

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,
Petitioners,

v.

W&WSENS DEVICES, INC.,
Patent Owner.

Case PGR2025-00082
U.S. Patent No. 12,243,948

PATENT OWNER'S SUR-REPLY

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I. INTRODUCTION

The Challenged Claims are patentable because Kuboi (Ex. 1004) does not disclose the microstructure limitations they require. Kuboi takes an altogether different approach to photodetection: its imaging device performs photoelectric conversion in an organic material while a light-shielding film 19 keeps light out of the surrounding silicon, whereas in the '948 Patent, it is the silicon that receives light and performs the photoelectric conversion. Kuboi discloses none of five independently dispositive limitations: (1) the array of silicon pillars; (2) silicon photodetectors configured to generate charge carriers; (3) holes fabricated at or under a light-receiving surface; (4) the increase in light absorption of at least $1.1\times$ caused by the holes; and (5) solid dielectric material filling the holes at least partly. Each is an independent basis to confirm the validity of the Challenged Claims.

Two developments confirm the point. First, the Office denied *ex parte* reexamination of the '948 Patent's parent, U.S. Patent No. 12,087,871 (Ex. 2045, the "'871 Patent"), requested by Petitioners, on the same Kuboi mapping, supported by the same expert, finding Kuboi does not teach the claimed pillars, holes, or $1.1\times$ absorption increase. Ex. 2040. Second, the District Court's claim-construction order, issued after Patent Owner's Response, and defended by Petitioners, construed hole in a way Kuboi cannot satisfy. Ex. 1072 at 11. Petitioners' Reply overcomes neither point; it retreats to attorney argument and to an angled-and-reflected-light

theory their expert first offered at his deposition, that is absent from both the Petition and his declaration.

This Sur-reply addresses each limitation in turn. Because Kuboi, Vasylyev, and Shinohara do not disclose the core microstructure limitations of the Challenged Claims and because the '948 Patent is fully enabled, the Board should confirm the patentability of Challenged Claims 1-16.

II. THE CHALLENGED CLAIMS ARE PATENTABLE OVER KUBOI, VASYLYEV, AND SHINOHARA (GROUNDS 1-4)

A. Kuboi Does Not Disclose the Claimed “Array of Pillars”

Kuboi does not disclose “an array of pillars comprising Si, Ge, and/or SiGe alloy semiconductor material, wherein at least some of the pillars are configured to include photodetectors and have respective light-receiving surfaces and respective sides.” Ex. 2039 (“D’Andrade Decl.”) ¶¶ 104-06. As illustrated in Fig. 49 of the '948 Patent, pillars are structural features with claimed “light-receiving surfaces” and, in addition, “respective sides”:

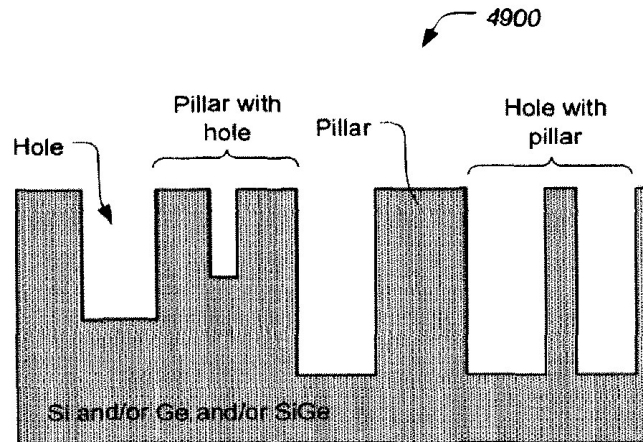


FIG. 49

'948 Patent at Fig. 49.

Petitioners contend that Patent Owner improperly narrowed claim 1 to Figure 49 and ignored the Petition's pixel-as-pillar mapping. Reply at 8-10. Patent Owner's Response, however, was grounded in claim 1's express language and cited Figure 49 to provide evidence of the plain and ordinary meaning of the term "pillar" as it is used in common parlance and the intrinsic record. Paper 23 ("POR") at 27-28. Indeed, the Examiner discussed Fig. 49 and its corresponding description in the Notice of Allowance because it provided "an understanding of the examiner's interpretation of the Applicant's independent claims as compared to disclosed embodiments in Applicant's Figures." Ex. 1003 at 19-21; *see also* Ex. 1003 at 298-301.

Petitioners cite *Hiniker*, but that case is inapposite because, unlike here, the patent owner presented arguments over unclaimed features, and in the context of

secondary considerations, which are not at issue here. Reply at 9, n.3; *see In Re Hiniker Co.*, 150 F.3d 1362, 1368-69 (Fed. Cir. 1998) (“Hiniker’s proffered facts, including its evidence of secondary considerations of nonobviousness, are not commensurate with the claim scope and are therefore unpersuasive”). Figure 49 thus informs, rather than narrows, the meaning of “pillar,” and neither *Phillips* nor *Hiniker* supports Petitioners’ position. Properly understood, claim 1 requires discrete Si/Ge/SiGe pillars with light-receiving surfaces and with sides, structures that Kuboi’s hybrid organic-silicon pixels do not possess. D’Andrade Decl. ¶¶ 104-06, 78-79.

