

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. IPR2024-01095
Patent No. 11,828,425

PATENT OWNER'S PRELIMINARY RESPONSE

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37 C.F.R. § 42.65(a)	29, 32, 54, 60, 63
37 C.F.R. § 42.104(b)(5)	22, 24, 26–27, 29, 32, 37, 51, 53–55, 59, 63
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MPEP 2143	59
PTAB Consolidated Trial Practice Guide (Nov. 2019)	27, 29, 32, 54–55, 63
S. Rep. No. 110-259 (2008)	64

EXHIBIT LIST

Exhibit	Description
2001	Disclaimer, U.S. Patent 11,828,425 (filed Oct. 25, 2024)
2002	Declaration of P. Morgan Pattison, Ph.D.
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-hydroxyquinolinato)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	Sunwoo Kang, Sang Ho Jeon, Taekyung Kim, Unraveling the complexation effect of electron transporting materials with Liq on the charge transport properties: A theoretical perspective, <i>Chemical Physics Letters</i> , Volume 810, 2023, 140207
2007	T. Sasaki, T. Oono, T. Shimizu, H. Fukagawa, Effects of Energy-Level Alignment on Operating Voltages of Blue Organic Light-Emitting Diodes. <i>Adv. Mater. Interfaces</i> 2023, 1, 2201925
2008	Vadim I. Adamovich, Steven R. Cordero, Peter I. Djurovich, Arnold Tamayo, Mark E. Thompson, Brian W. D'Andrade, Stephen R. Forrest, New charge-carrier blocking materials for high efficiency OLEDs, <i>Organic Electronics</i> , Volume 4, Issues 2-3, 2003, Pages 77-87
2009	Björn Lüssem, Chang-Min Keum, Daniel Kasemann, Ben Naab, Zhenan Bao, and Karl Leo, Doped Organic Transistors, <i>Chemical Reviews</i> 2016 116 (22), 13714-13751

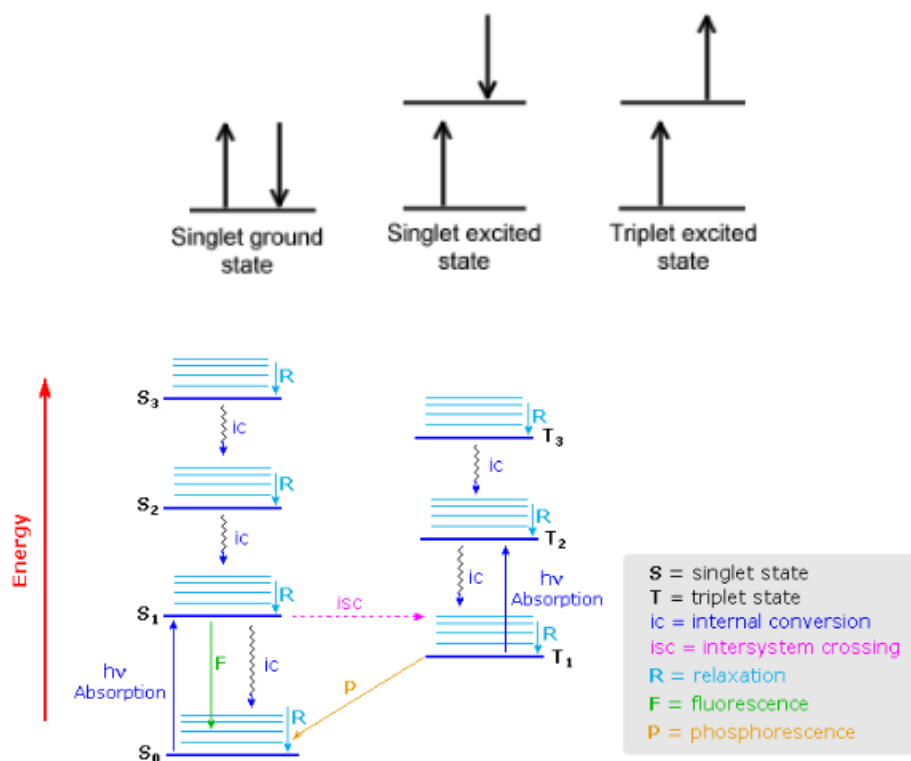
2010	U.S. Patent No. 11,585,504
2011	U.S. Patent No. 10,605,422
2012	U.S. Patent No. 9,797,567
2013	Federal Court Management Statistics for U.S. District Courts, available from https://www.uscourts.gov/statistics/table/na/federal-courtmanagement-statistics/2024/06/30-1
2014	Samsung Invalidity Contentions in the parallel district court case

