

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG DISPLAY CO., LTD.,
Petitioner,

v.

PICTIVA DISPLAYS INTERNATIONAL LTD.,
Patent Owner.

Case No. IPR2026-00129
Patent No. 12,158,250

PATENT OWNER'S PRELIMINARY RESPONSE



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EXHIBIT LIST

Exhibit ¹	Description
2001	250 Disclaimer
2002	2024-10-28 Declaration of P. Morgan Pattison, Ph.D. from IPR2024-01095
2003	Kim, H. M., Seo, J. H., Han, W. K., Lee, K. H., Kang, H. J., Yoon, S. S., & Kim, Y. K. (2011), Improvement of Mixed Electron Transport Structure Red Phosphorescent Organic Light-Emitting Diodes, <i>Molecular Crystals and Liquid Crystals</i> , 538(1), 53–60
2004	Arunandan Kumar, Ritu Srivastava, Priyanka Tyagi, D. S. Mehta, M. N. Kamalasanan, Effect of doping of 8-hydroxyquinolinatolithium on electron transport in tris(8-hydroxyquinolino)aluminum), <i>J. Appl. Phys.</i> 1 June 2011; 109 (11): 114511
2005	Chan Seok Oh, Jun Yeob Lee, High triplet energy n-type dopants for high efficiency in phosphorescent organic light-emitting diodes, <i>Organic Electronics</i> , Volume 16, 2015, Pages 34-39
2006	Intentionally Left Blank
2007	T. Sasaki, T. Oono, T. Shimizu, H. Fukagawa, <i>Effects of Energy-Level Alignment on Operating Voltages of Blue Organic Light-Emitting Diodes</i> . <i>Adv. Mater. Interfaces</i> 2023, 1, 2201925
2008	Intentionally Left Blank
2009	Intentionally Left Blank
2010	Intentionally Left Blank
2011	Intentionally Left Blank
2012	Intentionally Left Blank
2013	Intentionally Left Blank

¹ To the extent possible, Patent Owner uses the same exhibit numbering as in IPR2024-01095 to make the cross-referencing easier for the Director and the Board.

Exhibit ¹	Description
2014	Intentionally Left Blank
2015	Intentionally Left Blank
2016	Intentionally Left Blank
2017	Intentionally Left Blank
2018	2025-05-05 Declaration of P. Morgan Pattison, Ph.D. from IPR2024-01095
2019	2025-04-24 Holmes Transcript
2020	2025-04-18 Holmes Transcript
2021	Intentionally Left Blank
2022	Screen shot of https://www.ossila.com/products/8-quinolinolato-lithium (last visited 05/04/2025)
2023	Jun Yeob Lee, <i>Efficient electron injection in organic light-emitting diodes using lithium quinolate/Mg:Ag/Al cathodes</i> , Journal of Industrial and Engineering Chemistry 14, 676–678 (2008)
2024	Kim, B. Y. et al., <i>Efficient Green Phosphorescent Organic Light-Emitting Diodes Depending on Concentration of Lithium Quinolate in Electron Transport Layer</i> , Journal of Nanoscience and Nanotechnology, Vol. 13, 7998-8001 (2013)
2025	Intentionally Left Blank
2026	Intentionally Left Blank
2027	C. Schmitz et al., <i>Lithium-Quinolate Complexes as Emitter and Interface Materials in Organic Light-Emitting Diodes</i> , Chem. Mater., 12, 3012-3019 (2000)
2028	Intentionally Left Blank
2029	Intentionally Left Blank

Exhibit¹	Description
2030	Intentionally Left Blank
2031	District Court Claim Construction Order
2032	2025-09-03 Holmes Deposition Transcript
2033	Verdict Form, Dkt. 577 in <i>Pictiva Displays International Ltd. v. Samsung Electronics Co., Ltd.</i> , et al, Case No. 2:23-cv-00495-JRG
2034	[Under Seal] Excerpted Trial Testimony from October 28, 2025 and October 30, 2025 in <i>Pictiva Displays International Ltd. v. Samsung Electronics Co., Ltd. et al</i> , Case No. 2:23-cv-00495-JRG (E.D. Tex.)
2035	Xu Wei, et al., Organic Light-Emitting Diodes by Doping Liq into an Electronic Transport Layer, <i>Journal of Semiconductors</i> 2008, Vol. 29, No. 1 (“Wei”) (JX-48)
2036	U.S. Publication No. 2006/0134460 A1 (Kondakova) (DX-32)
2037	Excerpted PD4 Kirk Schanze Demonstratives (PD4.29)
2038	Screen shot of https://www.ossila.com/products/balq
2039	Screen shot of https://www.ossila.com/products/tpbi
2040	[Under Seal] Samsung’s Motions for Judgment as a Matter of Law Under Rule 50(B), Dkt. 617 in <i>Pictiva Displays International Ltd. v. Samsung Electronics Co., Ltd.</i> , et al, Case No. 2:23-cv-00495-JRG
2041	Email correspondence regarding litigation developments dated November 6, 2025
2042	[Under Seal] Petitioner's Response to Patent Owner's Statement Regarding District Court Trial in IPR2024-01095
2043	Email servicing '250 claim chart
2044	Samsung’s Opposition to Plaintiff’s Second Motion for Leave to Amend Complaint, Dkt. 117 in <i>Pictiva Displays International Ltd. v. Samsung Electronics Co., Ltd.</i> , et al, Case No. 2:23-cv-00495-JRG

Exhibit ¹	Description
2045	Pictiva's Motion to Withdraw Plaintiff's Motion for Leave To File Second Amended Complaint (Dkt. 111 & 112), Dkt. 125 in <i>Pictiva Displays International Ltd. v. Samsung Electronics Co., Ltd.</i> , et al, Case No. 2:23-cv-00495-JRG
2046	[Under Seal] Patent Owner's Statement Regarding District Court Trial in IPR2024-01095
2047	Patent Owner's Response in IPR2024-01095
2048	[Under Seal] Samsung's Reply in Support of its Motions for Judgment as a Matter of Law Under Rule 50(B), Dkt. 636 in <i>Pictiva Displays International Ltd. v. Samsung Electronics Co., Ltd.</i> , et al, Case No. 2:23-cv-00495-JRG
2049	Redacted version of EX2040
2050	Redacted version of EX2048
2051	EX3002 from IPR2024-01095
2052	EX3102 from IPR2024-01095
2053	Reply Declaration of Russell J. Holmes, Ph.D. In Support of Petition for Inter Partes Review of U.S. Patent No. 11,828,425 from IPR2024-01095
2100	U.S. Patent No. 7,911,129 to Hofmann et al. (Novaled AG)
2101	K. Walzer et al., <i>Highly Efficient Organic Devices Based on Electrically Doped Transport Layers</i> , 107 Chem. Rev. 1233-71 (2007)
2102	Intentionally Left Blank
2103	Intentionally Left Blank
2104	Min Seok Ki et al., <i>Improved Thermal Stability and Operational Lifetime of Blue Fluorescent Organic Light- Emitting Diodes by Using a Mixed-Electron Transporting Layer</i> , ACS Materials Lett. 4, 1676–1683 (2022)

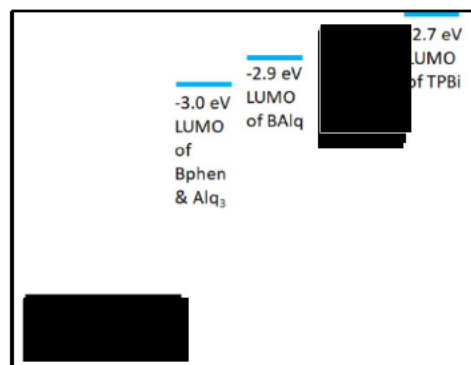
Exhibit ¹	Description
2105	T. Sasaki et al., <i>Effects of Energy-Level Alignment on Operating Voltages of Blue Organic Light-Emitting Diodes</i> , Supporting Information for Adv. Mater. Interfaces 2023, 10, 2201925, available at DOI: 10.1002/admi.202201925 (supporting information for EX2007)

I. INTRODUCTION

The challenged U.S. Patent No. 12,158,250 (the '250 patent') is a continuation of U.S. Patent No. 11,828,425 ("the '425 patent"). To simplify issues, Patent Owner has filed a disclaimer (EX2001) to disclaim certain claims of the '250 patent. The remaining claims of the '250 patent contain all limitations of claim 2 of the '425 patent. *See* Section II.C. Claim 2 of the '425 patent was the subject of a jury trial completed in October 2025, where the jury found the claim infringed and not invalid. EX2033 at 4, 6.

Like claim 2 of the '425 patent, the remaining claims of the '250 patent also all require a combination of an Ir-containing emission layer and an "n-doped" electron transport layer ("ETL") with Liq. *See* Section II.C. In the district court, Petitioner and the real parties-in-interest (collectively "Samsung") insisted that to show an n-doped ETL with Liq, Patent Owner must demonstrate that Liq's HOMO is higher than the LUMO of the ETL material to which Liq is added. EX2040 at 8-11; EX2034, 859:14-16, 868:19-25 (testimony by Petitioner's engineer, Seo) (cited on p. 11 of EX2040, Samsung's post-trial motion), 917:7-13 (Katona, Samsung expert) (discussing alleged prior art Clix2); Section IV.A. But the Petition

does not apply the same interpretation and does not address the fact that the LUMOs



of the prior art ETLs also lie far above Liq's HOMO. *See* illustration (blue for LUMOs of the relied-on prior art ETLs and red for LUMOs of accused products).