The conclusion that Kuboi’s pixels are not the claimed “pillars” is consistent with the Office’s decision to deny re-examination of the ’948 Patent’s parent, the ’871 Patent. Ex. 2040 at 4. In the ’871 Patent EPR, the Office weighed Kuboi and Petitioners’ same mapping of Kuboi to similar claim limitations, with the same expert’s declaration, under a lower legal threshold, and found that Kuboi does not teach the claimed pillars, holes, or the 1.1x increase in light absorption. *Id.* at 9 (Kuboi does not teach an array of pillars, “configured as photodetectors that have respective light-receiving surfaces and are configured to respond to illumination . . . by generating electrical charge carriers,” and does not teach “holes that are deliberately formed into the light-receiving surfaces and are filled at least partly with solid dielectric material.”). For these reasons, the Office concluded that Kuboi was

“not directly related to subject matter considered the basis for allowability” of the ’871 Patent’s claims and that “a reasonable examiner would not consider evaluation of Kuboi alone or in view of Shinohara important in determining the patentability of the claims.” *Id.* at 10, 8.

The Office’s precedent under 35 U.S.C § 325(d) includes a commitment to “defer[ring] to previous Office evaluations” of the same art, absent material error. *Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH*, No. IPR2019-01469, Paper 6 at 9 (P.T.A.B. Feb 13, 2020) (precedential). Similarly, the September 16, 2025, Office Memorandum requires an explanation for “why a different outcome is warranted” when “patent claims being challenged ... or substantially similar patent claims, have already been adjudicated, post-issuance, before the Office.” Also, “when the same or substantially the same evidence and/or arguments that were previously presented to the Office,” as is the case here, “[a] more detailed explanation is required from the Board.” *Id.*

Patent Owner notes that the Board is not strictly bound by an examiner’s determination and can reach a different result on a different record and a different burden. *In re Baxter Int’l, Inc.*, 678 F.3d 1357, 1360-61 (Fed. Cir. 2012). But in this case, the record is the same. And the higher burden applicable here cuts in favor

of Patent Owner, not against it. For the reasons below, nothing before the Board warrants a different result.¹

First, Petitioners do not dispute the record here is the same as in the '871 Patent EPR. Petitioners argue the '948 Patent is a “different patent” with “different claim[s],” but do not challenge the limitation-by-limitation comparison in Patent Owner's Response. Reply at 4; POR at 17-18. Moreover, Petitioners do not dispute the overlap between the '871 Patent Reexam Request and the instant Petition. They confirm it: As Petitioners concede, “[t]he '871 EPR Request, like the instant Petition,” identified Kuboi's pixels as the claimed “pillars,” the lower surface of transparent electrode 22 as the pillars' “light-receiving surfaces,” and the organic

¹ Petitioners continue to deny they should have informed the Board of their filings and subsequent denials of *ex parte* reexamination for the related patent, pursuant to the Board's Scheduling Order (Paper 18), or at a minimum, as a change to Related Matters under 37 C.F.R. § 42.8(a)(3) (requiring an updated Mandatory Notice “within 21 days of a change of the information” to Related Matters). Reply at 4, n.1. Petitioners had notified the Board of their petition for inter partes review of the '871 patent as a Related Matter at the outset of this proceeding. Pet. at 143. There is no reason to find their follow-on requests for *ex parte* reexamination of the same '871 Patent to be unrelated.

material filled holes within each pixel as the claimed “holes.” Reply at 5. The reexamination was requested by the same counsel that represents Petitioners here (Ex. 2040 at 2), supported by the same expert's opinions and declaration (Ex. 2042), and built on the same primary reference Kuboi. Petitioners thus brought the Office the same Kuboi mapping they now bring before the Board, and the Office found it unpersuasive.

Second, the different burden and “different legal question” favors the Patent Owner, not the Petitioners. Reply at 4. The threshold burden in an *ex parte* reexamination is whether a request for reexamination raises a substantial new question of patentability, that is, whether “an [e]xaminer would reasonably consider the prior art . . . important in deciding whether or not the claim is patentable.” Ex. 2040 at 7. That threshold is markedly lower than Petitioners' burden in this proceeding to prove unpatentability by a preponderance of the evidence. The Office already found that Kuboi does not clear even that lower bar, concluding that “a reasonable examiner would not consider evaluation of Kuboi alone or in view of Shinohara important in determining the patentability of the claims.” Ex. 2040 at 8. If Kuboi is not even “relevant” or “important” enough to warrant reexamination, it cannot carry Petitioners' heavier burden of establishing unpatentability here. *See Ex Parte Ditzik*, No. 2018-000087, 2018 WL 3409672, at *4-5, n.3 (P.T.A.B. July 10, 2018) (“If a challenger *fails* to meet the lower standard to prove invalidity in a PTO

proceeding, then the same challenger typically is estopped from relying on the same arguments and evidence to prove invalidity in subsequent proceedings.”).

Petitioners fault the Office for allegedly “*sua sponte*” mapping the claims to Kuboi in a manner supposedly different from the instant Petition or the EPR Request (Reply at 5-6), but nothing requires that the Examiner adopt a requester’s characterization of the prior art. *See* Manual of Patent Examining Procedure (“MPEP”) § 2242; *see also* MPEP § 2246 (an examiner “may,” not must, “adopt the reasons provided by the requester in the discussion of the substantial new question of patentability”); MPEP § 2244 (“The examiner is not limited in making the determination based on the patents and printed publications relied on in the request.”). Petitioners’ “*sua sponte*” charge carries no legal significance.