I. INTRODUCTION¹

U.S. Patent No. 11,828,425 (the '425 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 '425 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 '425 Patent is not directed to any OLEDs, but specifically to those including an “iridium-containing compound.” '425 Patent at 88:7-9. Iridium-based compounds are phosphors, where light emission involves a change in electron spin from the higher energy, excited state to a lower energy, ground state. This results in a lifetime from seconds to minutes, significantly longer than that for molecules undergoing fluorescence, which does not change electron spin.

¹ This POPR focuses on claims 2, 4, 7, 9-12, and 17, as Pictiva has disclaimed certain claims to narrow the dispute before the Board. EX2001. Disclaimer “does not legally constitute ‘an admission that the subject of the disclaimer appears in the prior art.’” *E.g., Raytheon Techs. Corp. v. Gen. Elec. Co.*, 993 F.3d 1374, 1379 n.4 (Fed. Cir. 2021).



EX2002, ¶ 43. As a result, material selections—especially for the emission layer and the layers immediately adjacent to the emission layer—are considerably different for a phosphorescent OLED than a fluorescent OLED. *Id.*, ¶ 44. For the latter, the chosen materials must be carefully chosen not to quench the triplet excited state, which could then make the entire system unsuitable for OLED application. *Id.*

Here, the Petition ignores this key distinction. Instead, Petitioner argues that because Ma (EX1010) reported on a fluorescent OLED that used Liq to dope an electron transport layer, a skilled artisan would do the same with a phosphorescent OLED (PHOLED) using Diekmann's and Suzuki's OLED materials. To that end, for the claimed n-doping of the electron transport layer (1[g]), Petitioner skips over

FIG 2A

100

6

410

3

402

401

2

101

1

5

4

Electron transport layer

Doped electron injection layer

But even then, Petitioner fails to provide any competent evidence of a reason to combine. For instance, Ma's use of Liq is specific to a combination of Liq and BPhen, but Diekmann does not even mention BPhen as a suitable ETL. Diekmann, 5 (listing Alq₃, BAQ, and TPBi as ETL materials). Nor has Petitioner provided any competent evidence to show that doping an ETL with an experimental dopant like Liq would have any expectation of success in PHOLEDs due to documented

challenges of utilizing Liq as a dopant in PHOLEDs. *E.g.*, EX2005 (Oh 2015) at 34; EX2003 (Kim 2011) at 54, 56-58; EX2006 (Kang 2022), Abstract, 6; EX1018 (Liu), Abstract, 213-214. Those include not only quenching concerns, but issues with poor electron transportation, unbalanced charge between holes and electrons, obstructed hole-electron recombination with dark spots, luminance decay, low efficiency, and weakened charge transport.

The combination fares no better in the Suzuki-based grounds. First, there is no competent evidence that an ETL “with a high n nature doped with impurities” means an n-doped ETL. An electron transport layer has a high n characteristic because it is used to transport electron (negative charges). But doping an ETL does not need to be for n-doping to increase the number of electrons, but could be for other purposes, such as for emission or hole blocking. Second, the Petition presents no evidence that Suzuki discloses using BPhen as an ETL material. *See* Suzuki (EX1006), ¶¶ [0329]-[0333]. Thus, like with Diekmann, Petitioner does not explain why Ma’s use of Liq in BPhen for a fluorescent OLED would have motivated a skilled artisan to use Liq as a dopant in a different ETL in a PHOLED system. Nor has Petitioner presented any competent evidence of a reasonable expectation of success.

The Petition is further infected with other defects. For instance, for claims 2 and 17, Petitioner has done nothing to meet its burden and prove that Ma was

publicly available and qualifies as a prior art printed publication. For claim 12, Petitioner has not shown that Harada teaches an OLED device “drivable by” gesture control. Harada’s “gesture recognition” generates an input to a separate personal computer—akin to a keyboard and mouse—controlling the computer, but not the OLED device. For claims 2, 12, and 17, Petitioner rests on conclusory motivations and expectations of success.

