

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

Petitioner's Reply

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
REPLY IN SUPPORT OF ITS PETITION**

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

TABLE OF CONTENTS

	<u>Page</u>
I. INTRODUCTION	1
II. CLAIM CONSTRUCTION	2
III. PERSON OF ORDINARY SKILL IN THE ART (“POSITA”).....	2
IV. THE CORRECT PRIORITY DATE OF THE ’802 PATENT IS OCTOBER 3, 2014—ITS FILING DATE.....	4
A. The Co-Pending Application Requirement Was Not Met	6
B. None Of The ’074 Provisional, ’817 Application, Or ’786 Application Provides Written Description Support	9
1. The ’074 Provisional Does Not Provide Support For [1D]	10
2. The ’817 Application Does Not Provide Support For [1E] or [1F]	11
3. The ’786 Application Does Not Provide Support For [1E] or [1F]	13
C. Dr. Sung Disclaimed All Earlier Priority Dates.....	14
V. GROUNDS II AND III RENDER ALL CLAIMS UNPATENTABLE.....	15
A. Ground III: Sung’146 With Sung’026 Renders Obvious Claims 1-7 And 13-21	15
B. Ground II: Tsai With Sung’026 Renders Obvious Claims 1-3, 6-14, And 16-18	16
1. Claims 1-3, 6-7, 13-14, And 16-18.....	16
2. Claims 8-12	16
i. Tsai’s “Cutters” Meet Claims 8-12	16
ii. Diamond Particles That “Deform” the CMP Pad Meet Claims 8-12	17

iii.	Tsai With Sung’026 Renders Obvious Claims 8-12	18
VI.	GROUND I: TSAI ANTICIPATES AND/OR RENDERS OBVIOUS CLAIMS 1-5, 13, 15, AND 19-21	19
A.	Tsai Teaches Or Suggests “Designated Profile”	19
B.	Tsai Teaches Or Suggests “Tip Variation” From The Designated Profile	24
C.	Tsai Teaches Or Suggests The Claimed Highest Protruding Tip, Second Highest Protruding Tip, The Highest 1% Of The Protruding Tips, And Difference In Protrusion Distance	25
D.	Dependent Claims 2-5 And 20-21	25
VII.	DR. TSAI’S LACK OF CREDIBILITY	27
VIII.	CONCLUSION.....	29

TABLE OF AUTHORITIES

	Page(s)
<u>Cases</u>	
<i>Hollmer v. Harari</i> , 681 F.3d 1351 (Fed. Cir. 2012)	4
<i>Maxlite, Inc. v. Jiaxing Super Lighting Electric Appliance Co., Ltd.</i> , IPR2020-00208, Paper 14, 7-8 (PTAB June 1, 2021).....	7
<i>Natural Alternatives, Inc. v. Iancu</i> , 904 F.3d 1375 (Fed. Cir. 2018)	4
<i>Parus Holdings, Inc. v. Google LLC</i> , 70 F.4 th 1365 (Fed. Cir. 2023)	4
<i>PowerOasis, Inc. v. T-Mobile USA, Inc.</i> , 522 F.3d 1299 (Fed. Cir. 2008)	5
<i>Purdue Pharma L.P. v. Faulding Inc.</i> , 230 F.3d 1320 (Fed. Cir. 2000)	10
<i>Regents of the Univ. of Minnesota v. Gilead Scis., Inc.</i> , 61 F.4 th 1350 (Fed. Cir. 2023)	10
<i>Studiengesellschaft Kohle, M.B.H. v. Shell Oil Co.</i> , 112 F.3d 1561 (Fed. Cir. 1997)	8
<i>Tech. Licensing Corp. v. Videotek, Inc.</i> , 545 F.3d 1316 (Fed. Cir. 2008)	7
<i>Vas-Cath Inc. v. Mahurkar</i> , 935 F.2d 1555 (Fed. Cir. 1991)	12
<u>Statutes</u>	
35 U.S.C. § 120	4, 7, 10
35 U.S.C. §112(a)	10

All emphases are added unless otherwise noted.

TABLE OF EXHIBITS

Petitioner Exhibit No.	DESCRIPTION
1001	U.S. Patent No. 9,724,802 (“’802 Patent”)
1002	Declaration of Dr. Stanley Shanfield
1003	File History of the ’802 Patent
1004	Tsai et al., “Organic diamond disk versus brazed diamond disk for dressing a chemical-mechanical polishing pad,” <i>Diamond & Related Materials</i> , 23, 2012, 144-149 (“Tsai”)
1005	U.S. Patent Application Publication No. 2007/0060026 (“Sung’026”)
1006	“The Organic Diamond Disk (ODD) for Dressing of Polishing Pads of Chemical Mechanical Planarization”, International Conference on Planarization / CMP Technology, 25-27 October 2007 (“SungICPT”)
1007	Fenna, Donald. “Hardness Numbers,” <i>A Dictionary of Weights, Measures, and Units</i> , 1st ed., Oxford University Press, 2004.
1008	Tsai et al., “Effect of CMP conditioner diamond shape on pad topography and oxide wafer performances,” <i>Int. J. Adv. Manuf. Technology</i> , 55: 253-262 (2011)
1009	U.S. Patent Application Publication No. 2008/0292869 (“Sung’869”)
1010	U.S. Patent Application Publication No. 2010/0248595 (“Dinh-Ngoc”)
1011	Declaration of Dr. [Chien-Min] James Sung In Support of Plaintiff’s Answering Brief In Opposition To Defendant’s Motion To Stay in <i>Chien-Min Sung v. Kinik Co.</i> , 1:20-cv-00247-RGA
1012	Order Denying Stay in <i>Chien-Min Sung v. Kinik Co.</i> , 1:20-cv-00247-RGA
1013	Ishizuka et al. “PCD Dressers for Chemical Mechanical Planarization with Uniform Polishing”, Proceedings of International Conference on Leading Edge Manufacturing in 21 st Century: LEM21, 2007, Volume 2007.4
1014	U.S. Patent No. 5,036,015
1015	Pysher et al. “Design, Characteristics and Performance of Diamond Pad Conditioners”, Materials Research Society Symposium Procedures, Vol. 1249, 2010 (“Pysher”)

Petitioner Exhibit No.	DESCRIPTION
1016	<i>Design, Characteristics and Performance of Diamond Pad Conditioners</i> . SpringerLink. https://link.springer.com/article/10.1557/PROC-1249-E02-04
1017	Exhibit 4 of Complaint in <i>Sung v. Samsung Electronics Co., Ltd. et al</i> , 4-23-cv-00752
1018	U.S. Patent No. 9,138,862 (“’862 Patent”)
1019	Scheduling Order in <i>Sung v. Samsung Electronics Co., Ltd. et al</i> , 4-23-cv-00752
1020	Electronic Copy of Tsai obtained from publisher (Elsevier)
1021	Electronic Copy of Tsai2011 obtained from publisher (Springer)
1022	Webpage of Diamond and related materials vol. 23, archived on May 9, 2012, by Internet Archive, available at https://web.archive.org/web/20120509185427/http://www.sciencedirect.com/science/journal/09259635/23 , accessed and obtained on February 11, 2024
1023	List of citations to Tsai, obtained from Google Scholar
1024	Library copy of Tsai2011 obtained from Linda Hall Library
1025	Bibliographic and MARC records for <i>International Journal of Advanced Manufacturing Technology</i> that contains Tsai2011, available at https://catalog.lindahall.org/permalink/01LINDAHALL_INST/191da7s/alma992717493405961 from the online catalog of the Linda Hall Library, accessed and obtained on February 11, 2024
1026	List of citations to Tsai2011, obtained from Google Scholar
1027	Webpage of Linda Hall Library online catalog archived on January 7, 2011, by Internet Archive, available at https://web.archive.org/web/20110107125151/http://leonardo.lindahall.org/ipac20/ipac.jsp?profile=lhlopen , accessed and obtained on February 18, 2024
1028	Declaration of Dr. Ingrid Hsieh-Yee
1029	U.S. Patent Application Publication No. 2012/0302146 (“Sung’146”)
1030	EDTX Caseload Profile (December 31, 2023)
1031	<i>Chien-Min Sung v. Samsung Electronics Co. Ltd., et al.</i> , Case No. 4:23-cv-00752 (E.D. Tex.), 82 (Order to Stay Pending Motion for Inter-District Transfer)
1032	<i>Chien-Min Sung v. Samsung Electronics Co. Ltd., et al.</i> , Case No.