In any event, the Office did not ignore the reasons Petitioners provided in their request; it expressly engaged the structures on which the EPR Request and the Petition rely and rejected Petitioners’ interpretation. For example, the Office considered Petitioners’ mapping of Kuboi’s element 38 to the claimed “holes” and found “Kuboi teaches, among other things, elements 38 as shown in Figure 4B that are ‘holes’ at least in the sense that they are negative spaces formed in the semiconductor layer 12.” Ex. 2040 at 7. Petitioners misread the Office’s denial as only rejecting a mapping in which the “pillars” constituted “the remaining sections of semiconductor layer 12 that are not removed in holes 38,” rather than their

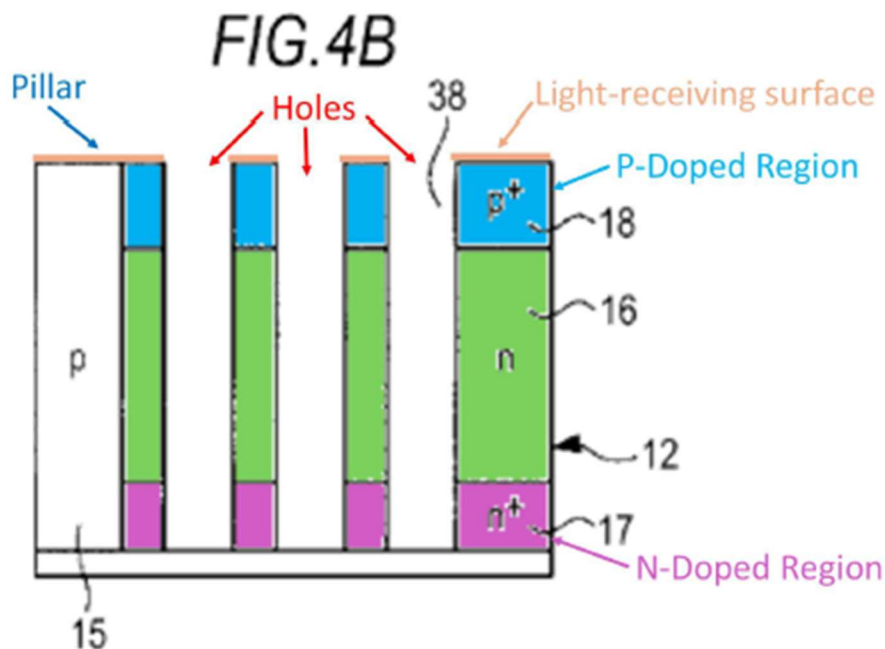
assertion that Kuboi's pixels are the claimed "pillars." Reply at 6 (citing Ex. 2040 at 8-9); *see also id.* at 15-16. But the Office rejected that assertion as well as an alternative finding. Ex. 2040 at 7 (making findings "[e]ven if for the sake of argument").

The Office rejected outright Petitioners' '871 EPR Request mapping of Kuboi's pixels to the claimed "array of pillars," finding "Kuboi does not teach pillars that are configured as photodetectors that have respective light-receiving surfaces and are configured to respond to illumination ... by generating electrical charge carriers." Ex. 2040 at 7. The Office then also considered an alternative mapping ("[f]or the sake of argument") of Kuboi's "remaining sections of semiconductor layer 12 that are not removed in holes 38" to the claimed array of pillars. *Id.* However, as the Examiner reasoned, this alternative reading of Kuboi would not read on the claimed pillars "because Kuboi teaches that the remaining sections of semiconductor layer 12 are covered by light shielding film 19 such that light photons would be incident on the organic photoelectric conversion film 13 in holes 38, not the semiconductor layer 12." *Id.*

Finally, the Office still further considered Kuboi's holes mapped to the recited "one or more holes that are deliberately formed into the light-receiving surfaces . . . and are filled at least partly with solid dielectric material" and found that "holes 38 are not deliberately formed into the light-receiving surfaces of the pillars and holes

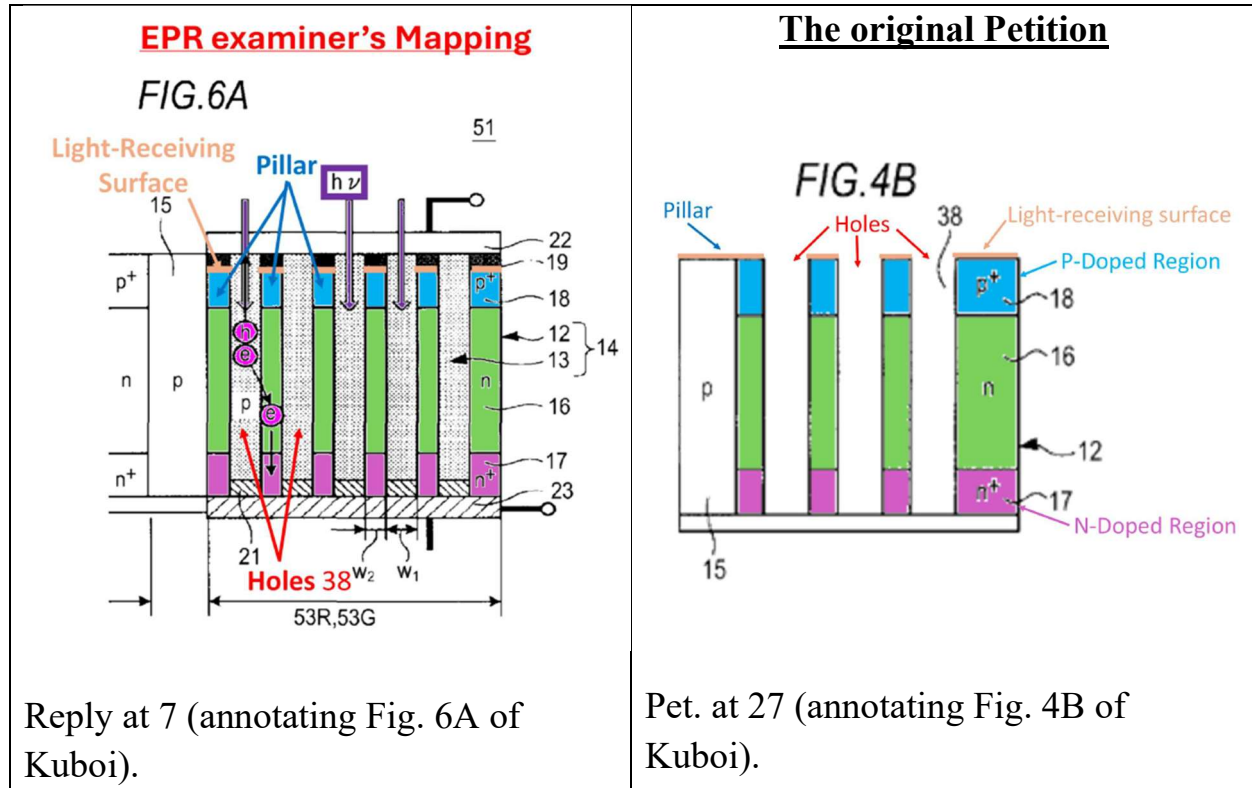
38 have organic photoelectric conversion film 13 therein (not solid dielectric).” Ex. 2040 at 7. The Office, thus, considered and rejected the Petitioners’ reasoning.