Indeed, all of Petitioner’s motivation to combine or reasonable expectations of success for these claims as well as claims 4 and 9-11 are each textbook cases of impermissible conclusory arguments, unsupported statements, and otherwise legally insufficient rationales. For example, Petitioner repeatedly relies on whether something was “well known” as a motivation, which is legally not a motivation to combine. Petitioner’s expectations of success are universally conclusory statements that the combination was “routine” without any explanation for how a skilled artisan—as defined by Petitioner—could have possibly accomplished any of these combinations with such a low level of expertise. This repeated boilerplate language is facially insufficient and does not address the combination or why a skilled artisan would have been motivated to combine the arts teachings in the claimed manner with a reasonable expectation success.

In addition, for claim 4, Petitioner ignores that Diekmann and Suzuki already had encapsulation layers and provides no reason for a skilled artisan to go through

with the complex redesign to utilize Lee’s polymer encapsulation. And, for the touch-sensitive elements in claims 9-11, Petitioner fails to provide any motivation to add touch-sensitive elements in Diekmann or Suzuki. Instead, Petitioner focuses on reasons to integrate an already existing, separate touch sensor into an OLED. Petitioner’s remaining motivations and expectations of success are again conclusory.

Finally, this petition should be discretionarily denied under 35 U.S.C. § 314(a) and *Apple Inc. v. Fintiv, Inc.*, IPR2020-0019, Paper 11 (PTAB, Mar. 20, 2020) (precedential). Given the already significant simplification due to Patent Owner’s voluntary statutory disclaimer of many of the challenged claims and the high likelihood of a trial—including on invalidity—occurring in the district court before a final written decision issues, this proceeding falls squarely within the discretionary denial framework and is not worth the significant duplication on these overlapping issues on such a meritless petition.

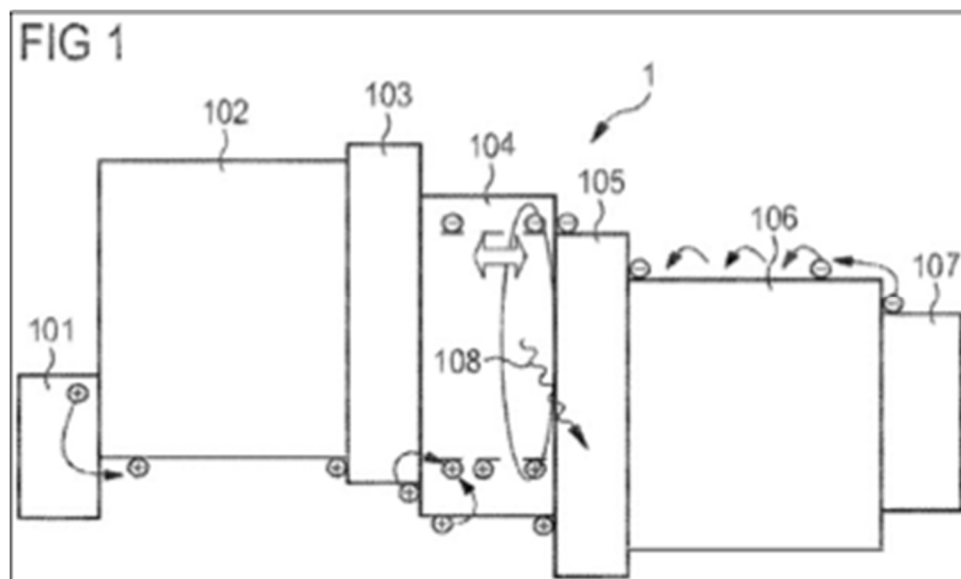
II. BACKGROUND

A. Overview of the ’425 Patent

The ’425 Patent relates to a novel “device comprising an organic light-emitting diode,” for use as luminaires in a vast array of products. ’425 Patent, Abstract, 1:21-27, 1:43-49, 17:5-26, 18:3-8, 19:59-66, 20:38-44, 68:4-8, 74:36-38, 82:60-67, 83:42-45, 84:59-61, 87:5-7. Structurally, the ’425 Patent’s “organic light-emitting diode” has “an organic layer sequence,” “a radiation exit area,” “an

encapsulation,” and at least one “carrier.” *Id.* at 1:28-31, 6:6-8. The organic layer sequence may include “at least one radiation-emitting region” with “at least one emission layer,” which “generates 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 1:31-35, 2:13-15, 3:28-29, 88:7-9.

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



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 24:33-62; *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.”