Under *Revvo Technologies, Inc. v. Cerebrum Sensor Technologies, Inc.*, IPR2025-00632, Paper 20 (Squires November 3, 2025) (precedential) (“*Revvo Technologies I*”), Petitioner is required to explain why it has adopted different claim constructions in the district court and before the PTAB; and it has not done so here. Thus, under Petitioner's own claim interpretation and standard for determining “n-doping”/“n-doped” advanced in the district court, the Petition fails as it misses a combination of elements 1G/1I, 6G/6I, 10G/10I, 11G/11I and 16G/16I that are either recited or incorporated by the remaining claims.

Petitioner also has not shown that the combinations disclose the above limitations under Patent Owner's interpretation of the term advanced in the district court. *See* Section IV.B. In particular, Patent Owner's expert, Dr. Schanze, explained to the jury that “[n]-doping is increasing the concentration of electrons or number of electrons.” EX2034, 423:11-12. Here, the unpatentability grounds require either a combination of Suzuki and Ma or Diekmann and Ma. The Petition makes no attempt to show that the incorporation of Ma's Liq in Suzuki or Diekmann would result in such an increase in the number or concentration of electrons. *See* Pet., 26-29, 59-62.

Petitioner's obviousness argument also presupposes that Liq is “interchangeable” with n-dopants used by Suzuki and Diekmann. *See id.* Petitioner,

however, fails to inform the Board that its alleged “prior art” PHOLED system Clix2, supposedly [REDACTED], did not have an n-doped [REDACTED] even though the [REDACTED] consisted of a mixture of [REDACTED]. *See* EX2034, 916:22-917:13 (trial testimony from Samsung’s expert) (*e.g.*, “Q: And does this [REDACTED] include [REDACTED]? A. It does. Q: Okay. Is this an N-doped [REDACTED]? A: I don’t believe it’s been shown that it is.”); 920:8 (Petitioner’s counsel: “Now, Clix2 doesn’t use an N-doped [REDACTED]”).² Put another way, the only “prior art” system identified by Samsung that combined PHOLED and [REDACTED]-containing [REDACTED] did not have an n-doped [REDACTED]. This directly contradicts Petitioner’s assumption that Liq was allegedly “interchangeable” with other n-dopants and that Suzuki’s or Diekmann’s ETL would remain n-doped if its n-dopant was replaced by Liq. *See* Pet. 28-29, 61-62.

Samsung’s expert in the district also did not testify that a POSITA would be motivated to modify Clix2’s non-n-doped [REDACTED] to an n-doped [REDACTED]. Instead, he merely stated that “if one were motivated to N-dope the [REDACTED], this prior art [Wei]³

² Petitioner does not dispute that the ’250 patent is entitled to a priority date of December 2008.

³ Wei and Ma (EX1011) have materially the same disclosures. *Compare* EX1011_Ma *with* EX2035_Wei, including their abstracts, figures, experimental details, results and discussions, and conclusions. *See* pp. 13–15 below.

would have been evidence that you could indeed go ahead and do that.” EX2034, 920:8-14. These omitted facts are fatal to Petitioner’s obviousness theory because they show (1) there is no reasonable expectation of success in obtaining a PHOLED with an [REDACTED] n-doped by [REDACTED] by adding [REDACTED] to the [REDACTED]; and (2) there is also no motivation for a POSITA to modify known system to n-dope the [REDACTED] with [REDACTED].

For these and other reasons stated below and in the discretionary denial brief, the Director should deny the Petition.

II. BACKGROUND

A. Overview of the ’250 Patent

The ’250 patent (EX1001) relates to organic light-emitting diode (OLED) technology at the heart of modern smartphones, televisions, wearables, computers and other devices. OLED technology provides higher resolutions, greater brightness, thinner panels, and higher power efficiency than prior technologies. The ’250 patent resulted from a collaboration between OSRAM engineers who designed the OLEDs and industrial designers who proposed applications that could take advantage of the inventive OLEDs.

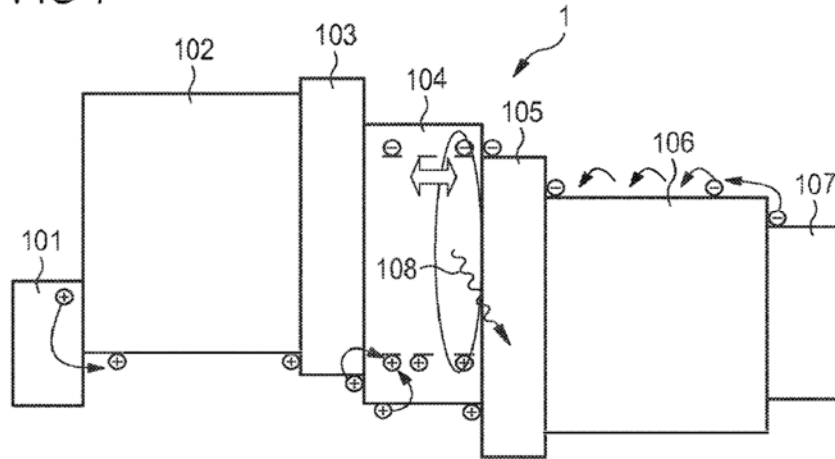
The ’250 patent is directed to and claims OLED devices with a phosphorescent “iridium-containing compound.” EX1001, 88:17-19. Unlike fluorescent emitters that emit light only from singlet excitons, which limits their quantum efficiency to 25%, phosphorescent emitters emit light from the triplet

excitons with rapid conversion of singlet excitons to triplet excitons, “increasing the maximum possible efficiency of the OLED to 100%.” EX1003, ¶¶31-32. Thus, quenching of triplet excitons, including by dopants diffused from a doped ETL, is a far more serious concern for a phosphorescent system than for a traditional fluorescent system with already low efficiencies. EX2018, ¶45; EX2020_2025-04-18-Holmes, 313:19-316:19. Consequently, material must be carefully chosen to avoid quenching the triplet excited state in a PHOLED, as triplet quenching would then make the entire system unsuitable for OLED application. EX2002, ¶¶43-44.

Structurally, the '250 patent's “organic light-emitting diode” has “an organic layer sequence,” “a radiation exit area,” “an encapsulation,” and at least one “carrier.” EX1001, 1:34-37, 6:15-17. The encapsulation “forms a seal of the organic layer sequence against environmental influences.” *Id.* at 1:42-44. The organic layer sequence includes a “radiation emitting region” with an “emission layer” to “generate[] electromagnetic radiation in the spectral range from infrared radiation to UV radiation during operation,” “an electron transport layer”—which may be n-doped—as a “charge carrier transport layer[],” and “an emission layer comprising an iridium-containing complex.” *Id.* at 1:37-41, 2:21-23, 3:34-35, 88:17-19.

Figure 1 illustrates an exemplary “organic light-emitting diode 1” shown in a schematic band diagram:

FIG 1



Id., Fig. 1. From left to right, Figure 1 depicts:

- an anode (“first electrode 101”);
- a “hole transport layer 102” for “transport[ing] the positive charge carriers toward the radiation-emitting region 104”;
- “an electron barrier layer 103, which prevents the penetration of electrons from the radiation-emitting region 104 into the hole transport layer 102”;
- a radiation-emitting region 104, which “[generates] electromagnetic radiation”;
- “a hole barrier layer 105, which prevents the penetration of positive charge carriers into the adjoining electron transport layer 106”;
- an electron transport layer 106, which “adjoins the hole barrier layer 105 and transports negative charge carriers—electrons—from the ... cathode[] to the radiation-emitting region 104”; and

- a cathode (“second electrode 107”).

Id. at 24:24-25:4; *see* EX2002, ¶¶35-41. The hole-transport layer 102 and electron transport layer 106 comprise “a matrix material that is p- and n-doped, respectively.” EX1001, 25:5-10. “Injection” layers can be added to the cathode or anode to improve electron and hole injection into the transport layers. *E.g., id.* at 28:27-30.

B. The Examiner Reviewed the Same Asserted Art Before Issuing the ’250 Patent

The ’250 patent is a continuation of the ’425 patent, which is the subject of IPR2024-01095 (“the ’425 IPR”).⁴ During the prosecution of the ’250 patent, the Applicants submitted the ’425 IPR petition and supporting exhibits. *See* EX1001, 3 (“Other Publications,” listing the ’425 petition, certified translations for Diekmann and Suzuki, Holmes declaration, Ma and Lee). The Petition asserts the same art and advances the same arguments as in the ’425 IPR. *Compare* Pet. with EX1049, EX1050. The examiner has thus already “considered” the same art and arguments as presented here before allowing the claims. EX1002-503, 491-496.

C. The Remaining Claims of the ’250 Patent Are Narrower Than and Include the Limitations of Claim 2 of the ’425 Patent

Claim 1 of the ’250 patent adds the underlined text below in Element 1D, but

⁴ Patent Owner will seek Director Review of the ’425 IPR because the Board failed to properly consider and did not address the district court proceeding.

is otherwise identical to claim 2 of the '425 patent. Claims 2-5 depend on claim 1 and also include all the limitations of claim 2 of the '425 patent.