Petitioner Exhibit No.	DESCRIPTION
	4:23-cv-00752 (E.D. Tex.), 37 (February 14, 2024 Scheduling Order)
1033	<i>Chien-Min Sung v. Texas Instruments Inc.</i> , Case No. EDTX-4-23-cv-00753 (E.D. Tex.), 26 (TI's Motion for Summary Judgment of Invalidity)
1034	<i>Chien-Min Sung v. Texas Instruments Inc.</i> , Case No. EDTX-4-23-cv-00753 (E.D. Tex.), 68 (Order To Stay the Case Pending Resolution of TI's Motion for Summary Judgment).
1035	<i>Chien-Min Sung v. Samsung Electronics Co. Ltd., et al.</i> , Case No. 4:23-cv-00752 (E.D. Tex.), 56 (Motion to Stay Pending Resolution of Texas Instruments Incorporated's Motion for Summary Judgment)
1036	<i>Chien-Min Sung v. Samsung Electronics Co. Ltd., et al.</i> , Case No. 4:23-cv-00752 (E.D. Tex.), 72 (Plaintiff's Sur-reply)
1037	<i>Chien-Min Sung v. Samsung Electronics Co. Ltd., et al.</i> , Case No. 4:23-cv-00752 (E.D. Tex.), 43 (Notice Of Intent To File A Motion To Stay Pending Inter Partes Review)
1038	<i>Chien-Min Sung v. Samsung Electronics Co. Ltd., et al.</i> , Case No. 4:23-cv-00752 (E.D. Tex.), 56 (Motion To Stay Pending Resolution of TI MSJ)
1039	<i>Chien-Min Sung v. Samsung Electronics Co. Ltd., et al.</i> , Case No. 4:23-cv-00752 (E.D. Tex.), 62 (Plaintiff's Opposition to MTS Pending Resolution of TI MSJ)
1040	<i>Chien-Min Sung v. Samsung Electronics Co. Ltd., et al.</i> , Case No. 4:23-cv-00752 (E.D. Tex.), 67 (Defendant's Reply)
1041	<i>Chien-Min Sung v. Samsung Electronics Co. Ltd., et al.</i> , Case No. 4:23-cv-00752 (E.D. Tex.), 72 (Plaintiff's Sur-Reply)
1042	<i>In re: Chien-Min Sung Subpoena Upon 3M Company</i> , Case No. 0:2023mc00104 (D. Minnesota), 1 (3M's Nov. 16, 2023 Motion To Quash Subpoena In The District of Minnesota)
1043	<i>In re: Chien-Min Sung Subpoena Upon 3M Company</i> , Case No. 0:2023mc00104 (D. Minnesota), 15 (Dr. Sung's Nov. 22, 2023 Cross-Motion To Compel And Motion For Sanctions)
1044	<i>In re: Chien-Min Sung v. 3M Company</i> , Case No. 6:23-mc-00002 (N.D. Tex.), 1 (Dr. Sung's Nov. 27, 2023 Motion To Compel In The Northern District of Texas)
1045	<i>In re: Chien-Min Sung Subpoena Upon 3M Company</i> , Case No.

Petitioner Exhibit No.	DESCRIPTION
	0:2023mc00104 (D. Minnesota), 38 (Court Entry Showing A Discovery Hearing Before The Court In The District Of Minnesota)
1046	Judge Jordan's Time To Order Motion of Summary Judgement Statistics
1047	Counsel's drawing with edits by Dr. Tsai
1048	Dr. Tsai's designated profile schematic
1049	M. Y. Tsai et al., Novel Diamond Conditioner Dressing Characteristics of CMP Polishing Pad, International Journal of Machine Tools & Manufacture 49 (2009) 722–729 (“TsaiADD”)
1050	Marked up Tsai et al., “Organic diamond disk versus brazed diamond disk for dressing a chemical-mechanical polishing pad,” <i>Diamond & Related Materials</i> , 23, 2012, 144-149 (“Tsai”)
1051	Dr. Tsai's drawing of mesh
1052	Deposition Transcript of Dr. Tsai in IPR2024-00533, Volume 1,
1053	Deposition Transcript of Dr. Tsai in IPR2024-00533, Volume 2
1054	Deposition Transcript of Dr. Tsai in IPR2024-00534
1055	Deposition Transcript of Dr. Tsai in IPR2024-00535
1056	U.S. Patent Publication No. 2004/0048557 (“Nabeya”)
1057	File History of U.S. Patent Application No. 13/797,704 (“’704 Application”)
1058	File History of U.S. Patent Application No. 12/726,786 (“’6786 Application”)
1059	Plaintiff's Answering Brief In Opposition To Defendant's Motion To Stay in <i>Chien-Min Sung v. Kinik Co.</i> , 1:20-cv-00247-RGA
1060	Declaration of Alex Chan In Support Of Plaintiff's Answering Brief In Opposition To Defendant's Motion To Stay in <i>Chien-Min Sung v. Kinik Co.</i> , 1:20-cv-00247-RGA
1061	Single Diamond Dressing Characteristics of CMP Polyurethane Pad” <i>Key Engineering Materials</i> Vol 329 (2007) pp 151-156
1062	PCD Pad Conditioners for Low Pressure Chemical Mechanical Planarisation of Semiconductors” <i>Int. J. Abrasive Technology</i> , Vol. 1, Nos. 3/4, 2008
1063	“Dressing Behaviors of PCD Conditioners on CMP Polishing Pads” <i>Advanced Materials Research</i> Vols 76-78 (2009) pp 201-206
1064	“Mosaic Diamond Pad Conditioners for Improved CMP Performance” <i>ECS Transactions</i> , 27 (1) 575-580 (2010)

Petitioner Exhibit No.	DESCRIPTION
1065	“The Black Pad with Graphite Impregnation for CMP” <i>ECS Transactions</i> , 27 (1) 581-586 (2010)
1066	“The CMP by Polishing with GiP Dressed by BODD” <i>Advanced Materials Research</i> Vols 126-128 (2010) pp 1013-1018
1067	“Development of a novel cooling system-assisted minimum quantity lubrication method for improvement of milling performance” <i>Journal of the Chinese Institute of Engineers</i> , 2015, Vol. 38, No. 3, 322–331
1068	Dr. Tsai's drawing of the “designated profile” (generated as EX2013 during re-direct)
1069	Dr. Tsai's drawing of the “designated profile” (generated as EX2014 during re-direct)

I. INTRODUCTION

Patent Owner (“PO”) argues that the ’802 Patent should be afforded an earlier priority date. But PO has not met its burden of production or proof. Moreover, just as Dr. Sung previously declared under the penalty of perjury, none of the applications PO relies on provide support for an earlier priority date.

Based on the correct priority date, PO raises no substantive challenge against claims 1-7 and 13-21 in Ground III and claims 1-3, 6-7, 13-14, and 16-18 in Ground II. As for claims 8-12 in Ground III, Tsai with Sung’026 renders obvious those claims because Tsai teaches or Tsai with Sung’026 renders obvious diamond particles that “cut or otherwise deform” the CMP pad. Hence, at a minimum, Grounds II-III render all challenged claims unpatentable.