Id. at 24:63-67. Additional “injection” layers can be added to the cathode or anode to improve electron and hole injection into the transport layers. *E.g.*, *Id.* at 28:16-18 (“In addition, the second electrode 107 can have, on a side facing the radiation-emitting region 104, a layer comprising LiF, which has good electron injection properties.”); *see* EX2002, ¶ 42.

The encapsulation “forms a seal of the organic layer sequence against environmental influences.” *Id.* at 1:36-38. Multiple encapsulation layers with different amorphicitities have independent “volume structure[s]” for improved

reliability and protection. *E.g., id.*, cl. 4, Fig. 19, 10:12-22, 44:11-39, 48:17-47. The '425 Patent acknowledged the “surprising[]” result that a second encapsulation layer with high amorphicity in combination with a non-amorphous first encapsulation layer enables a “hermetically impermeable” encapsulation because the amorphous second layer “does not continue structure and/or lattice defects” from the first encapsulation layer. *Id.* at 44:18-39.

The '425 Patent also describes touch sensors and gesture controls that change the operating state of the luminaire by switching the luminaire on or off, dimming the luminaire, or increasing its brightness. *E.g., id.*, cls. 9-12, Abstract, 14:31-37, 15:26-35, 18:31-37, 23:17-20, 61:38-45, 62:14-21, 64:1-10, 68:46-54, 71:58-72:3, 74:1-30, 76:59-67, 79:48-55, 80:15-22, Figs. 31A-B, 35, 42A-C, 46A-B.

B. Prosecution History

The '425 Patent issued from Application No. 18/098,326, filed on January 18, 2023, as a continuation of Application No. 16/790,198, filed on February 13, 2020, now U.S. Patent No. 11,585,504 (the '504 Patent, EX2010). The '504 Patent is a continuation of Application No. 15/651,508, filed on July 17, 2017, now U.S. Patent No. 10,605,422 (the '422 Patent, EX2011). The '422 Patent is a continuation of Application No. 13/139,514, filed on January 3, 2012, now U.S. Patent No. 9,797,567 (the '567 Patent, EX2012). The '567 Patent claims priority to

PCT/DE2009/001741, filed Dec. 9, 2009, and to German Application No. 10 2008 061 563.3, filed December 11, 2008. The '425 Patent makes the same priority claim.

While Petitioner alleges that the “record is silent on whether the '425 Examiner considered Diekmann” (Pet. 9), that is demonstrably false. Diekmann and its U.S. equivalent were both expressly considered during prosecution of the '425 Patent. '425 Patent, [56] (listing WO 2008/040323 A1 and U.S. Patent Pub. No. 2010/157585 A1).

The Office determined that the “[p]rior art of record,” which includes Diekmann, “fails to disclose or fairly suggest” the following limitations “in combination with the remaining claim limitations”: “[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, [1g)] 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.” EX1002 at 267-268. This consideration during the '425 Patent’s prosecution is unsurprising because the Office expressly discussed Diekmann, at great length, during prosecution of the parent application, as Petitioner admits, and thus was well aware of Diekmann. *See* EX1025 at 1406-1413, 2055.

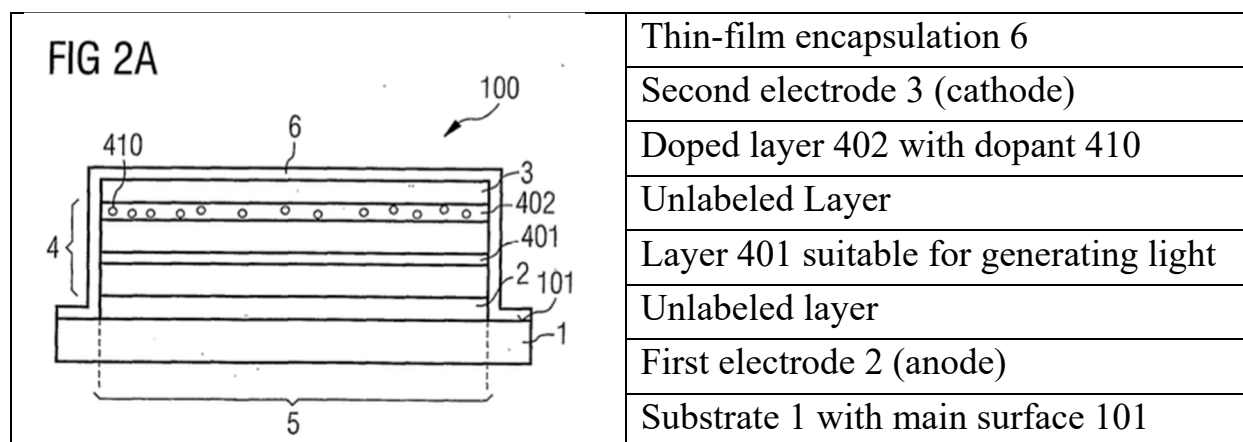
Four examiners across each of the parent prosecutions to the '425 Patent have considered Diekmann and found the claims allowable. EX2010 (U.S. Patent No. 11,585,504), [56] (listing WO 2008/040323 and U.S. Patent Pub. No. 2010/157585); EX2011 (U.S. Patent No. 10,605,422), [56] (same); EX2012 (U.S. Patent No. 9,797,567), [56] (same). While Petitioner makes much of the assignment of the later applications to different examiners (Pet. 9, 79-81), this only confirms that the Office was well-aware of Diekmann and that multiple examiners agreed that it was not a bar to patentability. That determination was correct because, as explained below, Diekmann does not disclose, at least, n-doping its ETL. *See* Section IV.A, *infra*.