'250 patent, claim 1 (numbering as on Pet. viii)	'425 patent, claim 2 (numbering as in 495 Action, <i>see</i> EX2037 at PD4.29)
1Pre. A device comprising:	1a. A device comprising:
1A. an organic light-emitting diode comprising:	an organic light-emitting diode comprising:
1B. an organic layer sequence,	1b. an organic layer sequence,
1C. a radiation exit area, and	a radiation exit area, and
1D. an encapsulation <u>wherein the encapsulation forms a seal of the organic layer sequence against environmental influences.</u>	an encapsulation,
1E. wherein the organic layer sequence and the encapsulation are disposed on a carrier,	1c. wherein the organic layer sequence and the encapsulation are disposed on a carrier,
1F. wherein the organic layer sequence comprises at least one radiation-emitting region configured to generate electromagnetic radiation in a spectral range from infrared radiation to UV radiation during operation,	1d. wherein the organic layer sequence comprises at least one radiation-emitting region configured to generate electromagnetic radiation in a spectral range from infrared radiation to UV radiation during operation,

'250 patent, claim 1 (numbering as on Pet. viii)	'425 patent, claim 2 (numbering as in 495 Action, <i>see</i> EX2037 at PD4.29)
1G. wherein the organic layer sequence comprises an electron transport layer that is n-doped; and	1e. wherein the organic layer sequence comprises an electron transport layer that is n-doped; and
1H. wherein the organic layer sequence comprises an emission layer comprising an iridium-containing compound; and	1f. wherein the organic layer sequence comprises an emission layer comprising an iridium-containing compound.
1I. wherein the electron transport layer comprises 8-hydroxyquinolinolato-lithium.	2. The device of claim 1, wherein the electron transport layer comprises 8-hydroxyquinolinolato-lithium.

Likewise, other remaining claims of the '250 patent include all the limitations of claim 2 of the '425 patent, as summarized below. The element numbering below for the '250 patent follows that set forth on pages x-xvii of the Petition.

'425 patent	'250 patent			
Claim 2	Claim 9	Claim 10	Claim 12	Claim 16
1Pre to 1d	6Pre to 6F	10Pre to 10F	11Pre to 11F	16Pre to 16F
1e	6G	10G	11G	16G
1f	6H	10H	11H	16H
Claim 2	Claim 9	10I	Claim 12I	16I

D. The Jury Found Claim 2 of the '425 Patent Infringed and Not Invalid in the 495 Action

In a trial concluded in October 2025 in *Pictiva Displays International Ltd. et al. v. Samsung Electronics Co., Ltd. et al.*, Case No. 2:23-cv-00495-JRG (E.D. Tex.) (Gilstrap, J.) (“the 495 Action”), a jury found that Samsung willfully infringed claim 2 of the '425 patent and that the claim was not invalid. EX2033 at 4, 6. As noted above, the remaining claims of the '250 patent include the same limitations as claim 2 of the '425 patent.

The co-defendants in the 495 Action are real parties-in-interest in this IPR. *See* Pet. 2. In addition, Petitioner’s engineers voluntarily testified at the trial. *See, e.g.*, EX2034, 838:20-25.

E. In the '425 IPR, The Board Failed to Consider the Inconsistent Positions Taken By Samsung in the District Court

The Board invalidated claim 2 of the '425 patent in IPR2024-01095 in light of (1) Diekmann and Ma and (2) Suzuki and Ma. *See* IPR2024-01095, Paper 54. As will be explained in further detail in the forthcoming Request for Director Review, the Board’s final written decision failed to consider the inconsistent positions that Petitioner took in the district court. The Board also mistakenly assumed that Liq would be interchangeable with other n-dopants, and it would thus be obvious to substitute other n-dopants with Liq with a reasonable expectation of success. That assumption was of course incorrect given Petitioner’s own failure to obtain an n-

doped [REDACTED] in a PHOLED by mixing [REDACTED] with an organic electron transport material.

See EX2034, 916:22-917:13.

F. The '250 Patent Was Withdrawn from District Court Cases to Avoid Delay

Months after Pictiva filed the 495 Action, Samsung sought to dismiss the case for failing to name Pictiva's parent company. In an excess of caution, Pictiva and its parent company refiled the complaint in Case No. 2:24-cv-00532 ("the '532 Action"), in addition to also naming the parent company in the 495 Action.

In the meantime, the '250 patent issued and Pictiva moved to amend the complaint to add the '250 patent. Pictiva served Samsung with the '250 patent's infringement chart in both cases. EX2043. Samsung then sought to use the inclusion of the '250 patent as a reason to delay the 495 Action's trial schedule. EX2044 at 6-9. To avoid the delay and to streamline the issues for trial, Pictiva withdrew its request for leave to add the '250 patent. EX2045.

III. STATE OF THE ART

For the remaining claims of the '250 patent, the Petition requires either a combination of Suzuki and Ma or Diekmann and Ma. In particular, the Petition relies on Suzuki and Diekmann for their disclosures of Ir-containing phosphorescent OLED ("PHOLED") with an n-doped ETL and Ma for its disclosure of a BPhen ETL allegedly n-doped by lithium quinolate ("Liq"). *See* Pet. 26-29, 59-62. Suzuki

and Diekmann do not disclose or suggest the use of Liq as n-dopants.

Ma describes a fluorescent OLED whose emission layer consists of pure Alq₃, as opposed to a phosphorescent emission layer doped with a small amount of Ir-based emitter materials. *See* EX1011_Ma, 811 (showing 20nm Alq₃ between hole injection material NPB and mixed ETL BPhen:y wt% Liq). This is also the case with the Kido-Endo paper (EX1034), the only other reference that Dr. Holmes identified as disclosing n-doping of Liq into an ETL before the '250 inventions. *See* EX2032_Holmes, 222:11-223:8, 60:13-14 (“In both Ma and in Endo, yes, the light emission is coming from Alq₃.”).

In the district court, Samsung identified an OLED panel called “Clix2” as prior art, which allegedly included both an Ir-based emission layer and a mixed [REDACTED] consisting of [REDACTED] and an organic material. *See* EX2034, 916:22-917:13. This is the only alleged “prior art” identified by Samsung that included a [REDACTED]-containing [REDACTED] and PHOLED. Despite the presence of [REDACTED] in the [REDACTED], however, the [REDACTED] in Clix2 was admittedly *not* n-doped. *Id.*, 917:1-13 (e.g., “Q: And does this [REDACTED] include [REDACTED]? A. It does. Q: Okay. Is this an N-doped [REDACTED]? A: I don’t believe it’s been shown that it is.”); 920:8 (Petitioner’s counsel: “Now, Clix2 doesn’t use an N-doped [REDACTED]”).

That is, adding [REDACTED] to an organic ETL material in a PHOLED did not turn the [REDACTED] into an n-doped [REDACTED] as required by elements 1G/1I, 6G/6I, 10G/10I, 11G/11I and 16G/16I. Thus, contrary to Petitioner’s assertion, Liq was not “interchangeable”

with other n-dopants, and it cannot be assumed that an ETL would remain n-doped if its n-dopant was replaced by Liq or if Liq was added to the ETL material. *Contra* Pet. 28-29, 61-62.

Samsung's expert in the district court also did not testify that a POSITA would be motivated to modify Clix2's non-n-doped [REDACTED] to an n-doped [REDACTED]. Instead, he merely stated that "*if one were motivated* to N-dope the [REDACTED], this prior art [Wei] would have been evidence that *you could* indeed go ahead and do that." EX2034, 920:8-14. In other words, the expert neither asserted that there was a reason why a skilled artisan would have wanted to obtain an n-doped ETL in the PHOLED or that they would have combined Clix2 with Wei. Of note, Wei describes the same set of experiments and provides materially the same discussions as Ma. *Compare* EX1011_Ma with EX2035_Wei, including figures, background, experimental description, and results and discussions, conclusion.

EX1011 (Ma)	EX2035 (Wei)
Figure 1	Figure 1
Figure 2	Figure 4
Figure 3	Figure 6
Figure 3 inset	Figure 5
Figure 4	Figure 2

Figure 5	Figure 3
Figure 6, lower left figure (33wt% doped ETL)	Figure 7
Conclusion: “A good carrier balance is considered to be one of the most important factors in getting an excellent performance in OLEDs. In this paper, the p-i-n devices with a novel n-doping (33 wt.% Liq:BPhen) layer as ETL and a p-doped (0 wt.%, 0.3 wt.%, 2 wt.% and 4 wt.% F4-TCNQ:m-MTDATA) layer as HTL is fabricated. We have demonstrated the high current efficiency of 5.90 cd/A, power efficiency of 4.51lm/W, and a driving voltage of 4.10V at a current density of 20mA/cm² in Alq₃ based p-i-n OLEDs. The J-V comparison between electron-only and hole-only devices has been presented to find the reason for the significant improvement in performance and come to a conclusion that an effective carrier balance is achieved due to the enhanced conductivity of doped transport layers, leading to the enhanced efficiency in	Conclusion: “A good carrier balance is considered to be one of the most important factors for improving OLEDs. In this paper, we use Liq as a dopant to fabricate p-i-n devices with a novel n-doping (33wt% Liq: BPhen) layer as ETL and a p-doped (0, 0.3, 2 and 4wt% F4 TCNQ: m-MTDATA) layer as HTL. We have also demonstrated the high current efficiency of 5.90 cd/A, power efficiency of 4. 51lm/W, and a driving voltage of 4. 10V at a current density of 20mA/ cm² in Alq₃ based p-i-n OLEDs. The J-V comparison between the electron-only devices and hole-only devices has been presented to determine the reason for the significant improvement in performance. We conclude that an effective carrier balance (the number of holes is equal to the number of electrons) between holes and electrons is achieved due to the

our devices.”	enhanced conductivity of the transport layers, leading to enhanced efficiency in our devices.”
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Petitioner withheld this material information from the Board. The omitted evidence is fatal to Petitioner’s obviousness theory because it shows (1) there was no reasonable expectation of success and indeed failure by Petitioner itself in obtaining a PHOLED with an ETL n-doped by Liq; and (2) there was also no motivation for a POSITA to modify known PHOLEDs to n-dope the ETL with Liq.

