

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

3D SYSTEMS CORPORATION AND 3D SYSTEMS, INC.,

Petitioner,

v.

INTREPID AUTOMATION, INC.,

Patent Owner

IPR2025-01242

U.S. Patent No. 11,338,511

PETITIONER'S REPLY

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PETITIONER'S EXHIBIT LIST

Exhibit No.	Reference
1001	U.S. Patent No. 11,338,511 (“’511 Patent”)
1002	Excerpts from the Prosecution History of the ’511 Patent (the “Prosecution History”), including: <ul style="list-style-type: none">• PPH Request (dated May 24, 2021)• PPH Request Decision (dated July 9, 2021)• Subsequent PPH Request and IDS (dated July 14, 2021)• Subsequent PPH Request Decision (dated July 16, 2021)• Non-Final Office Action (dated September 2, 2021)• Applicant-Initiated Interview Summary (from interview held on December 6, 2021)• Terminal Disclaimer and Approval of Terminal Disclaimer (dated December 20, 2021)• Response (dated December 20, 2021)• Notice of Allowance (dated January 28, 2022)• Rule 312 Amendment (dated February 28, 2022)• Additional IDS (dated March 8, 2022)• Issue Fee Payment (dated April 19, 2022)• Issue Notification (dated May 4, 2022)
1003	Yong Chen, Ph.D. Declaration dated July 18, 2025
1004	U.S. Patent No. 8,666,142, “System and Method for Manufacturing” (“Shkolnik”)
1005	International Patent Application Publication WO 2017/154564 A1, “Three-Dimensional Shaping Device” (“Sekine”) – translated to English and including declaration of Eric Vance (translator)
1006	U.S. Patent Application Publication No. 2017/0102679, “Sub-Pixel Grayscale Three-Dimensional Printing” (“Greene”)
1007	Paul F. Jacobs, “Fundamentals of Stereolithography,” <i>Proceedings of the 1992 International Solid Freeform Fabrication Symposium</i> , pages 196-211 (“Jacobs”)
1008	C. Groth <i>et al.</i> , Three-Dimensional Printing Technology, VOLUME XLVIII NUMBER 8 © 2014 JCO, Inc. (“Groth”)
1009	U.S. Patent 8,102,332 (“Intensity Scaling for Multi-Projector Displays”)
1010	Song <i>et al.</i> , “A new edge blending paradigm for multi-projector tiled display wall,” <i>2010 International Conference on Computer Application</i>

	<i>and System Modeling</i> (ICCASM 2010), Taiyuan, 2010, pp. V5-349-V5-352, doi: 10.1109/ICCASM.2010.5620133
1011	Brown and Lowe, “Automatic panoramic image stitching using invariant features,” <i>International Journal of Computer Vision</i> , 74 (2007): 59-73
1012	U.S. Patent 6,456,339 B1 (“Super Resolution Display”)
1013	U.S. Patent 7,079,157 B2 (“Matching the Edges of Multiple Overlapping Screen Images”)
1014	Garcia-Dorado and Cooperstock, “Fully automatic multi-projector calibration with an uncalibrated camera,” <i>CVPR 2011 WORKSHOPS</i> , Colorado Springs, CO, USA, 2011, pp. 29-36, doi: 10.1109/CVPRW.2011.5981726
1015	Harville <i>et al.</i> , “Practical Methods for Geometric and Photometric Correction of Tiled Projector,” <i>2006 Conference on Computer Vision and Pattern Recognition Workshop (CVPRW '06)</i> , New York, NY, USA, 2006, pp. 5-5, doi: 10.1109/CVPRW.2006.161
1016	U.S. Patent 7,443,364 B2 (“Projection of Overlapping Sub-Frames onto a Surface”)
1017	U.S. Patent 7,907,792 B2 (“Blend Maps for Rendering an Image Frame”)
1018	U.S. Patent 7,292,207 B1 (“Computing Blending Functions for the Tiling of Overlapping Video Projectors”)
1019	U.S. Patent 8,427,391 B2 (“Configurable Imaging System”)
1020	U.S. Patent 8,446,431 B2 (“DLP Edge Blending Artefact Reduction”)
1021	U.S. Patent Application Publication No. 2013/0269882 A1 (“Tiled Display Rotational Assembly”)
1022	U.S. Patent Application Publication No. 2013/0278840 A1 (“System and Method for Image Aspect Preservation in Multiple Projector Alignment”)
1023	U.S. Patent Application Publication No. 2013/0321475 A1 (“Zonal Illumination for High Dynamic Range Projection”)
1024	U.S. Patent Application Publication No. 2016/0046075 A1 (“Three-Dimensional Printing with Supported Build Plates”)
1025	Y. Chen <i>et al.</i> , “Digital Material Fabrication Using Mask-Image-Projection-Based Stereolithography,” <i>Rapid Prototyping Journal</i> , Vol. 19(3), 2013
1026	Y. Chen <i>et al.</i> , “Hopping Light Vat Photopolymerization for Multiscale Fabrication,” <i>Small</i> , Vol. 19(11), 2205784, 2023
1027	Y. Chen <i>et al.</i> , “Smooth Surface Fabrication Based on Controlled Meniscus and Cure Depth in Microstereolithography,” <i>Journal of Micro-and Nano-Manufacturing</i> , Vol. 3, September 2015
1028	European Patent Application Publication No. EP 3,053,729 A1, “Method for exposing a photo polymerizable material for solidification of material layer by layer to build a 3D object” (“Jørgensen”)

