

**UNITED STATES PATENT AND TRADEMARK OFFICE**

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**BEFORE THE PATENT TRIAL AND APPEAL BOARD**

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SAMSUNG DISPLAY CO., LTD.  
Petitioner,

v.

PICTIVA DISPLAYS INTERNATIONAL LTD.,  
Patent Owner.

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Case No. IPR2024-01222  
Patent No. 6,949,389

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**PATENT OWNER'S RESPONSE**

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

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**EXHIBIT LIST**

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| EX2001      | Declaration of Mr. Kurt Humphrey in Support of POPR                                                                                                                                                                                                                                                                      |
| EX2002      | Declaration of Dr. E. Fred Schubert on behalf of Samsung Electronics Co., Ltd. et al. in <i>Pictiva Displays Int'l Ltd. v. Samsung Electronics Co. Ltd.</i> , et al., Case No. 2:23-cv-000495 (Nov. 12, 2024)                                                                                                            |
| EX2003      | Samsung's Notice of Corrected Exhibit B to Joint P.R. 4-3 Statement in <i>Pictiva Displays Int'l Ltd. v. Samsung Electronics Co. Ltd.</i> , et al., Case No. 2:23-cv-000495, Dkt. 110 & 110-1 (E.D. Tex. Nov. 13, 2024)                                                                                                  |
| EX2004      | Samsung's Proposed Claim Constructions for the Terms and Phrases Identified for Construction per Local Rule 4-2 in <i>Pictiva Displays Int'l Ltd. v. Samsung Electronics Co. Ltd.</i> , et al., Case No. 2:23-cv-000495 (E.D. Tex. Oct. 22, 2024)                                                                        |
| EX2005      | omitted                                                                                                                                                                                                                                                                                                                  |
| EX2006      | 389 Invention Disclosures                                                                                                                                                                                                                                                                                                |
| EX2007      | U.S. Patent Application No. 2003/0054579A1 to Pakbaz et al.                                                                                                                                                                                                                                                              |
| EX2008      | U.S. Patent Application No. 2003/0052616A1 to Antoniadis et al.                                                                                                                                                                                                                                                          |
| EX2009      | U.S. Patent Application No. 2004/009304A1 to Pichler et al.                                                                                                                                                                                                                                                              |
| EX2010      | U.S. Pat. No. 7,121,642 to Stoessel et al.                                                                                                                                                                                                                                                                               |
| EX2011      | U.S. Pat. No. 6,702,419 to Stoessel et al.                                                                                                                                                                                                                                                                               |
| EX2012      | Seog Soon Kim et al., <i>Ultra-high Precision Inkjet Printing Technology for Display</i> , 64-1 SID 2018 Digest, 839-842 (2018), available from <a href="https://sid.onlinelibrary.wiley.com/doi/abs/10.1002/sdtp.12244">https://sid.onlinelibrary.wiley.com/doi/abs/10.1002/sdtp.12244</a> (last visited Dec. 10, 2024) |
| EX2013      | Lorentz Force downloaded from <a href="https://en.wikipedia.org/wiki/Lorentz_force">https://en.wikipedia.org/wiki/Lorentz_force</a> (last visited Dec. 10, 2024)                                                                                                                                                         |
| EX2014      | Docket Control Order in <i>Pictiva Displays Int'l Ltd. v. Samsung Electronics Co. Ltd.</i> , et al., Case No. 2:23-cv-000495, Dkt. 40 (E.D. Tex. Apr. 17, 2024)                                                                                                                                                          |
| EX2015      | Federal Court Management Statistics for U.S. District Courts, available from <a href="https://www.uscourts.gov/statistics/table/na/federal-court-management-statistics/2024/06/30-1">https://www.uscourts.gov/statistics/table/na/federal-court-management-statistics/2024/06/30-1</a>                                   |

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| EX2016      | Samsung Invalidity Contentions in <i>Pictiva Displays Int'l Ltd. v. Samsung Electronics Co. Ltd., et al.</i> , Case No. 2:23-cv-000495 (E.D. Tex. Jun. 11, 2024)                                                                                                                                                                                 |
| EX2017      | Stephen J. Matthews, <i>Back to Basics: Organic LEDs</i> , Laser Focus World (Jul. 31, 2001), downloaded from <a href="https://www.laserfocusworld.com/lasers-sources/article/16556776/back-to-basics-organic-leds">https://www.laserfocusworld.com/lasers-sources/article/16556776/back-to-basics-organic-leds</a> (last visited Dec. 10, 2024) |
| EX2018      | <i>Sotera</i> Stipulation                                                                                                                                                                                                                                                                                                                        |
| EX2019      | Markman Hearing Transcript in companion district court case, <i>Pictiva Displays Int'l Ltd. v. Samsung Electronics Co. Ltd., et al.</i> , Case No. 2:23-cv-000495 (E.D. Tex. Feb. 4, 2024)                                                                                                                                                       |
| EX2020      | 2025-05-30 Deposition Transcript of Dr. Vivek Subramanian                                                                                                                                                                                                                                                                                        |
| EX2021      | 2025-05-31 Deposition Transcript of Dr. Vivek Subramanian                                                                                                                                                                                                                                                                                        |
| EX2022      | U.S. Patent No. 6,590,157 to Boroson et al.                                                                                                                                                                                                                                                                                                      |
| EX2023      | Steven Molesa et al., “High-quality inkjet-printed multilevel interconnects and inductive components on plastic for ultra-low-cost RFID applications,” <i>Mat. Res. Soc. Symp. Proc.</i> Vol. 769, H.8.3.1-H8.3.6 (2003)                                                                                                                         |
| EX2024      | Jin-Seong Park et al., “Thin film encapsulation for flexible AM-OLED: a review,” <i>Semicond. Sci. Technol.</i> 26, 034001 (2011)                                                                                                                                                                                                                |
| EX2025      | Daniel Huang et al., “Plastic-Compatible Low Resistance Printable Gold Nanoparticle Conductors for Flexible Electronics,” <i>Journal of The Electrochemical Society</i> , 150 (7), G412-G417 (2003)                                                                                                                                              |
| EX2026      | Wenbo Zhou et al., “Experimental Study on Viscosity of Colloidal Silica in Aqueous Electrolytic Solutions,” <i>Journal of Dispersion Science and Technology</i> , 29:842-847 (2008)                                                                                                                                                              |
| EX2027      | Junhui He et al., “Preparation of Porous and Nonporous Silica Nanofilms from Aqueous Sodium Silicate,” <i>Chem. Mater.</i> , 2003, 15, 3308-3313 (2003)                                                                                                                                                                                          |

| Exhibit No. | Document Description                                                                                                                                                                                                                                                                                                                                                                                |
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| EX2028      | Kyoung-Min Kim et al., “Surface treatment of silica nanoparticles for stable and charge-controlled colloidal silica,” International Journal of Nanomedicine 2014:9 (Suppl 2) 29–40 (2014)                                                                                                                                                                                                           |
| EX2029      | reserved for IPR2024-01222, 389 Invention Disclosures for IPR2024-01223                                                                                                                                                                                                                                                                                                                             |
| EX2030      | Lorenza Moro et al, “Large-Scale Manufacturing of Polymer Planarization Layer,” informationdisplay.org, 10-15 (March/April 2021), available from <a href="https://sid.onlinelibrary.wiley.com/doi/epdf/10.1002/msid.1194">https://sid.onlinelibrary.wiley.com/doi/epdf/10.1002/msid.1194</a> (last visited Jun. 20, 2025)                                                                           |
| EX2031      | [Under Seal], Deposition Transcript of Dr. Homer Antoniadis in <i>Pictiva Displays Int’l Ltd. v. Samsung Electronics Co. Ltd., et al.</i> , Case No. 2:23-cv-000495 (E.D. Tex. Jun. 4, 2025)                                                                                                                                                                                                        |
| EX2032      | Deposition Exhibit 5 to Dr. Antoniadis’s deposition, Final Technical Progress Report Polymer OLED White Light Development Program – (#DE-FC26-04NT41947)                                                                                                                                                                                                                                            |
| EX2033      | reserved                                                                                                                                                                                                                                                                                                                                                                                            |
| EX2034      | Jeff Hebb of Kateeva, “Advanced Inkjet Printing: Enabling the OLED Revolution” (Sept. 28, 2017), available from <a href="https://nccavs-usergroups.avs.org/wp-content/uploads/TFUG2017/TFUG917-3-Hebb.pdf">https://nccavs-usergroups.avs.org/wp-content/uploads/TFUG2017/TFUG917-3-Hebb.pdf</a> (last visited June 15, 2025)                                                                        |
| EX2035      | Roll to Roll (R2R) Processing Technology Assessment, Pre-decision draft, available from Available from <a href="https://www.energy.gov/sites/prod/files/2015/02/f19/QTR%20Ch8%20-%20Roll%20To%20Roll%20Processing%20TA%20Feb-13-2015.pdf">https://www.energy.gov/sites/prod/files/2015/02/f19/QTR%20Ch8%20-%20Roll%20To%20Roll%20Processing%20TA%20Feb-13-2015.pdf</a> (last visited June 15, 2025) |
| EX2036      | Chandra Kant et al., “Large area inkjet-printed OLED fabrication with solution-processed TADF ink,” nature communications (2023)                                                                                                                                                                                                                                                                    |
| EX2037      | P.E. Burrows et al., “Gas Permeation and Lifetime Tests on Polymer-Based Barrier Coatings,” Proceedings of SPIE Vol. 4105, 75-83 (2001)                                                                                                                                                                                                                                                             |
| EX2038      | Screenshot of <a href="https://global.samsungdisplay.com/31159">https://global.samsungdisplay.com/31159</a> , “[Learn Display] 100. Inkjet Printing” by Samsung Display                                                                                                                                                                                                                             |
| EX2039      | [Under Seal] Pictiva 80x48 display product specification                                                                                                                                                                                                                                                                                                                                            |

| Exhibit No. | Document Description                                                                                                                                                                                                                                                                                                                                                                            |
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| EX2040      | U.S. Patent No. 6,605,483 to Add-Vision, Inc.                                                                                                                                                                                                                                                                                                                                                   |
| EX2041      | U.S. Patent No. 7,115,216 to Add-Vision, Inc.                                                                                                                                                                                                                                                                                                                                                   |
| EX2042      | U.S. Patent Application Publication No. 2008/000889 to 3M                                                                                                                                                                                                                                                                                                                                       |
| EX2043      | Patrick Stark et al., “OLED – Evaluation and clarification of the new Organic Light Emitting Display technology,” Department of Science and Technology, Linkopng University, Sweden (Mar. 11, 2002), available from <a href="https://www.diva-portal.org/smash/record.jsf?pid=diva2%3A18218&amp;dswid=4057">https://www.diva-portal.org/smash/record.jsf?pid=diva2%3A18218&amp;dswid=4057</a> . |
| EX2044      | U.S. Patent No. 6,337,222 to Shimoda                                                                                                                                                                                                                                                                                                                                                            |
| EX2045      | Screenshot of <a href="https://kateeva.com/solutions/technology/why-inkjet/">https://kateeva.com/solutions/technology/why-inkjet/</a> (last visited June 20, 205)                                                                                                                                                                                                                               |
| EX2046      | Declaration of Mr. Kurt Humphrey in Support of POR                                                                                                                                                                                                                                                                                                                                              |
| EX2047      | Declaration of Mr. Kurt Humphrey in Support of IPR2024-01223 POR                                                                                                                                                                                                                                                                                                                                |
| EX2100      | Conor Madigan, “Inkjet Technology for OLED SSL Mass Production,” (Jan. 28, 2015), available from <a href="https://energy.gov/sites/prod/files/2015/02/f19/brown-madigan_inkjet_sanfrancisco2015.pdf">https://energy.gov/sites/prod/files/2015/02/f19/brown-madigan_inkjet_sanfrancisco2015.pdf</a> .                                                                                            |

## **I. Introduction**

Claims 34-37, 40-41 and 46 were conceived before the filing dates of Yamazaki, Weaver, Ghosh, Palanisamy and Burrows and reduced to practice with reasonably continuous diligence. *See* Section III.

The challenged claims are directed to “encapsulating a plurality of devices fabricated on a substrate.” EX1001, 34[pre], 41[pre]. Yamazaki, the primary reference for Ground I-II, however, describes only fabricating a single device on a single substrate. Pet. 17-26 (relying on AAPA and Ghosh for multiple devices on a substrate). Hence, to the extent that the Board even considers Grounds I-II, which improperly relies on AAPA as a basis for the challenge, none of the references disclose “selectively depositing at least one barrier layer over said planarization layer” that is deposited “upon said devices” (plural). *See* EX1001, 34[b]-[c], 41[e], 41[c]. This is because Yamazaki does not disclose multiple devices on a substrate and AAPA and Ghosh both disclose non-selective deposition of the barrier layer. *See* Section VI.B.

Grounds I-II also fail because Petitioner has not demonstrated that Yamazaki discloses or suggests a “planarization layer” under the parties’ agreed-to construction. *See* Section VI.A. This agreed-to construction is based mostly on Samsung’s own proposed construction and is consistent with the intrinsic record. *See* Section V.A. Because Petitioner is the master of the petition and is required to

show how the claims are invalid as construed, the Board should evaluate the patentability under this agreed-to construction.

Additionally, a POSITA would not have started with Yamazaki's methods and then extended them to fabricating and encapsulating multiple devices on a substrate, and certainly not for reduced cost, increased throughput or increased yield in manufacturing. *See* Section VI.C. This is because Yamazaki relies on experimental methods for both fabricating the EL and for encapsulating the resulting devices. *See* Yamazaki, abstract. There were significant challenges for both and those challenges also differed. Consequently, a POSITA with just one year of experience in displays would not have chosen Yamazaki for manufacturing or would have had a reasonable expectation of success. Section VI.C. Indeed, there is not even any evidence that Yamazaki's methods could afford an organic encapsulation layer with sufficient thickness for defect decoupling but still retain the required planarity to be a "planarization layer."

Ground II also fails because in Yamazaki, masks, if used, would be "between" the substrate and the chamber, *i.e.*, not touching the substrate. Yamazaki, [0086]. If the mask is not even designed to contact the substrate, there would be no reason to use Fujimori's mask to allegedly increase adhesion to the substrate. *See* Section VII.A. Additionally, the magnetic field associated with Fujimori's magnetic mask would indisputably alter the trajectory of the charged

particles in Yamazaki's electric-field-application method, and a small decrease in accuracy multiplied over thousands of pockets would rapidly destroy yields: for example,  $(99.99\%)^{1000}$  gives a yield of 90.5%, but  $(99.9\%)^{1000}$  gives a yield of merely 36.8%. *See* Section VII.A.

Ground III-V based on Weaver also fail because Petitioner has not shown that Weaver's organic layers 151a-c are the claimed "planarization layer" under the parties' agreed-to construction or are "selectively deposit[ed]." *See* Sections VIII.A-VIII.B. Petitioner has also not provided any cogent reasons for substituting Weaver's expressly stated methods of applying the organic layer with inkjet printing given the number of options available and the known challenges for inkjet printing to form an organic film with sufficient thickness and planarity over the large encapsulation area at the time of the invention. *See* Section VIII.C. Likewise, Petitioner has not shown that a POSITA would have used screen-printing or a shadow mask to deposit organic layers in Weaver's roll-to-roll process. *See* Sections VIII.D-VIII.E.

For these and reasons stated below, the Board should uphold the patentability of the challenged claims.

## **II. The '389 Inventions**

The challenged claims of the '389 patent all relate to encapsulating multiple devices fabricated on a substrate. *E.g.* claims 34, 41. At the time of the

inventions, thin film encapsulation methods were being explored as “a cheaper and better manner of encapsulation.” EX1001, 1:17-19. One way to achieve thin film encapsulation is using PML or polymer multi-layer comprising “alternating and repeating layers of an organic ... and a barrier layer.” *Id.*, 1:19-22. The organic layer, such as layer 106, typically serves as a “planarization layer” that “is provided to give a planar surface for the deposition of the PML structure 112a” as depicted below. *Id.*, 1:30-36, Fig. 1. The PML structure 112a includes a barrier layer 108 and another organic planarization layer 110. *Id.*, 1:37-47. The PML structure 112 may be repeated with the barrier layer deposited on a planarization layer of a lower PML structure. *Id.*

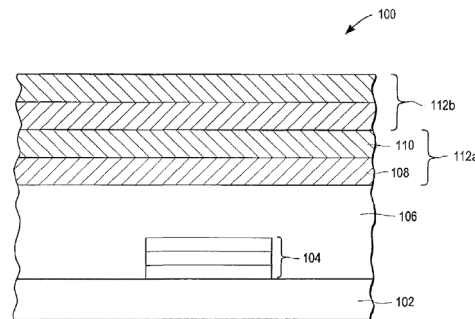


FIG. 1 (PRIOR ART)

Direct thin-film encapsulation results in “thinner and/or lighter and/or mechanically more flexible” encapsulation with “cost reduction and improved reliability.” *Id.*, 1:48-52. The use of the planarization layer also addresses the drawbacks associated with “point defects (i.e., pin holes) in [the barrier layer’s] surface.” *Id.*, 1:56-62.