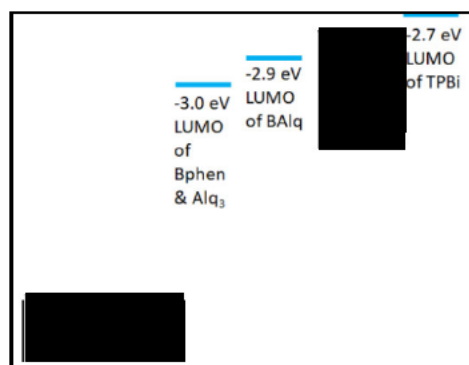
IV. ARGUMENTS

A. The Petition Fails Under the Claim Interpretation Petitioner Advanced in the District Court Because the Proposed Combinations Cannot Have n-Doped ETLs with Liq Under that Interpretation

All remaining claims of the ’250 patent require an “organic layer sequence [that] comprises an electron transport layer that is n-doped” and that the “electron transport layer comprises 8-hydroxyquinolinolato-lithium” (*i.e.*, Liq). *See* Pet. viii–xvii (elements 1G, 1I, 10G, 10I, 11G, 11I, 16G, 16I). The Petition interprets the combination of these two elements as requiring an ETL n-doped with Liq. *E.g.*, Pet. 26 (“It would have been obvious to a POSITA to use 8-hydroxyquinolinolato-lithium (‘Liq’) as the dopant in Suzuki’s n-doped ETL as taught by Ma. Ma discloses an OLED with an ETL n-doped with Liq and teaches its benefits.”); Pet. 59 (“It would have been obvious to a POSITA to use 8-hydroxyquinolinolato-lithium

(‘Liq’) as the dopant in Diekmann’s n-doped ETL as taught by Ma.”). The same limitations appear as the combination of element 1e and claim 2 in the ’425 patent. *See* pp. 8–9 above. Petitioner does not assert that the term “n-doped” in the ’250 patent should be interpreted differently than the same term appearing in the parent ’425 patent. Nor could it given the same specification shared by the two patents.

In the 495 Action involving the parent ’425 patent, Samsung argued and continues to argue that Liq n-dopes an ETL only if Liq’s HOMO is higher than the LUMO of the ETL material to which Liq is added. EX2040 at 8–11. The LUMOs of the prior art ETLs discussed in the Petition, however, also lie far above Liq’s HOMO. *See* illustration (blue for LUMOs of the relied-on prior art ETLs and red for LUMOs of accused products). The Petition does not even mention this requirement for n-doping that Samsung has advanced in the district court, let alone explain why a POSITA would have used Liq to n-dope these prior art ETLs with a reasonable expectation of success under Samsung’s interpretation of n-doping in the district court.



Specifically, at trial, Petitioner’s engineer testified that [REDACTED] does not n-dope the [REDACTED] in the accused products because the HOMO value for [REDACTED] is “lower than” the LUMO value of the organic ETL material it is mixed with:

Q. What is your role at Samsung Display?

A. I'm a principal engineer and I lead Materials Development Group.

...

Q. Okay. Now, what does this document tell us about whether or not the [REDACTED] is an N-dopant?

A. *This document shows us that [REDACTED] cannot be an N-dopant because when you look at the HOMO values for [REDACTED], that is indicated to be minus [REDACTED], and when you compare that to the LUMO values of the organic material, which is minus [REDACTED], it's lower than that. That's why.*

EX2034, 859:14-16, 868:19-25 (Seo) (cited on p. 11 of EX2040, Samsung's post-trial motion). Likewise, when discussing a prior art system, Samsung's expert testified:

Q. Okay. Is this an N-doped [REDACTED]?

A. I don't believe it's been shown that it is.

Q. What is the LUMO of the [REDACTED] organic material in this ETL?

A. The LUMO value for [REDACTED] is [REDACTED] EV, which is similar to what Dr. Seo testified yesterday for all of the allegedly infringing products.

EX2034, 917:7-13 (Katona, expert) (discussing alleged prior art Clix2).

Thus, in the district court, Samsung has insisted that Liq would only serve as an n-dopant if it has a HOMO that is higher than the LUMO of the ETL material so it can "result[] in electron donation to its host [ETL] material." EX2040 at 8 (alleging that "Dr. Schanze confirmed that one indicator of a material functioning as an n-dopant is having a highest occupied molecular orbital ('HOMO') value and lowest unoccupied molecular orbital ('LUMO') value that results in electron donation to its

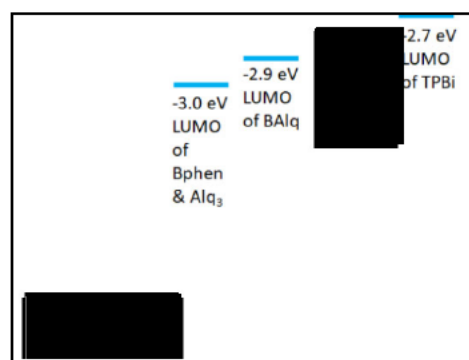
host material.”);⁵ *id.* at 9 (arguing that there is no infringement because “the un rebutted evidence for the Accused Products shows that [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]”); *id.* (arguing non-infringement based on Dr. Seo’s testimony “that the HOMO and LUMO values of the materials in the ETLs in the Accused Products confirm that they are not n-doped”); EX2034, 450:9-24, 449:9-24, 423:9-23 (Schanze cross) (Samsung counsel repeatedly attempted to get admission that n-doping occurs “as a situation where the HOMO of the electron donor is higher than the LUMO of the acceptor” so that an electron is transferred from the donor to the LUMO of the acceptor).

Hence, under Samsung’s own interpretation of “n-doping”/“n-doped” in the 495 Action, for both infringement and invalidity, n-doping by Liq requires Liq’s HOMO be higher than the LUMO of the ETL material to which Liq is added. However, this condition is not met for the ETL materials in the prior art references that form the basis of the Petition. *See*



⁵ Dr. Schanze explained that n-doping can occur by other mechanisms, including by using “electrode” rather than Liq as “a source of electrons to increase a concentration in the electron transport layer” as in the accused products. EX2034, 471:25-473:9.

illustration and table below.

ETL Material	ETL's LUMO Level	Liq's HOMO higher than ETL's LUMO? ⁶	n-doped?
BPhen	-3.0 eV (Ma, 813; EX1019, Fig. 1)	No	Allegedly yes
Alq ₃ ⁷	-3.0 eV (EX1034, L800)	No	Allegedly yes
BAIq	-2.9 eV (EX2038)	No	Allegedly yes
TPBi	-2.7 eV (EX2039)	No	Allegedly yes
██████████	██████████ ██████████ ██████████	██████████	██████████
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The Petition ignores this inconsistency and insists instead that it would be obvious for Liq to serve as n-dopants in these systems where the LUMOs of ETLs

⁶ HOMO and LUMO energy levels are all negative values. EX2034, 409:23-410:2. The HOMO of ██████████ is about ██████████ eV. *See* EX2022; EX2034 at 846:16-22.

⁷ Pet. 29 (“Alq₃ (identified as ETL in Suzuki)”; EX1009, 5 (Diekmann listing Alq₃, BAIq and TPBi as materials for ETL).

are—just like in Clix2 and the accused products—much higher than Liq’s HOMO. Pet. 26-29, 59-62.

In its Opposition to Patent Owner’s Statement on Discretionary Denial, Petition argues that “no party proposed a construction[.]” Paper 9 at 2. That is incorrect because a proposed construction may be explicit or implicit. *See, e.g., Sigray, Inc., v. Carl Zeiss X-Ray Microscopy, Inc.*, 137 F.4th 1372 (Fed. Cir. 2025) (rejecting the Board’s implicit and incorrect claim construction). In the ‘495 Action, by arguing when infringement occurs or not occurs, Petitioner engaged in implicit claim construction because it was trying to establish the scope and meaning of the claim. *Cf., id.* At 1377 (“If the outcome of the Board’s analysis establishes the scope and meaning of the claim, then the Board has implicitly construed the term.”). Petitioner is therefore wrong to state that it has not engaged in claim construction in the district court. It did; and its Opposition to Patent Owner’s Statement on Discretionary Denial does not explain why Petitioner did not engage in implicit claim construction by the non-infringement argument it advanced. Paper 9 at 9-11. Nor does it explain how the Petition can prevail under the claim construction and the non-infringement theory Petitioner advanced in the district court. *Id.* Nor does it provide any justification for why the same theory Samsung advanced for non-infringement should not apply to the materials used for the Petition. *Id.*

As the Director explained in *Revvo Technologies I*, “although a petitioner is

not necessarily precluded from arguing different claim construction positions before a district court and the Board, the petitioner should explain sufficiently why the different positions are warranted, even in instances that do not implicate Section 112(f).” *Revvo Technologies I* at 3-4. The Director explained that the Board’s rules on claim construction “discourage petitioners from seeking broader constructions at the Board to support a patentability challenge while seeking narrower constructions in litigation to avoid infringement liability.” *Id.* at 4. Here, Samsung is clearly seeking a narrow meaning of “n-doped”/“n-doping” in the district court to avoid infringement, but is running away from that same interpretation in this proceeding. That is exactly the gamesmanship that *Revvo Technologies I* seeks to prevent.