Finally, PO’s arguments against Ground I are belied by the admissions Dr. Tsai made during cross-examination. Namely, Dr. Tsai could not articulate even his basic position on what “designated profile” means in the context of the ’802 Patent, rendering his opinion that Tsai does not teach any “designated profile” highly dubious with respect to claims 1-5, 13, 15, and 19-21. Moreover, Dr. Tsai admitted that all of the diamond particles were equally spaced from each other across the entire CMP pad dresser, confirming the accuracy of the approach articulated in the Petition with respect to dependent claims 2-5 and 20-21.

II. CLAIM CONSTRUCTION

PO identifies “conditioner” as having an express definition, (POR, 5-6), even though this term is not recited in the challenged claims. Moreover, PO identifies “cutting depth” as having an express definition (*id.*), even though no definition exists in the '802 Patent. Petitioner submits no construction is necessary for these terms.

III. PERSON OF ORDINARY SKILL IN THE ART (“POSITA”)

PO disagrees with the level of ordinary skill in the art articulated by Petitioner in an effort to disqualify Dr. Shanfield as an expert. *See* POR, 5. However, Dr. Tsai could not even articulate the proper level of education of a POSITA and the objective evidence demonstrates that Patent Owner's arguments lack merit.

First, Dr. Tsai could not even decide what the proper education level of a POSITA should be. When asked about the missing level of education in his '802 Declaration compared to required level set forth in his '270 Declaration, he said he's “not sure.” *See* EX1052, 109:9-14 (“Q: Do you want to add any statement about ‘a POSITA would have had at least a master's in the field of material science’ to this sentence here? A: (In English) I'm not sure. I'm not sure.”).

Dr. Tsai's indecisiveness is not merely a clerical error. He testified that the education level he articulated in his '270 Declaration was incorrect. *See* EX1052, 107:18-25 (“Q: So is a bachelor in mechanical engineering sufficient or not sufficient to meet the level of a POSITA? A: Well, personally, to my opinion, such

a professional technology, I think it would take at least a master degree or Ph.D. degree. Then this person may have a better chance, but still no guarantee of that, but that would be my opinion.”). When asked again to clarify, he remained uncertain. EX1052, 109:2-8 (“Q: And I’m just trying to make sure that the record is clear, so it’s just a very simple question. Do you want to change this from ‘at least a bachelor’s degree in mechanical engineering’ to ‘at least a master’s degree in materials science’? A: (In English) I’m not sure. I’m not sure. I’m not sure. I’m not sure.”). Dr. Tsai’s inability to consistently articulate even the proper education level of a POSITA serves as a clear indication that Dr. Tsai’s opinion lacks credibility.

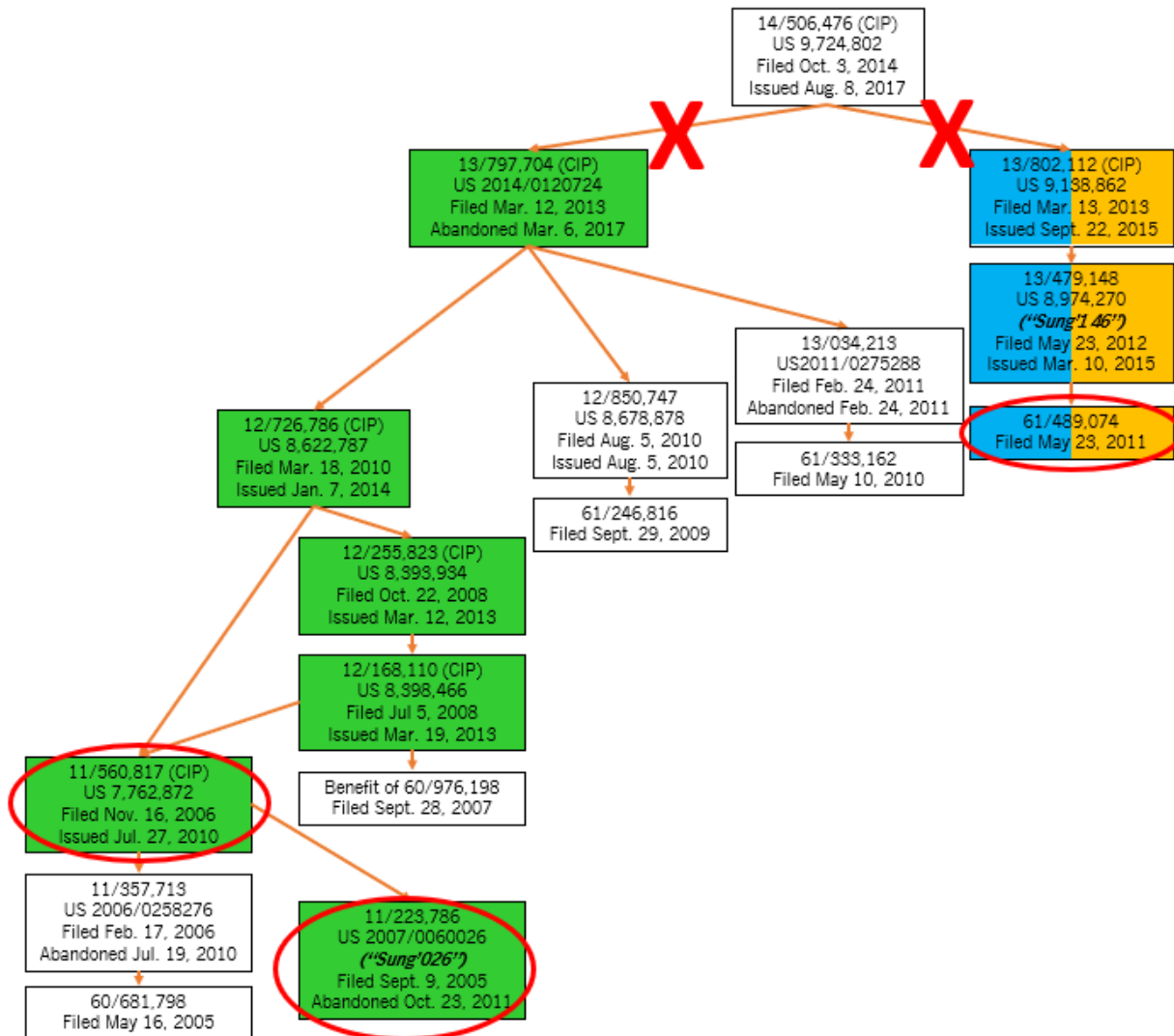
Dr. Tsai further contends that “*experience in the field of integrated circuit processing and fabrication techniques,*” (Pet., 23), should be replaced by “*experience in developing CMP technology including experience with the design and development of CMP pad dressers.*” EX2011, ¶16. But Dr. Tsai articulates no objective rationale why the requisite experience must be so limited. See EX2011, ¶¶13-17. In fact, the references overcome during prosecution explain how CMP technology is relevant in the field of integrated circuit processing and fabrication, supporting Petitioner’s broader definition of POSITA. See EX1003, 126-131, 205. US 2010/002485995 (“Dinh-Ngoc”) explains that “[i]n the fabrication of electronic devices, ... [c]hemical mechanical planarization (CMP) is a common technique

used to planarize or polish workpieces such as semiconductor wafers.” EX1010, [0005]. US 2004/0048557 (“Nabeya”) explains that “[i]n the process of manufacturing a semiconductor silicon wafer substrate or a minute electronic circuit, such as an integrated circuit, on a silicon wafer substrate, CMP is generally performed in order to remove asperities and crystal defects present on the surface of the substrate.” EX1056, [0002].