One significant drawback of the traditional direct thin film encapsulation method was that the PML structure was deposited on areas—such as “electrical contact pads,” “scribe and break lines and/or the glue lines”—that do not require and should thus not have encapsulation. EX1001, 2:17-29.

The challenged claims address this drawback by providing for selective deposition of the PML layers. *E.g.*, EX1001, Fig. 5 (using a mask to selectively deposit organic layers and barrier layers), Figs. 6A-6E (using masks deposited on the substrate to control the areas of deposition for organic layers, followed by selective deposition of barrier layers); Figs. 7A-7C (using gas to direct organic materials away from undesired areas).

### **III. The Inventors Conceived Certain Claims First and Exercised Reasonably Continuous Diligence to Reduce Them to Practice**

#### **A. Conception**

The inventors conceived the challenged claims 34-37, 40-41 and 46 by February 8, 2001, before Yamazaki, Weaver, Ghosh, Palanisamy and Burrows were filed. EX2006-389-ID at 1; Pet. 3-4; EX2046-Humphrey, ¶¶149-158. The discussions in the email exchanges related to “producing an array of small displays on a large plate of glass,” *i.e.*, to fabricating a plurality of devices on a substrate, and then encapsulating those devices with at least one organic layer and a barrier layer over the organic layer. *Id.*; EX2046-Humphrey, ¶¶149-150. The

encapsulation involves the “PML” and related “LML” (liquid PML, *see* U.S.2008/0008893, [0009]) processes, as referenced in the email chain. *Id.*; EX2046-Humphrey, ¶150.

The ‘389 patent describes “PML” as understood by the inventors. EX2046-Humphrey, ¶¶150-153; EX1001, 1:19-47. According to the inventors, “PML” is the abbreviation for “polymer multi-layer,” which “compris[es] alternating and repeating layers of an organic (usually acrylate or the like) and a barrier layer.” EX1001, 1:19-22. The inventors understood the PML structures as “[t]ypically” including “a planarization layer” that “is provided to give a planar surface” for deposition of an upper layer, such as another PML structure or a “barrier layer.” *Id.*, 1:31-37, 1:41-44. The inventors viewed the “primar[ely] the reason that a planar organic layer is typically used as a substrate upon which the barrier layer is deposited” is to address “any point defects (i.e. pin holes)” that might appear in the barrier layer’s surface without the planar organic layer. *Id.*, 1:56-62. The inventors regarded barrier layer(s) as “provid[ing] the necessary environmental isolation from the corrosive effects of oxygen and moisture.” *Id.*, 1:39-41.

In the email, Inventor Pichler referenced “PML” and “LML” and discussed a non-selective deposition technique involving “spinning ... a ...cross-linkable solution ... with subsequent cross-linking and barrier layer sputtering ....” EX2006, p.1. Inventor Frischknecht responded with proposals for selectively

depositing an “acrylate layer” while “keeping the electrical pins free of the coating” and “masking the areas for the scribe lines[.]” *Id.* Those selective deposition techniques included “vapor deposition through a shadow mask,” ink-jetting, screen printing and/or spin-coating via a mask. *Id.* Given this context, a POSITA would understand that the inventors were discussing selectively depositing an organic planarization layer of the PML, even though the term “planarization layer” does not appear. EX2046-Humphrey, ¶154; *see also* EX2031-Antoniadis, 206:9-208:3 (discussing the email, “Q: But in the context here it’s specifically talking about the PML structures, correct? A: Mmm. Yep. Yeah. The polymer multilayer, yeah.”). Inventor Pichler in turn suggested selectively depositing the barrier layer over the planarization layer by sputtering the barrier layer through a mask to selected areas over the OLED devices to leave contact pads and scribe lines free of the barrier layer. EX2006, p.1.

Dr. Antoniadis, who was retained by Samsung and who witnessed the invention disclosure, confirmed these understanding. EX2031-Antoniadis, 215:3-6 (“The way I understand it, by reading this, is that they’re focusing primarily on how to keep the metal lines free of the inorganic and the organics.”); 206:9-212:6 (confirming that the inventors were describing “methods to reduce the processing steps for a thin film encapsulation” by “freeing up the metal lines” and describing the inventors as “experts in thin film encapsulation”).

The chart below provides an element-by-element mapping of the ideas conceived by February 8, 2001 against the claim elements. EX2046-Humphrey, ¶¶154-158.

| Element         | Evidence                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 34[pre] & 34[a] | “[I]t very well may be that vapor deposition through a shadow mask is the easiest <i>method for producing an array of small displays on a large plate of glass.</i> ”                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 34[b]           | <ul style="list-style-type: none"> <li>• “I anticipate that vapor deposition through a shadow mask will keep the pins free of the coating; therefore I have been quite partial to the vapor deposition method. Also ... I anticipate that masking the area for the scribe lines will be a good practice.”</li> <li>• “[I]t very well may be that <i>vapor deposition through a shadow mask</i> is the easiest method for producing an array of small displays on a large plate of glass.”</li> <li>• “we could consider printing techniques (Screen/Inkjet).”</li> <li>• “Any thoughts on masking for spin coating”?</li> </ul> |
| 34[c]           | “Spin-, roll- or whatever-coat, cross-link/cure and then <i>sputter the dielectric barrier through a mask over the OLED area only</i> , i.e. leave the contact pads, scribe lines, etc. free from the barrier and then stick the whole thing in, for example, a plasma asher and ash-off the organic where there is no dielectric barrier film.”                                                                                                                                                                                                                                                                                |
| 35 & 36         | “we could consider printing techniques (Screen/Inkjet).”                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 37              | See citations in the first two bullet points for 34[b].                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 40              | See citation for 34[c].                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 41[pre] & 41[a] | Same as for 34[pre] and 34[a].                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

| Element | Evidence                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 41[b]   | <p>See citations in the first two bullet points for 34[b].</p> <p>(A POSITA would understand that shadow masks would be placed on top of the substrate, with the opening placed on top of the devices so that the materials to be deposited would encapsulate the devices. Humphrey, p.81)</p>                                                                                                                                                       |
| 41[c]   | <p>Same as for 41[b].</p> <p>(A POSITA would understand that vapor deposition through a shadow mask would generally deposit materials on both the mask and through the opening onto the plurality of devices to be encapsulated. Humphrey, p.82; EX2031-Antoniadis, 136:5-10 (flash evaporation “goes all over”)).</p>                                                                                                                               |
| 41[d]   | <p>Same as for 41[b]; and additionally, “... whatever-coat, cross-link/cure and <i>then sputter the dielectric barrier through a mask over the OLED area only</i>, i.e. leave the contact pads, scribe lines, etc. free from the barrier ....”</p> <p>(A POSITA would understand that the vapor deposition mask used for the organic layer deposition is removed in order to use the mask for sputtering the barrier layer. Humphrey, pp.82-83.)</p> |
| 41[e]   | Same as for 34[c].                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 46      | <p>Same as for 34[c].</p> <p>(A POSITA would understand that vapor deposition through a shadow mask could deposit materials over the entire mask depending on the directionality of the vapor plumes. EX2031-Antoniadis, 136:5-10 (flash evaporation “goes all over”); EX2046-Humphrey, ¶156)</p>                                                                                                                                                    |

## B. Diligence

Inventor Pichler continued to work on improving the discussed processes,

including sketching out additional thoughts on August 14 and 15, 2001. EX2006, 40-41. The invention disclosure dated 9/30/2001 included detailed description, drawings and proposed claims. *Id.* at 42-51. Dr. Antoniadis confirmed that he witnessed the invention disclosures (pp. 42-51) on October 1, 2001. EX2031-Antoniadis, 195:16-19, 182:7-24, *see also generally* 183:9-195:19.

Inventor Pichler sketched additional ideas on October 1, and drafted claims covering the idea on October 14, 2001. *Id.* at 8, 10-11. There were also illustrations dated April 15, 2002 that became Figures 7A-7C of the '389 patent "for Stu," *i.e.*, Attorney Stuart P. Kaler who filed the '389 application. *Id.*, 12-13; *compare* '389, Figs. 7A-7C; EX2046-Humphrey, ¶¶166-168.

Dr. Antoniadis confirmed that in the relevant period, the time it took "from invention disclosure to application" could "range from 2 to 3 months to 6 to 12 months" for the inventions that had been approved for filing. EX2031-Antoniadis, 24:13-25:8. Dr. Antoniadis stated that most of the times, one of the two resident patent attorneys would meet with the inventors before drafting the application and the inventors would then give feedback on the draft to ensure accuracy. *Id.*, 27:2-28:5.

Dr. Antoniadis testified that in the relevant times, Dr. Frischknecht was working on encapsulation, including the glass-glass encapsulation for commercial products and thin-film-encapsulation for research and development; and Dr.

Pichler, “a senior experienced individual,” worked on various OLED projects, including evaluating encapsulation techniques and looking into who’s who in the inkjet printing area. EX2031-Antoniadis, 217:25-223:25, 20:22-22:6, 32:15-33:7, 34:11-35:7.

Dr. Antoniadis testified that the inventions originated from OSRAM’s research projects, but his team—including the inventors—were also supporting OSRAM’s commercialization effort. *Id.*, 217:25-219:25, 220:1-21 (“The most important project for all of us was to help the manufacturing to introduce the products in the market. ... So very frequently, many of us will stop everything we were doing and we would focus on this.”); 112:1-22 (OSRAM introduced its first OLED display in May 2003). Time devoted by the inventors on commercial activities within the confines of their occupation demonstrated excusable delays. *Perfect Surgical Techniques, Inc. v. Olympus America, Inc.*, 841 F.3d 1004, 1007-1008, 1012 (Fed. Cir. 2016) (surgeries unrelated to the inventions and performed by the inventor could corroborate that “within the confines of [the inventor’s and the prosecution attorney’s] occupations,” the inventor diligently pursued the application); EX2046-Humphrey, ¶179 (commercialization effort could limit the inventors’ time to work on the inventions, but patent filings indicated reasonably continuous diligence).

The commercialization activity was also relevant because it also included

making commercially viable OLED devices, without which there would be nothing to encapsulate. EX2031-Antoniadis, 222:12-19; *Scott v. Koyama*, 281 F.3d 1243, 1248-49, (Fed. Cir. 2002) (activities for building a plant to practice the claimed process of producing tetrafluoroethane on a large scale constituted efforts toward actual reduction to practice, and were thus evidence of diligence).

Patent activities between 2001-2003 further demonstrated reasonably continuous diligence exercised by the inventors, as they worked on developing claim elements necessary to practice the inventions. *See ATI Technols. ULC v. Iancu*, 920 F.3d 1362, 1370-75 (Fed. Cir. 2019) (work done on the R400 in general sufficient to establish diligence, noting “[d]iligence is not negated if the inventor works on improvements and evaluates alternatives while developing an invention” and can be shown by “work required to develop a first invention in order to develop or reduce to practice a second invention”).

For example, Inventor Pichler was named in a pair of applications filed on September 19, 2001, both involving using selective deposition techniques such as ink-jetting to deposit organic layers of OLED devices. *E.g.*, EX2007-US2003/0054579, [0002] (uniform deposition of polymer layers over the whole substrate could cause “the resultant OLED display unreliable”), [0003] (“desirable to deposit the polymer layers precisely on the display initially”), [0004] (disclosing “a novel method for fabricating an OLED display wherein one or more conducting

polymer layers is/are selectively deposited over the surface of the display”); EX2008-US2003/0052616, [0012] (“The active layers ... could be deposited selectively via ink jet printing ..., screen printing, off-set printing, electrostatic printing, gravure printing, flexographic printing, laser-induced thermal transfer, shadow stencil masking ... or other”); [0013]-[0014] (organic layer 108 may be deposited “up to several microns thick” so that “large particle impurities ... that find their way on the surface of the active panel during manufacture can be nicely coated and covered under the thick polymer layer” and avoid “a pinhole defect, which otherwise would have shorted anode and cathode”).

These efforts were directed towards fabricating OLED devices to be encapsulated, as related to *e.g.*, 34[a] of the ‘389 patent (a requisite part of the invention for subsequent encapsulation steps) as well as the commercial effort to make devices. *E.g.*, EX2007-US2003/0054579, pending claims (directed to methods for “fabricating an organic light emitting display”); EX2008-US2003/0052616, pending claims (directed to “[a]n OLED light source”); EX2046-Humphrey, ¶¶175-176. This is in addition to efforts in fabricating actual OLED devices, including in developing the right tools. EX2031-Antoniadis, 221:18-222:19, 217:25-218:16.

As Dr. Antoniadis testified and consistent with EX2006, without acceleration, it could take 6-12 months between receiving an invention disclosure

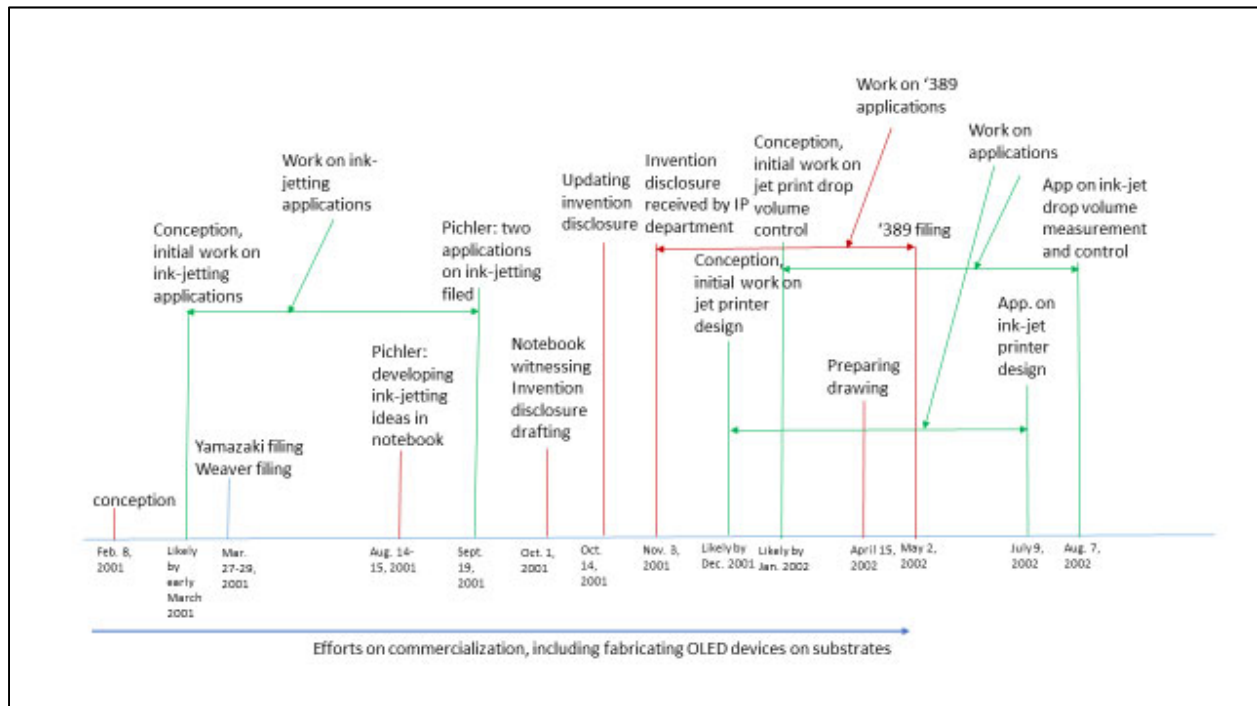
and filing an application. *See* EX2031-Antoniadis, 24:13-25:8; EX2006-389-ID, 42 (invention disclosure received on Nov. 3, 2001); EX1001, field 22 (May 2, 2002 filing date); EX2046-Humphrey, ¶180 (similar timeline to Mr. Humphrey’s experience). Thus, the September 19, 2001 filing of the applications suggests that the invention disclosures for these applications would likely have been received by mid-March, 2001, before the filing dates of Yamazaki and Weaver. This would indicate that Dr. Pichler was working on ideas related to “fabricating a plurality of devices on a substrate” in the relevant period.