The Director has reversed institution decisions when Petitioner fails to apply the same claim construction position as in the district court, including when the inconsistency involved related patents having the same claim terms. *See, e.g., Revvo Technologies, Inc. v. Tire Stickers LLC*, IPR2025-00631, Paper 34 (Director Feb. 3, 2026) (“*Revvo Technologies III*”) (reiterating that when a petitioner advances alternative claim construction positions before the Board and a district court, the petitioner must, at a minimum, explain why alternative positions are warranted; and merely stating that the Petition applied Patent Owner’s construction is not sufficient); *Generac Power Systems, Inc. v. Champion Power Equipment, Inc.*, IPR2025-00805 & IPR2025-00951, Paper 40 (Director Feb. 3, 2026, vacating

institution decisions and denying petitions in two related IPRs following *sua sponte* Director Review, noting that although one of the patents was not asserted in the related litigation, the risk of inconsistency persists because the same claim terms appeared in related family members that were asserted the district court and challenged in the Petitions). Here, Petitioner advances one interpretation of “n-doped”/“n-doping”/n-dopant in the district court, and another before the Board, without offering any explanation as required by Rule 104(b).

Petitioner and its counsel cannot say that it is unaware of this inconsistency because (1) Petitioner’s engineer gave her testimony in October 2025 (EX2034, 859:14-16, 868:19-25 (Seo)), and (2) Patent Owner pointed out this inconsistency to Petitioner’s counsel in an email nearly two weeks before their filing of the Petition. *Compare* EX2041 at 3 (dated Nov. 6, 2025) *with* Pet. (filed Nov. 18, 2025). Petitioner also cannot claim ignorance of *Revvo Technologies I* because Pictiva cited the same case in its email to Petitioner’s counsel. EX2041 at 3. Thus, by not even attempting to address it in the Petition at all, it is clear that Petitioner is intentionally hiding the inconsistency from the Board, in contravention to its duty of candor and 37 C.F.R. § 42.51(b)(1)(iii).

Petitioner does not assert that the term “n-doped” should be interpreted differently in the related ’250 and ’425 patent, and yet it has made no attempt to analyze unpatentability under the interpretation of “n-doped” it advanced for the

'425 patent in the district court. Consequently, the Petition lacks any analysis on how the claims, as Samsung construes in the district court, are “unpatentable under the statutory grounds identified in paragraph [42.104(b)(2)],” in contravention to 37 C.F.R. § 42.104(b)(4).

Petitioner also cannot argue that it need not analyze invalidity under the interpretation of the term “n-doped” it advanced in the district court because by finding infringement, the jury must have rejected Samsung’s claim interpretation. The argument fails because Samsung is still advocating for its interpretation of “n-doped”/“n-doping” in its post-trial briefing (*see* examples cited on pp. 17-18 above; *see also generally* EX2040 at 8-12) and presumably will also do so in its appeal to the Federal Circuit in the 495 Action. Thus, there is a continued risk of inconsistent results caused by inconsistent claim construction. As such, under *Revvo Technologies I* and *Generac Power*, Petitioner must explain sufficiently why it should be permitted to advance different constructions in different forums or show how the claims are unpatentable under the construction it advanced in the district court. It has done neither and the Petition should therefore be denied. The appropriateness of denial is confirmed by the recent decision in *Revvo Technologies III*, where the Director reversed institution decision on a Petition that allegedly adopted Patent Owner’s construction which differed from Petitioner’s construction in the district court.

Finally, as Pictiva noted in the discretionary denial brief, the requirement Petitioner itself imposed in the district court on n-doping is particularly relevant given Petitioner's theory that a POSITA would have used Liq as a "molecular n-dopant." EX1003, ¶ 41; Pet. 27 ("Doping with large molecules like Liq"); EX2019, 58:6-7 (Petitioner's expert, Dr. Holmes testified "Ma's data supports that conclusion that Liq is a molecular n-dopant in Bphen"). As Pictiva previously explained, *molecular n-dopants* operate by transferring electrons from the n-dopant's HOMO to the acceptor's LUMO and their HOMO energy levels thus need to be at least comparable to the ETL's LUMO. EX2047 at 30; EX2101, Fig. 14 (molecular n-doping shown as involving transferring of electrons from Dopant's HOMO to organic matrix material's LUMO, with the caption noting that for "n-Type doping of molecular materials relevant for OLED...", "OLED requires stronger donors with a HOMO at about 3.0 eV").

Because the Petition's unpatentability theory assumes that Liq acts as a molecular n-dopant, under that unpatentability theory and the fact that Liq's HOMO at about minus 5.6 eV is far lower than the LUMO of the ETLs (at about minus 2.7–3.0 eV), a POSITA would not expect Liq to act as a molecular n-dopant as the Petition argues. *See, e.g.*, EX2100, 7:5-6 ("an n-doped electron transport layer from the organic matrix material O2"), 10:56-60 ("For a molecular n-dopant ... in the result the electron affinity [LUMO] of the matrix EA(O2) shall not drop below the

value, reduced by 0.5 eV, of the ionisation potential [HOMO] of the donor IP(D).”), 10:61-63 (“the following relationships result from the requirement of the doping capability: ... $EA(O2) > IP(D) - 0.5 \text{ eV}$ ”).

In the 425 IPR, Petitioner’s expert denied that this requirement was necessary because the requirement on HOMO-LUMO energy levels is for “doping by charge transfer” while he imposed no such requirement for n-doping in the combination. EX2019, 53:3-19 (discussing EX2100, “I’ll also note that the doping being alluded to here in this patent is a doping by charge transfer. And as we’ve already discussed, the conductivity can be improved via charge carrier number or mobility. And in Ma, they’re arguing based on their data that what’s happening is an increase in the mobility of electrons in the electron transport layer.”). But doping by charge transfer is precisely the definition Petitioner argued for infringement. *See* EX2040, 8-9 (Samsung selectively citing testimony regarding whether there would be “electron donation to [REDACTED] host material” to argue for non-infringement); EX2034, 472:11-473:9 (Dr. Schanze explaining that there are different n-doping mechanisms, and the one focused on by Samsung at trial, that “of adding electrons from a –from the dopant itself” (i.e., charge transfer from dopant to the organic matrix material) is just one of them). Simply put, Petitioner argued for a narrow construction of “n-doping” in the district court but a broad one here in the Petition. That is impermissible under *Revvo Technologies I*.

B. The Petition Also Fails under Under Pictiva's Claim Construction Because None of the References in the Grounds Disclose an n-Doped ETL with Liq Under Pictiva's Claim Construction

The Petition also cannot prevail under Pictiva's interpretation of "n-doped" advanced in the district court because it also did not show that inclusion of Ma's Liq-doped ETLs would result in an n-doped ETL under Pictiva's interpretation. At trial, Pictiva's expert, Dr. Schanze explained that "n-doping," as related to the term "n-doped," means "adding a material to some other material to increase the concentration or number of electrons in the material." EX2034, 323:22-324:2; *see also id.*, 423:11-12 ("N-doping is increasing the concentration of electrons or number of electrons"); 473:2-3 ("N-doping, just broadly speaking, is the act of increasing the number of electrons in a material."). Dr. Schanze also explained that n-doping can occur by using "electrode" as "a source of electrons to increase a concentration in the electron transport layer" as in the accused products. EX2034, 471:25-473:9. Dr. Schanze cited to testimony by Petitioner's witness to establish that Liq "is used to support electron injection into the cathode" and "helps increase the amount of electrons entering into the ET [electron transport] layer." *Id.*, 327:9-15 (Schanze); 592:10-14 (Seo, Petitioner's engineer) ("Q: Why does Samsung include [REDACTED] in its [REDACTED]? A. It is used to support electron injection in the cathode. Q: So [REDACTED] helps increase the amount of electrons entering into the [REDACTED]. Correct? A: I believe so.").

In contrast, Petitioner's own expert, Dr. Holmes, conceded that, in the Ma reference—the sole base reference for allegedly teaching using Liq as an n-dopant in an ETL—there is no evidence that Liq improves electron injection or increases electrons:

Q: So in Ma, does the addition of Lithium Q to the Bphen layer help reduce injection barrier?

A. That's a good question. I don't think it does.

EX2019 (Holmes), 291:16-22. In fact, when asked whether in Ma “there is an increase in the number of electrons,” Dr. Holmes replied that “Ma specifically focuses on the change in mobility and specifically via the improvement in hopping transport in the electron transport material.” EX2019, 47:12-18; *see also* Ma at 813 (reduced hopping distance accounts for observed electrical properties); EX2018, ¶110. Dr. Holmes's response confirms that Ma lacks any disclosure or suggestion that Liq's addition to ETL resulted in an increase in the number of electrons entering the ETL. Simply put, Ma does not disclose, and the Petition does not assert that Ma discloses, that Liq would lead to more electrons in the ETL, as required under Pictiva's understanding of the term “n-doping.”

Hence, although Ma characterizes Liq as an n-dopant, that characterization is based on interpreting n-dopant as “a dopant that increases the conductivity of an electron transport material.” EX2019, 46:14-47:10. Petitioner acknowledges,

however, increased conductivity “may be achieved by increasing the number *or mobility* of charge carriers.” EX1050 at 7. Merely increasing mobility without increasing the number or concentration of electrons does not qualify as n-doping under either party’s interpretation of n-doping advanced in the district court.

Because Ma does not disclose that the addition of Liq would cause its ETL to have an increased number of charge carriers, Petitioner has not shown that Suzuki, Diekmann or Ma discloses an ETL n-doped by ETL under Patent Owner’s claim interpretation either. Since none of these base references disclose the material limitations 1G/1I, 6G/6I, 10G/10I, 11G/11I and 16G/16I, the combinations also necessarily do not teach these limitations. The petition therefore fails under Patent Owner’s interpretation of n-doped as well.