IV. THE CORRECT PRIORITY DATE OF THE '802 PATENT IS OCTOBER 3, 2014—ITS FILING DATE

PO attempts to antedate the prior art references by claiming an earlier priority date. POR, 8. But the '802 Patent cannot claim a priority date that precedes the filing date of the '802 Patent because (1) PO failed to meet its burden of production and proof by failing to establish it has met the co-pending application requirement, (2) none of the applications relied on by PO provides written description support for limitations [1D]-[1F], and (3) Dr. Sung already disclaimed all earlier priority dates.

As a preliminary matter, the '802 Patent's claimed priority chain showing the filing, issue, and/or abandonment dates is provided below. The red circles indicate the *only* applications mentioned in the POR as allegedly providing written description support.



In this Reply, Petitioner uses the following shorthand notations when discussing priority, which comports with the shorthand notations adopted by the Board. See DI, 26 (“When issues of priority filing date arise, the controlling evidence is the parent application *as filed*, not the parent application *as later published*.”). The second column shows the shorthand utilized in the POR.

Application No.	POR Shorthand	Reply/Board's Shorthand
11/223,786 (EX2009)	Sung'786 Sung'026	'786 Application
11/560,817 (EX2001)	Sung'817	'817 Application
13/797,704 (EX1057)	N/A	'704 Application
12/726,786 (EX1058)	N/A	'6786 Application
61/489,074 (EX2002)	Sung'074	'074 Provisional

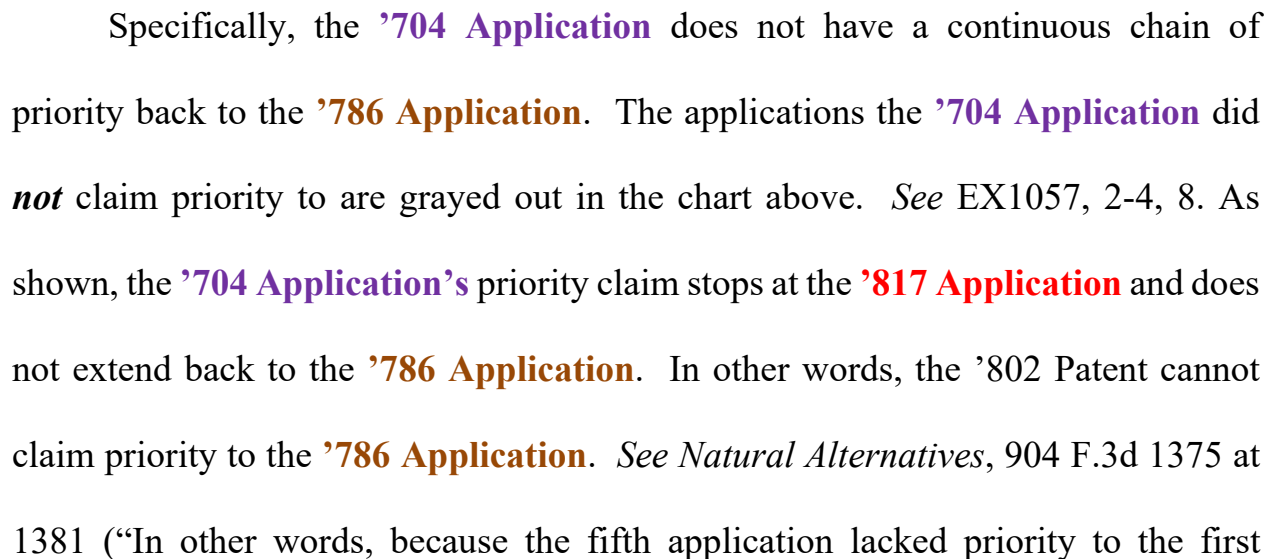
A. The Co-Pending Application Requirement Was Not Met

PO fails to meet its burden because it fails to properly demonstrate that the co-pending application requirement was met. Specifically, the Board “encourage[d] both parties to address whether there are the requisite intervening application(s) per *Hollmer* [v. *Harari*, 681 F.3d 1351, 1355 (Fed. Cir. 2012)] and related case law” “[i]n the event Patent Owner continues to rely on one or more of the [earlier-filed applications] as providing a priority filing date.” DI, 48-49. PO distinguishes the facts of the instant case from that of *Hollmer*, arguing that “no new matter was incorporated from outside of [*sic*] family of applications to which the '802 patent claims priority.” POR, 34. But that is not the analysis requested by the Board.

“[W]hen a patent owner attempts to antedate an asserted prior art reference [in an IPR proceeding,] the patent owner assumes a temporary burden of production.” *Parus Holdings, Inc. v. Google LLC*, 70 F.4th 1365, 1371 (Fed. Cir.

2023). “[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.” *Natural Alternatives, Inc. v. Iancu*, 904 F.3d 1375, 1380 (Fed. Cir. 2018) (internal quotes omitted). In other words, “claims in a patent or patent application are not entitled to priority under § 120 at least until the patent owner *proves* entitlement to the PTO, the Board, or a federal court.” *Id.* (citing *PowerOasis, Inc. v. T-Mobile USA, Inc.*, 522 F.3d 1299, 1305-06 (Fed. Cir. 2008)).

As such, the Board requested an analysis, such as the following, which was never carried out by the PO. For example, the **'6786 Application** issued on January 7, 2014—before the filing date of the **'802 Patent** on October 3, 2014. Hence, the **'704 Application**'s priority claim must allow a continuous priority chain all the way back to the **'786 Application**. *But it does not.*



application, the eight application's priority claim to the first application (via the fifth application) did not satisfy all of § 120's requirements.”).

Further, PO does not even attempt to show that the remaining intervening applications between the **'802 Patent** and the **'817 Application/'074 Provisional** satisfied the co-pending application requirement. But that is PO's burden to prove. *See Maxlite, Inc. v. Jiaxing Super Lighting Electric Appliance Co., Ltd.*, IPR2020-00208, Paper 14, 7-8 (PTAB 2021) (citing *Tech. Licensing Corp. v. Videotek, Inc.*, 545 F.3d 1316, 1327 (Fed. Cir. 2008)) (“after ... the petitioner in an IPR—established a date prior to the filing date of the challenged patent, the patent owner ‘has the [production] burden of going forward with evidence . . . the patent owner was required ‘to show not only the existence of the earlier application, but why the written description in the earlier application supports the claim’”). In short, PO has failed to meet its burden of production and proof to prove a priority date that precedes the filing date of the '802 Patent.

B. None Of The '074 Provisional, '817 Application, Or '786 Application Provides Written Description Support

Even worse, the three applications PO relies on do not provide written description support. “35 U.S.C. §120 requires an applicant to meet the disclosure requirements of §112, ¶1 in a *single* parent application in order to obtain an earlier filing date for individual claims.” *Studiengesellschaft Kohle, M.B.H. v. Shell Oil*

Co., 112 F.3d 1561, 1564 (Fed. Cir. 1997). And each of the three applications PO relies on fails to satisfy the disclosure requirements because the '074 Provisional does not provide support for [1D] and neither the '817 nor '786 Applications provide support for [1E] or [1F]. And Dr. Tsai's opinions regarding priority should be disregarded because he was not even aware of the concept of claiming priority. EX1052, 71:18-20 ("Q: Have you heard of the concept of claiming priority? A. I don't know.").

1. The '074 Provisional Does Not Provide Support For [1D]

For [1D], PO relies on identical arguments presented in its POPR, merely citing to 13:4-9 and 23:5-11 of EX2002 as alleged support. POR, 10. Despite the fact that the Board already explained why no support exists in these passages, (*see* DI, 26-34), PO fails to provide any responses to the Board's findings—including the Board's finding that "Dr. Sung referred expressly to limitation [1D] as being missing from the '862 patent which issued from the '112 Application." DI, 29.



11

to particle tips *varying from a designated profile* within variously specified tolerances.” DI, 37; *see also id.*, 37-41.