1029	Yi et al., “Delta DLP 3-D Printing of Large Models,” IEEE Transactions on Automation Science and Engineering, Vol. 15, No. 3 (DOI: 10.1109/TASE.2017.2751664) (“Yi”)
1030	Stipulation
1031	Intrepid’s Opposition to Stay
1032	Federal Court Statistics
1033	Declaration of Ben Roxborough in Support of Unopposed Motion for <i>Pro Hac Vice</i> Admission Under 37 C.F.R. § 42.10(c).
1034	Deposition Transcript of David Rosen, Ph.D. dated May 26, 2026 with errata
1035	Excerpts of Rebuttal Report of William J. Allen Intrepid Automation, Inc. v. 3D Systems Corporation et al, Dkt. 27-5, 24-cv-02262-AGS-DDL (SDCA)
1036	LinkedIn Profile of Ben Wynne, CEO of Intrepid (being Exhibit 13 to Deposition Transcript of David Rosen, Ph.D. dated May 26, 2026 with errata)
1037	Deposition Notices IPR2025-01241 & IPR2025-01242, dated May 13, 2026 (being Exhibit 2 to Deposition Transcript of David Rosen, Ph.D. dated May 26, 2026 with errata)

I. INTRODUCTION

Patent Owner's ("PO") Response is flawed—Petitioner will show herein that it systematically ignores critical teachings in favor of word play. PO's Response is directed to the variable nature of the English language, and not toward the technical disclosure of the prior art. The use of an expert to emphasize select citations, while ignoring others does nothing but attempt to confuse and obfuscate a plain reading of the prior art.

Notwithstanding that the parties agree that the plain and ordinary meaning applies to the claims, PO repeatedly attempts to avoid the plain and ordinary meaning by importing limitations from the specification to evade invalidity. PO did not amend the claims during prosecution to include such limitations; nor did PO avail itself of the opportunity to propose claim amendments in the current proceedings. PO seeks to have the full breadth of the claims in District Court, yet before this panel has adopted a far narrower construction. Such gamesmanship is no stranger to the Board, but as demonstrated below, the PO has taken positions that are contradictory to the written record and inconsistent with its own prior statements¹.

II. PERSON OF ORDINARY SKILL IN THE ART

PO's Response adopts Petitioner's description of a POSITA. Response, 4. The same description is used herein.

¹ See EX1035.

III. CLAIM CONSTRUCTION

Both parties adopt the plain and ordinary meaning of all claim terms. Response, 4. Despite the PO's consenting to the plain and ordinary meaning, the arguments made in PO's Response impart artificial constructs pulled from thin air that do not exist in a plain reading of the claims. As evidence, PO's expert admitted that his analysis did not take into account the entirety of the intrinsic record. EX1034, 49:18-19 ("I don't know. I haven't studied the prosecution history.").

IV. PO'S ARGUMENTS FAIL

A. Ground 1 Invalidates the '511 Patent

Ground 1 invalidates the '511 Patent, for at least the reasons below.

1. Shkolnik discloses "an irradiance mask that normalizes irradiance" (All Claims)

The parties *agree* regarding the *plain and ordinary meaning* of the claim language: "*all pixels (once 'normalized') have uniform brightness.*" EX1003, ¶50; EX2015, ¶57.

The parties also *agree* that *irradiance normalization is one step in a multi-step process* of making light-based adjustments. First, irradiance is normalized across an entire image (e.g., the image projected by a single DLP projector), and then other corrections may be made if desired (e.g., edge blending). Response, 2

(“The stack or set of filters comprises a warp correction filter...and three separate filters that all manage the intensity of the projected light in different ways to accomplish different purposes.”); EX2015, ¶51 (“[T]he ’511 Patent’s stack of digital filters work as a set—each adjustment has a cascading effect on the other properties.”); EX2016, 78:8-22 (“Typically we do one by one...[First] you adjust the light intensity to compensate for any defects of the hardware limitation. [Then] after you make the light intensity homogenous, you essentially get normalized light intensity everywhere or standard light intensity everywhere. And then you have another filter...to deal with overlapping area....”); 85:10-22.

PO attempts to confuse Shkolnik’s teaching of the well-known, basic step of irradiance normalization by discussing at great length other types of adjustments and calibrations taught by Shkolnik. While Petitioner wholly agrees that Shkolnik teaches other adjustments and calibrations, irradiance normalization is also prominently disclosed. *See, e.g.*, EX1003, ¶¶144-147; EX2015, ¶¶65-73.

PO misrepresents Shkolnik’s teachings of irradiance normalization by using wordplay, pointing to the absence of specific words or phrases in Shkolnik, such as “ideal,” “standard,” or “normalized” irradiance.² PO consistently downplays other

² The quote marks used by Petitioner regarding these words were single quotation marks, not double quotation marks, which may account for PO’s confusion regarding what

words and phrases used by Shkolnik—such as “intensity compensation”—even though *PO’s own expert admits that “intensity compensation” can be used interchangeably with “irradiance normalization,” including in his own publications and in the ’511 Patent itself*. EX1034, 66:5-9 (“It’s possible that you can find some references where my use of the term ‘compensation’ or ‘intensity compensation’ or ‘irradiance compensation’ would be the same as normalization.”); 75:15-22 (“Intensity compensation” in the field of additive manufacturing “could mean normalized irradiance”); 68:20-70:19 (admitting the ’511 Patent uses the word “compensate” to mean “normalize”³); 77:15-78:16 (agreeing that a skilled artisan understood the term “intensity compensation” in Shkolnik to mean “normalize irradiance”).

PO incorrectly states intensity compensation is an “add-on.” Response, 9. Regardless of whether or not Shkolnik’s teaching of “intensity compensation” is an “add-on” to other adjustments taught by Shkolnik, it is nonetheless still taught.

PO also argues that Shkolnik does not teach how irradiance normalization can be carried out, such that a POSITA reading Shkolnik would not arrive at the claimed

Shkolnik teaches. EX1003, ¶170.

³ EX1001, 11:49-51: the “irradiance mask filters enable control over the energy across the build area to *compensate* for non-uniformities in the projector....”

irradiance normalization. Response, 8. ***This assertion is incorrect.*** Shkolnik teaches such a process:

“To provide precise and consistent manufacturing processes...[a] calibrated imager (e.g., a camera) may be used to view an uncompensated test pattern to determine the inaccuracies for a pattern generator. The uncompensated test pattern may then be compared with the ideal (or expected) test pattern to generate a pattern correction map. This pattern correction map may include positional compensation (e.g., to adjust for linear and nonlinear distortions) and may also provide for intensity compensation.” EX1004, 5:38-49.

The camera-based irradiance normalization process taught by Shkolnik is consistent with standard practice in the field, going back decades. EX2016, 130:1-2 (“That’s exactly what we are doing in the field for 20 years.”).

In addition, PO’s own expert in the related Trade Secrets Case testified that it was well known to a POSITA how to carry out irradiance normalization before the priority date of the ’511 Patent: “Practitioners within the digital display and projection community would be well-familiar with the concept of irradiance/irradiance uniformity/irradiance characterization, and would have access to prior art patents and publications that disclose irradiance/irradiance uniformity/irradiance characterization generally as well as providing specific methods, techniques, and algorithms that would enable one to perform irradiance/irradiance uniformity/irradiance characterization.” EX1035, 32. Notably, ***PO’s expert William Allen reviewed and cited Shkolnik itself at least six times in his report.*** EX1035, 17-18, 26.

PO cannot have it both ways: asserting in the present proceedings that Shkolnik’s explicit teachings are not enough to teach or enable a person to carry out irradiance normalization, while also alleging in the Trade Secrets Case that irradiance normalization was “well-familiar” and described in “prior art patents” before the priority date of the ’511 Patent. The fact is that many prior art publications, including Shkolnik, describe the “well-familiar” process of irradiance normalization, whether as an “add-on” or otherwise.

2. Shkolnik discloses a “gamma adjustment mask that adjusts sub-image energy based on a reactivity of resin in the resin pool” (All Claims)

The parties agree that the “plain and ordinary meaning” standard applies to the claim language. PO explicitly purports to “appl[y] the plain-and-ordinary meaning” to all claim terms and “does not believe construction of any term is necessary to resolve the issues.” Response, 4-5. Additionally, PO acknowledges that the ’511 Patent describes gamma adjustment broadly: “The ’511 Patent further illustrates a number of examples of resin-specific gamma adjustment calculations of varying complexity that can be used in a gamma adjustment mask.” Response, 11. Further, the ’511 Patent itself explicitly teaches that “adjusting the curing time for a specific resin” is the same as “‘gamma’ corrections.” EX1001, 6:3-4. See also 11:61-65 (“Another example of a type of digital filter that can be used to adjust an image is gamma correction, where the composite image (or each sub-image in a composite

image) has a gamma correction filter applied that is based on the particular resin reactivity ranges in the PRPS.”).

PO alleges that any gamma adjustment taught by Shkolnik is “offstage and off of the page.” Response, 18. PO is incorrect. The “pages” of Shkolnik teach gamma adjustment in multiple places. In a shocking example, ***PO’s own expert acknowledges that Shkolnik teaches material-dependent curing adjustments:*** “Shkolnik identifies that intensity is material dependent.” EX2015, ¶86. This admitted teaching of Shkolnik matches what the ’511 Patent calls “gamma correction”: in “gamma correction, [a] composite image...has a gamma correction filter applied that is based on the particular resin reactivity ranges....” EX1001, 11:62-66.