To the extent that Petitioner argues that it has demonstrated unpatentability under Patent Owner’s interpretation of “n-doped” by showing that Liq could increase electron injection in some instances, that argument also fails. First, none of the other references form a basis for the grounds of challenge. Rule 42.104(b)(4) requires “[t]he petition [to] specify where each element of the claim is found in the prior art patents or printed publications relied upon,” where “the prior art patents or printed publications relied upon” refers back to the ones identified under Rule 42.104(b)(2) “for each ground.”

Second, in references such as Liu and Zheng, Liq was used as an electron

injection layer, and not electron transport layer. EX1028_Liu at 1 (“This paper will report our results on OLEDs where a combination of lithium quinolate as an electron injection layer with Al ... resulted in improved electron injection”), *accord* EX1003, ¶40; EX1039_Zheng, title (“Efficiency improvement of organic light-emitting diodes using 8-hydroxy-quinolate lithium as an electron injection layer”).

Third, Petitioner has presented no evidence Liq in modified Suzuki and Diekmann in specific would increase electron injection in the base ETL. *See, e.g., ActiveVideo Networks, Inc. v. Verizon Comm’ns, Inc.*, 694 F.3d 1312, 1327-28 (Fed. Cir. 2012) (obviousness requires demonstrating “how specific references could be combined, which combination(s) of elements in specific references would yield a predictable result, or how any specific combination would operate or read on the asserted claims” and generic testimony that “bears no relation to any specific combination of prior art elements” is insufficient to show obviousness). For example, Kumar studied the energy levels “for the Al/Liq doped Alq₃ junctions for different doping concentrations of Liq.” EX2004 at 114511-7. Petitioner identifies Alq₃ as the ETL in Suzuki. Pet. 29. The authors of the Kumar paper concluded “the effective injection barrier will be 0.11, 0.15, 0.17, 0.19, and 0.22 eV for 0, 15, 33, 50, and 100 wt. % Liq doped Alq₃, respectively.” *Id.* The authors further notes “as the energy barrier [] increases, the injected carrier density decreases.” *Id.* And they attributed the observed “*decrease in carrier density with increase in doping*

concentration ... to the increase in barrier height induced by decrease in energetic disorder.” *Id.* Put another way, contrary to the Petition’s incorrect assumption, adding Liq does not necessarily or even obviously result in improved electron injection or increased electron density. Rather, as with Ma’s Liq-containing ETL, mixing Liq with Alq₃ resulted in higher electron mobility of the resulting mixed ETL, but not increased number of electron carriers. *Id.*, Abstract (“The increase in current density with doping up to 33 wt. % was found to be due to an increase in electron mobility upon doping”). Given these facts, it is critical for the Petition to present evidence that after replacing its existing n-dopants with Liq, Suzuki and Diekmann’s ETLs would remain n-doped. No such showing has been made.

C. Petitioner’s Own Failure and the State of the Art Confirm Non-Obviousness in Obtaining an n-Doped ETL in a PHOLED by Mixing Liq with an Organic ETL Material

As discussed in Section II.C above, all remaining claims include the same requirements as claim 2 of the ’425 patent. At trial for the ’425 patent, Pictiva’s expert, Dr. Schanze explained that combinations of elements 1e, 1f and 2 of claim 2 of the ’425 patent—which correspond to 1G-1I, 6G-6I, 10G-10I, 11G-11I and 16G-16I of the ’250 patent and recite a combination of an n-doped ETL with Liq and an Ir-containing PHOLED—were not known. EX2034, 471:3-16.

The Petition interprets the claims as requiring an ETL n-doped with Liq. *E.g.*, Pet., 26 (“It would have been obvious to a POSITA to use 8-hydroxyquinolinolato-

lithium ('Liq') as the dopant in Suzuki's n-doped ETL as taught by Ma. Ma discloses an OLED with an ETL n-doped with Liq and teaches its benefits."); Pet., 59 ("It would have been obvious to a POSITA to use 8-hydroxyquinolinolato-lithium ('Liq') as the dopant in Diekmann's n-doped ETL as taught by Ma."). The Petition then assumes that Liq is "interchangeable with other n-dopants" (Pet., 28, 61) such that an ETL would remain n-doped if its n-dopant is replaced by Liq. *See* Pet., 26-29, 59-62. This assumption, however, is not supported by the evidence, as detailed below.

Specifically, in the district court, the parties agree that adding Liq to an organic material does not necessarily result in n-doping. For example, Pictiva's expert, Dr. Schanze testified that whether [REDACTED] acts as an n-dopant to an ETL material "depends specifically on the interaction between the two materials." EX2034, 324:3-12. In the post-trial briefs, the parties agreed that "the presence of [REDACTED] alone does not establish that the mixed ETL layer is n-doped or that [REDACTED] serves as an n-dopant." EX2048 at 1; *see also* EX2040 at 5-6 (Samsung incorrectly complaining that Pictiva's infringement theory relied only on the presence of Liq in ETL); EX2048 at 1 (Samsung mistakenly complaining that "Dr. Schanze relied solely on evidence that merely showed [REDACTED] exists in the accused mixed ETLs"). Yet, the Petition presents no evidence that any Liq-containing ETL in modified Suzuki or Diekmann was n-doped. *See* Pet., 26-29, 59-62. Instead, it simply assumes that this was the case by

proclaiming that Liq was “interchangeable with other n-dopants.” *Id.* at 28, 61.

That assumption is not supported by the state of the art, including by Petitioner’s own course of development. For example, in [REDACTED], Samsung developed an OLED panel called Clix2, which included an [REDACTED]-containing emission layer, and an [REDACTED] having a mixture of [REDACTED] and an organic material [REDACTED]. EX2034, 916:22-917:13.⁸ Samsung conceded that despite having [REDACTED] the mixed [REDACTED] in this Clix2 PHOLED system was not n-doped:

Q. Okay. Is this an N-doped [REDACTED]?

A. I don't believe it's been shown that it is.

Q. What is the LUMO of the [REDACTED] organic material in this ETL?

A. The LUMO value for [REDACTED] is [REDACTED] EV, which is similar to what

Dr. Seo testified yesterday for all of the allegedly infringing products.

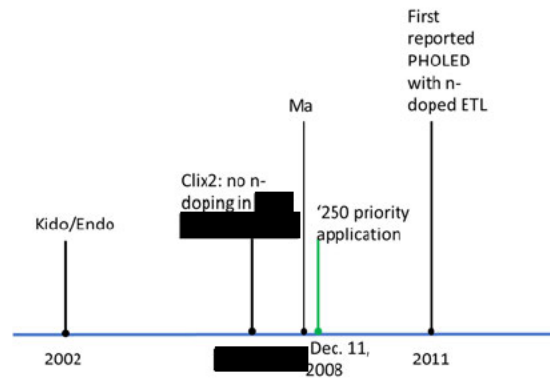
EX2034, 917:7-13 (Katona, expert) (discussing alleged prior art Clix2); *see also id.* at 920:8 (Samsung counsel: “Now, Clix2 doesn’t use an N-doped [REDACTED]”).

The failure by Samsung engineers—who presumably had at least ordinary skills—to obtain n-doped [REDACTED] by mixing [REDACTED] with an organic material [REDACTED] before the invention demonstrates the lack of reasonable expectation of success in obtaining the inventions by simply adding Liq to an organic layer at the time of the

⁸ As noted in footnote 2, Petitioner does not dispute that the inventions are entitled to a priority date of no later than December 2008.

invention, at least in a PHOLED. Put another way, “*an [REDACTED]-doped [REDACTED]*” is *not necessarily an n-doped ETL*, as Petitioner’s own Clix2 product demonstrates. EX2034, 917:1-13; *see also id.* at 920:8 (Samsung counsel: “Now, Clix2 doesn’t use an N-doped [REDACTED]”), 1208:9-20 (Petitioner’s engineer Jo) (“Q: Does [Clix2] include an N-doped electron transport layer? ... A. No”) (clarification omitted). The unpredictability is further heightened by LG’s report after the invention that its engineers allegedly “developed an n-type doped ETL” consisting of “LGC201 + Liq.” *See* EX1040 (2009) at 1.

The unpredictability and the lack of reasonable expectation of success are further demonstrated by the state of art. Specifically, the OLED community was allegedly “fast moving,” and would be “interest[ed]” in integrating “interesting new material or device architecture” “into their own work.” EX2053 [’425_EX1044] (Holmes), ¶14. The first known publication (EX1034) on using Liq in an electron transport layer (“ETL”) came from Professor Kido, “an expert in the area of OLEDs” whose work “the community would follow.” EX2032_Holmes, 28:17-30:5, 217:25-218:25. Of note, Professor Kido did not even describe his resulting ETLs as n-doped. *See* EX1034 *generally*.



It took another six years after Kido-Endo published their work on Liq-doped ETLs in 2002 for Ma/Wei to publish their work in 2008. *See* EX1011_Ma; EX2035_Wei. Kido-Endo and Ma/Wei are the only two pre-invention work that Dr. Holmes identified disclosed an Liq-containing ETL. EX2032_2025-09-03_Holmes, 222:11-20 (“Q: But the fact is, you searched and besides Ma, you only located the Endo paper, correct? Or at least the -- only cited to the Endo paper? A: Those are the two references I’m citing to support the doping of Liq into an ETL. Q: Did you locate other papers? A: None that I’m aware of at the moment.”). Petitioner’s failure to produce additional art in the relevant time period is strong evidence that such additional art does not exist give that Dr. Holmes regards himself as “a pretty good researcher as far as locating the relevant literature” and thinks of himself as “effective in finding literature.” *Id.*, 220:3-19. Despite those skills, he managed to locate only two references that allegedly show the presence of ETLs n-doped by Liq (where Kido-Endo does not expressly state n-doping). *Id.*, 222:11-20.

As to other “prior art” references that mention the use of Liq, those uses of

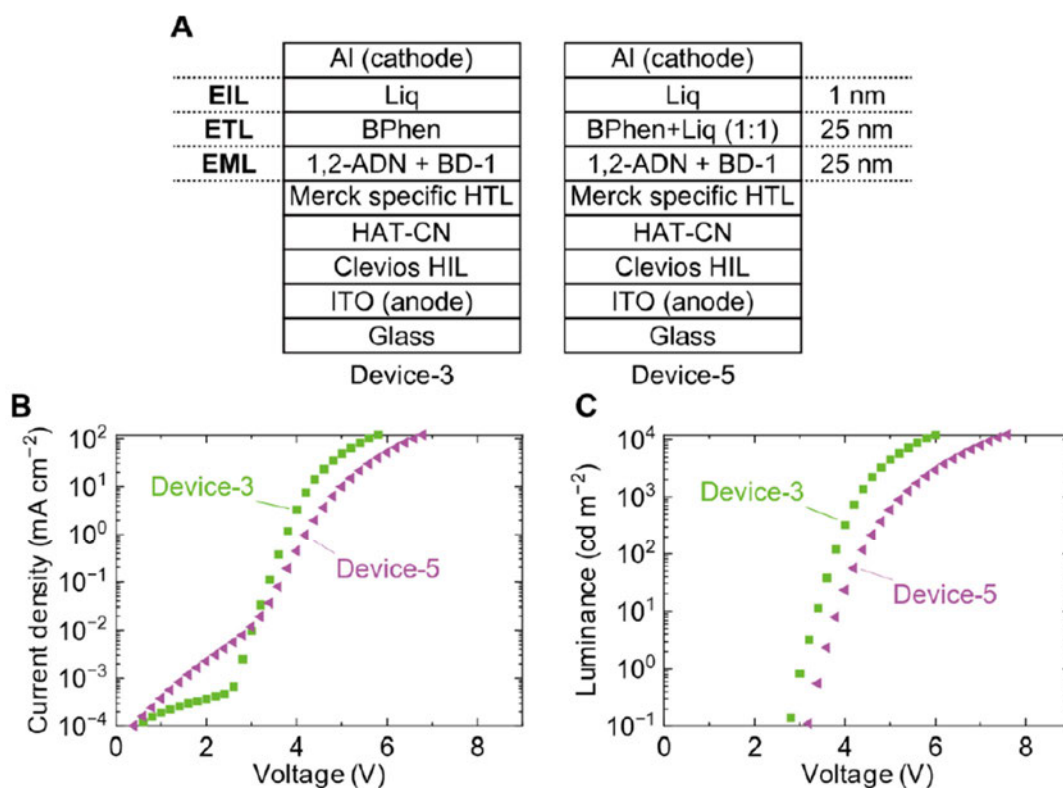
Liq are for electron *injection* layers, and not as part of an electron *transport* layer as required by 1G/1I, 6G/6I, 10G/10I, 11G/11I and 16G/16I. EX1028_Liu at 1 (“This paper will report our results on OLEDs where a combination of lithium quinolate [Liq] as an electron injection layer with Al ... resulted in improved electron injection”), *accord* EX1003, ¶40; EX1039_Zheng, title (“Efficiency improvement of organic light-emitting diodes using 8-hydroxy-quinolate lithium [Liq] as an electron injection layer”).

The scarce report of n-type ETL doped by Liq at the time of the invention demonstrates a general lack of interest in such a composition and/or a lack of reasonably expected success. This belies Petitioner’s assertion of a motivation to use Liq to n-dope ETL or that “Liq-doped ETLs were [allegedly] well-known.” EX2053 [’425_EX1044], ¶44; Pet., 29. Indeed, the Petition only generally alleges that “[i]t was well-known that applying Liq as a dopant to ETL materials,” but does not affirmatively argue that applying Liq as an n-dopant to ETLs was well-known. *E.g.*, Pet. 29, Pet. 62. Nor can it in good faith make such an assertion given its own admitted failure in obtaining an n-doped [REDACTED] by mixing [REDACTED] with an ETL material. *See* discussion on pp. 32–33 above regarding Clix2. Thus, Petitioner’s own failure confirms that, contrary to Petitioner’s incorrect assumption, replacing Suzuki’s or Diekmann’s known n-dopants with Liq is *not* a simple substitution of one known element for another. *Contra* Pet. 27, 29, Pet. 61, 62.

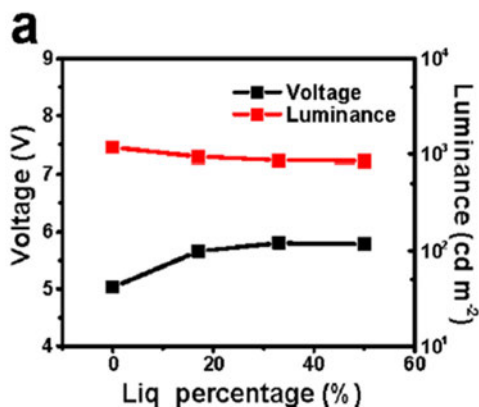
Moreover, both Kido-Endo and Ma involved fluorescent Alq₃-based OLEDs, not Ir-containing PHOLEDs as required by 1H, 6H, 10H, 11H and 16H. *See* EX1011_Ma, 811 (Liq-doped Bphen next to pure Alq₃ emissive layer); EX1034_Kido, Fig. 1b (Liq-doped ETL next to pure Alq₃ emitting layer). Indeed, as noted in the '425 IPR, the first reported PHOLEDs (required by the claims) with Liq-n-doped ETLs came three years after the priority date, a fact that Petitioner does not dispute. *See* EX2003 (“Kim 2011”); EX2053 [’425_EX1044], ¶38 (Holmes acknowledging Kim 2011 was the closest in time to priority date in using Liq in a PHOLED system). That it took an allegedly fast-moving community three years after the priority date to report such devices demonstrates a lack of motivation or reasonable expectation of success. This conclusion is reinforced by Petitioner’s own failure to obtain an n-doped ETL in its PHOLED system before the date of the invention. *See* EX2034 at 920:8 (Samsung counsel: “Now, Clix2 doesn’t use an N-doped [REDACTED]”), 1208:9-20 (Petitioner’s engineer Jo) (“Q: Does [Clix2] include an N-doped electron transport layer? ... A. No”) (clarification omitted). This failure by skilled artisans like those of Petitioner’s own engineers to obtain the inventions provides objective evidence of non-obviousness.

Data from post-invention experiments further demonstrate unpredictability and lack of reasonable expectation of success. For example, while Ma reports higher current density and reduced driving voltage in BPhen by adding Liq to BPhen,

Sasaki's 2022 experiment showed that OLED devices with undoped BPhen (device 3) had higher current densities and lower voltages than BPhen doped with Liq (device 5) at operating voltages that provide sufficient luminance. *See* EX2105 at 2 (reproduced below); EX2007, 2201925 ("Although we fabricated a blue OLED with Liq used as the EIL and BPhen doped with Liq used as the ETL, its operating voltage was much higher than that of Device-3 (Figure S1, Supporting Information). Actually, OLEDs fabricated using BPhen doped with Liq as the ETL have rarely been reported.").



Likewise, Ki showed that addition of Liq to BPhen resulted in an increase, and not a decrease, in driving voltage. *See* EX2104, Fig. 4(a).



See also id. at 1681 (“The driving voltages and luminance of the devices using mETL respectively showed an increase (+33%) and a decrease (−14%), compared to the device with pristine BPhen, but showed similar values among the devices using mETLs of different mixing ratios. This ***increase in the driving voltages of the mETL device*** is consistent with the XPS analysis (see Figures 1e and 1f) where the lone-pair electrons of N atoms in BPhen transfers to the Li atom of Liq, resulting in a decrease in the electron transport of BPhen.”). Ki also observed that before thermal treatment, “[t]he current density versus driving voltage and luminance versus current density characteristics of the devices with mETLs [of BPhen and Liq] were almost identical to each other[.]” *Id.* at 1680.

Hence, to the extent that Petitioner is of the view that increased current density or reduced driving voltage suggests n-doping, (*see* Pet., 26), the experiments above confirm that adding Liq to an organic material, including to BPhen used by Ma, does not always result in n-doping. Simply put, the Petition has presented no evidence

that the modified ETLs in Suzuki and Diekmann would remain n-doped when Liq is substituted in place of Cs, Li, Ba or LiF. *See* Pet. 26-29, 59-62.

Samsung expert's trial testimony also demonstrates a lack of motivation to obtain n-doped ETL in a PHOLED system. Specifically, Samsung's expert testified that "if one were motivated to N-dope the [REDACTED]" in Clix2 (which has an Ir-containing emission layer), a reference called Wei "would have been evidence that you could indeed go ahead and do that." EX2034, 920:8-16. Notably, Samsung expert does not argue that a motivation to n-dope [REDACTED] in a PHOLED actually existed, or that a POSITA would have looked to Wei—as opposed to that they could look to it—if they were so motivated. *Id.* It is well-established that "obviousness 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." *Beldon Inc. v. Berk-Tek LLC*, 805 F.3d 1064, 1073 (Fed. Cir. 2015) (emphasis in original). Here, ***Wei has materially the same disclosure as Ma***, the reference that serves as the basis of an allegedly n-doped ETL in the Petition. *Compare* EX2035 (Wei) with EX1011 (Ma) (sharing Wei Xu/Xu Wei, Zhang Zhilin/Z.L. Zhang, and Jiang Xueyin/X.Y. Jiang as coauthors as well as substantively identical abstracts, disclosures and figures, *see* pp. 13–15 above); Pet., 13, 26, 59. Thus, Samsung expert's testimony would apply equally to Ma.