PO's argument essentially boils down to: “a POSITA would know that the ranges of tip variation as taught in Sung '817 would encompass all of the asperities, including those with the highest and second highest tip” (POR, 17-18) and “the highest 1%” (POR, 19). But the fact that PO wanted to *specifically* carve out a “difference in protrusion distance *between the highest* protruding tip *and the second highest* protruding tip” and “*between the highest 1%* of the protruding tips” as the purported/claimed invention was not disclosed. *See Purdue Pharma L.P. v. Faulding Inc.*, 230 F.3d 1320, 1328 (Fed. Cir. 2000) (“[T]he specification does not clearly disclose to the skilled artisan that the inventors ... considered the ratio ... to be part of their invention. ... There is therefore no force to Purdue's argument that the written description requirement was satisfied because the disclosure revealed a broad invention from which the [later-filed] claims carved out a patentable portion”); *see also Regents of the Univ. of Minnesota v. Gilead Scis., Inc.*, 61 F.4th 1350, 1356-58 (Fed. Cir. 2023) (finding no benefit under 35 U.S.C. §120, because the earlier-filed applications did not provide sufficient blaze marks to provide the later-filed claims with sufficient support under 35 U.S.C. §112(a).).

Even Dr. Tsai admitted during cross-examination that he “cannot be sure about” whether the '817 Application provides written description support for

limitation [1F] because he is “not able to accurately talk about” the legal conclusions drawn in his declaration. EX1055, 105:9-25 (“Q: Does what you point out here in paragraph 65 provide written description support for Limitation 1F? A: From the text, it does not mention about 1 percent. Q: So it does not support Limitation 1F or it does support Limitation 1F? A: I cannot be sure about that, but it does mention their tips. ... 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.”), 107:12-20 (“Q: The legal conclusions that are drawn between paragraph 56 through 81, you don't really have a good understanding, correct? A: I think I am roughly or generally have some understanding of that, but then again, I am not the expert or my profession is not in these regards. Therefore, that I am not able to accurately to talk about them.”).

3. The '786 Application Does Not Provide Support For [1E] or [1F]

Just as in the '817 Application, “[n]one of the cited '786 Application disclosures *directly* pertain to *the difference in protrusion distance between the two highest particles tips*,” (DI, 44) or “the highest 1% of particle tips differing in protrusion distance.” (DI, 46). *See* Section IV.B.2.

Additionally, PO's argument that “Samsung has *waived any argument*” (*see* POR, 19-20, 24-25) that [1E] and [1F] are not supported by the '786 Application due to Petitioner's positions in IPR2024-00534 for the '862 Patent is without merit.

As explained in the Petition, the '786 Application's disclosure Petitioner relies on (*i.e.*, "they are arranged such that their tips vary from the designated profile by less than about ***1 micron***") represents just one species within the more broadly claimed genus. *See* Pet., fn.6 (citing *Vas-Cath Inc. v. Mahurkar*, 935 F.2d 1555, 1562 (Fed. Cir. 1991)).

C. Dr. Sung Disclaimed All Earlier Priority Dates

PO argues that "Dr. Sung's declaration filed in the *Sung v. Kinik* matter did ***not*** disclaim 'all earlier priority dates.'" POR, 32. But as the Board already determined, Dr. Sung stated "[t]his **invention** [of the '802 patent] is not disclosed in **any** of the patents or patent applications to which the '802 Patent claims priority' prior to October 28, 2013." DI, 33 (citing EX1011, ¶¶17-18) (emphasis added). Dr. Sung never stated that "this invention" is limited solely to that claimed in claims 8-12. Indeed, doing so would require finding that the '802 Patent was subject to joint ownership between Dr. Sung and Kinik—a finding which was vehemently opposed by Dr. Sung and recognized by Judge Andrews in the Kinik litigation. *See* EX1011, ¶¶11, 14-23; EX1059, 7-8, 10-12, 22, 24; EX1060, ¶¶3-6, 9, 10; EX1012, 2.

And it was not Dr. Sung alone who made such a representation under the penalty of perjury. Dr. Sung's counsel, Alex Chan—the same lead counsel for PO in this IPR—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.” EX1059, 11; EX1060, ¶¶3-6, 9-10, Exs. 1-4, 7-8. Dr. Sung and his counsel consistently argued that “[t]he subject matter added by the ’802 patent is neither disclosed nor claimed in any” of the “more than ten members in the ’802 patent family.” EX1059, 8. Specifically, they argued that the “Parent and Grandparent Patents” to the ’802 Patent “do not disclose a ‘designated profile’ with a specified tip variation associated with the superabrasive particles or a tip variation at, for example, ‘about 100 microns,’ which was invented by Dr. Sung after the JV had terminated” and was a “direct result of Dr. Sung’s extensive R&D conducted after the JV termination.” EX1059, 11-12 (citing EX1011, ¶¶20-21; EX1060, Exs. 1-4).

In summary, the earliest priority date afforded to the ’802 Patent should be its actual filing date of October 3, 2014. Hence, Tsai, Sung’026, and Sung’146 all qualify as prior art.

V. GROUNDS II AND III RENDER ALL CLAIMS UNPATENTABLE

A. Ground III: Sung’146 With Sung’026 Renders Obvious Claims 1-7 And 13-21

PO raises no substantive argument except to argue that Sung’146 and Sung’026 are not “prior art to the ’802 Patent.” POR, 54. Because Sung’146 and Sung’026 qualify as prior art, claims 1-7 and 13-21 are unpatentable. *See* Section IV.

B. Ground II: Tsai With Sung'026 Renders Obvious Claims 1-3, 6-14, And 16-18

1. Claims 1-3, 6-7, 13-14, And 16-18

PO raises no substantive argument except to argue that Tsai and Sung'026 are not “prior art to the '802 Patent.” POR, 48-49. Because Tsai and Sung'026 qualify as prior art, claims 1-3, 6-7, 13-14, and 16-18 are unpatentable. *See* Section IV.

2. Claims 8-12

i. Tsai's “Cutters” Meet Claims 8-12

PO argues that “‘all’ superabrasive particles are working superabrasive particles that cut into a CMP pad finds no support in Tsai.” POR, 49. Petitioner respectfully disagrees that “[i]t is not clear ... that all of the diamond particles in [Tsai's] ODD are cutters.” DI, 76.

First, a POSITA reading Tsai would have readily understood Tsai to teach that ODD was designed to make all of the superabrasive particles function as cutters. As Dr. Tsai explained during his cross-examination, the goal of Tsai was to obtain a dresser that “remarkably improves the leveling of diamond tips and markedly reduces the CMP cost” to mimic, at a lower production cost, an earlier-developed CMP pad dresser called ADD. EX1055, 40:15-21 (“Q: So ODD was really trying to mimic ADD, but trying to make it as a lower cost, is that fair? A: That was what we intend to try 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.”). ADD “contains diamond grits with *equal heights and identically shaped tips*.” EX1004, 3:1-10. In other words, just like ADD, a POSITA would have understood Tsai's ODD to teach that all (and certainly substantially all) of the superabrasive particles function as “cutters.”

Second, it is undisputed that 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. *See* EX1004, 2:14-16 (“A typical diamond disk [BDD] contains over 10,000 grits; however, less than 10% of the diamond grits are engaged in cutting the polishing pad.”). And as Dr. Tsai admits, “ODD has more cutters than the BDD.” EX1055, 57:21-23 (“Q: All you know here is that the ODD has more cutters than the BDD, correct? A: Yes.”). Hence, ODD will have more than ~1,000 cutters, confirming that a POSITA would have understood claims 8-12 to be taught by Tsai.

ii. Diamond Particles That “Deform” the CMP Pad Meet Claims 8-12

Alternatively, Tsai also teaches claims 8-12 based on the definition of “working superabrasive particles” being “superabrasive particles that cut *or otherwise deform* a CMP pad during a dressing or conditioning procedure.” EX1001, 4:46-48; POR, 5-6. Even if some of Tsai's cutters may not actually cut the CMP pad, Tsai's diamond particles will at a minimum “deform” the CMP pad, just

as the '802 Patent explains. *See* EX1001, 4:48-50 (“This action ... *can deform the surface* either elastically or plastically, ...”).