III. OVERVIEW OF THE ALLEGED PRIOR ART

A. Diekmann (EX1004 & EX1005)

Diekmann² was expressly overcome during prosecution of the parent to the '425 Patent and considered in every subsequent prosecution. *See* Section II.B, *supra*. Diekmann describes an “an organic lighting device.” Diekmann, 1. Figure 2A describes a series of layers, listed below:

² Citations to Diekmann are referring to the translation provided by Petitioner (EX1004). Patent Owner does not concede that Petitioner's translation is accurate.



Diekmann, 91-92, Fig. 2A; EX2002, ¶ 45.

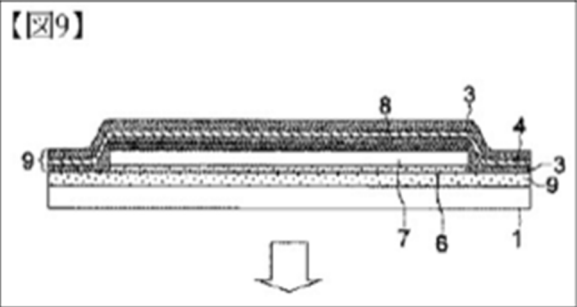
The organic layer stack includes separate electron injection and transport layers. *See id.* at 4 (“the organic layer stack may comprise further organic layers, such as a hole-injecting layer, a hole-conducting layer, an electron-injecting layer and an electron-conducting layer”). Diekmann contrasts its “electron-conducting layer” materials (“Alq3,” “BALq,” “TPBi”) with its “electron injection layer” materials (“LiF,” “NaF,” “Cs2CO2,” “Ba,” “NET-5 with NDN-1”). *Id.* at 5; EX2002, ¶¶ 46-47. NET-5 with NDN-1 is referring to a doped injection layer. EX2002, ¶¶ 48-49; *see* EX1029 at 7.

Doped layer 402, lying next to the cathode, improves electron ***injection***. Diekmann, 91 (“dopant 410, which acts as an electron donor” ... “advantageously increases the ***injection*** of electrons from the cathode into the organic layer stack.”); *see id.* at 10 (“in the case of an n-doped layer adjacent to the cathode,” doping “leads to better ***injection*** of electrons from the cathode into the organic layer stack.”);

EX2002, ¶¶ 50-51. A skilled artisan would understand from these disclosures and the fact that another layer separates layer 402 and the emission layer 401 that layer 402 is an electron injection layer while the unlabeled layer between layers 401 and 402 is an electron transport layer. EX2002, ¶¶ 52-57; EX1003, Fig. 3(a), ¶ 34. Diekmann does not describe any other layers. EX2002, ¶ 54.

B. Suzuki (EX1006 & EX1007)

Suzuki³ describes bottom emitting “organic electroluminescent device” with a “gas barrier resin substrate material.” Suzuki, ¶ [0001]. Petitioner relies on Figure 9 and the accompanying description in paragraph 274:

	Thin film laminate 9	Buffer film 3
		Barrier film 4
		Buffer film 3
	Cathode 8	
	Organic layer 7	“comprising a hole transport layer, a light emission layer, an electron transport layer, and the like”
	Anode 6	
	Thin film laminate 9	
	Resin substrate 1	

³ Citations to Suzuki are referring to the translation provided by Petitioner at EX1006. Patent Owner does not concede that Petitioner’s translation is accurate.