Samsung expert's unwillingness to assert under oath that a motivation to n-

dope ETL in a PHOLED existed (EX2034, 920:8-16) speaks volumes and is not surprising. The community would be aware of the risk associated with using Liq in a PHOLED: “the Liq dopant can act as a luminance quencher in phosphorescent organic light-emitting diodes (PHOLEDs) because of low triplet energy of Liq (2.0 eV).” EX2005 at 1; *see also* EX1034, abstract (“we assume that alkaline metal ions in the complexes are reduced to free metal by thermally activated Al.”). But the claims at issue all require a **combination** of ETL n-doped by Liq **and** an Ir-based emission layer (i.e., a PHOLED). *See* Pet. viii–xvi & Section II.C (1G–1I, 6G–6I, 10G–10I, 11G–11I, 16G–16I).

Dr. Holmes and the Petition suggest that a blocking layer can address the concern for quenching, but provides no evidence that at the time of the invention, a POSITA would have known that the conductivity would still be sufficient when such a blocking layer was added in the case of Liq. For example, He (EX1018) specifically referenced by the Petition for that point (Pet. 28) observed that when larger and less diffusible Cs was used instead of smaller Li, “the driving voltage of the OLEDs rapidly increases with the thickness of the undoped buffer layer” EX1018 at 5775. Petitioner asserts that Liq is less diffusible than Cs, but presents no evidence that it was known that Liq-doped ETL with a blocking layer would have resulted in lower driving voltage, higher current density or other alleged performance advantages over an undoped ETL in a PHOLED at the time of the

invention. In fact, Novaled which developed the p-i-n structure discussed in the Petition specifically stated that He's BPhen/BPhen:Cs (blocking layer/doped layer) "is not compatible with the combination of emitter materials selected at that location." EX2100, 3:4-22.

In summary, the Petition fails to demonstrate a reasonable likelihood of success in establishing that a POSITA would have been motivated to make the proposed modification to arrive at the claimed invention with a reasonable expectation of success, given (1) Petitioner's concession that adding Liq to ETLs would not necessarily result in n-doped ETLs, (2) Petitioner's admission that the [REDACTED] in its alleged prior art PHOLED Clix2 was not n-doped even though it had both [REDACTED] and an organic material (which demonstrated either a failure to obtain or a disinterest in obtaining an n-doped ETL in the PHOLED), and (3) the lack of any analysis that Suzuki's and Diekmann's modified ETLs would remain n-doped when Liq was used to replace Cs, Li, Ba and LiF.

D. The Petition Is Deficient in Many Other Ways

Improper Incorporation by Reference. It has been long established that a petition may not incorporate by reference exhibits and other papers to circumvent the word limit. *Cisco Systems, Inc. v. C-Cation Techs., LLC*, IPR2014-00454 (PTAB Aug. 29, 2014) (Paper 12) (informative). But the Petition does exactly that. For example, on pages 13-14 of the Petition, Petitioner incorporates 53 paragraphs or 22

pages of materials from EX1005, ¶¶11-63. If one counts the documents cited in those 53 paragraphs, that would be another few hundred pages. *See* EX1005. The Petition also does not explain what in the incorporated declaration and exhibits specifically support its arguments. *See* Pet. 13-14. The Director should deny the Petition to discourage such blatant attempt to circumvent the word limit.

Improper Reliance on Hearsay Testimony of an Unavailable Witness The Petition relies in part on the same Garland declaration that Petitioner previously submitted in IPR2024-01094 and -01095. *See* Pet. 13-14 (citing EX1006 in various places); EX2051. In prior IPRs, while Petitioner used the Garland declaration to gain institution (*e.g.*, EX1047, 16-19), it failed to produce Ms. Garland for a deposition as required by the Consolidated Trial Practice Guide (“CTPG”). EX2052 at 2-3; CTPG at § 1.F.1.b (requiring production of “non-party witnesses” for examination). Petitioner does not represent that anything has changed since then; and the testimony from such an unavailable witness generated for another proceeding is nothing more than inadmissible hearsay, warranting discretionary denial. *OpenSky Inds., LLC v. VLSI Tech. LLC*, IPR2021-01056, Paper 18 (Dec. 23, 2021) (denying institution when Petition relied on a declaration from an unavailable expert).

The Opposition to Patent Owner’s Statement of Discretionary Denial points to the Board’s email in the 425 IPR to justify its continued reliance on the testimony of an unavailable witness, without denying that it neither has the ability nor the

willingness to produce Ms. Garland for deposition this time. Paper 9 at 2-3.

Petitioner fails to mention that at the hearing, Judge Baer stated the following exchange on Garland Declaration:

JUDGE BAER: On this issue of the Garland Dec., and, you know, I'm sympathetic; you can only control what you control, that sort of thing. At the same time, *as Judge Obermann articulated, it is hard for us to say, well, we're going to give this declarant weight*, even though whether it's your fault or not is sort of beside the issue; *she wasn't available for cross-examination*.

So my question is, are you aware of any case law that addresses this specific issue when it's a third-party declarant that -- and it's a little different than if it were an expert. I sort of understand it logically, but my question specifically is, *is there any case law addressing that that it's a little bit more acceptable if it's a declarant that's not really in your control?* And that's fine if you want to take some time, but if you're aware of any case law, that would be helpful.

MS. HANSEN: Off the top of my head, I am not. I would be happy to submit supplemental briefing if that would be of interest to Your Honors.

IPR204-01095, Paper 52 at 72:10-24. No supplemental briefing was submitted after the hearing to provide the requested authority, and no authority was cited in the Petition or in the Opposition to Patent Owner's Statement of Discretionary Denial to support Petitioner's view that a petitioner should be allowed to rely on a

declaration that it knows it cannot produce for cross-examination.

Improper Withholding of Inconsistent Testimony and Evidence

Petitioner's counsel owes a duty of candor to the Board. The rules also require Petitioner to serve "information that is inconsistent with a position advanced by the party during the proceeding concurrent with the filing of the documents or things that contains the inconsistency." 37 C.F.R. § 42.51(b)(1)(iii). Petitioner has not done that. For example, the Petition argues that "[c]ombining Suzuki [or Diekmann] and Ma would have merely amounted to applying a known technique (Ma's Liq-doping the ETL) to improve similar OLEDs (Suzuki's [or Diekmann's] devices with n-doped ETLs) in the same way." Pet. 27, 61. But Petitioner fails to inform the Board that its engineers failed to obtain an n-doped [REDACTED] when mixing [REDACTED] with an organic material. EX2034, 917:1-8, 920:8-14. That failure, carried out by Petitioner's own engineers with at least ordinary skills, undermines its argument that it would be obvious to obtain Liq-n-doped ETL by mixing Liq with the ETL with a reasonable expectation of success. *See also, e.g.*, EX2042 at 3 (arguing that Kondakova's disclosure on use of Liq was not about using Liq for n-doping, but as an ETL); EX2048 at 1 (the parties agree that "the presence of [REDACTED] alone does not establish that the mixed ETL layer is n-doped or that [REDACTED] serves as an n-dopant"). These facts show that adding Liq to an ETL does not necessarily, and often does not, yield an n-doped ETL, thus undermining Petitioner's obviousness arguments. Petitioner's failure to

disclose this material information to the Board disregards Rule 42.51 and the duty of candor.

The Board should not waste its limited resources on a petitioner who chooses the forum but then repeatedly disregards the Board's rules, especially when the Office has already considered the same art and arguments and a jury has rejected substantially the same arguments.

In its Opposition to Patent Owner's Statement on Discretionary Denial, instead of meaningfully addressing the material omissions, Petitioner attempts to point fingers at Patent Owner. The evidence, however, actually highlights the errors the Board made: it repeatedly ignored the evidence Patent Owner tried to bring to its attention on the inconsistent positions that Petitioner took and the implications of those happenings in the 425 IPR. The simple fact is, a jury has considered and rejected Samsung's validity theories cumulative of those advanced in the '425 IPR; and Samsung has advanced inconsistent claim construction positions in the district court and before the Board. The Director should deny the petition to mitigate the risk of inconsistent claim construction positions and to better use the Board's limited resources elsewhere.

V. CONCLUSIONS

The Director should deny the Petition to reduce the risk of inconsistent outcomes and to ensure integrity of the IPR proceeding.

Dated: March 2, 2026

Respectfully submitted,

By: /Hong Zhong/

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CERTIFICATE OF WORD COUNT

I hereby certify, pursuant to 37 C.F.R. § 42.24, that the foregoing Patent Owner's Preliminary Response contains 10,118 words, excluding the words in the table of contents, table of authorities, mandatory notices under § 42.8, this certificate of word count, certificate of service or exhibit list. The word count is based on the word count of the Microsoft Word program used to prepare the Patent Owner's Preliminary Response.

/Hong Zhong/

H. Annita Zhong

CERTIFICATE OF SERVICE

I hereby certify, pursuant to 37 C.F.R. § 42.6, that on March 2, 2026, a complete copy of the **PATENT OWNER'S PRELIMINARY RESPONSE** and **EXHIBITS 2002-2005, 2007, 2023-2024, 2027, 2032, 2053, 2104-2105** were served upon the following, by ELECTRONIC MAIL:

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