The Examiner referenced this material because the Request referred to Kuboi’s teachings with respect to paragraph [0072] concerning FIG. 4B. Reply at 6 (arguing that the Examiner wrongly identified the “light-receiving surface” in its proposed rejection). This is the same material referred to in the Petition that led Petitioners to include the following annotated version of Fig. 4B given that it is the fabrication step where the recesses are formed:



Pet. at 26-27 (citing Kuboi [0072]). It is no surprise, therefore, that the Examiner considered and ultimately rejected the idea that this surface could be the claimed

light-receiving surface since Petitioners cited the same evidence (while omitting the annotated version of FIG. 4B).



As shown above, the alleged “EPR examiner’s Mapping” annotates the top of P-doped region 18 in orange as the light-receiving surface corresponds to the instant Petition’s annotated Figure 4B. Pet. at 26-27.

Accordingly, whether measured against the claim language or the Office’s own analysis of the identical Kuboi mapping, Kuboi does not disclose the claimed “array of pillars,” and Ground 1 fails on this limitation alone.

B. Kuboi Does Not Disclose Doped Semiconductor Pillars Configured to Respond to Illumination by Generating Charge Carriers

Kuboi does not disclose “at least some of the pillars comprise P-doped and N-doped regions and are configured to respond to illumination with light in selected visible and infrared wavelengths by generating electrical charge carriers.” ’948 Patent at 55:39-47.

Kuboi performs photoelectric conversion in its organic film 13 (“The organic material layer 13 is [the] region where photoelectric conversion is performed”), and its light-shielding film 19 ensures that “[t]he light $h\nu$ does not enter the semiconductor layer 12.” Kuboi at [0057], [0059], [0064]; POR at 31-32. The charge carriers are generated in the organic material, not in the doped silicon, as recited in the Challenged Claims. D’Andrade Decl. ¶¶ 107-14; *see also* Ex. 2040 at 7 (denying ’871 Patent reexamination because “[t]he remaining sections of semiconductor layer 12 are not pillars”).

In Reply, Petitioners argue that claim 1 requires only that the “pillar” as a whole, not its P- and N-doped regions, respond to illumination. Reply at 16-17. That reading cannot be squared with the claim language, which ties the doped

regions and the charge-generating function to the same “at least some of the pillars.”² ’948 Patent at 55:39-47. In all events, under either reading, Kuboi generates carriers in organic film 13 and shields the silicon from light, so no part of Kuboi’s “pillar” responds to illumination by generating charge carriers in doped regions as the claim requires. *See* POR at 31-32 (discussing Kuboi’s hybrid photodetector).

Petitioners mischaracterize the prosecution history of a W&Wsens related patent to argue “W&W cannot now import a limitation it found necessary to add by express amendment.” Reply at 18-19. This is incorrect. The prosecution history of related U.S. Application No. 19/036,506 (Ex. 1057, the “’506 Application”) does not create any disclaimer or estoppel, because Patent Owner never amended the claims of the ’506 Application to overcome any rejection applying Kuboi, as Petitioners’ Reply suggests. Reply at 19. Rather, the Patent Owner cancelled then-pending claims 1-17, and ultimately added new claims 37-49 in a response to an

² Petitioners’ header stating “Claim 1 Does Not Require that the Semiconductor Layers of the Pillars Generate Charge Carriers—Only that the Pillars Generate Charge Carriers” also conflicts with the District Court’s claim constructions, that expressly calls for “the absorption of light entering the void by the light absorbing material abutting the void.” Ex. 1072 at 11; *see* Section II.C.2, *infra*.

office action rejecting the claim over other references (not Kuboi). Ex. 1057 at 282; *id.* at 419-38 (Office Action dated March 18, 2025).

Petitioners' last rejoinder on this limitation is a new theory: that Patent Owner mischaracterized Dr. Lebby by omitting his testimony that angled and reflected light reaches semiconductor layer 12 and generates carriers there notwithstanding light-shielding film 19. Reply at 19-20. That belated theory is Petitioners' sole attempt to locate charge generation in the silicon of Kuboi's hybrid photodetector. *Id.* at 2-3. The Board should reject this theory because it is untimely and does not satisfy the express claim language, for the reasons discussed below.³

First, Petitioners' angled and reflected light theory is untimely. A reply may only respond to arguments raised in the corresponding opposition, patent owner preliminary response, patent owner response, or decision on institution. 37 C.F.R. § 42.23(b); 35 U.S.C. § 312(a)(3); *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1369-70 (Fed. Cir. 2016) (affirming the Board's refusal to consider an argument raised for the first time in the petitioner's reply and upholding the challenged claims as not unpatentable). Here, Petitioners introduce in their

³ Petitioners also point to "the semiconductor layers of the blue pixel" 53B in their Reply, but that blue pixel 53B fails to satisfy the claims because it lacks any in-pillar holes required by the rest of the claim. Reply at 20; D'Andrade Decl. ¶ 105.

Reply an entirely new theory about how angled and reflected light reaches semiconductor layer 12 and generates carriers there notwithstanding light-shielding film 19. Reply at 19-20. The angled-and-reflected-light theory appears nowhere in the Petition and nowhere in Dr. Lebby's declaration. *See* Pet. at 8-52. Dr. Lebby confirmed as much at his deposition, conceding that he did not discuss indirect incident light in Kuboi in rendering his opinion that Kuboi invalidates the Challenged Claims. Ex. 2048 ("Lebby Tr.") at 134:12-21.

This is not a case where Petitioners cite to a different embodiment in the same prior art reference already relied upon. *See Rembrandt Diagnostics, LP v. Alere, Inc.*, 76 F.4th 1376, 1384-85 (Fed. Cir. 2023) (finding a reply may legitimately expand on a previously raised argument by pointing to additional disclosures of a reference already in the petition). Rather, the theory finds no support in Kuboi itself. Kuboi states that "[t]he light hv does not enter the semiconductor layer 12 due to the light shielding film 19." Kuboi at [0064]; *see also* POR at 31. When asked during cross-examination, Dr. Lebby admitted he was "not aware that Kuboi is . . . expressly" discussing direct or indirect light entering the semiconductor layer 12. Lebby Tr. at 102:19-103:2. He nonetheless offered, for the first time, an improvised opinion that light could reach region 18 through angled or reflected paths, despite conceding that the intention of light-shielding film 19 in Kuboi is to prevent incident light from reaching P-region 18. *Id.* at 104:9-16; *see id.* at 103:13-18, 104:2-3

(extemporaneously providing his theory “as [he] look[s] at Kuboi [F]igure 1A again”). The Board should disregard Petitioners’ belated theory under 37 C.F.R. § 42.23(b) as improper reply arguments.

Second, even considering Dr. Lebby’s new theory, it does not satisfy the limitation. That some quantum of stray, scattered light might reach the shielded silicon fails to establish that Kuboi’s pillars with P-doped and N-doped semiconductor regions are *configured* to respond to illumination by generating electrical charge carriers, as the claim requires. Kuboi performs photoconversion in organic film 13 and deliberately shields the surrounding silicon, which is the opposite of configuring the silicon material to generate charge carriers. Petitioners’ stray-light theory, invented at deposition, cannot supply what Kuboi’s disclosure teaches against.

For each of these independent reasons, Kuboi does not disclose pillars “configured to respond to illumination . . . by generating electrical charge carriers.” Kuboi generates charge carriers in its organic film while deliberately shielding the surrounding silicon from light. This is the opposite of what claim 1 requires.

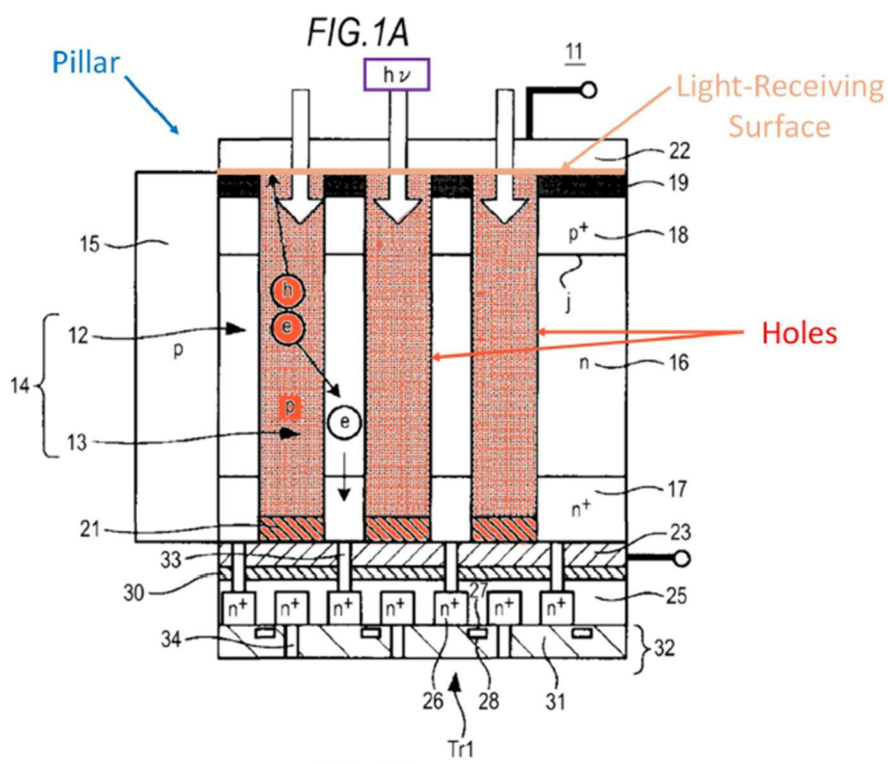
C. Kuboi Does Not Disclose Holes Fabricated as Recesses at or Under a Light-Receiving Surface

Claim 1 requires “one or more holes that are fabricated as recesses at or under the light-receiving surface of each of at least some of the pillars.” Kuboi fails to teach or suggest holes fabricated as recesses at or under the identified “light-

receiving surface.” Nor does Kuboi disclose “holes” under the District Court’s claim construction order.

1. Kuboi Does Not Teach Holes Fabricated at or Under a Light Receiving Surface

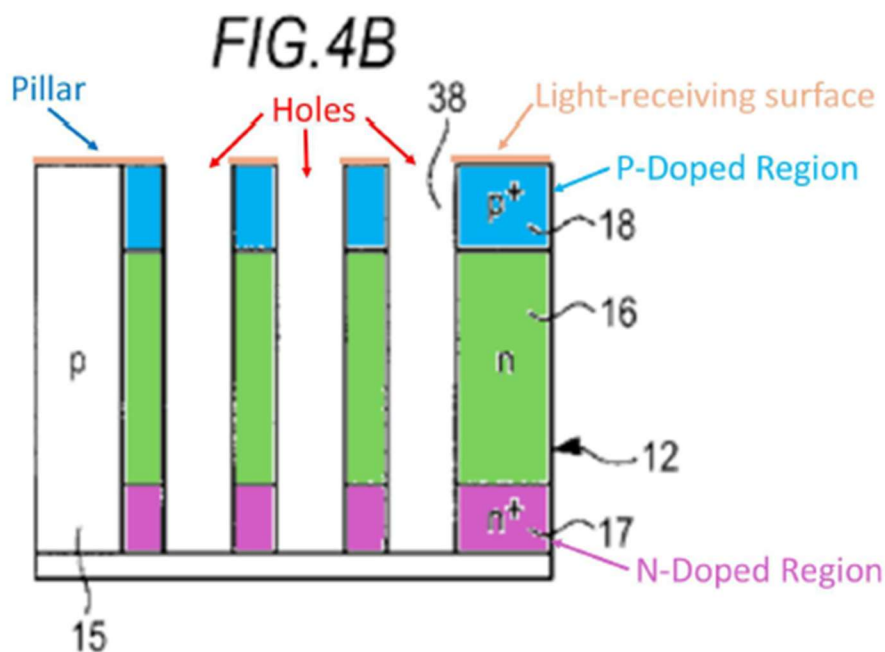
The Petition contends that the lower surface of upper electrode 22 is a “light-receiving surface.” Pet. at 18; POR at 34. But Kuboi’s holes 38 are not “fabricated” at or under upper electrode 22; they are dry-etched into a region laterally and separate from electrode 22. POR at 35-36.



Pet. at 28 (citing Kuboi, Fig. 1B (annotated)).

In Reply, Petitioners argue that the disjunctive “at or under” is satisfied because holes etched into region 18 are necessarily “under” electrode 22’s lower

surface. Reply at 21. This argument ignores that the “holes” allegedly located “under” electrode 22’s lower surface were not “fabricated as recesses at or under this surface,” they were fabricated as recesses at and under the top surface of P-Doped Region 18, which Petitioners’ briefly identified as the light-receiving surface in the Petition:



Pet. at 27. Petitioners’ Reply drops any reliance on this reading because the top of P-Doped Region 18 does not receive light. The express purpose of light-shielding film 19 is to block light, not receive it. Kuboi at [0064] (“The light $h\nu$ does not enter the semiconductor layer 12 due to the light shielding film 19.”); POR at 37. A surface that abuts an opaque, light-blocking film is not a “light-receiving surface.” Petitioners’ own expert confirmed the point, conceding that “[t]he intention of light-

shielding film 19 in Kuboi is to prevent direct incident light from reaching P region 18.” Lebbby Tr. at 104:9-16.

Petitioners’ argument also ignores that the claimed light-receiving surface must be a surface of a *pillar*, and Petitioners do not explain why electrode 22 should be considered part of a “pillar.” Indeed, Petitioners map electrode 22 to the claimed “electrical contacts” recited later in the claim (Pet. at 37-38), but the claimed electrical contacts are recited as part of the entire “integrated structure,” not as part of “an array of pillars comprising Si, Ge, and or SiGe.”

For each of these reasons, Petitioners have not demonstrated that Kuboi teaches fabricating holes as recesses at or under a light-receiving surface of a pillar.

2. Petitioners Fail to Show Kuboi Discloses “Holes” Under the District Court’s Construction

Petitioners fail to show that Kuboi discloses “holes” under the District Court’s construction of “hole.”⁴ In the parallel litigation, Patent Owner urged the plain and

⁴ Patent Owner respectfully disagrees with the District Court’s construction and has moved for reconsideration. Patent Owner addresses here in the alternative, solely for purposes of this proceeding and without waiver of its position that “hole” carries its plain and ordinary meaning, under which the Challenged Claims are likewise patentable over Kuboi.

ordinary meaning of “hole” (“an absence of material” or “a physical void”). Ex. 1072 at 6. The District Court adopted a narrower construction, defining a “hole” as “a void whose primary purpose is to increase the absorption of light entering the void by the light absorbing material abutting the void.” *Id.* at 11. In their Reply, Petitioners mention that construction only in a single conclusory sentence in a footnote, asserting that “Kuboi’s hole also meets the District Court’s construction” with a vague reference to “each of the reasons described above.” Reply at 3-4, n.1.

That conclusory assertion does not meet Petitioners’ burden. Under the court’s construction, a “hole” is “a void whose primary purpose is to increase *the absorption* of light entering the void *by the light absorbing material abutting the void.*”⁵ Ex. 1072 at 11 (emphasis added). Petitioners never show that the organic material in Kuboi’s holes 38 increases absorption in the abutting material—the semiconductor region abutting the alleged hole. The record shows the opposite: Kuboi’s stated purpose is eliminating light that otherwise could reach and be

⁵ Although Petitioners did not advocate for this construction in its claim construction briefing, it has now filed a brief advocating for the District Court’s construction. Patent Owner will seek, in parallel, leave to file a Motion to Terminate the proceedings in view of Petitioners’ late-arriving inconsistent claim construction positions.

absorbed in the material surrounding the alleged “holes,” by ensuring that it is absorbed by the organic material instead of the surrounding material.

Petitioners’ only argument that Kuboi satisfies this construction is its new Reply theory that “angled” and “reflected” light may scatter into Kuboi’s silicon semiconductor layer 12, causing photoelectric conversion, notwithstanding light-shielding film 19. Reply at 2-3. This argument fails for the reasons given in § II.B: it is untimely, and unsupported by Kuboi, which states that “[t]he light $h\nu$ does not enter the semiconductor layer 12 due to the light shielding film 19.” Kuboi at [0064].

Moreover, this belated argument falls far short of satisfying the construction. That some quantum of stray, indirectly scattered light might reach the silicon region beneath light-shielding film 19 does not mean that the “primary purpose” of Kuboi’s holes is to *increase* absorption in that material. Ex. 1072 at 11. Kuboi’s holes and organic photoelectric conversion film 13 perform the photoconversion itself; the surrounding silicon is deliberately shielded from light. POR at 31. Petitioners point to Dr. Lebby’s cross-examination testimony, but it makes no mention of any “primary purpose” of Kuboi’s holes. Reply at 2-4, n.1.; *see* Lebby Tr. at 133:10-134:11, 99:22-101:1, 102:17-104:16. Petitioners could have submitted a reply declaration addressing the court’s construction but chose not to.

Kuboi, thus, fails to satisfy the claimed “one or more holes that are fabricated as recesses at or under the light-receiving surface of each of at least some of the pillars.”

D. Kuboi Does Not Disclose the Increased-Absorption Limitation

Kuboi does not disclose “the presence of said one or more holes increases by a factor of at least 1.1 the absorption of the light by at least some of the photodetectors relative to like photodetectors lacking said holes.” POR at 38-42; *see also* Ex. 2040 at 7. Petitioners do not rely on Kuboi for teaching a 1.1x increase and instead rely on Dr. Lebby’s after-the-fact Lambert-Beer estimate, an HCG analysis, and Han. Pet. at 40-52, 118. Each fails.

First, the purported improvement in Kuboi’s hybrid pixels comes from Kuboi’s organic material, not from any hole structure improving light absorption in surrounding silicon. POR at 40-41. Dr. Lebby admitted as much: asked whether the increase “is due to the use of organic photoelectric conversion films,” he testified, “That is the essence of what Kuboi is teaching.” Lebby Tr. at 147:7-148:5. The claim ties the 1.1x increase to the presence of the holes, not to a choice of absorptive material. D’Andrade Decl. ¶¶ 121-27.

In Reply, Petitioners offer only unsupported attorney argument that the improved absorption is a “direct consequence” of the holes themselves. Reply at 22-24. But Petitioners concede a chain of causation (“without holes, *there is no*

organic material, no enhanced absorption, and no 1.1X improvement”) which places the organic material, not the holes, as the “direct” reason for the alleged enhanced light absorption by the hybrid pixel. *Id.* at 23 (emphasis added).

Petitioners also counter that Dr. Lebby explained during cross-examination how Kuboi meets the 1.1x limitation, “regardless of any material’s absorption characteristics.” Reply at 24. But none of the deposition testimony or declaration cited in the Reply demonstrates such an analysis, and just repeats Petitioners’ arguments in their Petition. *Id.* (citing 148:6-13, 151:7-152:4, 152:19-153:13, 156:11-157:7; Lebby, ¶¶ 188-200). Petitioners offer no evidence addressing Dr. D’Andrade’s reasoning that Kuboi’s organic material and not its holes cause any alleged improved absorption. Dr. Lebby did not submit a Reply Declaration to supplement his analysis. Petitioners also cancelled a planned cross-examination deposition of Patent Owner’s expert Dr. D’Andrade. *See* Paper 26. Dr. D’Andrade’s un rebutted expert opinions demonstrate Kuboi fails to disclose the 1.1x limitation. D’Andrade Decl. ¶¶ 121-27.

Second, Dr. Lebby’s opinions are based on improper hindsight because he used the ’948 Patent itself as a roadmap to recreate the claimed invention from asserted prior art. POR at 41. He admitted that he used the ’948 Patent’s own equation “to see if it really does increase absorption by 1.1x.” *Id.*; Lebby Tr. at 152:5-18; *see also* Lebby Tr. at 151:14-18 (admitting he “based [his] analysis . . .

that was based on what was taught in the '948 patent for high-contrast gra[t]ing effects and how HCG effects can increase absorption"). Petitioners do not address their expert's admission in their Reply. Reply at 25-26. Even if Dr. Lebby used "contemporaneous disclosures, published data, and established physics" (*id.*), his motivation and analysis was taken from first reading the '948 Patent Specification which spoils his subsequent analysis as impermissible hindsight. D'Andrade Decl. ¶¶ 128-29; *In re NTP, Inc.*, 654 F.3d 1279, 1298-99 (Fed. Cir. 2011) (finding an obviousness determination may not be based on hindsight reconstruction using the challenged patent as a template).

Thus, Petitioners have not demonstrated that Kuboi teaches the 1.1x limitation.

E. Kuboi Does Not Disclose Holes Filled At Least Partly with Solid Dielectric Material

Kuboi does not disclose holes "filled at least partly with solid dielectric material." Kuboi's holes are filled with organic photoelectric conversion film 13, which is a semiconductor, not a dielectric, over a thin film 21 that only serves to electrically isolate the organic material from bottom electrodes and merely coats the bottom electrode under the hole to a thickness of "several tens of nm." Neither satisfies the limitation. D'Andrade Decl. ¶¶ 133-50 (quoting Kuboi at [0073]).

As to film 21, the claim requires that solid dielectric material at least partly fill the *volume* of the hole, consistent with the specification's disclosure of a filler

that “fills or partially fills” the space between pillars. POR at 43 (citing ’948 Patent at 19:30-42). A nanometers-thin liner on the hole bottom is not a partial volumetric fill. As to organic film 13, it is not a dielectric at all. A dielectric is an insulator; Kuboi’s organic material is a p- or n-type semiconductor that generates and transports signal charges. Ex. 2029 at 3 (Electrical Engineering Dictionary); Kuboi at [0055]-[0056], [0085]; D’Andrade Decl. ¶ 145.

Petitioners’ backup theory—that undoped organic semiconductors are dielectric in the dark state, and that “p-type” denotes only majority carriers—is refuted by their own expert. Reply at 29-30. Dr. Lebby conceded a POSITA “wouldn’t characterize a semiconductor material as a dielectric material” (Lebby Tr. at 127:3-9), and that “a semiconductor is a semiconductor, and a dielectric material is a dielectric material,” (*id.* at 126:15-17). His “dark/light” testimony describes semiconductor behavior—conductive when illuminated, insulating in the dark—not a passive dielectric fill. POR at 51-52 (citing Lebby Tr. at 32:12-22). Kuboi’s material is designed to convert light and transport charge; that is the antithesis of a solid dielectric.

Because Kuboi’s holes are filled with a light-absorbing organic semiconductor over only a nanometers-thin electrical isolation over the bottom electrode liner, Kuboi fails to disclose any “holes filled at least partly with solid dielectric material.”

**F. Vasylyev and Shinohara Do Not Cure Kuboi's Deficiencies
(Grounds 2-4)**

Grounds 2-4 add secondary references Vasylyev and Shinohara, but neither supplies the pillars, in-pillar holes, dielectric fill, or hole-driven absorption increase missing from Kuboi. Petitioners rely on Vasylyev only for single-port and elongated-hole teachings, and on Shinohara only for monolithic integration and a base dielectric region—not for any limitation shown above to be absent from Kuboi. D'Andrade Decl. ¶¶ 152, 97-99, 100-101. Patent Owner disclosed Vasylyev during prosecution, and the Office allowed the claims over it. POR at 23. Petitioners' Reply does not argue otherwise. Because the combinations still lack the core microstructure limitations, Grounds 2-4 fail for the same reasons as Ground 1.

III. THE CHALLENGED CLAIMS ARE ENABLED (GROUND 5)

Petitioners cannot carry their burden of proving non-enablement. As Petitioners concede, the specification teaches a POSITA how to make and use the claimed invention. POR at 53. Even in their Reply, Petitioners still offer no analysis of the *In re Wands* factors and identify no experimentation, let alone undue experimentation, required to practice the claims. *In re Wands*, 858 F.2d 731, 737 (Fed. Cir. 1988).

Petitioners' enablement theory rests on a false premise: that the high contrast grating (HCG) effect is the sole mechanism for the claimed $\geq 1.1\times$ absorption increase, and that a single hole "cannot be periodic." Reply at 31. But the '948

Patent discloses that the enhancement arises from one or more of several mechanisms: optical field concentration, resonance, interferences, scattering, and HCG effects. POR at 56; D'Andrade Decl. ¶¶ 157-59. Petitioners' myopic focus on just the alleged limitations of HCG effects fails to show the challenged claims are not enabled. And, the claim is on a structure, not a theory of why that structure works.

There is no merit to Petitioners' allegation of lack of enablement based on the prosecution history of the '948 divisional. Reply at 31-32; POR at 57-58. In that case, the Examiner withdrew a § 112(a) rejection in response to Patent Owner's arguments, not because of any claim amendment unique to the '948 Divisional, as Petitioners argue. Ex. 2034 at 158-159. Petitioners' contention (Reply at 31) that allowance turned on an added 50-2000 nm width limitation misreads the record: The examiner withdrew the enablement rejection "in light of [the Applicant's] remarks." Ex. 2034 at 158-159. Finally, Petitioners' conditional argument—that the claims are unenabled only "if 'the prior art's disclosure is deemed insufficient'"—conflates two distinct inquiries. POR at 54-55. Whether Kuboi discloses a limitation says nothing about whether the '948 Patent specification enables a POSITA to practice it. *Id.* The claims are enabled.

IV. CONCLUSION

For all of these reasons, W&Wsens requests that the Board confirm the validity of the Challenged Claims of the '948 Patent.

Respectfully submitted,

Dated: September 8, 2026

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CERTIFICATE OF COMPLIANCE WITH 37 C.F.R. § 42.24

The undersigned hereby certifies that the portions of the foregoing
PATENT OWNER'S SUR-REPLY has 5,573 words in compliance with the
word limit set forth in 37 C.F.R. § 42.24. This word count was prepared using the
Microsoft Word word-processing system used to prepare this paper.

Dated: September 8, 2026

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CERTIFICATE OF SERVICE

The undersigned certifies, in accordance with 37 C.F.R. § 42.6(e), and pursuant to agreement by the parties that filing with the Board through the Patent Trial and Appeal Case Tracking System (P-TACTS) constitutes electronic service, that service was made on Petitioners as detailed below.

<i>Date of service:</i>	September 8, 2026
<i>Manner of service:</i>	Electronic Filing with the Board
<i>Documents served:</i>	PATENT OWNER'S SUR-REPLY
<i>Persons Served:</i>	Finnegan, Henderson, Farabow, Garrett & Dunner, LLP: Joshua L. Goldberg Benjamin A. Saidman Abhay A. Watwe Biju I. Chandran Kai Rajan

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