Id., Fig. 9, ¶ [0274]; EX2002, ¶ 58. Suzuki also discloses using electron injection layers next to the cathode, such as a layer of LiF. *Id.*, ¶¶ [0295], [0338]. Suzuki mentions “an electron transport layer with a high n nature doped with impurities.” *Id.*, ¶ [0333]. Suzuki also uses a thin film laminate made of a ceramic barrier layer 4 in between two buffer film layers 3. *Id.*, ¶¶ [0068]-[0069] (metal oxides, metal nitrides, metal carbides, metal sulfides, metal halides, such as silicon oxide, silicon oxide nitride, or silicon nitride), [0274], Fig. 9. Barrier film 4 is a “dense intervening layer” with “low water vapor transmission” comprising “a ceramic composition with low or no carbon content and having at least Si and O atoms.” *Id.*, ¶ [0117].

C. Ma (EX1010)

Ma admits that “no work” had previously been done on Liq as a dopant for an ETL based on Bphen. Ma, 810. Ma describes an Alq₃-based fluorescent OLED stack using both “8-hydroxy-quinolinato lithium doped 4’7-diphenyl-1,10-phenanthroline as [the] electron transport layer (ETL)” (Liq-doped Bphen) and “[t]etrafluoro-tetracyano-quinodimethane doped 4,4’,4’’-tris(3-methylphenylphenylam[i]no)triphenylamine as hole transport layer (HTL)” (F₄-TCNQ doped *m*-MTDATA). Ma, Abstract; EX2002, ¶¶ 61-63. Ma compares “[t]he conductivity of [those] carrier transport layers with different doping concentration[s].” *Id.* Ma’s results are then “[c]ompared with the referenced device (without doping)” to show a “current efficiency and power efficiency.” *Id.*

The specific devices fabricated in Ma are compared by varying the doping ratios “x” and “y” within the specific layered arrangements:

	Complete Device
Anode	ITO
HTL	<i>m</i> -MTDATA: x wt.% F ₄ -TCNQ (40nm)
Interlayer	NPB (10nm)
Emission layer	Alq ₃ (20 nm)
ETL	BPhen:y wt.% Liq (50 nm)
EIL	LiF (1 nm)
Cathode	Al (130nm)

Ma, 811; EX2002, ¶ 64. Ma emphasizes the need for maintaining “efficient charge balance in the emission zone.” *Id.*, Abstract, 812 (“[t]he high carrier balance is reached in the emission zone, which leads to the enhanced current and power efficiency at low driving voltage”), 813 (“current efficiency” depends “on the carrier balance”), 814 (discussing “good balance” between electrons and holes with “efficient charge balance” in the emission layer). This “good carrier balance” is “one of the most important factors in getting excellent performance in OLEDs.” *Id.* at 814. In Ma, that balance is tailored to a fluorescent emission zone material using Alq₃ and the specific layer materials for the injection and transport layers surrounding that zone. EX2002, ¶¶ 65-66.

Ma’s results focused on a “33 wt.% ratio” of Liq to BPhen for the electron transport layer with a “0wt.%, 0.3wt.%, 2wt.% and 4wt.%” ratio of F₄-TCNQ to *m*-

MTDATA for the hole transport layer. *Id.* at 810-811, 814. Ma makes no general statement about doping any other materials besides BPhen with Liq or with different layers besides fluorescent Alq₃ as the emission zone materials. EX2002, ¶ 67.

D. Lee (EX1008)

Lee describes a multi-layered encapsulation using parylene-based polymer layers 32 (a “semi-crystalline parylene-based polymer”) and 38 (an annealed “highly crystalline parylene-based polymer”) sandwiching an inorganic barrier layer 34. Lee, ¶¶ [0002], [0005], [0020]-[0024], Fig. 2. Lee reports an “improved lifetime” only in contrast to “prior OLEDs having polyacrylate or amorphous parylene barrier layers.” *Id.*, ¶ [0020].

E. Koshihara (EX1012)

Koshihara describes a two-electrode touch panel structure as part of the sealing substrate. Koshihara, ¶¶ [0002], [0004], [0028], [0030]-[0031], Fig. 3.