An application filed on July 9, 2002 by Pichler and co-inventor described an improved design for a print head of an ink-jet printer and ink-jetting method. EX2009-US2004/0009304, abstract. This was followed by an application filed on August 7, 2002 that describes novel ways to measure inkjet drop volume and thereby control ink-jet printing. EX2010-US7121642, abstract. These work on improving ink-jet printing constituted qualifying work because ink-jetting was one of the proposed ways to selectively deposit an organic planarization layer as claimed. *E.g.*, EX2006 at 1 (discussing using ink-jetting to deposit organic layers); EX2046-Humphrey, ¶177. The July and August filing of these inventions suggests that the inventions were likely disclosed by early 2002, demonstrating reasonably continuous work by Inventor Pichler on selective deposition techniques. *Id.*

Other OSRAM engineers were also working in the critical time period on

improving the selective deposition. For example, OSRAM filed an application on May 3, 2002 on improved targeted delivery of inkjet droplets. *E.g.*, EX2011-US6702419 (teaching using two cameras to help determine an angular displacement of the nozzle for targeted inkjet droplet delivery); EX2046-Humphrey, ¶178. The first named inventor of that application, Mr. Stoessel, is a co-inventor of EX2009-US2004/0009304 mentioned above. Thus work reflected in the '419 patent constituted efforts toward actual reduction to practice and thus was evidence of diligence. *Id.*; *see also Scott*, 281 F.3d at 1248-49.

A timeline for these relevant activities are shown below. EX2046-Humphrey, ¶181.



These activities in the critical period provide substantial objective evidence of

continuous improvement on creating an OLED that could embody the inventions during the critical period. Thus, the asserted references do not qualify as prior art for at least claims 34-37, 40-41 and 46.

#### IV. Improper Grounds or References Under 35 U.S.C. § 311(b)

##### A. AAPA is not a Proper Basis for IPR

The AIA limits the basis for an IPR to “prior art consisting of patents or printed publications.” 35 U.S.C. §311(b). In *Qualcomm Incorporated v. Apple Inc.*, 134 F.4<sup>th</sup> 1355 (Fed. Cir. 2025), the Federal Circuit held that AAPA may not be part of the basis for IPR. Here, Grounds I-II expressly states that they are “based on” “AAPA,” and relies on it for a missing limitation. *See* Pet. 3 (reproduced below), 20-21, 22, Headings VIII.A-B.

Petitioner requests IPR based on the following grounds:

- **Ground I:** Claims 34, 35, 37, and 40 are obvious over Yamazaki in view of the applicant admitted prior art (“AAPA”) and/or Ghosh;
- **Ground II:** Claims 41-46 are obvious over Yamazaki in view of AAPA/Ghosh and Fujimori;

The Board should thus hold Petitioner to “its express inclusion of AAPA in the basis of a ground” and not consider Grounds I-II under § 311(b). *Qualcomm*, 134 F.4th at 1367-68.

**B. Yamazaki, Weaver, and Palanisamy Are Not Printed Publications under 35 U.S.C. § 311(b)**

Yamazaki, Weaver and Palanisamy are all patent applications published after the filing date of the '389 patent. *See* EX1001, field 22 (389 filing date was May 2, 2002), EX1005, field 43 (Yamazaki published on Nov. 6, 2003), EX1008 field 43 (Weaver published on Oct. 3, 2002); EX1007, field 43 (Palanisamy on Jan. 16, 2003). Even though the Federal Circuit has held that such references are “printed publications” under 311(b), to preserve arguments on appeal, Patent Owner submits that such an interpretation is inconsistent with the plain statutory language, the precedent, and non-public accessibility of an unpublished patent application. *E.g., In re Nuvasive, Inc.*, 842 F.3d 1376 (Fed. Cir. 2016) (“Section 102 provides that prior art includes ‘printed publication[s]’ describing the invention either ‘before the invention thereof’ or ‘more than one year prior to the date of the [patent] application....’ 35 U.S.C. § 102(a), (b).”); *In re Lister*, 583 F.3d 1307, 1311 (Fed. Cir. 2009) (“In order to qualify as a printed publication ..., a reference ‘must have been sufficiently accessible to the public interested in the art.’”); 35 U.S.C. § 122(a) (a patent application “shall be kept in confidence by the Patent and Trademark Office”). Thus, under the proper statutory interpretation, Yamazaki, Weaver and Palanisamy are neither “patents” nor “printed publications” under the Patent Act; and all grounds fail.

## V. Claim Construction

### A. “Planarization Layer”

Each of the challenged independent claims 34 and 41 recite “planarization layer.” At the Markman hearing in the parallel litigation, the parties agreed that the term means “a layer of material that planarizes such that the propagation of defects from one layer to another layer can be interrupted and the topography of the underlying layer and/or structure is not reproduced.” *See* EX2019, 28:25-29, 31:15-21, 35:5-8, 40:20-25.

The agreed-to construction is consistent with the intrinsic evidence. For example, the '389 patent describes how an organic layer provides a planar structure on which a barrier layer is deposited “to substantially cover point defects (e.g., dirt particles) in lower layers” such that “any point defects are not geometrically projected upwards into layers deposited above.” EX1001, 4:33-41; *see also id.*, 1:56-62 (“The barrier layer should ideally not contain any point defects (i.e. pin holes) in its surface otherwise its usefulness as a barrier layer is severely compromised. That is primarily the reason that a planar organic layer is typically used as a substrate upon which the barrier layer is deposited.”). This can be seen in FIG. 5 from the '389 patent, for example, in which the OLED device 504 is shown in **red**, the organic planarization layer 506 is shown in **blue**, and the barrier layer 508 is in **orange**.

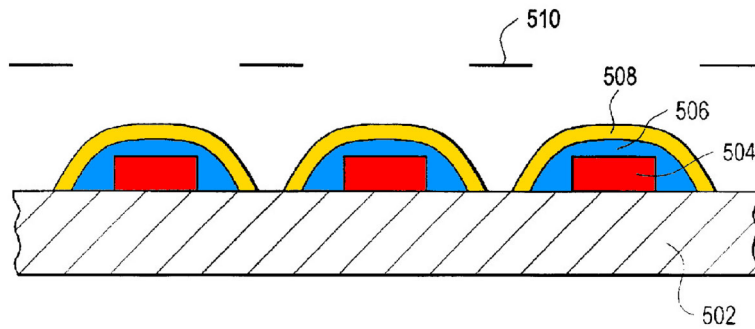


FIG. 5

Similarly, during prosecution the examiner rejected the independent claims, which included “depositing at least one planarization layer,” based on a combination of Ghosh (EX1006) and Boroson (US 6,590,157) (EX2022). *See* EX1002, 292. The examiner cited, in part, to Boroson’s disclosure of a “sealing material 20” as the recited “planarization layer.” EX1002, 293 (citing to Boroson at col. 9, lines 28-52). In response, the applicants argued that Boroson’s “sealing material 20” is not a planarization layer since it is not used to interrupt the propagation of defects from one layer to another layer (see Applicants’ specification at page 7, lines 16-21). EX1002, 371. Page 7 of the specification (EX1002, 52) contains the same disclosure cited above at EX1001, 4:33-41.

The examiner also mapped a claimed “planarization layer” to metal studs 5 of another reference, Palmans. *See* EX1002, 212. In response, the applicants argued that the relied-on structure in Palmans “cannot be used as a planarization layer because the metal studs 5 do not provide a flat surface” and because “[m]etals, and copper in particular, that are evaporated onto a layer do not cover-up

the imperfections of the underlying layer, but rather, the metals reproduce the topography of the underlying layer.” EX1002, 18.

Based on the specification and prosecution history summarized above, Samsung argued that “planarization layer” must be “a layer of material that planarizes such that the propagation of defects from one layer to another layer is interrupted and the topography of the underlying layer is not reproduced.” EX2003, 6; EX2002, ¶¶56-59. While Pictiva initially argued that the plain and ordinary meaning should apply, at the Markman hearing, Pictiva agreed to Samsung’s construction, with some adjustments in light of the Court’s questioning. EX2019, 12:13-19 (“we can agree to their construction of ‘planarization layer’”), 28:25-29, 31:15-21, 35:5-8, 40:20-25. The agreed-to construction is “a layer of material that planarizes such that the propagation of defects from one layer to another layer **can be** interrupted and the topography of the underlying layer **and/or structure** is not reproduced.” *Id.* (text in red denotes changes from Samsung’s original proposed construction). Moreover, both Samsung’s and Pictiva’s district court experts applied the agreed construction in their expert reports. Thus, it is that construction which will be argued at trial and applied by the jury. Petitioner’s IPR expert, Dr. Subramanian, agrees that the construction is “generally reasonable.” EX2020\_2025-05-30-Final, 212:9-213:9.

The agreed-to construction has three prongs: (1) “a layer of material that

planarizes”; (2A) the planarization allows the propagation of defects from one layer to another layer to be interrupted, and (2B) the planarization results in the topography of the underlying layer and/or structure not being reproduced in the planarization layer. EX2046-Humphrey, ¶24. Samsung argued during the Markham hearing that “from an engineering standpoint it is important” to have both 2A and 2B. EX2019, 36:24-37:16. Samsung added that “both of these functions were highlighted during prosecution to distinguish over just putting barrier layers on top of each other, for example, and that’s because these two functions--shielding defects from traveling upwards and then providing a substantially smoother surface--are both important aspects of the planarization layer ....” *Id.*, 38:13-19. By requiring that the two functions be called out and separately, Samsung effectively concedes that those are distinct functions and one should not infer one function from the existence of another or from the presence of planarity. EX2046-Humphrey, ¶24.

The Board should adopt the same claim construction here. Not only have the parties agreed to a construction of “planarization layer” that will be applied in the district court, that construction is supported by the intrinsic evidence. The agreed-to construction should also be applied in the IPR to preserve consistency between the district court proceeding and this trial and, because it is based largely on Samsung’s constructions, to hold Petitioner to the requirements under 37 C.F.R.

§ 42.104(b).

**B. “Selectively Depositing”**

Samsung has proposed in the parallel litigation that “selectively depositing” means “depositing a material in only desired areas, such that no additional processing must be performed for removing unwanted material.” EX2003, 7. In support, Samsung pointed to the statement in the ’389 patent that “at a minimum, additional processing must be performed for the removal of the PML structure over these areas,” and argued that “this is one of the key drawbacks that the claimed invention was seeking to improve upon with PML techniques;” namely, that “one of the drawbacks was that you would have to go back and remove unwanted areas where you had materials being deposited.” EX2019, 46:19-47:3; *see also id.*, 48:1-4 (“Selectively deposit means that you're only putting it down in the areas where you want it and then there's no need for you to go back and do additional processing to remove materials.”).

Pictiva disagrees with that interpretation. The reference to the removal of “PML structure” does not suggest that any and all post-deposition removal of encapsulant materials—such as residues or scums—is prohibited. EX2046-Humphrey, ¶28. Those residues or scums do not form a “PML structure,” which would be understood as alternating layers of organic-inorganic encapsulant materials (EX1001, 1:19-22, 1:34-36, 1:43-46, Fig. 1), and their removal is

therefore not disparaged by the '389 patent.

But consistent with Samsung's district court arguments, during his IPR deposition, Dr. Subramanian took the position that "selectively depositing" means that the material is deposited "where you wanted, and it won't be where you don't, so that you don't need to do a subsequent removal step to remove it from unwanted regions." EX2020\_2025-05-30-Final, 20:2-9; *see also id.*, 23:2-17 (if materials deposited using a shadow mask are "in unwanted regions" and "I will follow that up with a removal process, whether it be an ash laser ablation or some other removal process, then it would not be selective"), 21:19-22:2. Thus, Petitioner's expert is applying an interpretation of "selectively depositing" in this IPR as advocated by Samsung in the district court. *See* EX2003, 7.

At institution, the Board declined to adopt Samsung's district court construction because "Petitioner has not proposed the same constructions here." DI, 11-12. Now, however, Petitioner's expert has testified to his understanding of the term and effectively endorsed Samsung's district court construction. *See* EX2020\_2025-05-30-Final at 20-23. Since Petitioner is "the master of its own petition" and is the one that needs to show "[h]ow the challenged claim is to be construed" and "[h]ow the construed claim is unpatentable under the statutory grounds identified..." (37 C.F.R. §§42.104(b)(3)-(4)), the Board should apply that meaning to evaluate whether the Petitioner has carried its burden based on the

record evidence.

## **VI. Petitioner Has Not Shown Obviousness Under Ground I**

### **A. Yamazaki does not disclose a “planarization layer” in accordance with the agreed-to construction**

#### **1. No express disclosure**

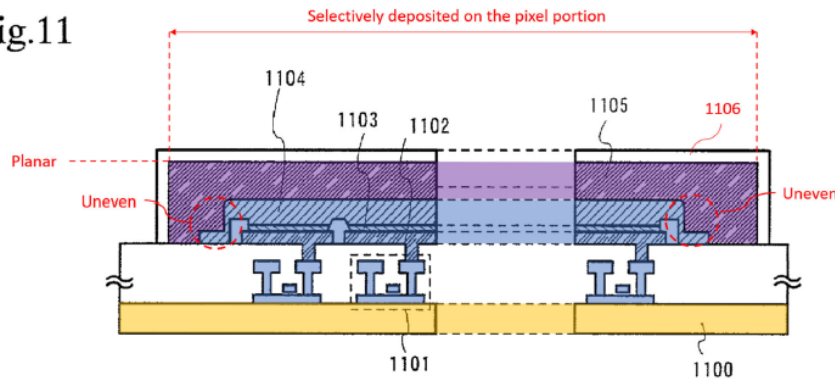
The Petition asserts that “Yamazaki’s cover layer 1105 constitutes a *planarization layer*.” Pet. 27 (emphasis in original). Petitioner argues that cover layer 1105 is a planarization layer because it is “a material that ... has *planarity*” and “the uneven surfaces [below 1105] are planarized (flattened) by the cover layer.” *Id.* (emphasis in original). Dr. Subramanian explains that “has planarity” means “it’s providing planar surface,” *i.e.*, “it’s relatively flat on top.” EX2020\_2025-05-30-Final, 96:5-10. Petitioner further alleges that Yamazaki’s cover layer 1105 is a planarization layer because allegedly “it was known to use such an organic layer to ‘make[] a smooth surface on the relatively irregular surface of the cathode’ when forming OLED devices.” Pet. 27.

The Petition similarly asserts that Yamazaki’s “cover layer 1407 constitutes a planarization layer, because the top surface of cover layer 1407 is flat (*i.e.*, planar) even though the underlying structure is uneven and thus the addition of layer 1407 results in a planar surface topography.” Pet. 28.

Put another way, Petitioner asserts that Yamazaki’s cover layers 1105 and 1407 are planarization layers because they have flat top surfaces that cover the

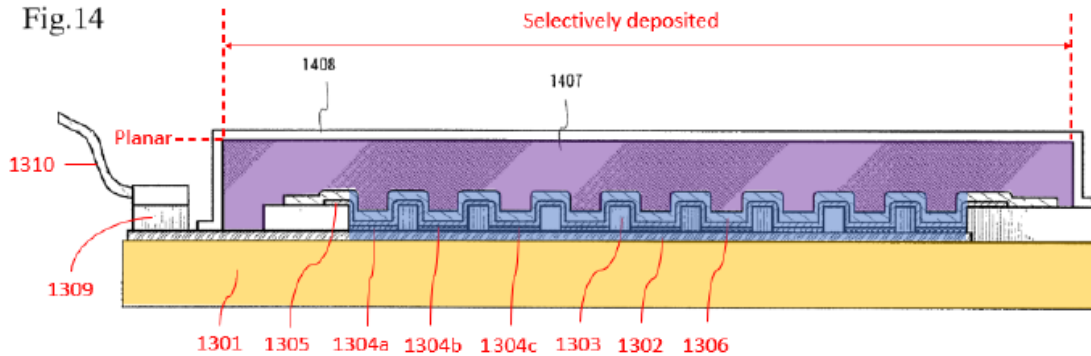
allegedly uneven underlying topology.