As with irradiance normalization, PO attempts to distract from Shkolnik’s teaching of the well-known step of gamma adjustment by selectively discussing portions of Shkolnik while wholly ignoring others. For example, PO completely ignores column 9 of Shkolnik, which teaches the assignment of an “intensity value” or level to each pixel or voxel of a sub-image. EX1004, 9:47-51. Shkolnik teaches that for an 8-bit system “intensity ranges of 0 to 255 are convenient.” EX1004, 9:59-62. Moreover, Shkolnik teaches that “[t]he time and intensity to achieve a particular depth of cure is material dependent,” with the result (explicitly taught by Shkolnik) that a given intensity value that provides a particular curing depth for a specific resin

“may not be usable” for a different resin. EX1004, 10:22-26; *see also* EX1004, 18:32-37. In addition, Shkolnik teaches that when a resin (“reactive material 118”) “has a minimum intensity threshold for polymerization or partial-polymerization, the ‘off’ or zero (0) value intensity (e.g., brightness and/or ‘on’ time) may be determined based on the reactive material threshold.” EX1004, 9:51-55.

These teachings of Shkolnik belie PO’s position that Shkolnik “does not identify the nature of the dependence [of intensity on material composition] or relevant material properties” or “provides no solution to the problem” of gamma adjustment. EX2015, ¶86; Response, 13. More particularly, with respect to adjustment of sub-image energy by mapping a plurality of pixel intensity levels to an addressable range of reactivity for curing resin of the resin pool, Shkolnik teaches that when a resin “has a minimum intensity threshold for polymerization or partial-polymerization, the ‘off’ or zero (0) value intensity...may be determined based on the reactive material threshold.” EX1004, 9:51-55. Shkolnik explicitly teaches gamma adjustment can be carried out by mapping a plurality of pixel intensity levels (such as the “intensity ranges of 0 to 255” taught by Shkolnik) to an addressable range of reactivity for curing the resin of the resin pool (such as wherein “the ‘off’ or zero (0) value intensity (e.g., brightness and/or ‘on’ time) may be determined based on the reactive material threshold,” as taught by Shkolnik). EX1004, 9:47-51, 59-62.

Regarding reducing aliasing artifacts of curved or smooth surfaces, which is an inherent result of successful gamma correction, PO alleges that the antialiasing/smoothing illustrated in Figs. 1MA-1MG of Shkolnik is not due to gamma correction but instead “is a geometric correction.” Response, 15. PO’s argument fails for at least two reasons. First, the argument ignores Shkolnik’s explicit teaching of *mapping pixel intensity levels based on the reactive material threshold (gamma correction)*. Second, *given this mapping*, the argument ignores the teaching of the ’511 Patent itself that *the desired antialiasing is a direct result of the foregoing mapping (gamma correction)*. The ’511 Patent provides that the purpose of the “gamma correction filter” is to “enable[] correct smoothing (and/or antialiasing) of pixels *by mapping* the pixel intensity range (e.g., 0-255) to the minimum and maximum reactivity characteristics of the pixel.” EX1001, 12:9-12. *Thus, the teachings of the ’511 Patent itself make clear that the phrase “thereby reducing aliasing artifacts of curved or smooth surfaces of curved or smooth surfaces” is the natural and well-understood result of the mapping that Shkolnik also discloses.* EX1001, 12:9-12; EX1004, 9:51-55.

3. Shkolnik discloses “wherein the irradiance mask additionally adjusts energy across the build area to compensate for the non-uniformities in optics of the plurality image projectors” (Claim 3)

PO failed to respond to Petitioner’s position regarding this claim. Instead, the Response merely notes that claim 3 is a dependent claim and then asserts that claim 3

is “not anticipated for the same reasons that claim 1 is not anticipated.” Response, 18.

The Response also includes an entirely unsupported conclusory statement that

“Shkolnik does not disclose an irradiance mask” in accordance with claim 3. PO’s response is incorrect. *See* Petition, 39.

4. Shkolnik discloses “wherein the gamma adjustment mask comprises a logarithmic relationship between a cure depth of the resin and energy per unit area in the build area” (Claim 4)

PO failed to respond to Petitioner’s position regarding this claim. Instead, the Response merely notes that claim 4 is a dependent claim and then asserts that claim 4 “is not anticipated for the same reasons that claim 1 is not anticipated.” Response, 19. The Response also includes an entirely unsupported conclusory statement that “Shkolnik does not disclose a gamma adjustment mask” in accordance with claim 4.

As an aside, PO asserts that Petitioner misapprehends the claim language when it argues the claim language is inherently disclosed. PO’s position appears to be that the “logarithmic relationship between a cure depth of the resin and energy per unit area in the build area” is a property of the gamma adjustment mask, not of the resin. Response, 19. However, this position is not consistent with the teachings of the ’511 Patent itself. As a mask, the gamma adjustment mask of the ’511 Patent does not “have” a cure depth or an energy per unit area, much less a relationship between the two, other than as such a relationship is derived from the physics and chemistry of the underlying photocuring process. Thus, the ’511 Patent teaches that “[t]he reactivity *of the resin* can change based on the resin composition...

Furthermore, *resins* tend to have nonlinear response curves with respect to energy.”

EX1001, 12:4-8. Similarly, the logarithmic relationship shown in Fig. 15A of the ’511 Patent is explicitly described as a “resin” relationship: “a plot showing the relationship between energy per unit area (E’) and pixel intensity (L) *for an example resin.*” EX1001, 3:19-21. The same is true for Fig. 15B. PO’s position that the recited relationship is somehow not “of the resin” is simply not credible.

5. Shkolnik discloses “a system controller that synchronizes exposure control of the plurality of image projectors with each other” (Claim 8)

PO argues that Petitioner has “failed to show...Shkolnik discloses” the above limitation because “Shkolnik does not use the word ‘*synchronize*’ or its variations” and because a specific passage of Shkolnik does not use the words “*coordinated*” or “*simultaneously.*” Response, 21. Once again PO attempts to avoid the explicit teachings of Shkolnik by *ignoring the entirety of Shkolnik’s teachings*, including *equivalent words* such as “*at the same time.*” The Petition and Chen Declaration cite multiple portions of Shkolnik that teach the above limitation. Petition, 42; EX1003, ¶208. Additionally, Shkolnik elsewhere depicts pattern generators that operate simultaneously in a coordinated manner to construct a work piece, EX1004, 31:51-60, and that project patterns “at the same time” as one another during calibration. EX1004, 32:40-53 (“both pattern generators...providing their calibration patterns...*at the same time*”); 40:1-2 (“patterns from generators...may

be projected *at the same time*").

6. Shkolnik discloses “applying the irradiance mask to each sub-image such that the composite image has a uniform irradiance range across the composite image” (Claim 14)

PO has not meaningfully responded to Petitioner’s position regarding this claim. Instead, the Response merely notes that claim 14 is a dependent claim and then asserts that claim 14 is “not anticipated for the same reasons that claim 1 is not anticipated.” Response, 22. The Response also includes an entirely unsupported conclusory statement that “Shkolnik does not disclose an irradiance mask” in accordance with claim 14. PO’s response is incorrect, as described in the Petition. Petition, 43.

7. Shkolnik discloses “applying the irradiance mask to each sub-image to normalize irradiance non-uniformities within the image projector system arising from a projector-based spatial energy non-uniformity” (Claim 15)

PO has failed to respond to Petitioner’s position regarding this claim. Instead, the Response merely notes that claim 15 is a dependent claim and then asserts that claim 15 is “not anticipated for the same reasons that claim 1 is not anticipated.” Response, 22. The Response also includes an unsupported conclusory statement that “Shkolnik does not disclose an irradiance mask” in accordance with claim 15. PO’s response is incorrect, as described in the Petition. Petition, 43-44.

B. Ground 2 Invalidates the ’511 Patent

Ground 2 invalidates the ’511 Patent, for at least the reasons below.

1. Sekine discloses “adjusting properties and aligning a position of each sub-image in the array using a set of filters” (All Claims)

The parties agree that the plain and ordinary meaning applies to all claim terms. However, *PO’s argument relies on a far narrower claim construction, importing limitations from the specification to attempt to avoid Sekine’s explicit teachings*. For example, PO asserts that the claimed filters “are ‘applied (or overlaid) to a base source file (i.e., part of the instructions used to define the geometry of a part to be printed by the system), rather than changing the base source file itself.’” Response, 23-24. PO’s limitation is not in the claims. The claims recite “adjusting properties” and “aligning a position” of each sub-image using a set of filters.

PO also attempts to avoid Sekine’s teaching of filters by arguing that Sekine’s adjustments are made “mechanically.” Response, 24. PO’s position is nonsensical and contradicts how *any* filter works. *Every filter ultimately causes a “mechanical” change somewhere in the system*, and it is the mechanical change that proximally causes the desired output (e.g., adjusting irradiance), as taught by the ’511 Patent itself: the display subsystem “can control the image projection system and *each of the image projectors to adjust the properties of each sub-image and the alignment*.” EX1001, 1:47-50, 4:16-19. PO’s own expert acknowledges that, in general, “*a digital filter effectuates a desired end result*, such as an adjustment of light projection[,], by causing the additive manufacturing system to *position the mirrors* [of an image projector] in...a certain way.” EX1034, 39:1-9. More

specifically, the mirrors are each individually controlled by “flipping” or “moving [the mirrors] *physically or mechanically*” to “achieve a desired complete light projection...pattern.” EX1034, 35:8-36:5. A POSITA thus understands that images produced by a stack of filters generally result from “changing the output of the light source” as taught by Sekine. EX1005, [0080].

Finally, PO argues that “the embodiments described in Sekine are not designed to work together.” Response, 24. ***This assertion contradicts Sekine itself.*** According to Sekine, features of various embodiments can in fact be combined and/or modified. In general, Sekine teaches that “Other Embodiments” are possible and that the invention of Sekine “is not limited to the specific configurations, component forms, properties of components, actual dimensions, and the like in embodiments 1 to 6. This can also be implemented in another embodiment that replaces part or all of the configurations of embodiments 1 to 6 with equivalent members.” EX1005, [0138]-[0139]. Sekine expressly teaches combining features of different embodiments, such as “embodiment 1” and “embodiment 2”: “In embodiment 1, alignment of the projection image TG adjacent in the boundary region KR is achieved by the mechanical movement of the image forming element 23, and in embodiment 2, alignment of the projection image TG adjacent in the boundary region KR is executed by data processing of the adjacent exposure images. ***However, alignment of the projection image TG adjacent in the boundary region***

KR may also be executed by combining the mechanical movement of the image forming element 23 and data processing of the exposure images.” EX1005, [00151]. PO’s argument thus fails for this reason as well.

2. Sekine discloses “an irradiance mask that normalizes irradiance” (All Claims)

PO argues that Sekine does not teach normalizing irradiance for three reasons, each of which fails.

First, PO argues that Sekine “does not attempt to normalize the irradiance range within an area”—i.e., the “whole image.” Response, 27. This argument is a selective recitation of Sekine and *fails to take into account the entirety of Sekine*, specifically paragraph [0071], which states:

[I]n embodiment 3, measurements of the illumination distribution on the projection plane TM of the projection image TG are performed, and [1] the brightness gradation (duty ratio) of each pixel in the plane of the image forming element 23 is controlled to **make the illumination distribution uniform [i.e., normalizing irradiance]**. [2] Furthermore, to ensure that the illuminance difference between adjacent projection images TG across the boundary is eliminated, the brightness gradation (duty ratio) of each pixel in the plane of the image forming element 23 is controlled to be the same [i.e., edge blending]. EX1005 [0071].

As stated above in IV.A.1, the parties agree that *irradiance normalization is one step in a multi-step process of making light-based adjustments*: first, irradiance is normalized across an entire image, and then other corrections (e.g., edge blending) can be made if needed or desired. Paragraph [0071] describes

both of these steps, *not just one*. *PO addresses Sekine’s teaching of only step [2] above, while ignoring Sekine’s teaching of step [1]*. Paragraph [0071] of Sekine explicitly teaches that “*each pixel* in the plane of the image [i.e., the entirety of the image]” is “controlled to *make the illumination distribution uniform*” [i.e., normalize irradiance]. Nowhere does PO address the language of step [1] of paragraph [0071], despite its repeated emphasis by Petitioner: “**make the illumination distribution uniform**.” Petition, 53; EX1003, ¶229.

Indeed, PO’s own expert admits that his declaration *fails to address step [1] anywhere*, despite its *repeated emphasis by Petitioner*; he instead addresses *only* language *before* and *after* step [1]. EX1034, 89:14-92:9.⁴ Even more telling, PO’s expert, when confronted with step [1] of Sekine in his deposition, admitted that a “fair reading” of paragraph [0071] to the POSITA would include the following: “*each pixel* in the plane of the image forming element 32 *is controlled to make illumination (irradiance) distribution uniform*.” EX1034, 93:20-95:8. This *admitted teaching of Sekine* is *nearly identical* to PO’s proffered definition of “normalizing irradiance”: “*causing the image to have a uniform irradiance*

⁴ Dr. Rosen admits that the word “uniform” was a “core concept to the concept of normalizing irradiance” (*id.*, 90:9-11)—yet he further admits the following: “Q And, Dr. Rosen, just on that point, in your declaration, you haven’t addressed the sentence starting with ‘thus’ through to the phrase ‘uniform,’ correct? A That is correct.” *Id.*, 92:5-9.

range across the entire image.” Response, 5.

Second, PO argues that “Sekine’s method would not correct the irradiance non-uniformity.” Response, 27. This argument is also misplaced, because it refers to step [2] of paragraph [0071] of Sekine, not to step [1], which is *again conveniently ignored*.

Third, PO argues that “Sekine teaches away from the use of a digital filter to provide illuminance control.” Response, 31. This argument fails because it relies on *language not in the claim* and because it is *factually unsupported*.

The claim language does not include limitations on what the “irradiance mask” is or how the mask “normalizes irradiance.” It requires an “irradiance mask” that “normalizes irradiance.” Nor does it preclude “modification of the underlying source file or adjustment of the light source.”⁵ Response, 27. Indeed, as described above in IV.B.1, the ’511 Patent itself teaches that a filter works by “adjustment of the light source.” PO’s own expert agrees: “a digital filter effectuates a desired end result, such as an adjustment of light projection[,] by

⁵ Notably, though Dr. Rosen proposes various alleged deficiencies in the comparison to Sekine, he never suggests that Sekine modifies base layer data, never suggests that Sekine cannot modify base layer data, and does not suggest that the “irradiance mask” as claimed requires (or does not require) modification of base layer data. See generally EX2015, ¶¶112-136.

causing the additive manufacturing system to position the mirrors [of an image projector] in...a certain way.” EX1034, 39:1-9.

3. Sekine discloses “wherein the irradiance mask additionally adjusts energy across the build area to compensate for the non-uniformities in optics of the plurality image projectors” (Claim 3)

PO again attempts to avoid Sekine’s teachings by arguing that Sekine’s adjustments are made “mechanically” and that Sekine teaches geometric correction using actuators. Response, 32. Even if Sekine uses actuators to make geometric corrections, PO’s argument fails for multiple reasons. First, the argument ignores Sekine’s teachings of the irradiance mask, as discussed above in IV.B.2. Second, the argument contradicts how filters work, as discussed above in IV.B.1.

4. Sekine discloses “a system controller that synchronizes exposure control of the plurality of image projectors with each other” (Claim 8)

PO argues that Petitioner has “failed to show...Sekine discloses” the above limitation because “Sekine does not use the word ‘*synchronize*’ or its variants” and because a specific passage of Sekine does not use the words “*coordinated*” or “*simultaneously*.” Response, 36. PO also disputes that this limitation is met by Sekine’s teaching of four projectors that combine to form one composite projection image. *Id.* PO’s argument is absurd. Sekine teaches four projectors that together produce an overall image “divided into four.” EX1005, [0043]. These sub-images are illustrated throughout Sekine as projected together (at the same time). *See*

EX1005, Figs. 10A-B; Petition, 65-66; EX1003, ¶287.

5. Sekine discloses “applying the irradiance mask to each sub-image such that the composite image has a uniform irradiance range across the composite image” (Claim 14)

As discussed above in IV.B.2, PO fails to address both step [1] and step [2] of paragraph [0071] of Sekine, which explicitly teaches the use of “adjacent projection images” and teaches that “*each pixel* in the plane of the image [i.e., the entirety of the image]” is “controlled to *make the illumination [irradiance] distribution uniform*” [i.e., normalize irradiance]. *Nowhere* does PO address the language of step [1] of paragraph [0071], despite its emphasis by Petitioner: “**make the illumination distribution uniform**.” Petition, 53; EX1003, ¶229. This admitted teaching of Sekine is nearly identical to PO’s proffered definition of “normalizing irradiance”: “*causing the image to have a uniform irradiance range across the entire image*.” Response, 5.

6. Sekine discloses “applying the irradiance mask to each sub-image to normalize irradiance non-uniformities within the image projector system arising from a projector-based spatial energy non-uniformity” (Claim 15)

PO failed to respond to Petitioner’s position regarding this claim. Instead, the Response merely notes that claim 15 is a dependent claim and then asserts that claim 15 is “not obvious for the same reasons that claims 1 and 11 are not obvious.” Response, 38. The Response also includes an unsupported conclusory statement that “Sekine does not disclose ‘applying the irradiance mask’” in accordance with claim 15. PO’s response is incorrect, as described in the Petition. Petition, 68-69.

7. **Petitioner Has Shown that a POSITA Would Be Motivated to Combine Disparate Embodiments of Sekine**

PO's position is legally untenable and factually unsupported. PO contends "Petitioner's reliance on Sekine creates a Frankenstein's monster, combining no fewer than 5 disparate embodiments described in Sekine in an attempt to identify three of the four filters of the '511 patent." Response, 40.

To support its legal position, PO relies on nothing more than a footnote from *In re Stepan Co.*, 868 F.3d 1342, 1345-46 n.1 (Fed. Cir. 2017). The footnote is *dicta* and is not binding on the Panel. It is equally telling that PO fails to analyze any District Court or Federal Circuit case since *In re Stepan Co.*—nearly a decade ago.

Even if *In re Stepan Co.* were controlling—it is not—PO has ignored key passages from Sekine which repeatedly address the teachings and techniques in **both** references (and within **each** reference) as being teachings and techniques that a POSITA would combine to arrive at the claimed invention. The following passages from Dr. Chen's declaration are illustrative:

- "In view of the fact that the references are directed towards the same field of endeavor—and that there are **no teachings in the references that would disparage a combination of the references**—the POSITA would be motivated to use them as starting references for the purposes of heightening precision and accuracy of printing 3D products, including to take into account well-known, inherent challenges of light projection

systems and the resins used to form 3D products.” EX1003, ¶298; Petition, 69-70.

- “[B]oth references are directed towards overall similar purposes, and the **specific techniques** of the references are **complementary**.” EX1003, ¶299; Petition, 69-70.
- “The POSITA would immediately appreciate that various such **techniques** could be combined.” EX1003, ¶299; Petition, 69-70.
- “[T]he POSITA would be motivated to combine and modify Sekine and Greene in exactly this manner.” EX1003, ¶300; Petition, 69-70.
- “A POSITA thus would have had a reasonable expectation that the **techniques work together** because the **techniques** disclosed are being used in their conventional ways—with the **techniques** operating as they are expected to function (**individually and in combination**)—to achieve predictable outcomes that would be expected by those persons skilled in the art. That is, **they would have been readily combined** due to the predictability of the art and how these techniques were known to improve precision and accuracy in 3D printing.” EX1003, ¶302; Petition, 69-70.

None of these passages are discussed in PO’s Response or controverted by Dr. Rosen. EX1034, 97:12-99:6. Consistent with *In re Stepan Co.*, Dr. Chen has thus opined (1) that there would have been a “motivation to make the combination” of the techniques disclosed in the references (including all techniques across both

references) and (2) that there would have been “a reasonable expectation” that combining those techniques would have been successful.” 868 F.3d 1342, 1345-46 n.1. Notably, those techniques were not just directed towards the four filters; analysis was also made of the projector system as a whole, as described extensively in paragraphs 330, 332, and 334. Petitioner’s motivation to combine analysis adheres to the controlling authorities. *See KSR Int’l Co. v. Teleflex, Inc.*, 550 U.S. 398 (2007).

In summary, *PO’s purported ‘Frankenstein’ argument is undercut by Sekine itself*—specifically at least [0138], [0139], and [0151] of Sekine, discussed above in IV.B.1 A POSITA would readily view these teachings as allowing for the combination of embodiments in Sekine to arrive at the claimed invention.

C. Ground 3 Invalidates the ’511 Patent

PO addresses Ground 3 only by referring back to arguments made regarding Grounds 1 and 2. These arguments fail in Ground 3 for the same reasons they fail in Grounds 1 and 2.

1. The combination of Sekine and Shkolnik discloses “an irradiance mask that normalizes irradiance” (All Claims)

As discussed in Sections IV.A.1 and IV.B.2 above, Shkolnik and Sekine each teach this limitation.

2. The combination of Sekine and Shkolnik discloses a “gamma adjustment mask that adjusts sub-image energy based on a reactivity of resin in the resin pool” (All Claims)

As discussed in Section IV.A.2 above, Shkolnik teaches this limitation.

3. **The combination of Sekine and Shkolnik discloses “wherein the irradiance mask additionally adjusts energy across the build area to compensate for the non-uniformities in optics of the plurality image projectors” (Claim 3)**

As discussed in Section IV.A.3 and IV.B.3 above, Shkolnik and Sekine each teaches this limitation.

4. **The combination of Sekine and Shkolnik discloses “wherein the gamma adjustment mask comprises a logarithmic relationship between a cure depth of the resin and energy per unit area in the build area” (Claims 4)**

As discussed in Section IV.A.4 above, Shkolnik teaches this limitation.

5. **The combination of Sekine and Shkolnik discloses “a system controller that synchronizes exposure control of the plurality of image projectors with each other” (Claim 8)**

As discussed in Section IV.A.5 and IV.B.4 above, Shkolnik and Sekine each teach this limitation.

6. **The combination of Sekine and Shkolnik discloses “applying the irradiance mask to each sub-image such that the composite image has a uniform irradiance range across the composite image” (Claim 14)**

As discussed in Section IV.A.6 and IV.B.5 above, Shkolnik and Sekine each teach this limitation.

7. **The combination of Sekine and Shkolnik discloses “applying the irradiance mask to each sub-image to normalize irradiance non-uniformities within the image projector system arising from a projector-based spatial energy non-uniformity” (Claim 15)**

As discussed in Section IV.A.7 and IV.B.6 above, Shkolnik and Sekine each teach this limitation.

8. Petitioner Has Shown that a POSITA Would Be Motivated to Combine Shkolnik With a Specific Embodiment of Sekine

PO's argument here is substantively similar to that in Ground 2 and is similarly flawed.

D. Ground 4 Invalidates the '511 Patent

PO addresses Ground 4 only by referring back to arguments made regarding Ground 2 and alleging that Petitioner did not adequately explain why a POSITA would combine the references. These arguments fail in Ground 4 for the same reasons they fail in Ground 2. *See* Petition, 81-82, EX1003, ¶¶391-398.

E. Ground 5 Invalidates the '511 Patent

PO addresses Ground 5 only by referring back to arguments made regarding Ground 2 and alleging that Petitioner did not adequately explain why a POSITA would combine the references. These arguments fail in Ground 5 for the same reasons they fail in Ground 2, including ignoring the detailed discussion in Dr. Chen's declaration why a POSITA would properly form this combination. *See* Petition, 84-85, EX1003, ¶¶405-414.

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Pursuant to 37 C.F.R. § 42.24(d), Petitioner hereby certifies, in reliance on the word count of the word-processing system used to prepare this Paper, that the number of words in this Paper is in compliance. The word count excludes the table of contents, table of authorities, mandatory notices, signature blocks, certificate of service, certificate of word count, appendixes and any claim listings.

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CERTIFICATE OF SERVICE

I hereby certify that the foregoing PETITIONER'S REPLY was served on June 15, 2026 by filing this document through the Patent Trial and Appeal Case Tracking System (P-TACTS) and via electronic mail upon counsel of record for the Patent Owner as follows:

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