F. Caldwell (EX1011)

Caldwell describes a touch-sensor for a bottom-emitting OLED device by adding a touch electrode and an insulating layer to an OLED stack. Caldwell, ¶¶ [0004]-[0006], [0074], Fig. 14C. Caldwell explains that separate touch sensitive components are “complicated” and “costly” where “the light ... can be attenuated ... by the touch sensor components before it reaches the user.” *Id.*, ¶ [0006]. Instead of separate touch sensors, Caldwell proposes integrating that touch sensor within the

light emitting device to “greatly reduce the cost and complexity” by “reduc[ing] or eliminat[ing] the extra material and manufacturing costs.” *Id.*, ¶ [0007].

G. Harada (EX1009)

Harada describes “gesture recognition using a hand shape” that provides a command “input in more natural ways” to an attached “personal computer.” Harada, ¶¶ [0071], [0073] (giving the example of instructing the computer to “zoom in”).

IV. THE PETITION FAILS TO DEMONSTRATE THAT ANY OF ITS GROUNDS RENDER OBVIOUS CLAIMS 2, 4, 9-12, & 17

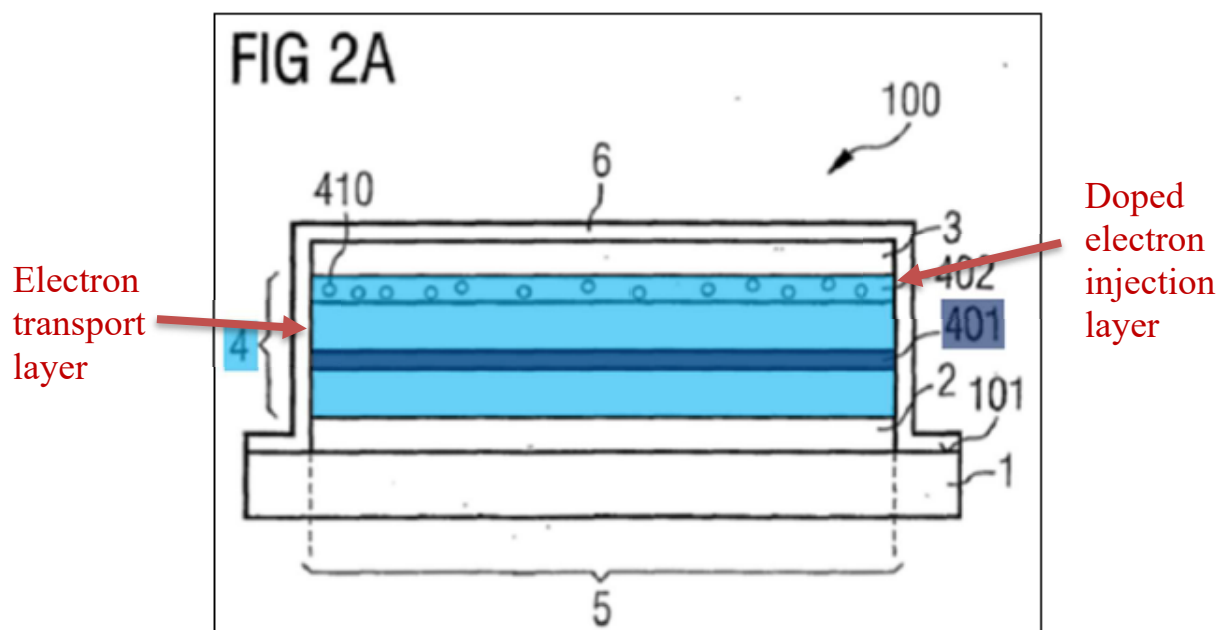
A. Petitioner Has Not Shown that Diekmann Discloses the Claimed n-Doped Electron Transport Layer [1g]

The claims of the '425 Patent all require “the organic layer sequence comprises an electron transport layer that is n-doped” ([1g]). Petitioner has not shown that Diekmann teaches an n-doped electron transport layer. Instead, Petitioner has at most shown that Diekmann has an n-doped electron injection layer.