Fig.11



(Pet. 26, annotation by Petitioner)

Fig.14



(Pet. 27, annotation by Petitioner)

Yet, the Petition provides no analysis whatsoever for why either layer 1105 or 1407 planarizes “such that the propagation of defects from one layer to another layer can be interrupted,” as required by the agreed-to construction. *See* Pet. 26-28; 37 C.F.R. § 42.104(b)(4) (requiring a petition to identify “[h]ow the construed claim is unpatentable ....”). The word “defect” or variations thereof does not appear anywhere in the Petition or Yamazaki. *See* Petition & Yamazaki *generally*; EX2046-Humphrey, ¶36. In fact, the Petition does not even assert that the

underlying cathode structure has defects. Pet. 26-29. Consequently, Petitioner has not shown that either 1105 or 1407 constitutes a planarization layer under the agreed-to construction. Dr. Subramanian also admitted that he did not address the agreed-to construction in his declaration. 2025-05-30-Final, 212:9-213:9.

## **2. Not obvious in the context of Yamazaki**

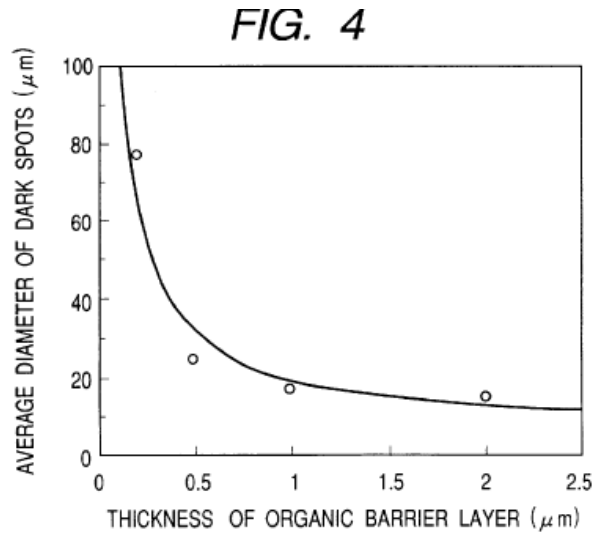
The Petition cites Suzuki to argue that organic layers like Yamazaki's cover layers 1105 and 1407 were known to “‘make[] a smooth surface on the relatively irregular surface of the cathode’ when forming OLED devices.” Pet. 27. Thus, under Petitioner's theory, Suzuki is relevant to whether Yamazaki's cover layer is a planarization layer. EX2046-Humphrey, ¶40.

Like the organic layer in Suzuki, Yamazaki's cover layers 1105 and 1407 were deposited directly on an electrode. *Compare* Yamazaki, Figs. 11, 14 *with* Suzuki, Fig. 1; EX2046-Humphrey, ¶38. Yamazaki and Suzuki also use the same type of resins. *Compare* EX1005-Yamazaki, [0178] (Yamazaki's resins include “epoxy resin, acrylic resin, polyimide, polyamide, and silicon[e] resin”) *with* EX1012-Suzuki, 6:7-64 (listing various acrylates, TPAC, polyethylene terephthalate and the like); EX2046-Humphrey, ¶39. To the extent that Suzuki's structure is informative on Yamazaki's properties, a POSITA would not find Yamazaki's organic layer suitable as a planarization layer as defined. EX2046-Humphrey, ¶37.

Specifically, Yamazaki discloses that the organic barrier layer formed by its methods has preferably a thickness range “between 10 nm and 300 nm.” EX1005-Yamazaki, [0177].<sup>1</sup> Suzuki, however, discloses that large dark spots would form if the organic layer in contact with the electrode is below 0.5 micron (or 500 nm). *See* EX1012, Fig. 4, 7:11-14 (“The organic barrier layer 20 should preferably be form[ed] in a thickness of 0.5  $\mu\text{m}$  or over in order to ensure good coverage of the unit U and to effectively intercept moisture therewith.”); 9:8-9 (“As will be apparent from the figure [Fig. 4], the sealing effect is significant when the layer thickness is 0.5 [ $\mu\text{m}$ ] or over.”).

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<sup>1</sup> Yamazaki’s first embodiment, using electric field application method, provides for a cover layer of “preferably 0.1  $\mu\text{m}$  to 20  $\mu\text{m}$ ” “after forming a barrier layer.” EX1005, [0090]. The Petition does not rely on this embodiment where the cover layer is above and not below the barrier layer as required by the challenged claims.



(EX1012-Suzuki, Fig. 4)

A POSITA would recognize that 0.5  $\mu\text{m}$  is the minimum thickness required to effectively interrupt defect propagation from one layer to another. EX2046-Humphrey, ¶¶41-42. But this threshold thickness is above the thickness range for Yamazaki's cover layer (10-300 nm or 0.01-0.3  $\mu\text{m}$ ). *Id.* At a minimum, this would indicate to a POSITA that Yamazaki's cover layer could not interrupt defect propagation from the cathode to the barrier layer to slow down the permeation of oxygen and moisture, and would therefore not qualify as a planarization layer. *Id.*

Mr. Humphrey also notes that, at Yamazaki's preferred thicknesses of 0.01-0.3  $\mu\text{m}$ , the organic layer would be too thin to fully encapsulate particulates that could occur in manufacturing. EX2046-Humphrey, ¶43. Thus, a POSITA would recognize that the cover layer 1105 or 1407 was not designed to decouple defects. *Id.* Rather, its ability to protect against moisture and oxygen originates from its

being a material that “is unlikely to allow[] substances such as moisture and oxygen to permeate.” Yamazaki, [0178]; EX2046-Humphrey, ¶43. As Mr. Humphrey notes, for Yamazaki’s cover layers, “it is the oxygen and moisture permeation rate through the material, as opposed to the layer’s effectiveness in decoupling defects in barrier layers, that resulted in reduced oxygen and moisture permeation (if any).” EX2046-Humphrey, ¶43. They would therefore recognize that Yamazaki’s cover layers “would not function as a planarization layer as defined” and would not have started with Yamazaki. *Id.*, ¶44.

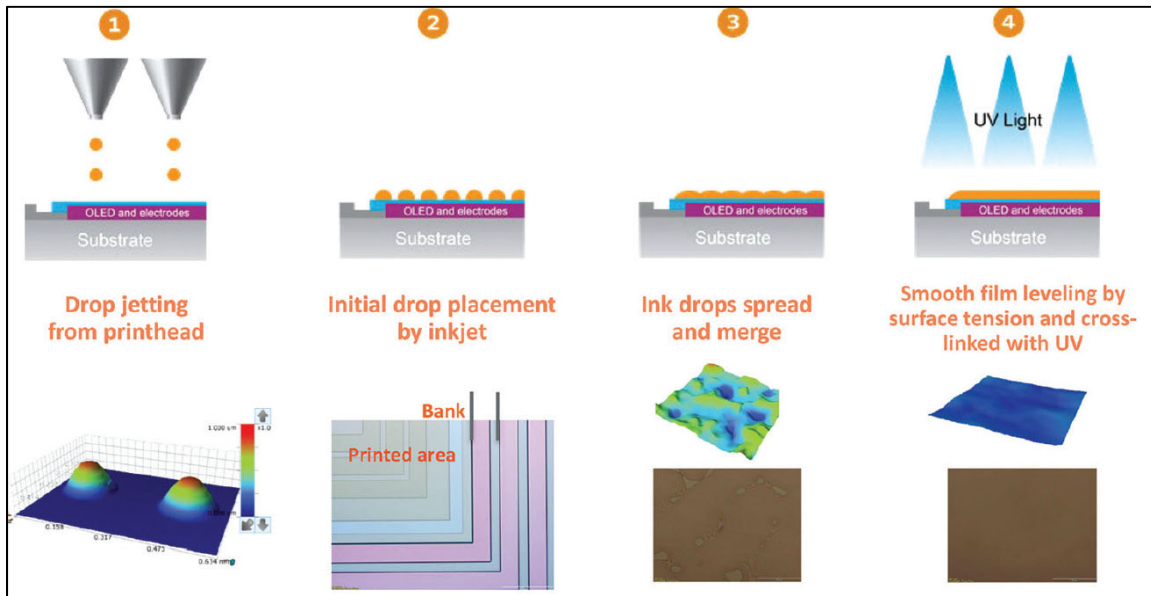
There is also no evidence that Yamazaki’s inkjet printing and electric field application methods could deposit organic encapsulant materials to sufficient thickness for decoupling defects while still maintaining planarity. *Id.*, ¶¶45-47, 65-68. Sturm, the only reference Petitioner cited that gave thicknesses for inkjet printed organic films, indicated a range of 40-70 nanometers. EX1013-Sturm, 4:20-24. Eight or more passes would be needed to obtain a film of desired thickness. EX2046-Humphrey, ¶45. Likewise, the electric field application method “involves dissolving the cover layer material in a solvent to form an application liquid, atomizing the application liquid to create charged particles or droplets, controlling the application liquid by the electric field, and forming the cover layer over a substrate at the application position.” *Id.*; EX1005-Yamazaki, [0012]-[0013], [0038] (describing electric field application method in reference to

EL layer, and “[t]he cover layer is formed by an application method that is similar to that for the formation of the EL layer”), [0142] (dissolving organic resin in a solvent to form “organic resin liquid” between  $1 \times 10^{-3}$  and  $3 \times 10^{-2}$  Pa-s or 1-30 cP).

“In each pass, the solvent would dissolve a bit of the deposited materials from the previous pass, changing the topologies and increasing the risk of defects as well as the risk of the material spreading onto undesired parts.” EX2046-Humphrey, ¶45. The difficulty is further compounded by the fact that the organic layer was to be formed over a relatively large area (*e.g.*, 2-3 orders larger than an EL area) and the planarity depended on ink drops spreading, merging and then levelling as designed over the large area and over multiple passes, which became increasingly challenging as the area increased. *See* EX2030\_Moro2021, Fig. 2 (TFE inkjetting requires ink drop spread and merge and the resulting film level properly); EX2039 (pixel sizes on the order of  $0.22 \text{ mm}^2$ , about  $1/1090^{\text{th}}$  the  $19.97\text{mm} \times 11.97\text{mm}$  active area of a display<sup>2</sup>); EX2023\_2003Molesa-Subramanian, Figs. 2, 4-5 (inkjet printed films each over  $100\mu\text{m} \times 100\mu\text{m}$  areas); EX2046-Humphrey, ¶¶46-47, 65-67. There is thus no evidence that Yamazaki could form planarization layers as defined. *Id.*

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<sup>2</sup> Petitioner maps each device to a display panel. Pet. 17-18.



(EX2030, Fig. 2)

**B. Petitioner has not shown that a POSITA would have “selectively deposit[ed]” a barrier layer when encapsulating a plurality of devices on a substrate**

Petitioner concedes that Yamazaki does not disclose “encapsulating a plurality of devices fabricated upon a substrate” or “fabricating a plurality of device on a substrate” as it relies on AAPA and Ghosh for those limitations. Pet. 19-25; EX2020\_2025-05-30-Final, 26:13-20 (“Q: You don’t contend that Yamazaki either expressly or inherently discloses fabricating a plurality of devices on a substrate, do you? A: No, I do not. ....”).

As such, Yamazaki does not disclose “selectively depositing at least one planarization layer upon said devices” or “selectively depositing at least one barrier layer over said planarization layer” that is deposited “upon said devices” (plural),

because Yamazaki does not involve multiple devices on a substrate. EX2046-Humphrey, ¶¶48-49. To understand how a POSITA would have encapsulated multiple devices on a substrate, one would look to references—in this case, AAPA and Ghosh—that actually encapsulated multiple devices on a substrate. EX2046-Humphrey, ¶53. This is important because the inventions as a whole relate to methods “of encapsulating a plurality of devices fabricated on a substrate,” (34[pre], 41[pre]), not about encapsulating one device on one substrate. *Id.* Yamazaki does not suggest that its method could be extended to multiple devices on a substrate. *See* Yamazaki *generally*; EX2046-Humphrey, ¶53.

Both AAPA and Ghosh, however, disclosed non-selective deposition of at least the barrier layer. EX2046-Humphrey, ¶¶50-52. For instance, the background of the 389 patent notes that a “problem” with the existing PML technique is that PML structures are formed on electrical contact pads, scribe and break lines and/or the glue lines. EX1001 2:17-29. Likewise, as the applicants pointed out and the examiner apparently agreed, the alleged barrier layer in Ghosh, the second encapsulation layer 22, “is nonselectively deposited.” EX1002, 376 (cited on Pet. 14); *see id.*, 387 (examiner withdrawing prior rejection).

Petitioner does not explain why a POSITA would have ignored these disclosures on how barrier layers are deposited when there are multiple devices on a substrate. Pet. 29-32. The state of art as reflected in AAPA and Ghosh is that

POSITAs perform non-selective deposition of barrier layers on a multi-device substrate. EX2046-Humphrey, ¶55. As such, Petitioner has not shown that any of the references in Grounds 1-2 disclose “*selectively* depositing at least one barrier layer over said planarization layer” that is deposited “upon said [plurality of] devices” on a substrate. The combination therefore does not disclose the limitation. And batch fabrication being a convention mode of manufacturing does not justify extending Yamazaki’s experimental methods to it, as further explained below. *Contra* Pet. 22. Grounds 1-2 therefore fail.

**C. A POSITA would not have used Yamazaki as the starting point for encapsulating multiple OLED devices on a substrate**

In its institution decision, the Board noted that “Petitioner relies on Yamazaki as a starting point to show that encapsulating a plurality of devices on substrate with selectively deposited planarization and barrier layers as recited in the challenged claims was known in the prior art.” D.I. 16. But, as explained above, Yamazaki discloses encapsulating a single device on a substrate, not multiple devices on a substrate as claimed. *See* Section above. Petitioner has also not shown that a POSITA would have extended Yamazaki’s single-device encapsulation method to encapsulating a plurality of devices on a substrate.

The petition argues that “flat panel displays ... were conventionally manufactured in bulk on a large sheet of substrate, in order to reduce costs,

increase throughput, and increase yield.” Pet.19; *see also* Pet. 22 (allegedly a “POSITA would have been motivated to used batch fabrication when applying the methods of Yamazaki’s Figures 11 and 14 for *encapsulating a plurality* of OLED display panel devices on a large sheet of substrate because such batch fabrication was the conventional mode of manufacturing display panels for OLEDs”). Reduced costs, increased throughputs and increased yields are concerns specific to manufacturing and commercialization. EX2046-Humphrey, ¶¶56-58.

In that context, a POSITA would not have looked to Yamazaki’s experimental processes, because Yamazaki’s methods are far from ready for manufacturing—just like a POSITA would not have consulted methods for making a one-of-a-kind product when they were interested in mass production. *Id.*, ¶58. Yamazaki has not demonstrated manufacturability for even the single device on a substrate, let alone multiple devices on a substrate, which would multiply defects and errors, drop the yield exponentially, and increase the cost drastically. *Id.*, ¶59.

The obstacle with Yamazaki would be particularly severe because it uses the same method to deposit both the organic layers of the OLED and the organic cover layer of the encapsulant. *Id.*, ¶60; Yamazaki, abstract (“By using a same film deposition method to form the EL layer and the cover layer ....”). The Petition does not propose changing this fundamental operating principle. *See* Pet. 19-33.

The challenges to both were serious, but in different ways. EX2031-

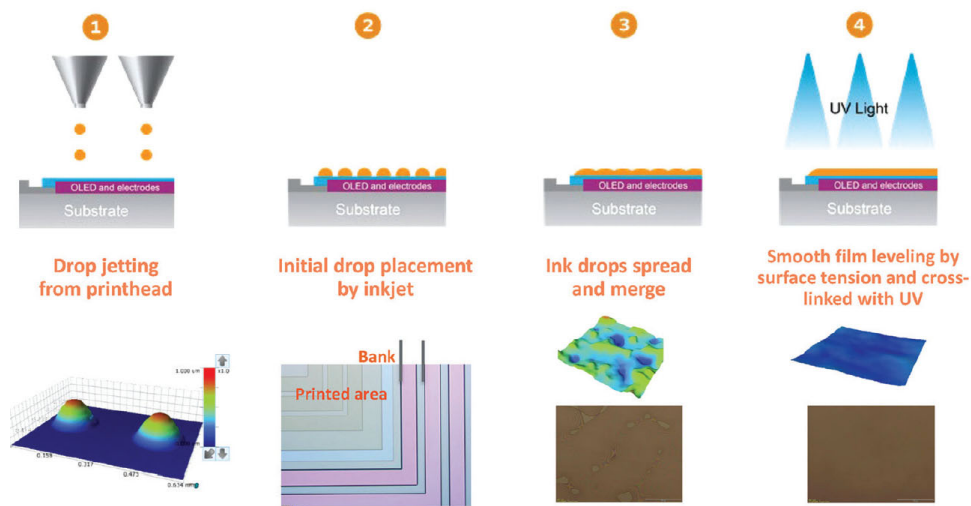
Antoniadis, 142:20-144:20 (“Q: Are you saying that the inkjet printing technology for TFE encapsulation is very different than the inkjet printing technology for the OLED pixel areas? A: Yes. Yes. That’s a good question. Very different indeed. ....”), 141:25-142:19 (“TFE doesn’t qualify you for full color and vice versa, developing full color doesn’t qualify you for TFE. These are different engines, right, so you cannot infer one from the other.”), 221:18-222:10 (“a thin film encapsulation didn’t happen for another 10 years”); EX2012 (2018 invited talk summarizing challenges for inkjet printing in OLED); EX2046-Humphrey, ¶¶61.

When it comes to EL printing, precision was a challenge. EX2031-Antoniadis, 143:25-144:20 (“each pixel consists of three droplets and you have millions of pockets”; “You have to hit them all precisely”); EX2046-Humphrey, ¶¶62-64. Sturm’s results showed that inkjet printing yielded devices of half the efficiency than spin coating. EX1013-Sturm, Fig. 5, 5:13-16. Between 2003 and 2005, OSRAM studied the use of inkjet printing to deposit EL layers as part of a multi-year-multi-million-dollar DOE project. *See* EX2031-Antoniadis, 13:1-9, 44:20-46:14, 113:8-15, 114:13-21, 115:20-25; *see also id.*, 92:14-16 (“There is a lot of work being done with inkjet printing but not successfully in mass production”); EX2032\_OSRAM-DOE-Report, pp. 7, 51-60 (OSRAM’s effort in inkjet-printing light-emitting-polymers). But they were only able to produce a demonstrator, a far cry from demonstrating manufacturability. *Id.* A 2002 thesis

also noted that inkjet printing is “not proper since the pixel pitch at  $28\text{ }\mu\text{m}$  is considered too large for microdisplays.” EX2043-2002Stark-Thesis, 15.

Printing an organic encapsulant was also challenging because it had to form a planar sheet over a much larger area than in the EL application in order to cover active area of a display. *E.g.*, EX2046-Humphrey, ¶¶65-68; EX2039 (at  $19.97\text{mm}\times 11.97\text{mm}$ , a display’s active area is 1090 times the pixel size).

The larger the printed area, the higher the likelihood for there to be defects in the film, such as non-planarity, pinholes, cracks, etc., *e.g.*, because it becomes more likely that not all the droplets spread and merge properly and/or because it becomes more difficult for the entire film to level. EX2046-Humphrey, ¶67.



(EX2030\_Moro2021, Fig. 2); *see also* EX2034\_Kateeva2017, p.16).

For example, while there were reports (after the invention dates) of overcoming the coffee-ring effects to form flat films over  $100\mu\text{m}\times 100\mu\text{m}$  areas,

those articles do not suggest the same solution could yield smooth films over areas 3+ orders larger. *See* EX2023; EX2036.<sup>3</sup> Additionally, as the encapsulant areas increase, solvent trapping and outgassing in subsequent process steps become more likely, which in turn negatively affect the resulting film's flatness, porosity and ability to decouple defects. EX2046-Humphrey, ¶67.

Indeed, at the time of the invention, even Vitex, the assignee of Ghosh (*see* Ghosh, cover) and “one of the pioneers in the field of flexible encapsulation,” was experimenting with TFE on 200-millimeter substrates at the time, 1/3 the size of Gen1 mother glasses that Dr. Subramanian was referencing, and only with vacuum deposition techniques. EX2031-Antoniadis, 39:2-42:14; EX2024\_Park2011, at 4; EX1003, ¶¶16-20. This highlights the immaturity of solution-based approaches used in Yamazaki; and a POSITA would know this fact. EX2046-Humphrey, ¶68.

Simply put, there is no evidence that a POSITA, with but one year of experience in displays (and not specifically in OLED displays), would start with Yamazaki's experimental approaches if manufacturability was a factor because of the need to tackle both the fine resolution for EL and the ability to form contiguous

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<sup>3</sup> In contrast to the solvent-based approaches in these papers, the '389 patent contemplated depositing monomer liquids (without solvent). EX1001, 6:61-62; Humphrey, p.31, n.9.

planar films over a large area for encapsulant, both being non-trivial. EX2046-Humphrey, ¶69. “Instead, if they were to start with Yamazaki’s approaches, they would start with fabricating a single device on a substrate as Yamazaki did to perfect the techniques before attempting to expand it to multiple displays on a substrate using these experimental methods to form both the EL elements and the organic layer of the TFE.” EX2046-Humphrey, ¶70. But as OSRAM’s experience demonstrated, applying inkjet printing to just the EL layers and just one panel was already challenging; and to fabricate multiple devices (*i.e.*, display panels)<sup>4</sup> on a substrate using inkjet printing for both the EL layer and the encapsulant layer would have had no reasonable expectation of success for a POSITA. *Id.*

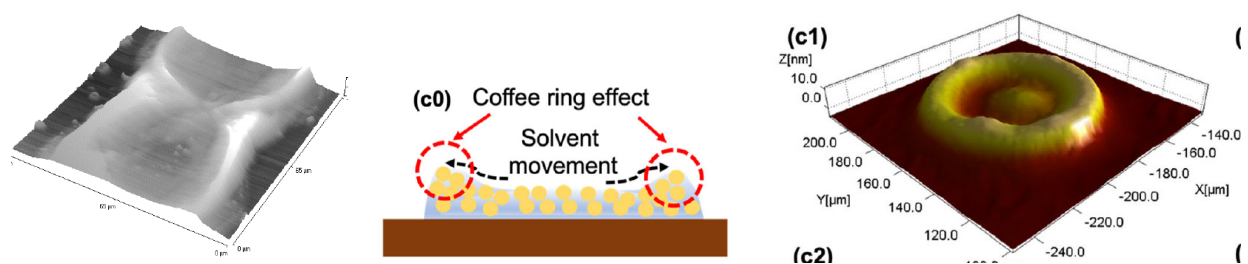
**D. Claims 35, 37 and 40 Are Not Obvious**

**Claim 35** requires the planarization layer to be “deposit[ed] by ink jet of an organic layer.” For reasons stated in Sections VI.A-C, a POSITA would not have used Yamazaki’s ink-jet printing for depositing the EL layers to fabricate a plurality of devices on a substrate and to then encapsulate these devices by selectively depositing a planarization layer by inkjet and a barrier layer. Nor is there any evidence that the organic layer formed using Yamazaki’s inkjet printing would be suitable for use in OLED encapsulation and qualify as a planarization

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<sup>4</sup> See Pet. 17-18 (mapping device to display panel).

layer under the parties' agreed-to construction. EX2046-Humphrey, ¶78. For instance, as discussed on pp. 36-37, there is no evidence that coffee-ring effect could be overcome when the organic film is built to sufficient thickness to decouple defects and spans the active area of a display panel (the "device" to be encapsulated, *see* Pet. 17-19), as opposed to a region that is 1/1000 the size. *See also* EX2031-Antoniadis, 136:16-17 ("Inkjet printing cannot do a large area uniformly").



(EX2023, Fig. 2; EX2036, Figs. c0-c1).

Yamazaki also does not mention defect decoupling. EX2046-Humphrey, ¶79. Instead, when Yamazaki discusses flattening a step in film 39 for the thin-film-transistors, it was because "poor luminescence occurs due to existence of a step." Yamazaki, [0063]-[0064]. This differs from the pinhole defect discussed in the '389 patent. *Compare* '389, 1:56-62. Yamazaki therefore does not disclose or suggest a planarization layer as construed.

**Claim 37** requires depositing the planarization layer by "depositing an organic layer through a shadow mask." Yamazaki's inkjet method described for

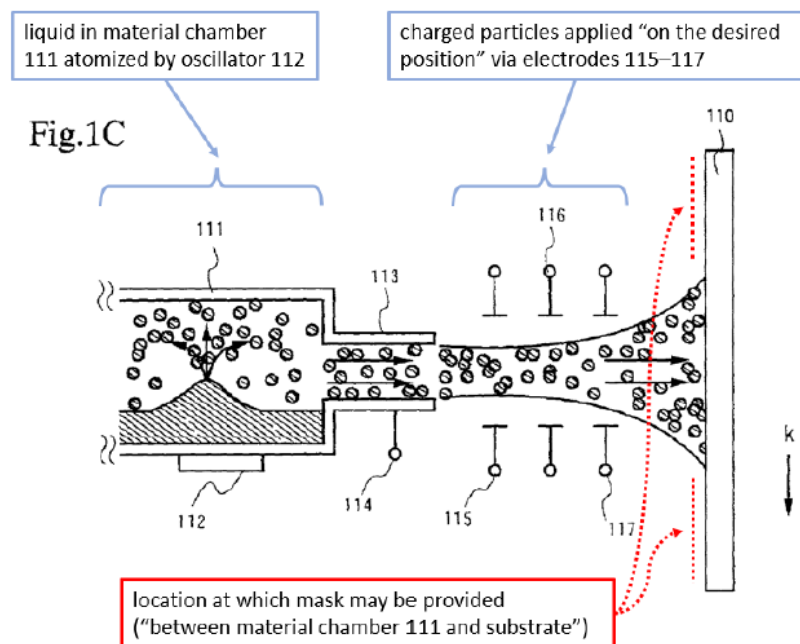
Embodiment 3 (Figure 11) does not mention the use of a mask. *See id.*, [0178]-[0182]; EX2046-Humphrey, ¶92 (not aware “of any ink-jet printing method that also used a shadow mask in the 2001-2002 time frame or even today”), ¶81 (no shadow mask used in ink-jet printing because “ink-jet printing is a patterned printing method whose deposition positions are controlled by print head instead of an external mask”); EX2045 (“In display manufacturing, inkjet printing (inkjet) creates patterned films without using a mask, ...”); EX2044-Shimoda, 5:45-50 (“In an inkjet method, ... processes such as mask fabrication and etching ... can be eliminated.”).

Unable to find disclosure in relied-on embodiment 3, Petitioner points to [0202] which describes forming a cover layer 1308 “by the same method for forming the EL layer.” Pet. 33. But the cover layer 1308 is not a recited planarization layer because it is not one over which a barrier layer is deposited as required by 34[c]—instead, it is the topmost layer. *See* EX1005-Yamazaki, Fig. 13; [0203] (in Figure 13, “the barrier layer 1307 is formed on the EL element over the substrate, and the cover layer 1308 is formed on the barrier layer 1307”).

Even if cover layer 1407 was made in the same way as cover layer 1308 and as described in Embodiment 1, it is made without using a mask. EX2046-Humphrey, ¶82 (Mr. Humphrey confirming that disclosures in [0086] “would indicate to a [POSITA] that the EL in embodiment 1 is formed without using a

mask” and any organic layer deposited using embodiment 1 method would also not involve the use of a mask; instead “electric field rather than mask controls where the application liquid will land or be applied to”); EX1005-Yamazaki, [0188]-[0198] (no mask mentioned), [0080]-[0085], [0016], Fig. 1C (no mask shown in the figure that illustrates “a thin film formation method of [Yamazaki’s] present invention”).

Moreover, “even if a mask is used in the electric field application method, the mask is not a shadow mask because, as Samsung’s own annotation demonstrates, electrodes 115-117 define the positions at which the liquid is applied and the mask does nothing to further define that position” (*id.*, ¶83):



(Pet. 34)

Ghosh also does not suggest using a mask with Yamazaki's solution-based process. *Contra* Pet. 34-35. Specifically, the "known" methods referenced in Yamazaki [0007] relate specifically to "film deposition methods for the polymer type organic EL material," not to methods for OLED encapsulation as Petitioner argues. *Contra* Pet. 35; EX2046-Humphrey, ¶84. As already explained, inkjet printing of EL is completely different from inkjet printing of an organic encapsulant. EX2031-Antoniadis, 141:25-143:19; EX2046-Humphrey, ¶84.

Moreover, Ghosh deposits its organic encapsulant layer via "forming vapor phase monomer species able to condense and polymerize on the first dielectric oxide encapsulation layer." EX1006, [0018]; *see also* [0032] (forming patterned first encapsulation layer 21 via a polymer layer using "shadow masking"); Pet. 36 (arguing that shadow masking allows use of "flash evaporation"). There is no evidence that a POSITA would have extended the tools used for an evaporative process to Yamazaki's solution-based process. EX2046-Humphrey, ¶87; *see also id.*, ¶82 (shadow mask notorious for particulate contamination).

Petitioner also does not provide any reason for why a POSITA would have substituted Yamazaki's two solution-based approaches (its alleged points of novelty) with "flash evaporation." Pet. 36; EX2046-Humphrey, ¶¶86, 88 (Yamazaki's alleged novelty is to use same solution-based process for both organic EL and organic encapsulant deposition). As the Federal Circuit has made clear, the

fact that an alternative was known does not provide a motivation to use that alternative. *Virtek Vision Int'l ULC v. Assembly Guidance Sys.*, 97 F.4th 882, 886-87 (Fed. Cir. 2024) (holding that it was not enough that two alternative arrangements for computer controlled aiming system were known; a reason to modify must be provided).

Yamazaki is aware of the evaporation method: it deposits cathodes by evaporation but does not suggest depositing the organic layer via evaporation. EX1005-Yamazaki, [0011]; *see id.* Thus, Petitioner should have, but does not explain, why a POSITA would have altered Yamazaki's principle operation to apply the organic layer using Ghosh's vaporization method. *Plas-Pak Indus. v. Sulzer Mixpac AG*, 600 Fed. Appx. 755 (Fed. Cir 2015) (not obvious when the proposed combination would change the principle operation of the primary reference); EX2046-Humphrey, ¶¶88-89 (POSITA would not ignore Yamazaki's deliberate choice of methods).

**Claim 40** depends on claim 34. For the same reasons stated for claim 34, Petitioner has not shown claim 40 is unpatentable.

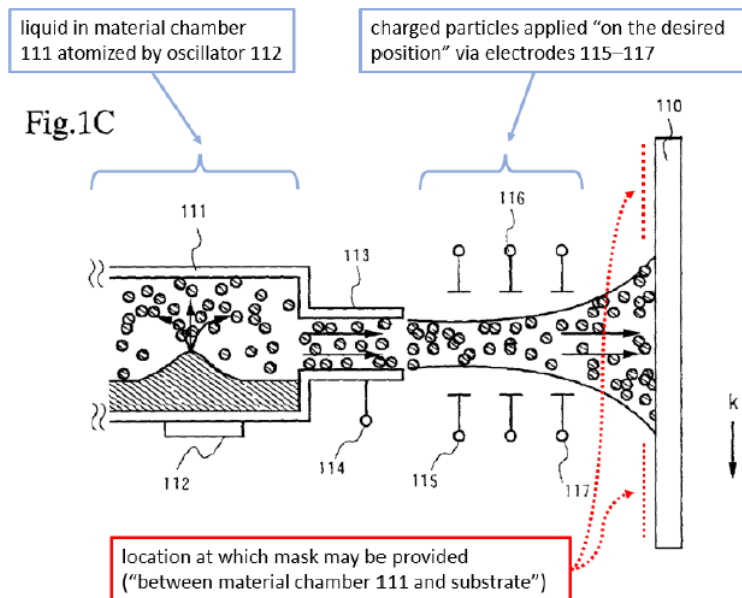
## **VII. Petitioner Has Not Shown Obviousness for Ground II**

The reasons stated in Sections VI.A-VI.D also apply to Ground II claims. Additional reasons of non-obviousness are stated below.

**A. The Petition fails to make a *prima facie* case that a POSITA would have combined Yamazaki with Fujimori**

As explained in connection with claim 37—the discussion of which is incorporated herein by reference, Petitioner has not made a *prima facie* case that a POSITA would have used a shadow mask with Yamazaki’s electric field application method or ink-jet method. Indeed, concerning the ink-jetting method of embodiment 3, nothing in Yamazaki ever suggests using a mask in connection with applying the organic layer (the alleged “planarization layer”). See EX1005, [0179]-[0182]; *cf.* Palanisamy, [0021]-[0025] (ink jetting is distinct from methods such as shadow masking); EX2046-Humphrey, ¶¶92.

Nor is there any reason to use Fujimori’s mask to improve adhesion. Specifically, Yamazaki’s disclosure in [0086] at most suggests placing a mask “between the material chamber ... and the substrate” and not in contact with the substrate. EX2046-Humphrey, ¶¶93, 107-109.



(Pet. 34)

But if the mask does not even touch the substrate, then there would be no motivation to improve adhesion between the mask and the substrate by using Fujimori's magnetized mask, *e.g.*, to avoid bleeding below the mask due to warpage and other factors. EX2046-Humphrey, ¶¶92, 107.

But even if a POSITA would have used a mask, as optionally in an electric field application method, there is no showing that a POSITA would have used a magnetized shadow mask or even that such a mask would be suitable for an electric field application method. This is not a concern in Fujimori because, unlike Yamazaki, it "uses a traditional evaporative deposition technique that does not utilize electric field to control the flight path of charged particles and deposition positions." EX2046-Humphrey, ¶96.

Petitioner provides no analysis on how the “electromagnet” used to adhere Fujimori’s mask and that “can electrically control the switching of the magnetic field” (Pet. 52) would alter the force operating on the charged particles of the electric field application method and the result particle trajectory.

Dr. Subramanian acknowledges (1) Yamazaki’s charged particles would assume a Gaussian distribution for their velocities, and (2) the charged particles “will tend to spiral” “in a corkscrew motion as [they] approach[] the surface.” EX2020, 77:9-78:8, 233:3-22; EX2046-Humphrey, ¶¶97-100 (as a charged particle “approaches the magnetic field, it veers off the path set by the electrodes 115-117 in Yamazaki Figure 1C”). Dr. Subramanian insists, however, that “the actual, lateral deviation will be small,” but provides no specifics on the amount of deviation. EX2020, 233:3-22.

Yet, even a small amount of deviation, multiplied over the number of pixels, could lead to a significantly increased error rate for the resulting display. EX2046-Humphrey, ¶101; EX2031-Antoniadis, 142:25-144:20 (Dr. Antoniadis explaining why inkjet printing is still not suitable for depositing EL in mass production: “each pixel consists of three droplets and you have millions of pockets. You have to hit them all precisely.”). This is in particular the case that the Gaussian distribution could differ slightly for each nozzle and each spot on the substrate. EX2046-Humphrey, ¶102; *see also id.*, ¶99 (concluding that particle-to-particle variation as

well as time-dependent variation as the particles fly from the material chamber towards the substrate “*would introduce unpredictable change in the particles’ trajectories, making it impractical to control the positions at which the particles will be deposited*”); ¶97 (“The electromagnet would affect the trajectory of the charged particles to be deposited on the substrate and there is no indication that the resulting combined forces could be controlled to reliably deposit the cover layer to the selected spots”).

Indeed, even if deviations are small for each particle or stream of particles, over a large number of particles, the uncertainties and error rate would be significantly increased. EX2046-Humphrey, ¶¶101-103. For example, a 99.9% per-ejection accuracy rate would correspond to a 36.8% defect-free rate over a 1000 particles; whereas the defect-free rate increased to 90.5% with a 99.99% per-ejection accuracy rate. *Id.*, ¶101.

The non-obviousness is further confirmed by the course of action taken by the people in the field. Dr. Subramanian concedes that he is not aware of anyone ever combining electric field application method with a magnetic mask in OLED or other application, at the time of the invention or since then, whether in commercialization or in research. EX2020\_2025-05-30-Final, 70:6-74:1. Notably, Dr. Subramanian himself had used magnetic masks and had separately used methods similar to Yamazaki’s electric field application method, but never the two

together. *Id.*, 73:10-74:1; EX2046-Humphrey, ¶94 (Dr. Humphrey is also not aware of anyone combining magnetic mask with electric field application or inkjet printing). This course of actions taken by people in the field in the last 25 years provides objective evidence of what POSITAs would do, and supports a finding of non-obviousness.

Simply put, Fujimori does not disclose or suggest that its magnetic mask and the attendant magnets used to adhere the mask are suitable for any and all deposition methods. In particular, it does not suggest it is suitable for electric field application method or ink-jet methods. *See* EX1014, [0041] (evaporation), [0044] (same), [0046] (same), [0050] (same); EX2046-Humphrey, ¶¶102-105 (noting that Fujimori suggested using magnetic masks in connection with fine resolutions and avoiding cross-talks, none of which apply to Yamazaki's organic encapsulants). Thus, there is no evidence that applying the magnetic mask to Yamazaki's electric field application method would constitute applying a known method to a known application case with predictable results. This is not about the weight of evidence, but the complete absence of evidence.

**B. The combination still fails to disclose multiple limitations**

**1. No disclosure or suggestion of “planarization layer”**

As explained for Ground 1, Petitioner has not shown that Yamazaki discloses or suggests a “planarization layer” under the agreed-to construction. The

same defect exists in Ground 2. *See* Pet. 49-51 (Petitioner not explaining why Yamazaki's organic layer allegedly would "interrupt[]" "the propagation of defects from one layer to another layer" as required by its own construction). It is Petitioner's burden to specifically point out "[h]ow the construed claim is unpatentable under the statutory grounds identified" in the petition, including "specify[ing] where each element of the claim is found in the prior art patents or printed publications relied on." 37 C.F.R. § 42.104(b)(4). The Petition fails to explain where "planarization layer" as Samsung construes is found in Yamazaki.

**2. No disclosure or suggestion of "selectively depositing" a barrier layer**

Element 41[e] is the same as 34[c]. Thus, for the same reasons as for 34[c], in view of Ghosh and AAPA's disclosure of non-selective deposition of the barrier layer, 41[e] is not disclosed either.

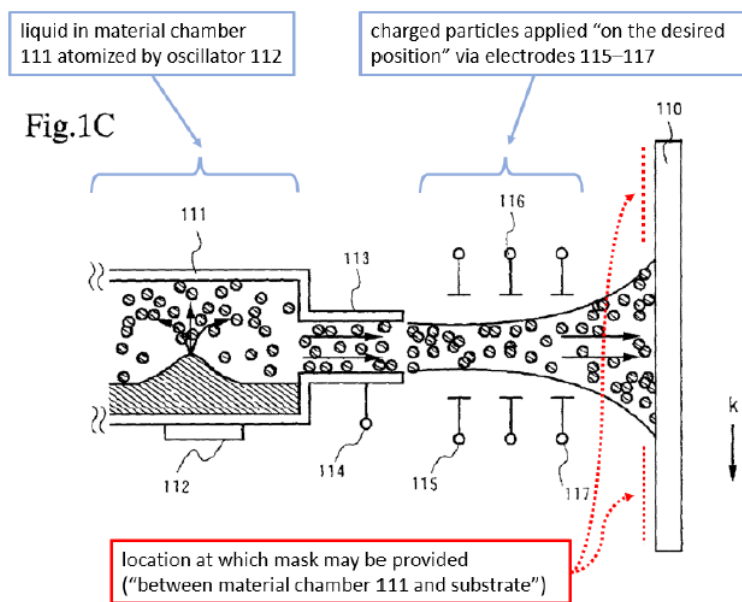
**3. No disclosure or suggestion of 41[b]**

Even if a POSITA would have used Fujimori's mask, nothing in Yamazaki suggests that a mask should be "deposit[ed] ... on top of [the] substrate" as in element 41[b]. Specifically, [0086] relied on Petitioner states that "a mask may be provided *between* the material chamber 111 and the substrate to thereby control the positions on the substrate at which the application liquid is via the mask."

EX1005-Yamazaki, [0086]. "Between" does not mean the mask is deposited "on

top of” or in contact with the substrate as Petitioner suggests. Pet. 42-45 (arguing for the use of Fujimori’s magnetized mask for added adhesion between the substrate and mask); EX2046-Humphrey, ¶¶107-108.

Rather, as Petitioner’s own figure correctly shows, in Yamazaki, if a mask is used, the mask would not be on top of or in contact with the substrate. *See* Pet. 34 (reproduced below); EX2046-Humphrey, ¶108 (“A [POSITA] would not understand placing a mask ‘between the material chamber ... and the substrate’ as requiring the mask to be placed in physical contact with the substrate as Samsung suggests.”).

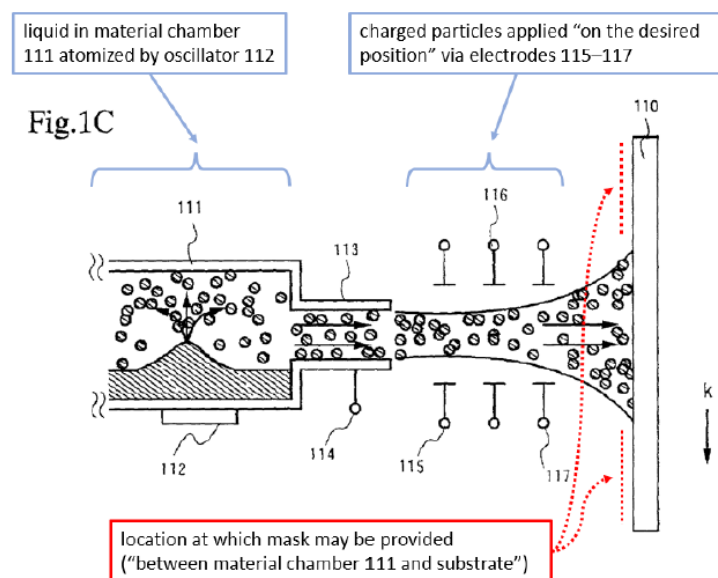


(Pet. 34)

#### 4. No disclosure or suggestion of 41[c]

Petitioner points to Fujimori’s disclosure that “organic material or electrode

material flying towards the substrate *in vapor deposition* or the like is deposited on the substrate through the mask opening ....” to argue that the same is true in Yamazaki. Pet. 51. But Yamazaki does not involve vapor deposition or the like: it’s a solution-based process involving injecting particles in solvents. See Yamazaki, [0012] (discussing the use of a solution-based “application liquid”), [0013] (“for the cover layer, an organic resin liquid ... is provided ....”). There is no evidence that what happens in vapor deposition would also happen in Yamazaki’s methods.



(Pet. 34 (no deposition of charged particles on the mask as illustrated))

Indeed, as Petitioner’s own annotation shows, electrodes 115-117 control the trajectory of the charged particles and “[t]he stream of the materials is shown to be narrower than the opening of the mask such that there is no deposition of the

organic materials on the mask.” EX2046-Humphrey, ¶110; *contra* Pet. 51. That is, Petitioner has not provided any competent evidence that the combination would involve “*depositing at least one planarization layer upon said mask* and said plurality of devices.” As Mr. Humphrey confirms, “[i]n Samsung’s own annotation, the organic materials is deposited on the devices, but *not also ‘upon said mask.’*” EX2046-Humphrey, ¶110.

#### 5. No disclosure or suggestion of 41[d]

Because in Yamazaki, even when a mask is used, it is a distance away from the substrate, there is also no “removing said mask *from* said substrate” as recited by element 41[d]. EX2046-Humphrey, ¶111.

Petitioner argues that the mask “would need to be removed after forming the cover layer, in order to subsequently deposit the barrier layer.” Pet. 51. Not so. “For example, the distance between the mask and the substrate can be adjusted to control the area of coverage in a manner similar to that disclosed in Weaver.” EX2046-Humphrey, ¶112 (citing EX1008, Fig. 9, [0060], which discloses “as shown in FIG. 9, ... each source 221b-c and 222 a-c is provided at a larger distance from the substrate than is the adjacent upstream source ... such that the material being deposited from each source again covers a progressively wider area as the substrate proceeds downstream ....”).

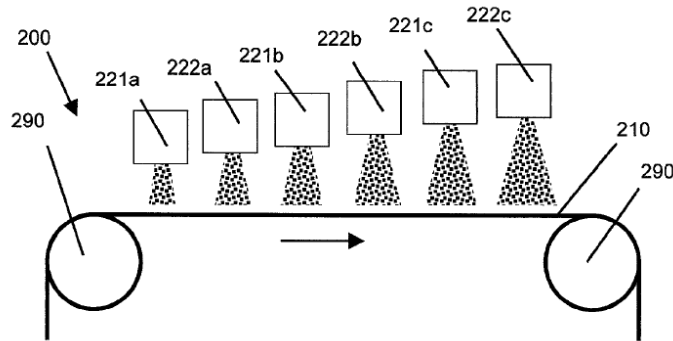


Fig. 9

In other words, by placing the masks where the sources are, that is, at variable distances away “between the material chamber 111 and the substrate to thereby control the positions on the substrate at which the application liquid is via the mask,” progressively larger layers could be obtained without removing the masks. EX1005-Yamazaki, [0086].

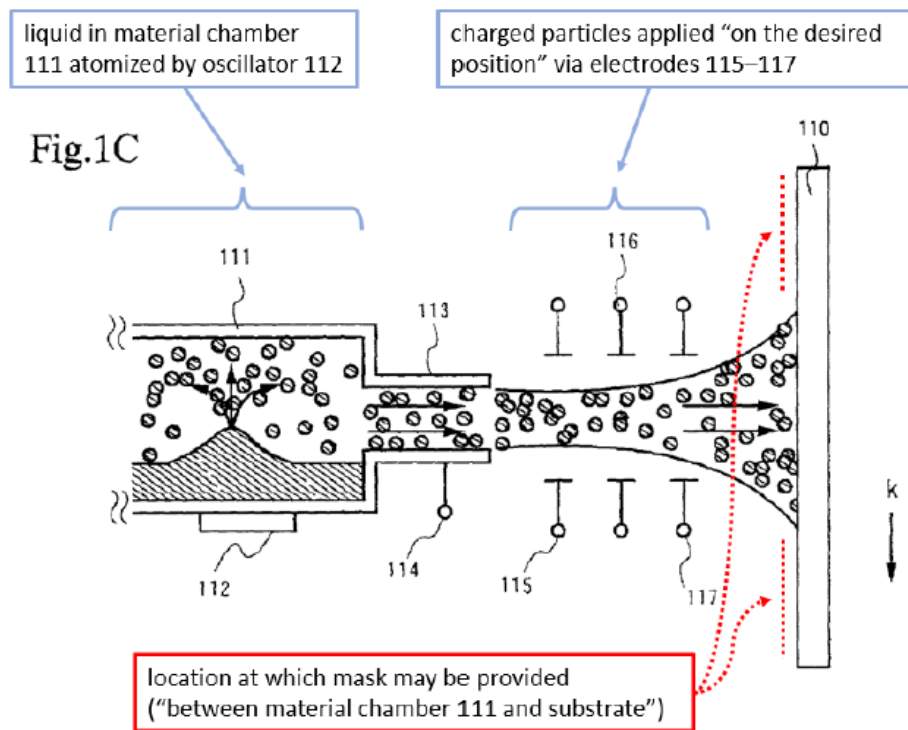
**C. Petitioner also fails to make a *prima facie* case of obviousness for claims 42-46**

Because claims 42-46 depend on claim 41, for at least the same reasons as stated for claim 41, Petitioner has not made a *prima facie* case of obviousness against claims 42-46.

In addition, for reasons stated in Section VII.B.3, Petitioner has not demonstrated that a POSITA would have deposited a mask “in contact with the substrate” as required by claim 43, because placing a mask “between” the material chamber 111 and substrate does not result in the mask “in contact with the substrate.” See EX1005, [0086]; EX2046-Humphrey, ¶¶107-109.

Additionally, “because Yamazaki’s mask is not in contact with the substrate, there is no need for the material to be non-sticking to the OLED substrate over the areas in between the active areas, as required by claim 44”. EX2046-Humphrey, ¶114.

Next, for reasons stated in Section VII.B.4, according to Petitioner’s own illustration, the organic material simply passes through the mask opening without depositing on the mask, let alone “over the entire mask” as required by claim 46. *Id.*, ¶110 (“In Samsung’s own annotation, the organic materials is deposited on the devices, but not also ‘upon said mask.’ And Samsung’s own depiction also does not show that the organic material is deposited ‘over the entire mask’ as recited in claim 46”).



(Pet. 34 (no deposition of charged particles on the mask as illustrated))

## VIII. Petitioner Has Not Shown Obviousness for Grounds III-V

### A. Petitioner does not explain why Weaver discloses a "planarization layer"

Petitioner also challenges claims 34, 35-37 and 40 based on Weaver and one or more secondary references. But as for Yamazaki-based references, Petitioner also fails to demonstrate that Weaver discloses a planarization layer under its own construction. Pet. 63-84. As explained in Section V.A, this agreed-to construction is consistent with the intrinsic evidence.

Weaver only describes its "planarizing material" as "a material that forms a smooth planar surface upon application, rather than forming a surface that reflects

irregular contours of the underlying surface.” EX1008, [0035]. The Petition likewise only argues that Weaver’s “planarizing layer 151a constitutes a *planarization layer* because it is used to form a smooth planar surface,” citing to Weaver, [0035]. Pet. 71. The Petition and the expert declaration are both silent on whether Weaver’s layer 151a enables or disables “the propagation of defects from one layer to another [to be] interrupted” as required under the parties’ agreed-to construction. See Pet. 70-73; EX1003, ¶¶186-191; EX2020\_2025-05-30-Final, 212:9-213:9. Thus, there is a complete failure of proof under 37 C.F.R. § 42.104(b)(3), (4), which requires a petition to identify “[h]ow the challenged claims is to be construed” and “[h]ow the construed claim is unpatentable ....”

Additionally, as depicted, Weaver’s “planarizing” layer generally reproduces the topology of the underlying layer, contrary to the parties’ agreed-to construction for “planarization layer.” EX2046-Humphrey, ¶¶116-117; see Figs. 2-7.

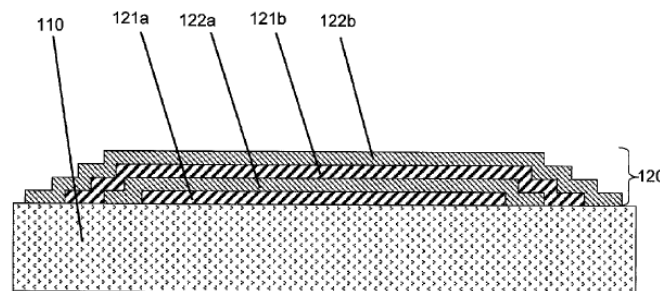
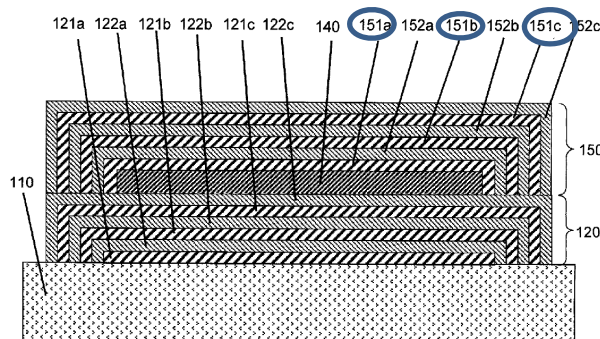
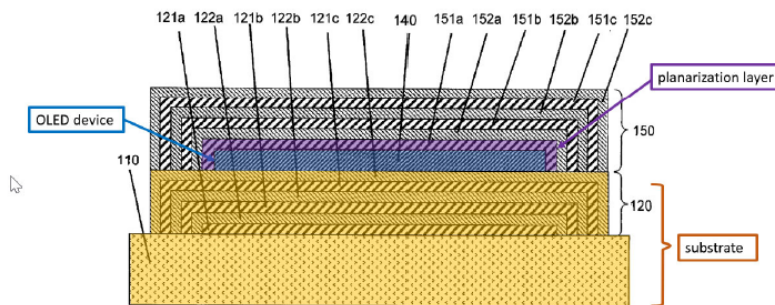


Fig. 5

As Mr. Humphrey observes:

For example, in Figure 5 above, planarizing layer 121a follows the surface topology of the underlying substrate 110 and the planarizing layer 121b follows the topology of high-density layer 122a. For instance, where the high-density layer 122a has steps along the edges of the deposition, so does 121b. And where the substrate has a general flat topology (except for unintentionally created surface irregularity), the planarizing layer also has that topology. In other words, Weaver's "planarizing layer" reproduces the topology of the underlying layer.

*Id.*, ¶117. The same is true for the relied-on Figure 6 (or Figure 7), in which "layers 151a-c follow the topology of the underlying layers 140, 152a-b respectively." *Id.*



The above differs from that of Figure 5 of the '389 patent which shows

selective deposition of planarization layer 506 (blue).

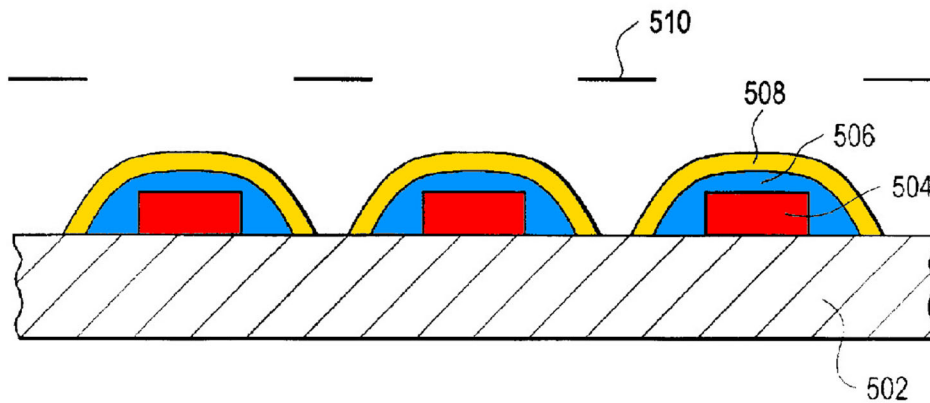


FIG. 5

Petitioner has also not shown that 151a-c provide a “lower frequency in terms of the spatial frequency of the asperities” (2025-05-30-final, 14:2-17:15) or that they reduces the non-planarity of the corresponding underlying layers (*id.*, 10:7-11:21, 18:4-18), under Dr. Subramanian’s test for planarity.

Because all challenges in Grounds III-IV rely solely on Weaver to supply the “planarization layer” limitation, all Weaver-based challenges fail as a matter of law.

**B. Petitioner has not offered competent evidence to demonstrate that Weaver performs selective deposition**

Petitioner first argues that Weaver’s layer 151a is selectively deposited because Figure 6 shows it “as surrounding the OLED device from the top and sides, but not extending laterally over the entire surface of the substrate.” Pet. 71-72.

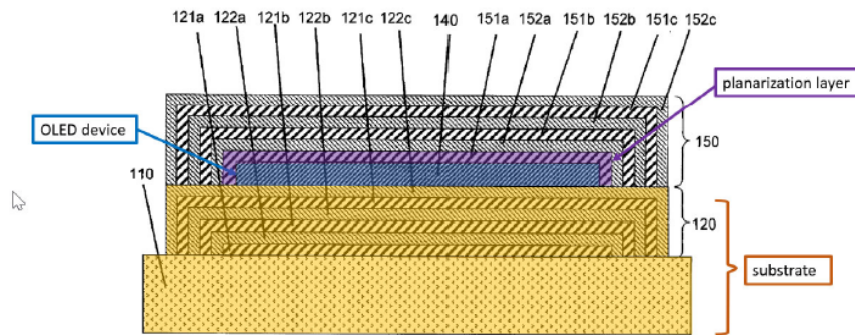


Fig. 6

But the same configuration can be obtained through non-selective deposition followed by patterned etching. EX2046-Humphrey, ¶119; *see, e.g.*, EX1001, 2:21-23 (discussing “additional processing ... for the removal the PML structure over [certain] areas”), EX1006-Ghosh, [0032] (patterning to expose substrate surfaces can be done by “ablation ... following layer formation”).

Thus, the final structure does not inform how the structure is obtained. EX2046-Humphrey, ¶ 119. For that same reason, the fact that “the high-density layer [i]s surrounding the [alleged] planarization layer from the top and sides, but not extending laterally over the entire surface of the substrate” does not inform how that final structure is obtained. *Id.*, ¶120; *contra* Pet. 75.

The Petition next cites Weaver’s Figure 8 and [0057]-[0059] to argue that the alleged planarization layer and barrier layer are selectively deposited. Pet. 72-73, 75.

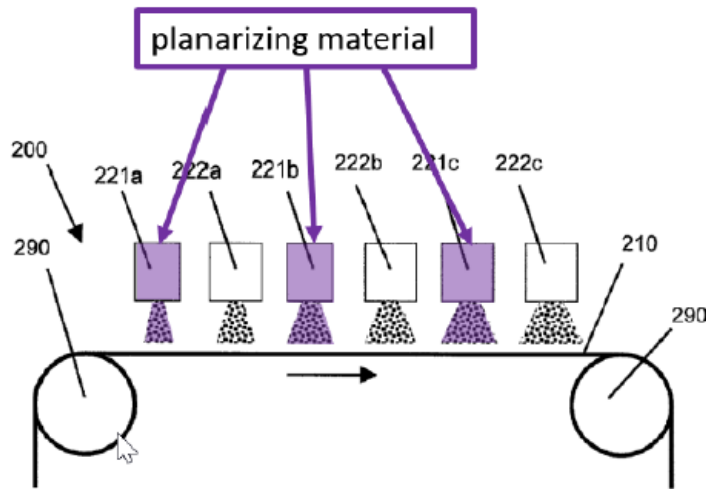


Fig. 8

Figure 8 (and Figure 9) as well as [0057]-[0059], however, relate to forming barrier region 120s over the substrate to form a covered substrate, not about sealing the OLED structure 140 with *barrier 150*. For example, Weaver states, “FIG. 8 is a schematic diagram of an apparatus for forming the covered substrate of Fig. 2 ....” [0022]; *see also* [0023] (Fig. 9 is also for illustrating “forming the covered substrate Fig. 2”). Figure 2, “is a cross-sectional view of a covered substrate ...” with *no devices* above it. EX2046-Humphrey, ¶122.

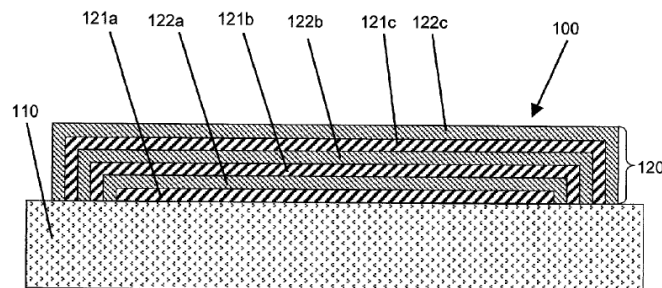


Fig. 2

Weaver’s [0054] likewise makes clear that the discussions “in connection

with FIGS. 4a-4g, FIG. 8 and FIG. 9” concern “*layers over a substrate material*,” not layers over OLED devices as required by the claims. EX1008-Weaver, [0054]; EX1001, cl. 34. Figures 4a-4f show how a structure as that in Figure 2 is formed step by step. EX2046-Humphrey, ¶123.

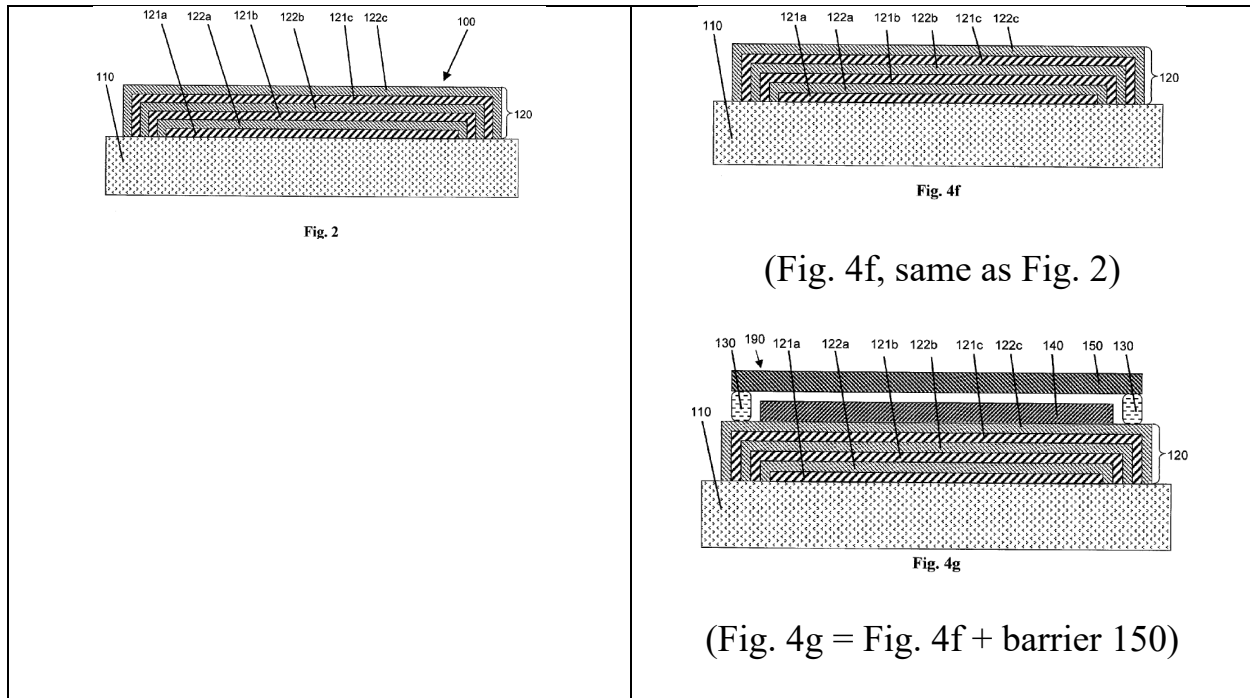


Figure 4g describes the formation of an “additional barrier region 150” that is “adhered to the substrate via adhesive region 130” to “completely enclose[e] the OLED 140 within the OLED structure 190, protecting it from moisture and oxygen.” Weaver, [0056]. Petitioner does not argue that the barrier structure 150 in Figure 4g meets the claim requirements. Pet. 71-76.

The Petition apparently assumes that the barrier structure 150 in Figure 6 that is used to encapsulate the OLED device 140 is made by the same processes as

for barrier structure 120. Pet. 72-73, 75. But Weaver never says so or even so suggests. *See* Weaver [0054]-[0061]; EX2046-Humphrey, ¶124. Nor should one assume so. *Id.*

As Mr. Humphrey explains, unlike substrates before device attachment, which do not contain any circuitry elements and need not leave uncovered electrical contact pads and are therefore more tolerant of positional misalignment, the barrier region 150 in Figure 6 need to take these into consideration. There is no evidence that Weaver's progressive deposition technique could handle the more demanding sealing of OLED devices. EX2046-Humphrey, ¶125.

Indeed, a 2015 presentation by Kateeva, which supplied inkjet printers for “[m]ore than 80 percent” of the encapsulant market, (EX2031-Antoniadis, 128:23-129:6), alleged that “[f]or the inorganic layer the only option in R2R [roll-to-roll] is blanket coating followed by removal material at the end of the process.” EX2100, p.20; *see also id.*, 14 (discussing two options for “pattern[ing] the stack in such a way that electrodes are exposed and edge is fully sealed by inorganic”), 15 (patterning with shadowmask possible “[i]n plating processing”). That is, according to this 2015 presentation, selective deposition of the barrier layer, as required by 34[c], was not an option for roll-to-roll processing. EX2046-Humphrey, ¶¶126-128.

- For the inorganic layer the only option in R2R is blanket coating followed by removal material at the end of the process (Option 2 stack)

- When depositing TFE over the OLED SSL cell, need method to pattern the stack in such a way that electrodes are exposed and edge is fully sealed by inorganic

Option 1:  
Deposit Patterned Organic and Inorganic

Option 2:  
Deposited Patterned Organic  
Deposit Blanket Inorganic (and etch at the end)

While Dr. Subramanian asserted that he used gravure printing to selectively deposit inorganic materials in 2005-2006 in a roll-to-roll process (years after the inventions), (EX2020\_2025-05-30\_Final, 62:4-17), gravure printing was not one of the techniques or sources identified in Weaver. *Compare* Weaver, [0057] (“Preferred sources are thermal evaporation, sputtering, PECVD and electron beam sources for the high-density layer”); EX2046-Humphrey, ¶129. Simply put, there is no evidence in the record that selective deposition of barrier layers over an OLED—as opposed to a substrate—was known at the time of the invention for a web-based (*i.e.*, continuous roll-to-roll process. EX2046-Humphrey, ¶¶129-130. This is another reason why the invention as a whole was not known or obvious at the time of the invention.

**C. Petitioner provides no competent reason for depositing Weaver’s organic layer using ink-jetting (claim 35)**

For claim 34, Petitioner relies on Weaver’s disclosure in Figure 8 to argue that the planarization layer is allegedly deposited selectively. Pet. 71-73. Figure 8

depicts a web-based processing technique. EX1008, [0057]. According to Weaver, in the Figure 8 embodiment, the preferred sources for depositing the “planarization” layer are “thermal evaporation, organic vapor phase deposition (OVPD), chemical vapor deposition (CVD), spraying and flash evaporation sources.” *Id.* Ink-jetting is not mentioned. *Id.*

Citing to Palanisamy, Petitioner argues that a POSITA would have deposited the “planarization” layer using ink-jetting because it was one of the techniques known in the art for selectively depositing an organic layer. Pet. 77-78. That argument fails as a matter of law. *Virtek*, 97 F.4th at 886-87 (even the existence of two interchangeable alternatives does not supply a reason for replacing one with the other). Moreover, Palanisamy does not characterize the materials it deposits as “planarizing”; instead, it characterizes them merely as “passivation materials.” *E.g.*, EX1007-Palanisamy, [0021]; *see also* EX2031-Antoniadis, 136:16-17 (“Inkjet printing cannot do a large area uniformly”); EX2038 (showing passivation as the layer below “bank” used to separate the pixels, and not the layer used to cover the OLED device); EX2046-Humphrey, ¶133. Ground IV references therefore do not teach or suggest using inkjet to deposit a planarization layer as required by claim 35.

Petitioner also argues that a POSITA would have used ink-jetting to “minimize[] risk of contamination” because “ink jet printing is a non-contact

deposition technique.” Pet. 79. But the web-based process shown in Figure 8 also uses a “non-contact deposition technique” that, according to Petitioner’s logic, would already pose no risk of contamination. *See* Fig. 8 (see below for figure annotated by Petitioner); EX2046-Humphrey, ¶134 (“Weaver’s web-based process shown in Figure 8 already uses a ‘non-contact deposition technique,’ so it also would have a minimized contamination risk under Samsung’s theory.”); EX1009-Burrows, 8:10-21 (explaining the use of a mask with a continuous roll-to-roll process in which “[t]he mask is positioned laterally and at a distance from the substrate”).

Petitioner also contends that a POSITA would have used ink-jetting because it is “a directed deposition technique.” Pet. 79. But so is Weaver’s existing method, as Mr. Humphrey and Dr. Subramanian have confirmed. *See* Fig. 8 (nozzle directing material to the deposition area); EX2046-Humphrey, ¶135; 2025-05-30\_final, 136:14-137:2 (Dr. Subramanian notes that the nozzles depicted in Weaver Figures 8-9 apply to “all of the techniques that are called out” and “you can use nozzles to control the directivity of evaporation et cetera, et cetera”).

Petitioner also argues that ink-jetting is “conducive to depositing multiple coats, allowing for the deposition of thicker layers.” Pet. 79. Again, so can Weaver’s existing method that used multiple nozzles, each depositing one layer of material, as Mr. Humphrey confirms. *See* Fig. 8 (annotation by Petitioner below);

EX2046-Humphrey, ¶137; *see also* ¶137 (solvent in ink-jetting ink would dissolve previously deposited material such that “multiple coats would increase the risk of the solution re-dissolving a portion of already deposited and dried ink material and the risk of the materials seeping to adjacent regions”). Additionally, if Sturm’s inkjet printing result is any indication, it may take more than a dozen passes in order to get the desired thickness. EX2046-Humphrey, ¶137 (Sturm’s inkjet printed layers are about 40-70nm, Suzuki indicated that at least 500 nanometer would be needed to provide the needed sealing in conjunction with a barrier layer). There is no evidence of the resulting film planarity, and there is no comparison of the thickness obtainable via inkjet with those from other techniques, or the processing time needed to obtain the same thickness. Indeed, in 2001, Burrows et al. claimed that evaporative technique used to form a covered substrate could proceed at rates up to 1  $\mu\text{m/s}$  and form up to 5 $\mu\text{m}$  of polymer layer in one pass. EX2037, 77. In contrast, as noted above, Sturm could only create 40-70 nm thick film in one pass. EX1013-Sturm, Fig. 1B, 4:22-24.

As to scalability, there is no explanation why the various evaporation processes or spraying process are any less scalable. Notably, Burrows proposed the same wrap-around structure as Weaver. *Compare* EX1009 and Weaver. But for continuous roll-to-roll (the same as Weaver’s web process), Burrows (which was filed after the ‘389 patent’s conception date) only proposed a mask-based

process, which Mr. Humphrey confirms would not suggest inkjet printing to a POSITA. Burrows, 8:10-21, 7:8-25; EX2046-Humphrey, ¶138; EX2045 (“... inkjet printing (inkjet) creates patterned films without using a mask”); EX2044-Shimoda, 5:45-50 (“In an inkjet method, ... processes such as mask fabrication and etching ... can be eliminated.”). Samsung’s expert, Dr. Antoniadis (a former OSRAM employee in charge of the OLED program), claimed that between flash evaporation and inkjet, “flash may be even faster” and that “[i]nkjet printing cannot do a large area uniformly,” but must be done “step-by-step.” EX2031-Antoniadis, 136:1-23.

Mr. Humphrey also confirms that Weaver’s methods can provide scalability by ganging together large numbers of nozzle heads to “rapidly print over large areas.” Pet. 79; EX2046-Humphrey, ¶¶139-140. “For example, Figure 8 shows just one nozzle array for one cross-sectional area, and in practice, there are other cross-sectional areas (not shown) with similar nozzle arrays.” *Id.*

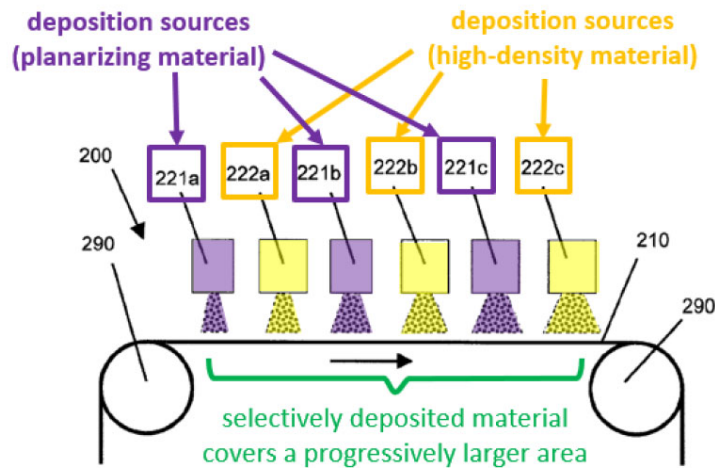


Fig. 8

(Pet. 66).

As Mr. Humphrey explains:

[I]n the above annotated figure, the nozzles are above the substrate and do not contact the moving substrate, and therefore have a minimal risk of contamination. In addition, each nozzle in the nozzle array directs the desired amount of materials to the substrate to add one coated layer to form multiple coats as illustrated in Weaver Figures 4-6, and there can be multiple nozzle arrays for scalability. Put another way, Weaver's method already provides the same alleged benefits as ink-jetting, but does so without using an ink-jet head. A [POSITA] would not have substituted Weaver's method with ink-jetting that does not seem to have any added benefits, but would require an ink-jet printer that adds costs, but no associated benefits.

EX2046-Humphrey, ¶140. Ganging together more nozzles also increase

variability, which given the immaturity of the technology would not be considered

suitable. *Id.*, ¶101 (example of how small variability leads to large drop in yields). The Petition and the associated Subramanian declaration do not provide any evidence to the contrary, as they do not explain why a POSITA would have replaced Weaver’s existing method with ink-jetting when the existing method already provides the alleged functionality of ink-jetting at lower cost (without the need for an ink-jet printer). In effect, Petitioner at most argues that ink-jetting could be used for Weaver, but it does not provide any cogent reason for why a POSITA would have replaced Weaver’s method with ink-jetting. *Belden*, 805 F.3d at 1073 (“[O]bviousness concerns whether a skilled artisan not only could have made but would have been motivated to make the combinations or modifications of prior art to arrive at the claimed invention.”).

That “ink jetting *may be* used as part of a continuous or web-based processing technique as taught in Weaver” (Pet. 80) does not mean a POSITA would have done so. As in *Virtek*, Petitioner here also fails to provide any competent evidence on why a POSITA would have replaced Weaver’s existing method with ink-jetting.

Nor is there any competent evidence that ink-jetting is “one of a finite number of predictable solutions for ‘selectively applying an organic passivation material’ for OLEDs.” *Contra* Pet. 80. Although Weaver gave many specific examples of suitable techniques for depositing the planarization layers—ranging

from dipping, spin coating, spraying to various evaporation techniques (OVPD, CVD, flash evaporation) and sputtering—ink-jetting was not mentioned. EX1008, [0035], [0057].

Dr. Subramanian criticizes Mr. Humphrey for ignoring Weaver’s use of the phrase “and so forth” when describing suitable methods for depositing the organic layer. 2025-05-30\_final, 130:14-131:14. But if any known roll-to-roll process could be a candidate as Dr. Subramanian seems to argue, there would be a large number of options given the number of known roll-to-roll printing techniques (whether suitable or not).<sup>5</sup> “The existence of many other choices indicates that ink-jetting is not just one of a finite number of choices, but that it is one of a large number of choices.” EX2046-Humphrey, ¶132.

At any rate, neither Burrows at Vitex which specialized in developing a commercial version of PML nor Weaver at UDC who collaborated with Burrows, (*see* EX2037; EX2031-Antoniadis, 42:4-14) mentioned inkjet, suggesting that it was not obvious to persons working in the field to use inkjet to obtain a planarization layer for TFE. *See also* EX2037\_Burrows2001 (describing a vacuum based process to obtain covered substrate); EX2020\_2025-05-30-final, 131:15-132:3 (Dr. Subramanian expecting that UDC “to be reasonably knowledgeable”

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<sup>5</sup> *See* EX2035-2015-02-13-DOE\_Draft\_Report at 3-7, 22 (not specific to OLEDs)

about typical processes used to deposit materials). That is for a good reason: as explained in Section VI.C, inkjet printing (whether for EL or for encapsulation) was still a very immature technology and with no demonstration of being capable of forming a planarizing film with sufficient thickness and planarity over the area needed for encapsulation. There is thus no competent evidence that a POSITA would have used ink-jetting in the context of Weaver.

**D. Petitioner provides no competent reason for depositing Weaver’s organic layer using screen printing (claim 36)**

Citing to Palanisamy, Petitioner also argues that a POSITA would have replaced Weaver’s web-based processes shown in Figure 8 with screen printing. Pet. 81-84 (claim 36), 71-73 (relying on Weaver Figure 8 for depositing planarization layer). But Palanisamy does not even disclose a planarization layer, only passivation. *See* Palanisamy, [0024]-[0026]; EX2046-Humphrey, ¶142. The combination therefore does not disclose depositing a planarization layer using screen printing as claimed.

Petitioner’s argument that “screen printing was [allegedly] among the ‘techniques known in the art’ for selectively depositing [a] planarizing layer” (Pet. 81-82) fails as a matter of law. *Virtek* made clear that even when two alternatives are interchangeable, that does not supply a reason for replacing one with the other. 97 F.4th at 886-87. Here, Petitioner does not even claim screen-printing and

Weaver's existing processes are interchangeable.

Screen printing is also not “one of a finite number of predictable solutions” for Weaver's roll-to-roll process as there existed many other known roll-to-roll printing process. Weaver, [0057]; EX2035-2015-02-13-DOE\_Draft\_Report, at 3-7, 22 (not specific to OLEDs).

There is also no evidence that screen printing is suitable for successively depositing Weaver's progressively larger cooperative barrier layers. Pet. 82-84. Palanisamy, for example, does not involve depositing multiple layers successively. *See* Palanisamy, [0024]-[0026]; EX2046-Humphrey, ¶142. The Sue Carter work Dr. Subramanian referenced at his deposition did not relate to OLED encapsulation, planarization layer or roll-to-roll process. *See* EX2040\_US6,605,483, EX2041\_US7,115,216; Humphrey, p.72 n.13.

Petitioner also argues that a POSITA would have used screen printing for “rapid processing time at lower temperatures,” and “enabl[ing] a range of material viscosities to be used for Weaver's planarizing layer 151a.” Pet. 83 (cleaned up). But as Mr. Humphrey observes, to obtain Weaver's structure, “a new screen would need to be set down and then removed for each successive layer,” and “[t]his would add process steps and reduce, rather than increase, the process speed.” EX2046-Humphrey, ¶143. Nor is there any evidence that screen-printing would operate at a lower temperature or that being able to use a range of material

viscosities is a desirable or even suitable choice for Weaver's continuous process.

Pet. 82-84.

In summary, there is no competent evidence that a POSITA would have used screen printing in Weaver's roll-to-roll process.

**E. Petitioner provides no competent reason for depositing Weaver's organic layer using a shadow mask (claim 37)**

Pointing to Burrows "encapsulation techniques that are [allegedly] very similar to those of Weaver," (Pet. 85), Petitioner argues that it would be obvious to use a shadow mask to deposit Weaver's organic layers. Petitioner asserts that "Weaver's Figure 8 apparatus for web-based processing of OLED devices" was "ready for improvement," but does not explain why a POSITA would have added a mask to Weaver's process that already achieved "selective deposition" without masks. Pet. 89; EX2020\_2025-05-30-Final, 134:20-135:8. Petitioner does not allege any drawbacks for Weaver's Figure 8 apparatus, making instead an attorney argument that "a shadow mask allows precise control of the positions on the substrate where the planarizing layers are formed." Pet. 90.<sup>6</sup> There is no

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<sup>6</sup> "[A]ttorney argument is not evidence" and has no weight. *Elbit Systems of Am., LLC v. Thales Visionix, Inc.*, 881 F.3d 1354, 1359 (Fed. Cir. 2018). Petitioner should also not be permitted to rely on the 8-page incorporated expert declaration

evidence that Burrow's masks, placed a distance away from the substrate, (Burrows, 8:10-22), would have improved precision over Weaver's directed nozzles. Pet. 90; EX2046-Humphrey, ¶148.

Likewise, Petitioner's allegation that "a shadow mask can be used in conjunction with other processes for depositing a layer of liquid material" and/or that it was a known technique (Pet. 85-90), even if true, show at most that a shadow mask *could have been* used, not that it *would have been* used, and thus fail to provide the requisite reason to modify. *Belden*, 805 F.3d at 1073; *Virtek*, 97 F.4th at 887-89. The truth is, the modification adds cost, process steps and increased risks of particulate contamination but no demonstrable benefits, and thus "would not be an improvement but a step-back." EX2046-Humphrey, ¶¶147, 92. A POSITA therefore would not have combined Weaver and Burrows.

Dated: June 20, 2024

Respectfully submitted,

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for its claim 37 analysis. *Cisco Sys., Inc. v. C-Cation Techs., LLC*, IPR2014-00454, Paper 12 (PTAB, Aug. 29, 2014).

**CERTIFICATE OF WORD COUNT**

I hereby certify, pursuant to 37 C.F.R. section 42.24, that the foregoing Patent Owner Preliminary Response contains 13,999 words, excluding the words in the table of contents, table of authorities, exhibit list, this certificate of word count, signature block and certificate of service. The word count is based on the word count of the Microsoft Word program used to prepare the Patent Owner Response.

/Susan M. Langworthy/  
Susan M. Langworthy

**CERTIFICATE OF SERVICE**

I hereby certify, pursuant to 37 C.F.R. section 42.6, that on December 11, 2024, a complete copy of the foregoing document **PATENT OWNER'S RESPONSE and EXHIBITS 2019-2028, 2030-2032, 2034-2047 and 2100** were served by electronic mail, as agreed to by the parties, upon the following:

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