Dr. Tsai admits that when a CMP pad dresser is pressed down against the CMP pad, CMP pad will experience at least some deformation. EX1052, 33:7-15 (“Q: So it's your testimony when a hard diamond particle is rubbed against a polyurethane, a very soft material, you cannot opine whether deformations of the polyurethane will occur? A: You are talking about deformation. There are many, many types. Of course, when this particle presses down to the soft material, that material will be pressed down.”). Hence, even if the particles do not actually cut, the diamond particles will at least deform the CMP pad and meet claims 8-12.

iii. Tsai With Sung'026 Renders Obvious Claims 8-12

Despite PO's arguments to the contrary (POR, 53-56), 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*.” EX1005, claims 3-6. Hence, there cannot be any dispute that Tsai with Sung'026 renders obvious the working superabrasive particles claimed in claims 8-12.

Moreover, Sung'026 also teaches a *deformation* of the CMP pad by the superabrasive particles because it teaches “uniformly distribut[ing] frictional forces across substantially *each* superabrasive particle.” EX1005, [0051]. Hence, Tsai and

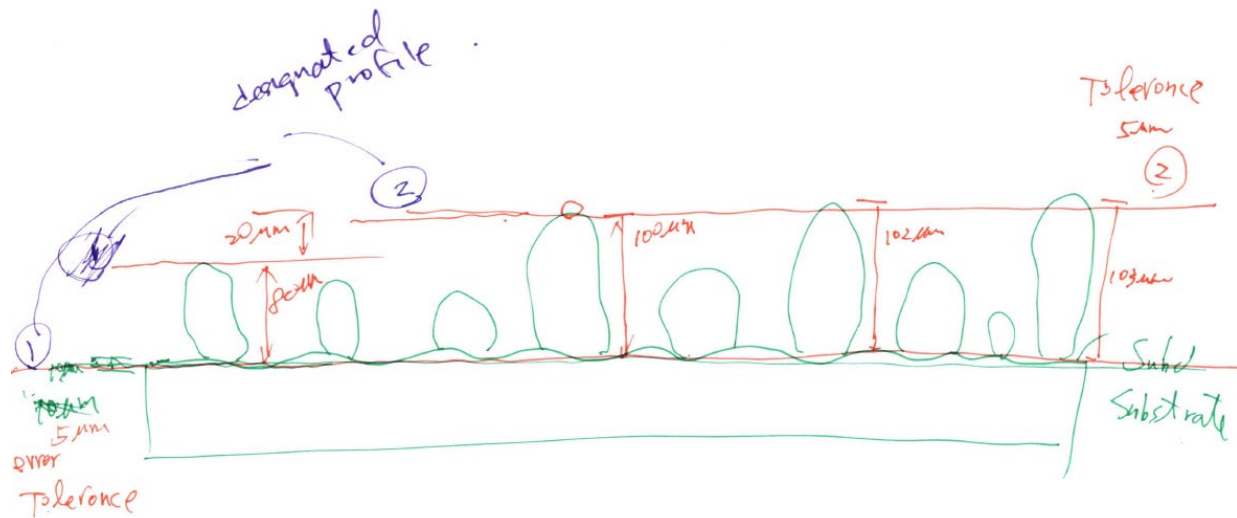
Sung'026 render obvious claims 8-12, as articulated in the Petition, for this independent reason.

VI. GROUND I: TSAI ANTICIPATES AND/OR RENDERS OBVIOUS CLAIMS 1-5, 13, 15, AND 19-21

A. Tsai Teaches Or Suggests “Designated Profile”

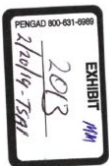
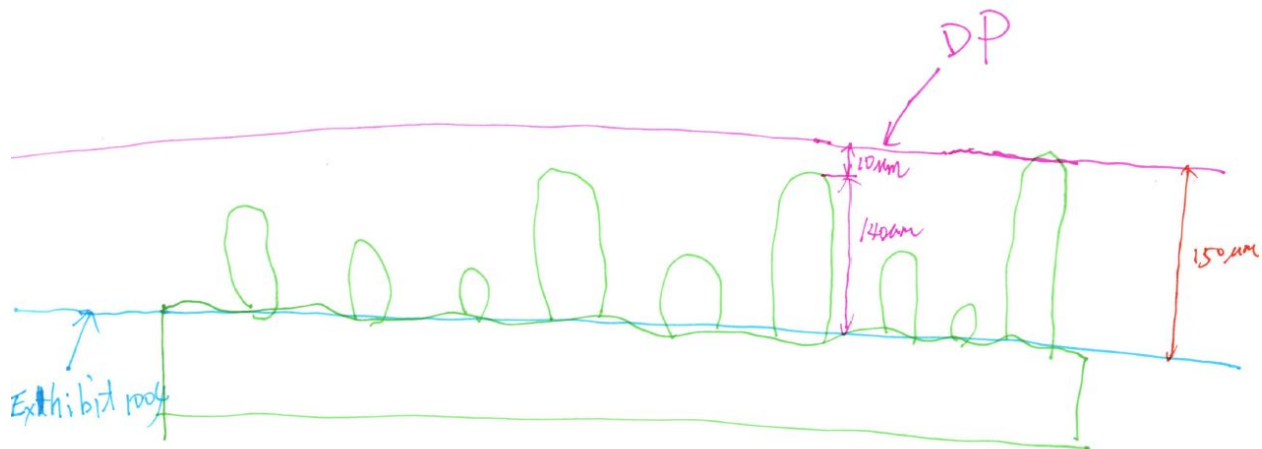
PO argues that Tsai does not teach or suggest the claimed “designated profile”—largely repeating the same arguments that have already been rejected by the Board. *See* POR, 36-41; DI, 55-59. But neither Tsai (paper) nor Dr. Tsai supports PO's assertions.

At the outset, Dr. Tsai cannot provide credible opinion whether Tsai teaches “designated profile” given he could not even precisely articulate what the term means in the context of the '802 Patent—none of which was accurate. Dr. Tsai first incorrectly testified during cross-examination that “designated profile” can refer to only the highest protruding tip or the substrate surface. EX1055, 14:11-16 (“Q: When you read the '802 patent, Claim 1, the word ‘designated profile,’ you were thinking either the substrate or the highest protruding tip, is that right? A: Yes.”); *see* EX1048 (labeled “designated profile 1 and 2”).



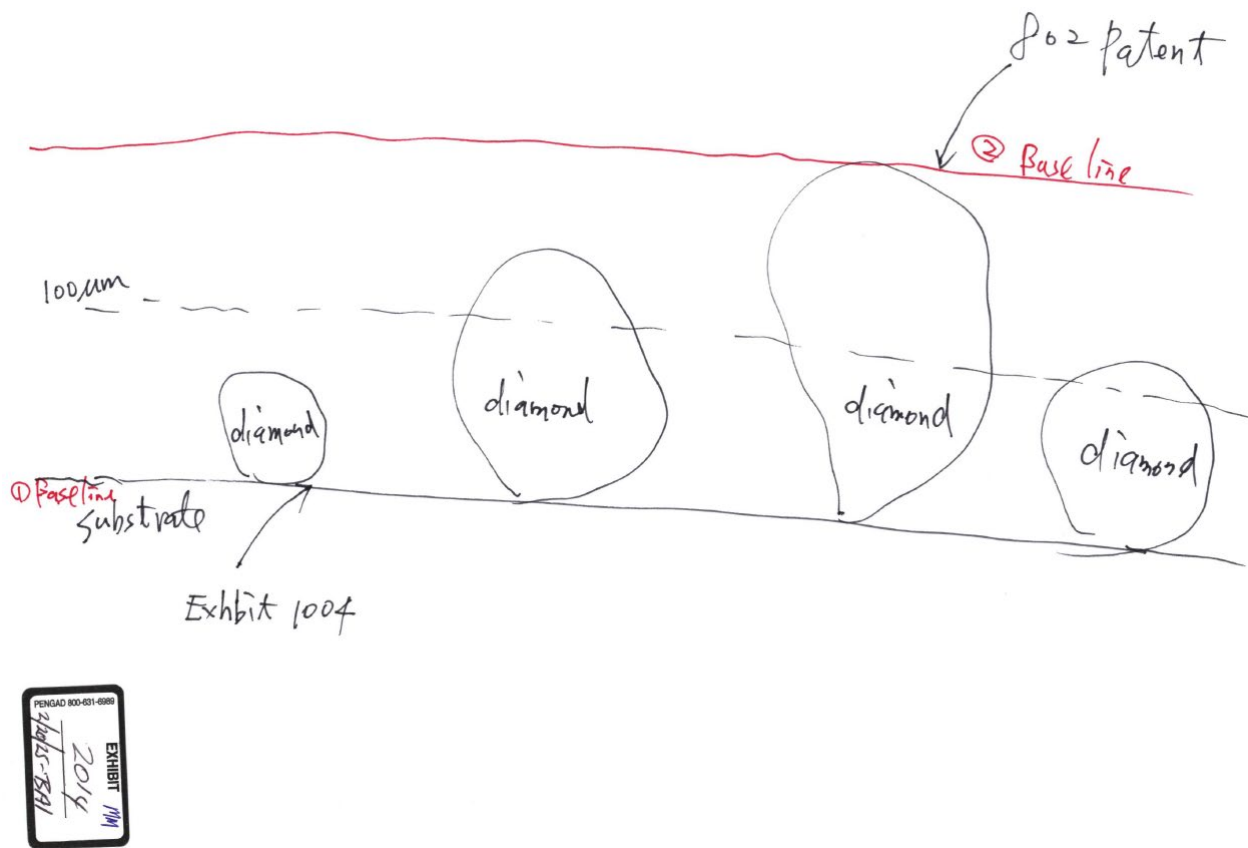
20

labeled as Exhibit 1004, can that line correspond to the designated profile described in Claim 1 of the '802 patent? A. No.”); *see* EX1068 (generated as EX2013) (labeled “DP”).



Dr. Tsai's inability to accurately articulate what “designated profile” means in claim 1 is not surprising, because he did not even apply the definition of “profile” when analyzing the claim term “designated profile.” EX1055, 15:17-16:2 (“Q: Did you apply that understanding of the term ‘profile,’ as written in column 6, lines 21 through 25, when you read the term ‘designated profile’ in Claim 1? A: No. ...”). PO's positions, buttressed by Dr. Tsai's opinion, are simply not credible.

In fact, despite PO's argument that "Prof. Ming-Yi Tsai, the lead author of this reference and Patent Owner's expert, confirms under oath that there is *no designated profile in Tsai, nor any mention of a profile or contour*," (POR, 36 (citing EX2011, ¶¶31, 33)), Dr. Tsai—in his *redirect* examination—again changes tune and testifies that a designated profile does indeed exist in Tsai—albeit at an incorrect location. *See* EX1055, 156:13-19 ("Q: Can you please clarify for the record which one is the accurate reflection of what you believe to *be the designated profile for* the '802 patents and *Exhibit 1004*? A: This one here. Q: Which exhibit? A. Exhibit 2014 [filed as EX1069]."). As shown below, Dr. Tsai now argues that "there is ... a designated profile in Tsai." POR, 36 (emphases added).



PO's attempt to rewrite Tsai through Dr. Tsai's unreliable and conflicting testimony some 10+ years later should be rejected.

Rather, the objective evidence demonstrates that a POSITA would have understood Tsai to disclose a "designated profile," just as explained in the Petition. **First**, Dr. Tsai admits that he did not speak with Dr. Sung in writing/publishing Tsai. See EX1055, 170:25-171:2 ("Q: So did you speak with or collaborate with Dr. Sung on this paper [EX1004]? A: No."). **Second**, Dr. Tsai admits that Dr. Sung already had possession of the concept of "designated profile" long before Tsai was published. See EX1055, 52:11-14 ("Q: ...in 2007, Dr. Sung published Sung '026,

talking about the concept of designated profile, correct? A: (In English) Yes.”).

Third, Dr. Tsai admitted he cannot be sure whether or not Dr. Sung considered “designated profile” when he published Tsai—which utilized the same reverse casting technique disclosed in the ’802 Patent. *See* EX1055, 196:5-8 (“Q: So you personally don't have any knowledge whether Dr. Sung thought about designated profile in either of Exhibit 1004 and 1049, correct? A: (In English) I don’t know.”); Pet., 10-11 (citing EX1004, 5:20-6:20, Fig. 2; EX1001, 25:14-27, 25:63-65).

Finally, Dr. Tsai admits that the goal of Tsai was to obtain a dresser that mimics the ADD CMP pad dresser that “contains diamond grits with *equal heights and identically shaped tips*.” EX1004, 3:1-10; *see also* EX1055, 40:15-21 (“Q: So ODD was really trying to mimic ADD, but trying to make it as a lower cost, is that fair? A: That was what we intend to try 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.”). Given the historical developments in the art, and just as the Board already found, a POSITA would have readily understood that Tsai teaches or at least renders obvious the claimed “designated profile.” DI, 55-59.

B. Tsai Teaches Or Suggests “Tip Variation” From The Designated Profile

Tsai teaches two independent teachings for the claimed “tip variation:” (1) a tip-to-designated profile variation of about 8.8 μm (33.0-24.2) or 11 μm (24.2-13.2)

shown in Figure 6 (*see* Pet., 37-38), and (2) Tsai's teaching that "the diamond tips of the ODD can be leveled to less than 15 μ m." *See* Pet., 38 (citing EX1004, 8:22-24). The Board already credited Dr. Shanfield's testimony on these points (DI, 64-65), and PO provides no further explanation or supporting evidence for its position. *See* POR, 42.

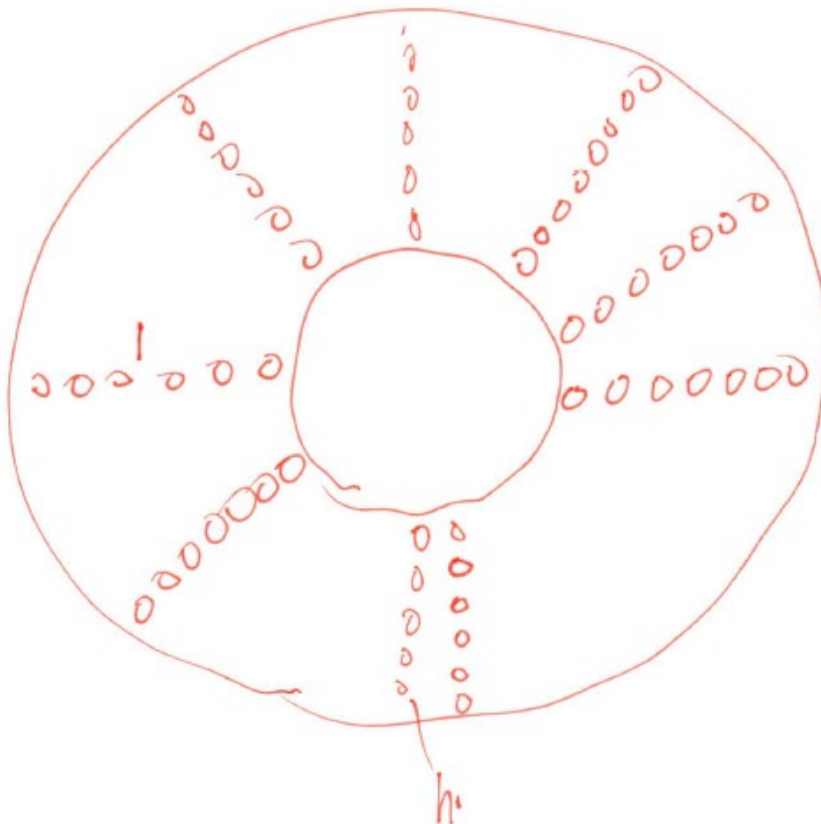
C. Tsai Teaches Or Suggests The Claimed Highest Protruding Tip, Second Highest Protruding Tip, The Highest 1% Of The Protruding Tips, And Difference In Protrusion Distance

PO repeats *verbatim* the same arguments that were previously raised in the POPR, and rejected by the Board. *Compare* POPR, 46-48 with POR, 43-45; DI, 66-70.

D. Dependent Claims 2-5 And 20-21

PO's argument boils down to the fact that Dr. Shanfield allegedly incorrectly relies on "images of partial segments of Tsai's pad conditioner" as being representative of the entire CMP pad dresser. But Dr. Tsai admits that is exactly what Dr. Shanfield should have done. A POSITA would have understood Tsai's reference to "regular distribution" at EX1004, 5:24 to refer to the expected arrangement, on average, across the entire ODD disk—in the regions where the diamond particles have been attached. Indeed, when asked what "regular distribution" means, Dr. Tsai explained that he used a mesh having "equal spacing" to place the diamonds across the entire CMP pad dresser when making the ODD.

EX1055, 82:7-83:2 (“Q: For the mesh that you utilized to make the ODD shown in Figure 5B, does the spacing of the holes on the right side of this new exhibit we’re generating [EX1051] approximately equal to the spacing of the holes on the left side of the image? A: We would do our best to make them equal. Q: And that's true on the top and the bottom portion of the image as well, correct? A: We will do our best to make them the same. Q: And in fact, that's true across the entire concentric circle of this image, correct? A: We will try to do our best to make them the same.”).



EX1051. Accordingly, PO's arguments have no merit.

VII. DR. TSAI'S LACK OF CREDIBILITY

Finally, Dr. Tsai's opinions lack credibility given his lack of understanding of the law, lack of requisite diligence, and bias towards Dr. Sung. Specifically, Dr. Tsai admitted:

- *He does not understand the legal principles in his Declaration.* See EX1055, 97:14-99:5 (“Q: And both on Monday and yesterday you provided the following testimony. ‘QUESTION: So you don't understand the ‘Legal Understanding’ sections in your declarations, correct?’ ‘ANSWER: For those, indeed, I don't have much understanding.’ Is that still true today? ... A: Still I would say that I don’t have much understanding about them.”); EX1054, 38:19-23 (“Q: U.S. law has a concept called enablement, which has certain requirements. Do you know what those requirements are to meet the enablement requirement? A: I don’t know.”); EX1052, 69:23-70:4 (“Q: Okay. So the ’802 patent is a continuation-in-part of the ’862 patent, correct? A: I am not familiar with patents so I don't know what that means. *THE CHECK INTERPRETER*: ‘I’m not familiar with the law. I'm not familiar with patents. I don’t know what it means.’”)).
- *He did not closely review the claims of the ’802 Patent to accurately determine the meanings of the claims.* See EX1052, 83:8-10 (“Q: Did

you review columns 27 through 29 [that contains the claims] of the '802 patent before rendering your opinion? A: I generally looked at them.”)).

- ***He did not review the Petition filed in this proceeding to properly formulate an understanding of Petitioner's positions but nevertheless cites to the Petition in his Declaration.*** See EX1055, 126:1-4 (“Q: Did you review the '802 petition before you submitted your declaration? A: (In English) No.”); EX1055, 124:22-25 (“Q: I get that but I'm just asking a very simple question. Does PET.@36 [in ¶29 of your Declaration] refer to the petition? A: I'm not quite sure.”)).
- ***He has worked closely with Dr. Sung over many years, having received funding from Dr. Sung, which in turn allowed him to advance his career.*** See generally EX1004, EX1049, EX1061-EX1067 (showing papers Dr. Tsai published with Dr. Sung as co-authors); EX2010, p. 104 (“The authors would like to thank ... Dr. J. S[u]ng of Kinik Company, Taiwan, for providing the financial support, and the conditioners used in this study.”); see also EX1053, 184:13-185:25; EX1053, 226:21-25 (“Q: And without Kinik's funding and tools, you could not have published many of your papers, correct? A: Well, then, it would be pretty difficult for me to do so.”); EX1053, 227:9-17: (“Q: And you testified – and this is your own words – ‘In academic field, you need to publish papers in order to be

promoted.' Correct? A: That's correct, generally we need to publish papers in order to be promoted. Q: So these papers did, in fact, help you get promoted, correct? A: Some papers offered the help, but some not."); EX1052, 60:13-23: ("Q: So by thanking Dr. Sung, you were hoping that Kinik will provide more future financial support? A: That's a typical Chinese way to do so in the hope that the company can give us further support in the future.").

Given these numerous issues, Dr. Tsai's purported opinions in his Declaration should be afforded no weight.

VIII. CONCLUSION

For the reasons stated above, and in the Petition, Samsung respectfully requests that the Board cancel the challenged claims.

Dated: March 5, 2025

Respectfully submitted,

/Yung-Hoon Ha/
Yung-Hoon Ha
Reg. No. 56,368
yha@desmaraisllp.com
DESMARAIS LLP
230 Park Avenue
New York, NY 10169
Telephone: 212-351-3400
Facsimile: 212-351-3401

*Lead Counsel for Petitioner
Samsung Electronics Co., Ltd.*

CERTIFICATION UNDER 37 C.F.R. § 42.24(d)

I hereby certify that this paper, excluding the portions exempted under 37 C.F.R. § 42.24(c), has 5,398 words as counted by Microsoft Word, the word-processing program used to prepare this paper.

Dated: March 5, 2025

Respectfully submitted,

/Yung-Hoon Ha/

Yung-Hoon Ha

Reg. No. 56,368

yha@desmaraisllp.com

DESMARAIS LLP

230 Park Avenue

New York, NY 10169

Telephone: 212-351-3400

Facsimile: 212-351-3401

Lead Counsel for Petitioner

Samsung Electronics Co., Ltd.

CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.6(e), the undersigned certifies that on March 5, 2025, a complete copy of Petitioner's Reply in Support of Its Petition and corresponding exhibits 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:

Alex Chan, Reg. No. 52,713
Devlin Law Firm LLC
1526 Gilpin Avenue
Wilmington, DE 19806
Phone: (302) 449-9010
Fax: (302) 353-4251
achan@devlinlawfirm.com
dlflitparas@devlinlawfirm.com

Joel Glazer, Reg. No. 76,493
Jason Shapiro, Reg. No. 35,354
Devlin Law Firm LLC
1526 Gilpin Avenue
Wilmington, DE 19806
Phone: (302) 449-9010
Fax: (302) 353-4251
jglazer@devlinlawfirm.com
jshapiro@devlinlawfirm.com

Dated: March 5, 2025

Respectfully submitted,

/Yung-Hoon Ha/
Yung-Hoon Ha
Reg. No. 56,368
yha@desmaraisllp.com
DESMARAIS LLP
230 Park Avenue
New York, NY 10169
Telephone: 212-351-3400
Facsimile: 212-351-3401

*Lead Counsel for Petitioner
Samsung Electronics Co., Ltd.*