Petitioner relies on Figure 2A’s doped layer 402 with dopant 410. Pet. 24-25. But Diekmann makes clear that doped layer 402—which is the layer right next to the electrode—is the electron *injection* layer and not, as Petitioner contends, an electron *transport* layer. As Petitioner concedes, doped layer 402 is designed to “increase[] the *injection* of electrons from the cathode into the organic layer stack.” Diekmann, 91. Elsewhere, Diekmann again explains “in the case of an n-doped layer adjacent to the cathode,” doping “leads to better *injection* of electrons from the

cathode into the organic layer stack.” *Id.*, 10; EX2002, ¶¶ 50-51. A skilled artisan would understand that this is describing an electron injection layer, not an electron transport layer, given its location and express purpose of increasing injection. EX2002, ¶¶ 52-57.

Confirming that these are doped ***injection*** layers and not Diekmann’s conducting layers, Diekmann explains how, in the organic layer stack, injection and transport layers are different layers. Diekmann, 4 (“the organic layer stack may comprise further organic layers, such as a hole-injecting layer, a hole-conducting layer, an electron-injecting layer and an electron-conducting layer”), 10 (“n-doped layer adjacent to the cathode” “leads to better injection of electrons from the cathode into the organic layer stack.”). The location of doped layer 402 in Figure 2A shows that doped layer 402 abuts the electrode 3 and there is another layer between doped layer 402 and the light generating layer 401 that would have been understood to be the conducting layer:



Diekmann, Fig. 2A (red annotations added); EX2002, ¶ 52; *see* Pet. 23 (adding blue annotations). A skilled artisan would have understood that the electron injection layer abuts the cathode and, next, the electron transport layer abuts the emissive layer in this arrangement. EX2002, ¶ 53; *see* EX1003, Fig. 3(a) (illustrating this arrangement, discussed below). In the cited portions, Diekmann does not describe any other layers between the electrode and the emissive layer. EX2002, ¶ 54.

Diekmann's "electron injection layer" is described as containing at least one of an organic material NET-5 doped with NDN-1 and also described as using inorganic materials cesium carbonate ("Cs₂CO₃,"), lithium ("LiF"), sodium fluoride ("NaF"), and barium ("Ba"). Diekmann, 5. Diekmann further discloses:

[D]oping advantageously increases the conductivity of the doped organic layer and, in the case of an n-doped layer adjacent to the cathode, leads to better injection of electrons from the cathode into the

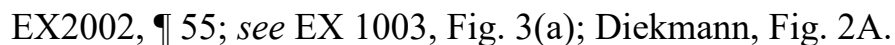
organic layer stack ... Preferred n-dopants are cesium, barium and lithium fluoride.

...

On its outer side facing the cathode, the organic layer stack 4 has a doped layer 402 with a dopant 410, which acts as an electron donor. This advantageously increases the injection of electrons from the cathode into the organic layer stack. The dopant 410 can be for example cesium, barium or lithium fluoride.

Id. at 10, 91.

Petitioner's expert expressly acknowledges the difference between injection and transport layers: "[A]n electron injection layer (EIL) may also be used in addition to an ETL," and, "where both a doped transport layer and injection layer are present, a distinction is made between the 'injection' and 'transport' layers," citing Ma as an example. EX1003, ¶¶ 27, 39; *see id.*, ¶ 34 (dedicating an entire section to electron injection layers that "[r]educ[e] the OLED driving voltage" and "the power consumed by the OLED"). He depicts these layers as Figure 3A, which are easily shown in Diekmann Fig. 2A:



⁴ See Pet. 25 (“a POSITA would understand that doped layer 402 is an n-doped electron transport layer.”).

layer”). Petitioner then turns to the ’425 Patent in a clear case of hindsight reasoning to show that electron transport layers “transport” electrons and that Balq and TPBi are materials used for electron conducting layers.⁵ Pet. 24-25 (citing ’425 Patent at 24:59-62, 26:32-43). This overlap merely confirms the uncontroversial point that the ’425 Patent and Diekmann both have electron transport layers (made up of Balq and TPBi) to transport electrons. Yet, Diekmann does not link Alq₃, BALq, and TPBi with the doped layer 402. This further proves doped layer 402 is not the ETL. No competent evidence is provided to show that Diekmann discloses n-doping its electron-conducting layer comprised of Alq₃, Balq, or TPBi.

B. Petitioner Has Not Shown that Suzuki Discloses the Claimed N-Doped Electron Transport Layer [1g]

Petitioner has also not shown that Suzuki teaches an *n-doped* ETL. Suzuki discloses using electron injection layers next to the cathode, such as a layer of LiF. