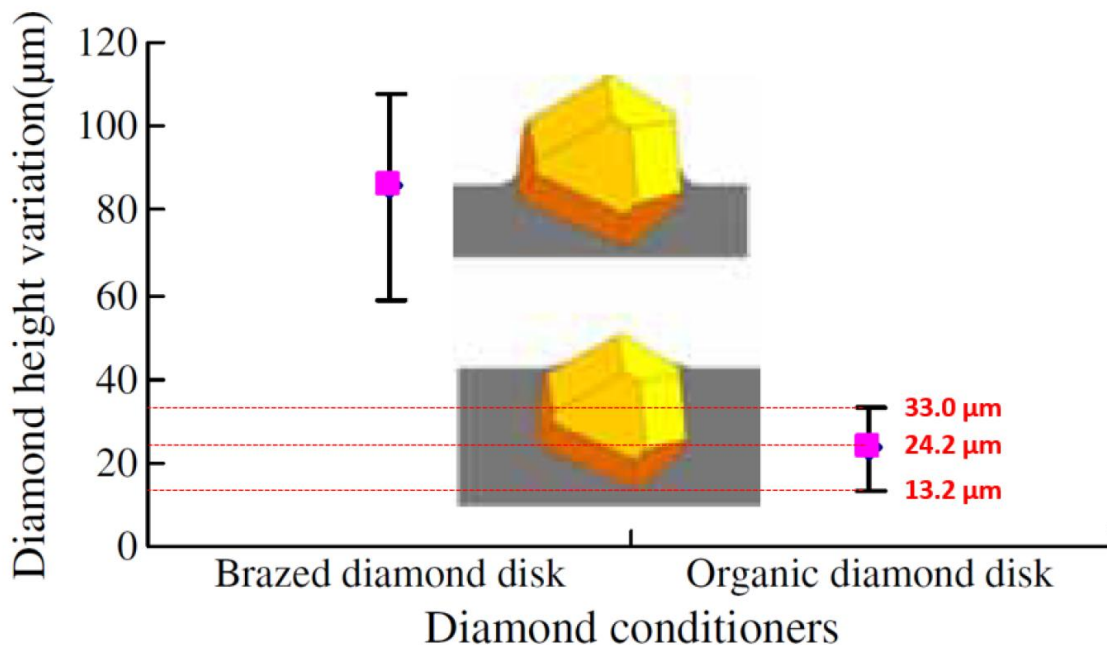
In conclusion, we find Tsai discloses a “designated profile” for its ODD diamond grit tips as a flat contour of leveled tips.

(ii) *Whether Tsai Discloses a Particle Tip Variation from the Designated Profile of From About 5 Microns To About 100 Microns*

The Petition

As discussed above, Petitioner and Dr. Shanfield “*tak[e] the average protrusion distance to be the designated profile*” in the Tsai ODD. Pet. 38

(emphasis added); Ex. 1002 ¶ 133. They conclude Tsai discloses that its ODD diamond grit tips vary from that profile within the range specified in claim 1, in Tsai's Figure 6 as reproduced below with Dr. Shanfield's annotations. See Pet. 37–39; Ex. 1002 ¶¶ 127–134.



Tsai, Figure 6 (As Annotated at Pet. 38).

Figure 6 is a graph titled “Height variation in tips for diamond conditioners,” which plots “Diamond height variation” in microns along the vertical axis, for an exemplary BDD (in the left region of the x-axis) and an exemplary ODD (in the right region of the x-axis). Ex. 1004, pg. 4 (Fig. 6). As described in Tsai, Figure 6 shows that:

The height variation in the diamond tips of the ODD is significantly smaller than that in the diamond tips of the BDD. In the case of the BDD, the diamond tips are leveled to more than 50 µm. However, as shown in Fig. 6, in the case of the ODD, the diamond tips of the ODD can be leveled to less than 15 µm because the diamond tips are already leveled. The better-leveled ODD has more cutters that can dress the pad, and thus, they share an equal dressing load.

Id. at 8:19–26.

Dr. Shanfield has annotated Tsai’s Figure 6 above by adding three dotted red lines between the ODD diamond height variation data and the y-axis values, corresponding to the minimum of the data at about 13.2 μm , the average of the data at about 24.2 μm ,¹⁶ and the maximum of the data at about 33.0 μm . See Ex. 1002 ¶ 132; Pet. 38.

Petitioner argues “Tsai’s Figure 6 . . . discloses ‘with a tip variation of from about 5 microns to about 100 microns’” as recited in limitation [1D]. Pet. 37–39. Dr. Shanfield testifies in support that his annotations in Figure 6 identify the minimum, average, and maximum *protrusion heights* of the diamond grits in the Tsai ODD of Figure 6. See Ex. 1002 ¶¶ 132–133 (citing Ex. 1004, Fig. 6, 5:23–24, 6:8–10, 8:14–16, 8:22–24); Pet. 37–38. In other words, according to Dr. Shanfield, *all* of the diamond grit tips in the Tsai ODD of Figure 6 fall within a height distribution envelope that is 19.8 μm wide ($33.0\ \mu\text{m} - 13.2\ \mu\text{m} = 19.8\ \mu\text{m}$) and that is roughly centered around an average value of 24.2 μm . See Ex. 1002 ¶¶ 132–134; Pet. 37–38. Dr. Shanfield then testifies that, based on those constraints, and taking Tsai’s average diamond tip height of about 24.2 μm as Tsai’s designated flat contour profile per claim 1, it follows that “the tip-to-designated profile variation disclosed by Tsai is approximately 8.8 microns ($33.0\ \text{microns} - 24.2\ \text{microns}$) or 11 microns ($24.2\ \text{microns} - 13.2\ \text{microns}$),” thereby falling with the range specified in claim 1. Ex. 1002 ¶¶ 133–134; see Pet. 38–39.

¹⁶ See Ex. 1002 ¶¶ 132–133 (Dr. Shanfield testifying that the purple box in Figure 6 is the “average protrusion height”); Ex. 2011 ¶ 32 (Dr. Tsai referring to “the average tip height indicated in Fig. 6”); PO Resp. 40–41 (Patent Owner agreeing with Dr. Shanfield and Dr. Tsai).

Petitioner and Dr. Shanfield also rely on Tsai’s written description that “the diamond tips of the ODD ***can be leveled to less than 15 μ m.***” Pet. 39–40 (citing Ex. 1004, 8:22–24); Ex. 1002 ¶ 135.

Petitioner and Dr. Shanfield further apply an alternative claim construction, whereby the “tip variation” of claim 1 refers to a “*tip-to-tip* variation” rather than the “*tip-to-designated profile* variation” discussed above. Pet. 38 (emphasis added); Ex. 1002 ¶¶ 133–134.

The Patent Owner Response

Patent Owner responds that Tsai does not teach or suggest the claimed tip variation from a designated profile, “[b]ecause Tsai does not teach or disclose a designated profile” as discussed above in Section III.E.2(b)(i). PO Resp. 43. Patent Owner also notes that the Institution Decision rejected Petitioner’s alternative “tip-to-tip variation” claim construction. *See id.* (citing Inst. Dec. 63).

Petitioner’s Reply

Petitioner replies by reiterating its arguments in the Petition for how Tsai discloses the claimed tip variation from a designated profile. *See* Pet. Reply 24–25 (citing Pet. 37–38; Ex. 1004, 8:22–24). Petitioner then asserts “[t]he Board already credited Dr. Shanfield’s testimony on these points” in the Institution Decision, and Patent Owner “provides no further explanation or supporting evidence for its position.” *Id.* at 25 (citing Inst. Dec. 64–65; PO Resp. 42 [sic 43]).

Analysis and Conclusion

We find Tsai discloses that its ODD diamond grit tips vary from Tsai's designated profile (i.e., a flat contour located at the average height of all of Tsai's diamond grit tips) by between about 5 microns and about 100 microns.

Dr. Shanfield's testimony relying on Tsai's Figure 6 as disclosing this claim requirement stands unopposed by argument from Patent Owner or testimony from Dr. Tsai, apart from their position that Tsai lacks a "designated profile" as addressed above in Section III.E.2(b)(i). *See* Ex. 1002 ¶¶ 127–134; PO Resp. 43; Ex. 2011 ¶¶ 20–36. We cautioned Patent Owner that "[a]ny arguments not raised by Patent Owner in a timely-filed response may be deemed waived." Inst. Dec. 78; *see also* Paper 15, 10 ("Patent Owner is cautioned that any arguments for patentability not raised in the [Patent Owner Response] may be deemed waived."). On the record thus presented, we agree with Dr. Shanfield's testimony that Tsai's Figure 6 establishes the Tsai ODD diamond grit tips vary from Tsai's designated profile by between about 5 microns and about 100 microns. *See* Ex. 1002 ¶¶ 131–134 (summarized above).

Therefore, we need not and we do not rely on Tsai's additional written description that "the diamond tips of the ODD can be leveled to less than 15 μm ," as cited by Petitioner, in relation to claim 1. Ex. 1004, 8:22–24; *see* Pet. 39–40; Ex. 1002 ¶ 135. We note however that Petitioner returns to this additional written description when arguing for the unpatentability of dependent claims 2 and 3, as we discuss below in Section III.E.3.

We also need not and we do not rely on Petitioner's alternative "tip-to-tip variation" claim construction. *See* Pet. 38; Ex. 1002 ¶¶ 133–134;

Inst. Dec. 63–64 (rejecting Petitioner’s alternative claim construction); Tr. 11:10–12:1 (Petitioner’s counsel arguing that “regardless of which interpretation you take, our position is that the prior art teaches it regardless” and “we will not push back on the construction that Your Honors have adopted which is it has to vary from the designated profile to the tip”).

In conclusion, we find Tsai’s Figure 6 discloses the Tsai ODD diamond grit tips vary from a designated flat contour profile with a tip variation of from about 5 microns to about 100 microns.

(iii) Whether Tsai Renders Obvious a Particle Tip Variation from the Designated Profile of From About 5 Microns To About 100 Microns

As discussed above, Petitioner has established Tsai discloses limitation [1D] by a preponderance of the evidence. Therefore, we need not and we do not reach Petitioner’s alternative contention that Tsai renders limitation [1D] obvious. See Pet. 40–42; Ex. 1002 ¶¶ 136–138.

(c) [1E] — “wherein the difference in protrusion distance between the highest protruding tip and the second highest protruding tip of the monolayer of superabrasive particles is less than or equal to about 50 microns”

Petitioner argues Tsai discloses and/or renders obvious that the difference in protrusion distance between a Tsai ODD’s two highest diamond grit tips is less than or equal to about 50 microns. See Pet. 42–43, 44–45. Patent Owner disagrees. See PO Resp. 43–45. For the following reasons, we determine a preponderance of the evidence establishes that Tsai discloses limitation [1E].

(i) *Whether Tsai's Two Highest Protruding Tips Have a Difference in Protrusion Distance of Less Than or Equal to About 50 Microns*

Petitioner argues “Tsai discloses” that its ODD’s two highest diamond grit tips differ in protrusion distance by less than or equal to 50 microns. Pet. 42; Ex. 1002 ¶ 139. Petitioner relies on its previous argument that Tsai’s Figure 6 discloses an ODD’s “**tip-to-tip variation** for all superabrasive diamond particles is about 19.8 μm ” — that is, as discussed above, *all* of the diamond grit tips fall within a height distribution envelope that is 19.8 μm wide ($33.0 \mu\text{m} - 13.2 \mu\text{m} = 19.8 \mu\text{m}$). Pet. 42–43; Ex. 1002 ¶¶ 139–141; *see supra* Section III.E.2(b)(ii). Petitioner reasons that, based on the 19.8 μm wide envelope for *all* diamond grit tip protrusion distances, the difference between the two highest diamond grit tips necessarily will be less than 50 μm . *See* Pet. 43; Ex. 1002 ¶ 141. Petitioner cites *Ineos*, 783 F.3d at 869, as holding that “[w]hen a patent claims a range, as in this case, that range is anticipated by a prior art reference if the reference discloses a point within the range.” Pet. 38, 43.

Patent Owner responds that “Tsai is completely silent” as to the two highest diamond grit tips in an ODD, so Tsai “does not anticipate.” PO Resp. 43–44. Patent Owner urges that if we nonetheless accept Petitioner’s argument for an inherent disclosure in Tsai, then we must apply the same reasoning to find the ’786 Application demonstrates possession of limitation [1E]. *See id.* at 44 n.5 (referring to “Sung ’026” which is the USPTO’s publication of the ’786 Application). Patent Owner also argues Dr. Shanfield’s testimony “holds no water because an ‘average protrusion height’ . . . does not address the protrusion difference between” an ODD’s two highest diamond grit tips, “particularly where ‘[a] typical diamond disk

contains over 10,000 grits.” *Id.* at 44 (citing Ex. 1002 ¶ 85; Ex. 1004, 2:14–15).

Petitioner replies that Patent Owner “repeats *verbatim* the same arguments that were previously raised in the [Preliminary Response], and rejected by the Board” in the Institution Decision. Pet. Reply 25 (citing Paper 10, 46–48; PO Resp. 43–45; Inst. Dec. 66–67).

We find Tsai inherently discloses that the ODD of Figure 6 has the two highest diamond grit tips differing in protrusion distance by less than or equal to 50 microns, per limitation [1E]. Specifically, as discussed above in Section III.E.2(b)(ii), Tsai’s Figure 6 expressly discloses that *all* of the ODD’s diamond grit tips fall within a height distribution envelope that is 19.8 microns wide. It necessarily follows from that disclosure that *the two highest tips* differ in protrusion distance by less than or equal to 19.8 microns, thereby satisfying the requirement of limitation [1E] for that difference to be less than or equal to about 50 microns. *See, e.g.*, Ex. 1002 ¶¶ 139–141.

Patent Owner points out correctly that the average diamond grit tip height in the Tsai Figure 6 ODD “does not address” the difference in protrusion distance between the two highest diamond grit tips. *See* PO Resp. 44. However, our foregoing finding of inherency is based on the minimum and maximum diamond grit tip heights disclosed in Tsai’s Figure 6 ($33.0\ \mu\text{m} - 13.2\ \mu\text{m} = 19.8\ \mu\text{m}$), not its average diamond grit tip height ($24.2\ \mu\text{m}$).

Finally, we have addressed Patent Owner’s arguments as to the filing date priority of claim 1 above in Section III.D.2.

In conclusion, we find Tsai inherently discloses that the Tsai Figure 6 ODD's two highest grit tips differ in protrusion distance by less than or equal to 50 microns.

(ii) Whether Tsai Renders Obvious that the Two Highest Protruding Tips Have a Difference in Protrusion Distance of Less Than or Equal to About 50 Microns

As discussed above, Petitioner has established Tsai discloses limitation [1E] by a preponderance of the evidence. Therefore, we need not and we do not reach Petitioner's alternative contention that Tsai renders limitation [1E] obvious. See Pet. 44–45; Ex. 1002 ¶ 146.

(d) [1F] — “the difference in protrusion distance between the highest 1% of the protruding tips of the monolayer of superabrasive particles are within about 80 microns or less”

Petitioner argues Tsai discloses and/or renders obvious that the difference in protrusion distance between a Tsai ODD's highest 1% of diamond grit tips are within about 80 microns or less. See Pet. 42–43, 44–45. Patent Owner disagrees. See PO Resp. 43–45. For the following reasons, we determine a preponderance of the evidence establishes that Tsai discloses limitation [1F].

(i) Whether Tsai's Highest 1% of Protruding Tips Have a Difference in Protrusion Distance Within About 80 Microns or Less

Petitioner argues “Tsai discloses” that its ODD's highest 1% of diamond grit tips differ in protrusion distance within about 80 microns or less, for substantially the same reasons discussed above in Section III.E.2(c)(i) regarding the ODD's two highest diamond grit tips differing in

protrusion distance by less than or equal to 50 microns. *See* Pet. 42–43; Pet. Reply 25; Ex. 1002 ¶¶ 139–142.

Patent Owner similarly responds as discussed above in Section III.E.2(c)(i). *See* PO Resp. 43–44. Patent Owner further argues “the variation across multiple tips as claimed in the ’802 Patent is distinct from the values claimed in” the *Ineos* decision cited by Petitioner. *Id.* at 44. Patent Owner asserts that in *Ineos* “the teaching of a prior art reference of a **single** value was found to anticipate a claimed range for a single value, ‘i.e. **a** lubricant in an amount between 0.05 and 0.5% by weight.’” *Id.* (citing *Ineos*, 783 F.3d at 868). In limitation [1F], by contrast, “‘tip variation’ encompasses **multiple** values of **multiple** superabrasive tips.” *Id.* Patent Owner concludes Tsai discloses only “a single value of a diamond tip” which is “insufficient to show multiple values of distinct superabrasive tips and their variation from one another,” so “*Ineos* is inapplicable” and there is no anticipation. *Id.* at 44–45 (citing *Colas Sols., Inc. v. Blacklidge Emulsions, Inc.*, 759 Fed. Appx. 986, 990 n.7 (Fed. Cir. 2019)).

We find Tsai inherently discloses that the ODD of Figure 6 has the highest 1% of diamond grit tips differing in protrusion distance within about 80 microns or less, per limitation [1F]. Specifically, as discussed above in Section III.E.2(b)(ii), Tsai’s Figure 6 expressly discloses that *all* of the ODD’s diamond grit tips fall within a height distribution envelope that is 19.8 microns wide. It necessarily follows from that disclosure that *the highest 1% of the tips* differ in protrusion distance by less than or equal to 19.8 microns, thereby satisfying the requirement of limitation [1F] for those differences to be within about 80 microns or less. *See, e.g.*, Ex. 1002 ¶¶ 139–142.

Patent Owner points out correctly that the average diamond grit tip height in the Tsai Figure 6 ODD “does not address” the difference in protrusion distance between the highest 1% of diamond grit tips. See PO Resp. 44. However, our foregoing finding of inherency is based on the minimum and maximum diamond grit tip heights disclosed in Tsai’s Figure 6 ($33.0\text{ }\mu\text{m} - 13.2\text{ }\mu\text{m} = 19.8\text{ }\mu\text{m}$), not its average diamond grit tip height ($24.2\text{ }\mu\text{m}$).

The *Colas* decision cited by Patent Owner does not hold otherwise. In *Colas*, the claims at issue required an asphalt coat composition with a “softening point greater than about 140°F .” *Colas*, 759 F. Appx. at 987. The petitioner tried to establish that “most” of the prior art’s asphalt coats having “a hardness of 20-pen or below” “will have the claimed softening point values above 60°C [i.e., above 140°F].” *Id.* at 988. The Board rejected that theory as unsupported by the evidence (*see id.* at 988–89), which the Federal Circuit affirmed because:

[T]he fact that some or most potential values may occur in a range does not confirm the actual softening point value for the specimen occurs within the range. It may, or it may not. *On this record, the actual softening point is simply unknown. . . .* Here, no ranges are disclosed.

Id. at 990 (emphasis added); *see also id.* at 990 n.7 (“But the prior art does not actually disclose *a range of softening points*.” (emphasis added)).

In the present case, by contrast, Tsai discloses that all of the Figure 6 ODD’s diamond grit tips fall within a height distribution envelope that is 19.8 microns wide, as discussed above. There is no need here for Petitioner to convert from one set of values (e.g., pen hardness) to another set of values (e.g., softening point) which was where the petitioner in *Colas* fell short.

See id. at 990 (“The challenge for Colas all along was that [the prior art] does not disclose any *actual* ‘softening point’ values for its asphalts.”).

Finally, we have addressed Patent Owner’s arguments as to the filing date priority of claim 1 above in Section III.D.2.

In conclusion, we find Tsai inherently discloses that the Tsai Figure 6 ODD’s highest 1% of grit tips differ in protrusion distance within about 80 microns or less.

(ii) Whether Tsai Renders Obvious that the Highest 1% of Protruding Tips Have a Difference in Protrusion Distance Within About 80 Microns or Less

As discussed above, Petitioner has established Tsai discloses limitation [1F] by a preponderance of the evidence. Therefore, we need not and we do not reach Petitioner’s alternative contention that Tsai renders limitation [1F] obvious. *See* Pet. 44–45; Ex. 1002 ¶ 146.

(e) Conclusion as to Claim 1

We conclude Petitioner has shown by a preponderance of the evidence that claim 1 is unpatentable as anticipated by Tsai. We do not reach any of Petitioner’s alternative obviousness theories for claim 1.

3. Claims 2 and 3

Claims 2 and 3 depend from claim 1 to narrow the range for the difference in protrusion distance between the two highest tips (limitation [1E]) to be less than or equal to about 10 microns (claim 2) or less than about 10 microns (claim 3). *See* Ex. 1001, 28:5–12.

Petitioner contends “Tsai renders obvious” the limitations of claims 2 and 3, because “Tsai teaches . . . [‘]the diamond tips of the ODD can be

leveled to ***less than 15 μm*** .” Pet. 45 (citing Ex. 1004, 8:22–24); Ex. 1002 ¶¶ 147–148. Petitioner asserts that, per that teaching, “the highest and second protruding tips can also be leveled to a value that is less than about 15 microns, which encompasses the claimed ‘less than [or equal to] about 10 microns.’” Pet. 45–46; Ex. 1002 ¶¶ 147–148. Petitioner cites *In re Peterson*, 315 F.3d 1325, 1330 (Fed. Cir. 2003), as stating that a “prior art reference that discloses a range encompassing a somewhat narrower claimed range is sufficient to establish a prima facie case of obviousness.” Pet. 45–46. Petitioner further asserts Tsai does not teach away from the claimed invention and the ’802 patent does not demonstrate any new and unexpected results, so “Patent Owner cannot overcome this presumption of obviousness.” *Id.* at 46 (citing *UCB, Inc. v. Actavis Laboratories UT, Nc.*, 65 F.4th 679, 689–90 (Fed. Cir. 2023)); see Ex. 1002 ¶¶ 149–150.

Patent Owner responds that “[i]mplicit in [claims 2 and 3] is an assessment of the total number of diamonds on the pad conditioner.” PO Resp. 45. However, Patent Owner does not expound on that position, or otherwise explain why or how Petitioner’s case for the obviousness of claims 2 and 3 might be deficient separately from Patent Owner’s arguments pertaining to the parent claim 1. See *id.* at 45–47.

We conclude Petitioner’s case for the obviousness of claims 2 and 3 is supported by *Peterson* and *UCB*. In *Peterson*, the claim was directed to an alloy consisting essentially of several components at specified percentage ranges. See *Peterson*, 315 F.3d at 1327. The Court stated that “[a] *prima facie* case of obviousness typically exists when the ranges of a claimed composition overlap the ranges disclosed in the prior art,” and cited various cases applying that principle. *Id.* at 1329. The facts presented here invoke

that principle, because the claimed range (less than or equal to about 10 microns) is completely encompassed by Tsai's disclosure (less than 15 microns). *See id.* at 1330 (“[W]hen, as here, the claimed ranges are completely encompassed by the prior art, the conclusion [of *prima facie* obviousness] is even more compelling than in cases of mere overlap.”).

The Court then stated: “In general, an applicant may overcome a *prima facie* case of obviousness by establishing ‘that the [claimed] range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range’ or ‘that the prior art teaches away from the claimed invention.’” *Id.* at 1330, 1331; *see also UCB*, 65 F.4th at 689–90 (“A presumption of obviousness applies ‘[w]here a claimed range overlaps with a range disclosed in the prior art’” and “[t]his presumption can be overcome if the ‘prior art teaches away from the claimed range, . . . the claimed range produces new and unexpected results,’ or other evidence demonstrates non-obviousness of the claimed range.”). As discussed above, Petitioner asserts there is no evidence of such criticality or teaching away in this case, and Patent Owner does not dispute that contention.

For the foregoing reasons, we conclude a preponderance of the evidence presented here establishes that claims 2 and 3 are unpatentable as having been obvious over Tsai.

4. *Claims 4 and 5*

Claim 4 depends from claim 1 to add that the difference in protrusion distance between the highest tip and the 10th highest tip is less than or equal to about 20 microns. *See Ex. 1001*, 28:14–17. Claim 5 depends from claim 1 to add that the difference in protrusion distance between the highest

tip and the 100th highest tip is less than or equal to about 40 microns. *See id.* at 28:18–21.

As discussed above in relation to limitations [1D], [1E], and [1F], *all* of the Tsai Figure 6 ODD diamond grit tips fall within a height distribution envelope that is 19.8 μm wide. *See supra* Sections III.E.2(b)–(d). Assuming there are at least 100 tips in the Tsai ODD (which Patent Owner disputes as discussed below), it necessarily follows that the distance between the highest tip and the 10th highest tip is less than or equal to about 20 microns per claim 4, and the distance between the highest tip and the 100th highest tip is less than or equal to about 40 microns per claim 5. *See, e.g.*, Pet. 51–52; Ex. 1002 ¶¶ 159–160.

Petitioner accordingly contends Tsai discloses that its ODD “contain[s] significantly more than 100 tips.” Pet. 46–47; *see* Ex. 1002 ¶¶ 151–152. Petitioner cites Tsai’s statement that “[a] typical diamond disk contains over 10,000 grits.” Ex. 1004, 2:14–15; *see* Pet. 47. Petitioner also relies on Dr. Shanfield’s geometrical analysis of the ODD illustrated in Tsai’s Figure 3 to conclude that it has about 154,800 diamond grits. *See* Pet. 47–49; Ex. 1002 ¶¶ 153–155. Dr. Shanfield similarly concludes the ODDs illustrated in Tsai’s Figures 5 and 8 both include about 24,768 diamond grits. *See* Pet. 49–51; Ex. 1002 ¶¶ 156–157. Thus, Petitioner’s view is that “regardless of the specific CMP pad dresser described by Tsai, they all contain a significantly larger number of diamond particles than” 100 particles. Pet. 51; Ex. 1002 ¶ 158.

Patent Owner responds that claims 4 and 5 require “an assessment of the total number of diamonds on the pad conditioner” — at least 10 in claim 4, and at least 100 in claim 5. PO Resp. 45. Patent Owner and

Dr. Tsai dispute Dr. Shanfield’s geometrical analysis of the ODDs shown in Tsai’s figures as incorrectly “assum[ing] that the individual segments of conditioning disks shown in these images are sufficiently representative of the entire disk that the same pattern and number of particles in those segments will be repeated across the entire disk.” *Id.* at 46; *see* Ex. 2011 ¶¶ 37–42.

We find Tsai discloses that its ODDs have at least 100 diamond grits, so Tsai anticipates claims 4 and 5. Tsai discloses as a general matter that: “A typical diamond disk contains over 10,000 grits.” Ex. 1004, 2:14–15. That alone, when combined with our findings above concerning how Tsai anticipates claim 1, is sufficient for Tsai to anticipate claims 4 and 5.

Moreover, Figure 3 of Tsai illustrates an exemplary ODD, and is reproduced below.

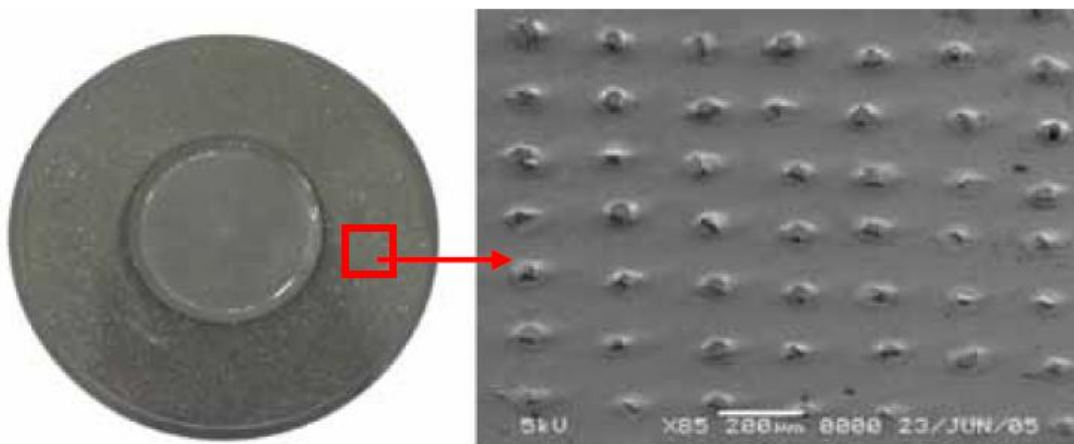


Fig. 3. Outer appearance of the organic diamond disk. Note that each diamond is covered with nickel.

Tsai, Figure 3 (Excerpt).

Id. at pg. 3. The excerpt of Figure 3 shown above depicts the outer appearance of a Tsai ODD (at left) and a magnified view of a portion of the Tsai ODD (at right) showing diamond particles on the ODD. *Id.* at pg. 3 (Fig. 3 caption), 6:18–20.

Claim 4 requires at least 10 particles. The magnified view of the Tsai ODD at right above includes at least 48 diamond grits. That is sufficient to anticipate claim 4, regardless of whether Dr. Shanfield is correct in testifying that the Tsai Figure 3 ODD has a total of about 154,800 diamond grits.

Claim 5 requires at least 100 particles, more than the diamond grits shown at right above. However, Tsai discloses that the ODD in Figure 3 has a diameter of 100 mm, and the magnified view at right above reflects a 200 micron scale at the bottom. See Ex. 1004, 6:18–20, 7:10–11; Pet. 47 (referring to the “scale bar” of “200 microns”); Ex. 1002 ¶ 155 (“The superabrasive particles are shown in the SEM image above [at right] to be arranged in a grid with an inter-diamond spacing of about 200 microns.”). Based on that scale, and the photograph at left above which shows diamond grits dispersed in a “regular distribution” throughout an annular region of the disk (Ex. 1004, 5:23–24), we find the Tsai Figure 3 ODD has many more than 100 diamond grits. Therefore, Tsai anticipates claim 5, regardless of whether Dr. Shanfield is correct in testifying that the Tsai Figure 3 ODD has a total of about 154,800 diamond grits.

Finally, we deny Patent Owner’s Motion to Exclude Dr. Shanfield’s testimony that the Tsai figures show ODDs having about 154,800 diamond grits (Figure 3) or about 24,768 diamond grits (Figures 5 and 8), set forth in Exhibit 1002 at ¶¶ 151–161. See Paper 30, 2, 7–11; Paper 31, 9–10; Paper 32, 4–5 (“***Lastly***”). The motion is moot as to this testimony, because our findings above do not rely on it.

For the foregoing reasons, we conclude a preponderance of the evidence presented here establishes that claims 4 and 5 are unpatentable as anticipated by Tsai. Therefore, we need not and we do not reach Petitioner’s

alternative contention that Tsai renders claims 4 and 5 obvious. *See* Pet. 52 (“To the extent Patent Owner argues . . .”); Ex. 1002 ¶ 161.

5. *Claims 13, 15, and 19*

Petitioner provides arguments and evidence in support of contending claims 13, 15 and 19 are unpatentable as anticipated by Tsai, including supporting testimony from Dr. Shanfield. *See* Pet. 42–44 (claims 13 and 15), 52–53 (claim 19); Ex. 1002 ¶¶ 139–145, 162–163. Patent Owner does not argue for the patentability of these claims separately from claim 1. *See, e.g.*, PO Resp. 45–48 (Patent Owner’s argument directed to the dependent claims). Therefore, Patent Owner has waived any such argument. *See* Inst. Dec. 78; Paper 15, 10.

We adopt Petitioner’s arguments as to Tsai anticipating claims 13, 15, and 19 as our own in this Decision. *See* Pet. 42–44, 52–53. Particularly concerning claims 13 and 15, we apply Petitioner’s “tip-to-designated profile” claim construction, and we find Tsai discloses that the highest tip of its Figure 6 ODD (at 33.0 μm) varies from Tsai’s designated flat contour profile (at 24.2 μm) by about 8.8 microns. *See supra* Sections III.E.2(b)–(d). That variance is “about 10 microns” per claim 13 and “less than about 20 microns” per claim 15.

We conclude a preponderance of the evidence presented here establishes that claims 13, 15, and 19 are unpatentable as anticipated by Tsai. Therefore, we need not and we do not reach Petitioner’s alternative contention that Tsai renders claims 13 and 15 obvious. *See* Pet. 44–45 (“To the extent Patent Owner argues . . .”); Ex. 1002 ¶ 145.

6. *Claims 20 and 21*

Claim 20 depends from claim 1 to add that “the plurality of superabrasive particles is arranged across the support substrate *in a predetermined pattern*.” Ex. 1001, 29:9–11 (emphasis added). Claim 21 depends from claim 20 to add that “the predetermined pattern includes an even distribution of the plurality of superabrasive particles spaced at a distance of from about 100 microns to about 800 microns.” *Id.* at 29:12–15.

Petitioner contends Tsai discloses the limitations of claims 20 and 21. *See* Pet. 53; Ex. 1002 ¶ 164. Petitioner cites Tsai’s Figures 3, 5, and 8 as showing that “the superabrasive diamond particles are arranged across the epoxy resin in a predetermined grid pattern in an even distribution” with “an even spacing between the superabrasive diamond particles.” Pet. 53–55 (also citing Ex. 1004, 3:10–4:1, 5:20–6:5); Ex. 1002 ¶¶ 165–167. “For example,” according to Petitioner, “Figure 3 shows an even spacing of about 200 microns, and Figures 5 and 8 show an even spacing of about 400–500 microns,” thereby satisfying claim 21’s particle spacing range. Pet. 55–56 (citing *Ineos*, 783 F.3d at 869); Ex. 1002 ¶ 167.

Patent Owner responds that Petitioner’s argument for claims 20 and 21 “relies on the same images of partial segments of Tsai’s pad conditioners” that are at issue for claims 4 and 5 discussed above, and should be rejected “for substantially the same reasons” discussed above. PO Resp. 47. For example: “Dr. Shanfield’s assumption that tip spacing will be uniform across the face of a pad conditioner was not contemplated by Tsai and runs contrary to the realities of CMP pad conditioner fabrication.” *Id.* at 47–48 (citing Ex. 1002 ¶ 166); *see also* Ex. 2011 ¶¶ 37–42 (Dr. Tsai’s supporting testimony). Further according to Patent Owner: “[W]ithout any

proof that the inter-diamond spacing of Figures 3, 5, and 8 was maintained in other segments of the disk, [Petitioner] cannot show that there was even distribution of particles, let alone one within the precise range of” claim 21. PO Resp. 48.

Petitioner replies that “[a] POSITA would have understood Tsai’s reference to ‘regular distribution’ [of particles] to refer to the expected arrangement, on average, across the entire ODD disk — in the regions where the diamond particles have been attached.” Pet. Reply 25 (citing Ex. 1004, 5:23–24). Petitioner asserts Dr. Tsai admitted during his deposition testimony that Tsai’s figures are “representative of the entire CMP pad dresser” in showing the “regular distribution” of particles described by Tsai, because “he used a mesh having ‘equal spacing’ to place the diamonds across the entire CMP pad dresser when making the ODD.” *Id.* at 25–26 (citing Ex. 1055, 82:7–83:2; Ex. 1051 (Dr. Tsai’s hand-drawn illustration)).

Patent Owner replies that “Dr. Tsai testified that neither the Tsai article nor his experiment could possibly convey information on spacing or any particular pattern between particles across the conditioner.” PO Sur-reply 21 (citing Ex. 1055, 173:18–174:15, 175:25–176:4, 176:21–177:14). For example, Patent Owner disputes whether the mesh Dr. Tsai used to place the diamond grits across the ODD had equal spacing. *See id.*

We find Tsai discloses arranging its particles in a predetermined pattern (per claim 20) including an even distribution of particles spaced at a distance of from about 100–800 microns (per claim 21).

First, the ’802 patent specification states that “a predetermined pattern . . . can be a uniformly distributed pattern or a non-uniformly distributed pattern,” wherein “[p]redetermined is understood to mean a

non-random pattern that has been determined prior to arranging the superabrasive particles.” Ex. 1001, 21:46–53. Further: “In one aspect, a predetermined pattern can also apply to a predetermined spacing between particles.” *Id.* at 21:53–55. Thus, as described in the ’802 patent, a “predetermined pattern” per claim 20 can be a non-uniform distribution of particles having a predetermined spacing between the particles, if the particle distribution is non-random and determined prior to arranging the particles on the substrate.

The ’802 patent specification states further that “the predetermined pattern can be a uniformly distributed grid” forming “an annular configuration having a central region devoid of superabrasive particles” and/or “an annular ring.” *Id.* at 22:3–13.

Second, we find Tsai discloses, correspondingly to the foregoing ’802 patent disclosures, a distribution of particles having a predetermined spacing between the particles, wherein the distribution is non-random and determined prior to arranging the particles on the substrate to form an annular ring on the substrate. This is shown, for example, in Tsai’s Figure 3 as reproduced below.

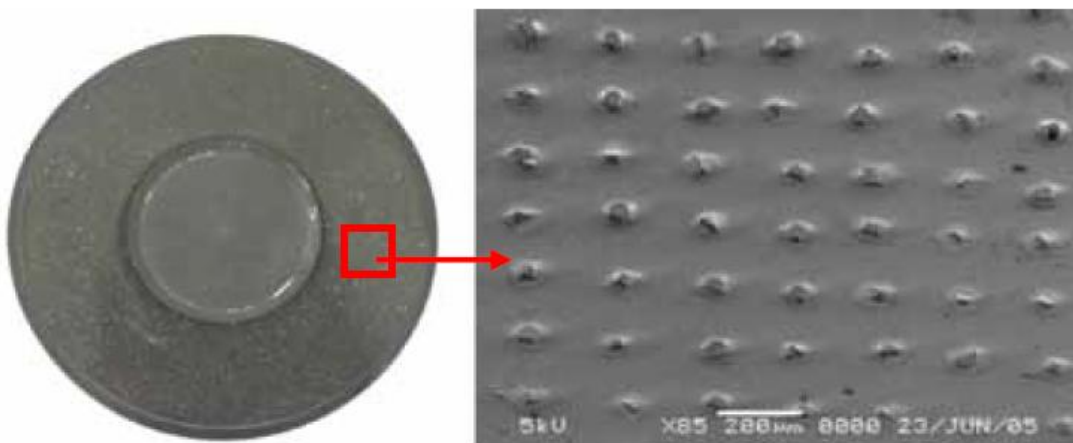


Fig. 3. Outer appearance of the organic diamond disk. Note that each diamond is covered with nickel.

Tsai, Figure 3 (Excerpt).

Ex. 1004, pg. 3. The excerpt of Figure 3 shown above depicts the outer appearance of a Tsai ODD (at left) and a magnified view of a portion of the Tsai ODD (at right) showing diamond particles on the ODD. *Id.* at pg. 3 (Fig. 3 caption), 6:18–20. The magnified view at right shows that the particles have a predetermined spacing of 200 microns per the scale at the bottom of the photograph, and that the particle distribution is a non-random grid determined prior to arranging the particles on the substrate. The overall view at left shows that the non-random grid forms an annular ring on the substrate.

Patent Owner and Dr. Tsai correctly point out that the magnified view at right above depicts a small portion of the disc. Nonetheless, the depicted portion is large enough, and the illustrated particle distribution is sufficiently regular, that we are persuaded by Dr. Shanfield’s testimony that Tsai discloses arranging its particles in a predetermined pattern across the entire substrate with an inter-particle spacing of about 200 microns. *See* Ex. 1002 ¶¶ 154–155, 164–167. Dr. Shanfield’s testimony also is supported by Tsai’s statement that the diamond grits are placed on a mold in a “regular distribution” as part of Tsai’s reverse casting manufacturing process.

Ex. 1004, 5:23–24. Moreover, the 200 micron spacing of Figure 3 falls within the range of claim 21 of about 100–800 microns.

Dr. Tsai testifies in opposition that the Tsai article’s study was “concerned with leveling diamond tip heights” and “[t]he reverse casting method was not intended to produce a specific distribution, spacing or pattern of diamonds.” Ex. 2011 ¶¶ 37–42. For example, Dr. Tsai “did not verify whether the spacing between all of the tips on the ODD disclosed in Tsai was *exactly the same* across the entire disk,” and “the diamonds [were]

distributed randomly (which lead to randomized spacing between the diamond particles) across the ODD.” *Id.* ¶ 40 (emphasis added). Further according to Dr. Tsai, Tsai’s reference to “regular distribution” (Ex. 1004, 5:23–24) “does not mean *perfect distribution* across the disk such that *all spacing is identical*,” and “[t]he distribution of the diamonds on the ODD is *not perfectly regular*.” *Id.* ¶ 41 (emphasis added).

As discussed above, however, the claim term “predetermined pattern” does not require, as Dr. Tsai’s testimony would have it, an exact or perfectly regular particle distribution. Instead, a “predetermined pattern” can be a non-uniform distribution of particles having a predetermined spacing between the particles, if the particle distribution is non-random and determined prior to arranging the particles on the substrate. Tsai’s Figure 3 illustrates an ODD satisfying that claim requirement, as discussed above.

Third, Dr. Tsai testified on re-direct examination during his deposition that the ODDs in Tsai were made by placing diamond grits on a mesh, and then shaking the mesh back and forth above a substrate so the diamonds pass through the mesh and fall on the substrate. *See* Ex. 1055, 173:14–177:17; Ex. 1051 (Dr. Tsai’s first hand-drawn illustration of the mesh); Ex. 2016 (Dr. Tsai’s second hand-drawn illustration of the mesh); PO Sur-reply 21–22. This testimony, however, does not detract from our foregoing reliance on Tsai’s Figure 3 and reference to a “regular distribution” of grits as disclosing the limitations of claims 20 and 21.

Fourth, we deny Patent Owner’s Motion to Exclude Dr. Shanfield’s testimony concerning claims 20 and 21, set forth in Exhibit 1002 at ¶¶ 164–167. *See* Paper 30, 2, 7–9, 11; Paper 31, 9–10; Paper 32, 4–5 (“***Lastly***”). As discussed above, we conclude Dr. Shanfield’s testimony as to claims 20

and 21 is amply supported by Tsai's disclosure. Moreover, this specific testimony is unrelated to whether the Tsai figures show ODDs having about 154,800 diamond grits (Figure 3) or about 24,768 diamond grits (Figures 5 and 8), so the motion is moot as to this testimony.

For the foregoing reasons, we conclude a preponderance of the evidence presented here establishes that claims 20 and 21 are unpatentable as anticipated by Tsai.

F. Ground Two — Obviousness over Tsai and Sung '026

Petitioner asserts claims 1–3, 6–14, and 16–18 of the '802 patent are unpatentable as having been obvious over Tsai and Sung '026. *See* Pet. 5–6, 56–75. Patent Owner disagrees. *See* PO Resp. 2, 4–5, 48–54.

For reasons that follow, we determine Petitioner has demonstrated the unpatentability of claims 1–3, 6–9, 12–14, and 16–18, but not of claims 10 and 11.

*1. Claims 1–3, 6, 7, 13, 14, and 16–18 —
Petitioner's Unopposed Contentions*

Concerning claims 1–3, 6, 7, 13, 14, and 16–18, Patent Owner's sole opposition to Ground Two is that neither Tsai nor Sung '026 is prior art to these claims. *See* PO Resp. 48–49; Pet. Reply 16. We disagree with Patent Owner for reasons provided above in Section III.D.

We adopt Petitioner's arguments as to claims 1–3, 6, 7, 13, 14, and 16–18 being obvious over Tsai and Sung '026 as our own in this Decision. *See* Pet. 56–62, 70–75. We accordingly conclude a preponderance of the evidence presented here establishes the unpatentability of these claims.

Patent Owner has waived any opposition other than his filing date priority arguments discussed above. *See* Inst. Dec. 78; Paper 15, 10.

2. *Claims 8–12 — Number of Working Particles*

Claims 8–12 each depend from claim 1, and require “*working* superabrasive particles” of various numbers — “at least 100” in claim 8, “at least 1000” in claim 9, “from about 1000 to about 6000” in claim 10, “from about 2000 to about 5000” in claim 11, and “at least about 1000” in claim 12. Ex. 1001, 28:22–47 (emphasis added).

The ’802 patent defines the term “working superabrasive particles” to mean “superabrasive particles that cut or otherwise deform a CMP pad during a dressing or conditioning procedure.” *Id.* at 4:46–54; *see also id.* at 4:55–59 (defining “non-working superabrasive particles” to mean “superabrasive particles in a CMP pad dresser that do not significantly cut or deform the pad”).

Petitioner argues the Tsai ODD includes working particles because its “diamond particles act as cutters and share an equal dressing load during the dressing or conditioning procedure.” Pet. 60 (citing Ex. 1004, Fig. 5b, 2:14–16, 8:13–14, 8:24–26); Ex. 1002 ¶¶ 178–180. Petitioner further contends “Tsai teaches or Tsai and Sung ’026 render obvious” the various numbers of working particles recited in claims 8–12. *See* Pet. 62–69; Ex. 1002 ¶¶ 153–157, 180, 186–203. We discuss these two alternatives (obviousness over Tsai alone, and obviousness over Tsai and Sung ’026) separately.

(a) *Obviousness Over Tsai Alone (Claims 8, 9, and 12)*

As to Tsai's teachings, Dr. Shanfield testifies that the ODD illustrated in Tsai's Figure 3 contains a total of about 154,800 particles. *See* Ex. 1002 ¶¶ 153–155, 187 (citing Ex. 1004, Fig. 3, 3:10–4:1, 6:19–20, 7:10–11); Pet. 62–63. Dr. Shanfield makes similar calculations for the ODDs illustrated in Tsai's Figures 5 and 8, with both having about 24,768 total particles. *See* Ex. 1002 ¶¶ 156–157, 188 (citing Ex. 1004, Figs. 5 and 8); Pet. 63–64. Dr. Shanfield then testifies that “Tsai discloses that *all* the diamond particles on the CMP pad dressers are cutters and share an equal dressing load when conditioning CMP pads,” thereby satisfying the number requirements of claim 8 (at least 100) and claims 9 and 12 (at least 1,000). Ex. 1002 ¶¶ 180, 189, 202 (emphasis added) (citing Ex. 1004, Fig. 5, 2:14–17, 8:13–14, 8:24–26); *see* Pet. 64, 69.

In the Institution Decision, based on the preliminary record, we concluded: “It is not clear to us, and Dr. Shanfield does not explain persuasively, how Tsai's disclosure that its ODD has more cutters (i.e., working particles per claim 9) than the conventional BDD leads to his conclusion that *all* of the diamond particles in the ODD are cutters.” Inst. Dec. 76 (emphasis added).

Patent Owner urges us to maintain that conclusion, for various reasons, including testimony from Dr. Tsai. *See* PO Resp. 49–52; Ex. 2011 ¶¶ 43–47. Patent Owner also reiterates his opposition to Dr. Shanfield's “extrapolation” from Tsai's Figures to reach a conclusion as to the total number of diamond grits in the Tsai ODD, including the “working” particles of claims 8, 9, and 12. *See id.* at 50–51 (citing Ex. 1002 ¶¶ 186–189).

Petitioner replies that “a POSITA reading Tsai would have readily understood Tsai to teach that [its] ODD was designed to make all of the superabrasive particles function as cutters.” Pet. Reply 16–17 (citing Ex. 1004, 3:1–10; Ex. 1055, 40:15–21). Petitioner also argues “more of the superabrasive particles in the ODD function as cutters because ODD is an improvement over BDD, which typically had over 10,000 grits with about 10% of the grits (*i.e.*, ~1,000) functioning as cutters,” so Tsai’s “ODD will have more than ~1,000 cutters.” *Id.* at 17 (citing Ex. 1004, 2:14–16; Ex. 1055, 57:21–23).

Petitioner moreover points out that “working” particles are defined in the ’802 patent as particles that merely *deform* a CMP pad during dressing. *See id.* at 17 (citing Ex. 1001, 4:46–48). Petitioner asserts that, even if some of the Tsai ODD’s diamond grits may not cut the CMP pad, they nonetheless “will at a minimum ‘deform’ the CMP pad.” *Id.* at 17–18 (citing Ex. 1001, 4:48–50). According to Petitioner, Dr. Tsai testified in IPR2024-00533 “that when a CMP pad dresser is pressed down against the CMP pad, [the] CMP pad will experience at least some deformation.” *Id.* at 18 (citing Ex. 1052, 33:7–15).

Patent Owner replies that Dr. Tsai “did not determine the number of working particles in his experiment reflected in” Tsai. PO Sur-reply 18–19 (citing Ex. 1055, 169:8–14, 115:25–116:6, 120:17–121:2, 153:7–10, 208:11–19, 209:12–20). Dr. Tsai also testifies that it is not possible to determine the number of working particles on a Tsai ODD based solely on the disclosure in Tsai, which reports diamond grit height data from only a small area of the ODD. *See id.* at 19–20 (citing Ex. 1055, 58:8–16, 60:5–13, 73:11–17, 169:8–17, 171:21–172:14, 207:3–7, 208:11–19). Patent Owner

further concludes “no number of working particles could be imputed by the qualifier ‘less than 10%’ [in Tsai], particularly where, as here, the number of total particles on the conditioner is **unknown**.” *Id.* at 20.

We conclude a preponderance of the evidence does not support Petitioner’s reliance on Tsai alone as rendering claims 8, 9, and 12 obvious. Dr. Shanfield’s testimony in this regard concludes that *all* of the diamond grits in Tsai’s ODD are *working* particles. See Ex. 1002 ¶¶ 180, 189 (“Tsai discloses that all the diamond particles on the CMP pad dressers are cutters and share an equal dressing load[.]”) (citing Ex. 1004, Fig. 5, 2:14–17, 8:13–14, 8:24–26); Pet. Reply 16 (arguing Tsai’s “ODD was designed to make all of the superabrasive particles function as cutters”). The cited disclosures in Tsai state that the conventional BDD had “less than 10% of the diamond grits [being] engaged in cutting the polishing pad,” whereas Tsai’s ODD has regularly distributed diamond cutters with a protrusion height of “approximately 30 μm ” such that “[t]he *better-leveled* ODD has *more cutters that can dress the pad*, and thus, they share an equal dressing load.” Ex. 1004, 2:10–17, 8:10–26 (emphases added); see also *id.* at 11:16–18 (“The height variation in the diamond tips of the ODD is significantly smaller than that in the diamond tips of the BDD.”).

We maintain our conclusion from the Institution Decision that Dr. Shanfield does not explain persuasively how Tsai’s disclosure that its ODD has more cutters (i.e., working particles per claims 8, 9, and 12) than the conventional BDD leads to his conclusion that all of the diamond particles in the ODD are cutters. See Inst. Dec. 76. For example, Tsai’s description of “an equal dressing load” refers to the *cutters* sharing an equal dressing load among themselves, not to *all* particles sharing an equal

dressings load. Ex. 1004, 8:24–26. Petitioner elected not to submit a reply declaration from Dr. Shanfield to bolster the record in this regard following institution.

Petitioner did submit more argument on this point, but it is not persuasive. First, Petitioner cites to Dr. Tsai’s deposition testimony, but it establishes only that Dr. Tsai was trying to improve the leveling of diamond tips in the ODD to mimic the ADD at a lower cost; it does not establish that the ODD’s tip leveling led to any particular number of working particles as recited in claims 8, 9, and 12, much less that all of the grits were working particles as Petitioner suggests. See Ex. 1055, 40:15–21; Pet. Reply 16–17.

Second, Petitioner relies on Tsai’s statements that “[a] typical diamond disk contains over 10,000 grits” wherein “*less than 10%* of the diamond grits are engaged in cutting the polishing pad” and “[t]he rest of the grits remain unused.” Ex. 1004, 2:14–17 (emphasis added). Petitioner mischaracterizes Tsai’s “less than” description to argue this disclosure reflects the conventional BDD had “*about 10%* of the grits” functioning as cutters. Pet. Reply 17 (emphasis added). Tsai’s lack of specificity in this regard fails to support Petitioner’s contention that Tsai discloses or suggests any particular number of working particles in its ODD, as required by claims 8, 9, and 12. *E.g.*, Ex. 1055, 58:8–61:22 (Dr. Tsai testifying under cross-examination that “[i]t could be anywhere from 1 percent to 10 percent” or “zero to 10 percent”) (cited at PO Sur-reply 20).

Third, Petitioner relies on the breadth of the ’802 patent’s lexicographic definition of “working” particles as including particles that merely deform (not necessarily cut) a CMP pad. See Pet. Reply 17–18. But even accepting Petitioner’s contention that a Tsai ODD will deform a CMP

pad, there is no evidence here to indicate that a Tsai ODD does so utilizing any particular number of particles as required by claims 8, 9, and 12. *See id.* (citing Ex. 1052, 33:7–15).

Thus, a preponderance of the evidence does not support Petitioner’s reliance on Tsai alone as rendering claims 8, 9, and 12 obvious.

(b) Obviousness Over Tsai and Sung ’026 (Claims 8–12)

Dr. Shanfield alternatively concludes the combination of Tsai and Sung ’026 renders the working particle numbers of claims 8–12 obvious. *See* Ex. 1002 ¶¶ 190–203; Pet. 64–69.

(i) Claims 8, 9, and 12

For claims 8, 9, and 12, Dr. Shanfield testifies “Sung ’026 discloses that, during CMP pad conditioning, frictional forces are distributed equally across each superabrasive particle” which “minimizes the stress placed on individual particles and prevents them from displacing from the organic material layer.” Ex. 1002 ¶ 191 (citing Ex. 1005 ¶¶ 51, 75, claim 2); *see* Pet. 64–65. Dr. Shanfield opines that “[i]f each superabrasive particle is experiencing the same force when conditioning a CMP pad, each superabrasive particle is itself cutting asperities in the CMP pad and is a working superabrasive particle.” Ex. 1002 ¶ 191; *see* Pet. 65. Further: “Sung ’026 discloses that a ‘majority’ of the superabrasive particles protrude to a predetermined height above the rigid epoxy support layer” in order to “produce cutting depths ‘that [are] essentially the distance[s] of protrusion.’” Ex. 1002 ¶ 192 (citing Ex. 1005 ¶¶ 52, 76, claims 3–6); *see* Pet. 65. “Therefore,” according to Dr. Shanfield, “at least the majority of the superabrasive particles on the disclosed CMP pad dressers are working

superabrasive particles” which, when applied to the total number of particles on Tsai’s ODDs discussed above, would lead to “at least 77,400 or 12,384” working particles being present. Ex. 1002 ¶¶ 192–193; see Pet. 65–66.

Patent Owner responds that Dr. Shanfield’s reliance on Sung ’026 as disclosing “each” particle is a working particle is not supported by Sung ’026. See PO Resp. 52–53 (citing Ex. 1002 ¶ 191; Ex. 1005 ¶ 51). Patent Owner argues Sung ’026 instead teaches “that its superabrasive particles include particles that ‘will be ***recessed in height*** as compared to superabrasive particles having tips and edges oriented towards the adhesive, and ***thus will not contact the CMP pad during dressing.***” *Id.* (citing Ex. 1005 ¶ 80). Patent Owner moreover asserts “Sung 026’s disclosure that ‘[t]he protruding superabrasive particles 12 ***can*** cut into the CMP pad to a depth that is essentially the distance of the protrusion’ does not dictate that all particles of all protrusion depths actually do cut into the CMP pad.” *Id.* at 54 (quoting Ex. 1005 ¶ 76).

Patent Owner further argues “Dr. Shanfield’s view that diamond particles that experience frictional forces are by definition working particles that cut a CMP pad reflects an understanding of how a pad conditioner works that had been superseded by 2012,” with the new understanding being “that it is the outlying superabrasive particles that provide the greatest contribution to the behavior of the CMP pad dresser in operation.” *Id.* at 53 (citing Ex. 2011 ¶¶ 52–53). Also according to Patent Owner, a POSITA in 2012 “would not be able to determine” which of a pad dresser’s particles are “working” particles per claims 8, 9, and 12. *Id.* at 53–54 (citing Ex. 2011 ¶ 55 and “¶ XX”).

Petitioner replies that “Sung ’026 expressly teaches that ‘a majority of the plurality of superabrasive particles protrudes to a predetermined height,’ ‘wherein the predetermined height produces a **cutting depth**,’” so “there cannot be any dispute that Tsai with Sung ’026 renders obvious” claims 8, 9, and 12. Pet. Reply 18 (citing Ex. 1005, claims 3–6). Further according to Petitioner: “Sung ’026 also teaches a **deformation** of the CMP pad by the superabrasive particles” per the ’802 patent’s lexicographic definition of “working” particle. *Id.* at 18–19 (citing Ex. 1005 ¶ 51).

The Patent Owner Sur-reply does not return to the issue of whether claims 8, 9, and 12 might have been obvious over Tsai and Sung ’026. *See* PO Sur-reply 18–21 (arguments directed to claims 8–12).

We conclude a preponderance of the evidence establishes that claims 8, 9, and 12 would have been obvious over Tsai and Sung ’026. We find Sung ’026 suggests frictional forces can be “distributed equally across *each* superabrasive particle” of a CMP pad dresser during pad conditioning to achieve certain benefits, as Dr. Shanfield testifies. Ex. 1002 ¶¶ 191–192 (emphasis added). In particular, Sung ’026 discloses particles may be secured to a substrate to uniformly distribute frictional forces across the particles during a pad dressing procedure, and thereby minimize the stress impinging on individual particles to prevent their separation from the substrate, by providing an “even height distribution” in “a majority” of the particles. Ex. 1005 ¶¶ 51–52, 75–76, claims 2–4. Tsai similarly teaches that its ODD is “better-leveled” than a BDD, which beneficially results in “more cutters that can dress the pad [to] share an equal dressing load.” Ex. 1004, 8:24–26; *see also* Ex. 1002 ¶ 189 (citing this disclosure in Tsai).

Tsai in turn discloses that “[a] typical diamond disk contains over 10,000 grits.” Ex. 1004, 2:14–15 (cited at Ex. 1002 ¶ 180 concerning claim 6, from which claims 8–12 depend); see Pet. 60 (arguing claim 6). Thus, regardless of whether the teachings of Sung ’026 discussed above are applied to each grit in a Tsai ODD ($\geq 10,000$ grits) or only a majority of the grits ($\geq 5,000$ grits), the combination results in a pad dresser including at least 1,000 working particles having an even height distribution to distribute frictional forces uniformly across the particles and thereby prevent their separation from the substrate. See Ex. 1002 ¶¶ 191–193.

Patent Owner cites Sung ’026’s disclosure that a micro sieve may be applied to a substrate, so the “[a]pexes and edges” but not the “faces” of the particles pass through the sieve to be attached to an adhesive. Ex. 1005 ¶ 80. Further: “Those faces that do adhere to the adhesive through the micro sieve will not affect the cutting of the tool, as they will be recessed in height as compared to superabrasive particles having tips and edges oriented towards the adhesive, and thus will not contact the CMP pad during dressing.” *Id.* This disclosure does not alter our findings above. It concerns how the particles are oriented on the substrate, specifically trying to keep the “faces” of the particles upright to perform a pad dressing procedure. It does not address the materially different issue providing an even height distribution for the particles to distribute frictional forces as discussed above.

We have also considered Dr. Tsai’s testimony concerning claims 8, 9, and 12. See Ex. 2011 ¶¶ 48–54. He most pertinently testifies that “particles that experience frictional forces do not *all* cut a CMP pad,” because the outlying particles provide the greatest contribution to a pad dressing operation. Ex. 2011 ¶ 51 (emphasis added); *id.* ¶¶ 48, 51–54. Dr. Tsai cites

unspecified “empirical data” that purportedly shows this. *Id.* ¶ 53. This testimony does not alter our findings above. In particular, even if the outlying particles provide the greatest cutting contribution, it still follows from Sung ’026’s disclosure that providing an even height distribution throughout all (or perhaps just a majority) of the particles will beneficially distribute frictional forces across the particles to minimize the stress impinging individual particles during a dressing operation. Moreover, as Petitioner correctly points out, “working” particles include particles that merely deform the pad, so actual cutting is not required. *See* Ex. 1001, 4:46–59.

Dr. Tsai also testifies “a POSITA cannot use height variation among particles and particle location alone to identify those tips that are cutting the pad.” Ex. 2011 ¶ 49 (citing Ex. 2010). However, claims 8, 9, and 12 do not require an identification of which particles are the working particles; they simply specify minimum numbers of working particles. That subject matter is rendered obvious by the combination of Tsai and Sung ’026 as discussed above.

Claim 12 additionally recites that the working particles “protrude from the rigid support substrate to distances within about 30 microns of one another.” Ex. 1001, 28:43–47. Petitioner asserts Tsai teaches this limitation because “Tsai discloses and/or renders obvious that all superabrasive particles of the CMP pad dresser protrude from the rigid support to distances that [are] less than 15 microns of each other.” Pet. 69 (citing Ex. 1004, Fig. 6, 8:22–24); Ex. 1002 ¶ 203. Patent Owner responds that “there is no telling” how many of the Tsai ODD’s diamond grits are “working” particles, as discussed above. PO Resp. 49. Therefore, Patent Owner’s view is that

Tsai's description that its "ODD can be leveled to less than 15 microns" (Ex. 1004, 8:22–24) does not aid Petitioner in relation to the protrusion distance limitation of claim 12. *See id.* at 49–50.

We conclude Petitioner's case for the obviousness of claim 12 over Tsai and Sung '026 in this regard is supported by Tsai's disclosure that "the diamond tips of the ODD can be leveled to less than 15 μm ." Ex. 1004, 8:22–24, Fig. 6. This suggestion in Tsai that "all superabrasive particles of the CMP pad dresser protrude from the rigid support to distances that [are] less than 15 microns of each other" (Pet. 69; Ex. 1002 ¶ 203), when combined with the Sung '026 disclosures concerning *working* particles discussed above, would have motivated a POSITA to practice the invention of claim 12. Patent Owner's opposition unpersuasively focuses on Tsai's limited disclosures concerning actual working particles, without addressing Tsai's combination with Song '026 in that regard.

Finally, we deny Patent Owner's Motion to Exclude Dr. Shanfield's testimony that the Tsai figures show ODDs having about 154,800 diamond grits (Figure 3) or about 24,768 diamond grits (Figures 5 and 8), as set forth in Exhibit 1002 at ¶¶ 180, 187–193, and 203. *See* Paper 30, 2, 7–11; Paper 31, 9–10; Paper 32, 4–5 ("***Lastly***"). The motion is moot as to this testimony, because our findings above do not rely on it.

Thus, a preponderance of the evidence presented here establishes that claims 8, 9, and 12 are unpatentable as having been obvious over Tsai and Sung '026.

(ii) *Claims 10 and 11*

Claims 10 and 11 both recite ranges of working particle numbers, about 1,000 to 6,000 in claim 10 or about 2,000 to 5,000 in claim 11. *See* Ex. 1001, 28:37–42.

Dr. Shanfield testifies for Petitioner that claims 10 and 11 are unpatentable over Tsai and Sung '026 “because a POSITA would have found it obvious to try different pad conditioners that meet the claimed number of particles based on the range of fabrication values disclosed in Tsai and Sung '026.” Pet. 66; Ex. 1002 ¶ 194. Dr. Shanfield cites Sung '026 as “explain[ing] that a wide range of diamond particle sizes and diamond-to-diamond particle spacing is possible.” Pet. 67; Ex. 1002 ¶¶ 196–197 (citing Ex. 1005 ¶¶ 12, 14, 52). Dr. Shanfield particularly cites Sung '026’s disclosure that “the plurality of superabrasive particle may be from about 30 microns to about **250 microns in size**” (Ex. 1005 ¶ 12) and “may be evenly spaced at a distance of from about 3 times to about **5 times the average size of the superabrasive particles**” (*id.* ¶ 14). Pet. 67 (emphasis added). Dr. Shanfield’s view is that, based on those disclosures in Sung '026, “a POSITA would have readily found it obvious to try a diamond-to-diamond spacing up to 1250 microns (5 x 250 microns)” in the context of Tsai’s Figure 3 ODD, resulting in “a CMP pad dresser with approximately 3,963 superabrasive particles,” falling within the ranges of claims 10 and 11. *Id.* at 67–69; Ex. 1002 ¶¶ 195–199.

Patent Owner’s opposition concerning claims 10 and 11 is discussed above, although Dr. Tsai adds some specific objections to Petitioner’s combination of Tsai and Sung '026 in relation to these claims. *See* PO Resp. 49–54; Ex. 2011 ¶ 55.

We conclude Petitioner’s case for the obviousness of claims 10 and 11 over Tsai and Sung ’026 fails to address that these claims require numbers of working particles. Specifically, the Petition’s analysis discusses the *total* number of particles in the pad dresser of Tsai and Sung ’026, without discussing the portion of that total that are or might be *working* particles. See Pet. 66–69. Petitioner’s Reply similarly groups claims 10 and 11 with claims 8, 9, and 12, and relies on Tsai as teaching that “*all* of the superabrasive particles function as cutters.” Pet. Reply 16 (emphasis added); see *id.* at 16–18. We are not persuaded by that theory, as discussed above in Section III.F.2(a).

Petitioner’s additional discussion of Sung ’026 in the Reply does not add anything new to the Petition’s analysis of the specific ranges of working particles recited in claims 10 and 11, including their respective maximums of about 5,000 or 6,000 *working* particles. See *id.* at 18–19.

Thus, we conclude a preponderance of the evidence does not support Petitioner’s reliance on Tsai and Sung ’026 as rendering claims 10 and 11 obvious.

G. Ground Three — Obviousness over Sung ’146 and Sung ’026

Petitioner asserts claims 1–7 and 13–21 of the ’802 patent are unpatentable as having been obvious over Sung ’146 and Sung ’026. See Pet. 5–6, 75–80.

Patent Owner’s sole opposition to this assertion is that neither Sung ’046 nor Sung ’026 is prior art to the challenged claims. See PO Resp. 2, 54; Pet. Reply 15. We disagree with Patent Owner for reasons provided above in Section III.D.

We adopt Petitioner’s arguments as to claims 1–7 and 13–21 being obvious over Sung ’146 and Sung ’026 as our own in this Decision. See Pet. 75–80. We accordingly conclude a preponderance of the evidence presented here establishes the unpatentability of these claims. Patent Owner has waived any opposition other than his filing date priority arguments discussed above. See Inst. Dec. 78; Paper 15, 10.

IV. SUMMARY OF CONCLUSIONS

In summary, we determine a preponderance of the evidence establishes claims 1–9 and 12–21 of the ’802 patent are unpatentable, but does not establish claims 10 and 11 of the ’802 patent are unpatentable, as shown in the following table:¹⁷

Claim(s)	35 U.S.C. §	Reference(s)/ Basis	Claim(s) Shown Unpatentable	Claim(s) Not Shown Unpatentable
1–5, 13, 15, 19–21	102 / 103	Tsai	1–5, 13, 15, 19–21	
1–3, 6–14, 16–18	103	Tsai, Sung ’026	1–3, 6–9, 12–14, 16–18	10, 11

¹⁷ Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner’s attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. See 37 C.F.R. § 42.8(a)(3), (b)(2).

1–7, 13–21	103	Sung '146, Sung '026	1–7, 13–21	
Overall Outcome			1–9, 12–21	10, 11

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 1–9 and 12–21 of the '802 patent have been proven by a preponderance of the evidence to be unpatentable;

FURTHER ORDERED that claims 10 and 11 of the '802 patent have not been proven by a preponderance of the evidence to be unpatentable;

FURTHER ORDERED that Patent Owner's Motion to Exclude is denied; and

FURTHER ORDERED that, because this is a final written decision, parties to this proceeding seeking judicial review of our Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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Patent 9,724,802 B2

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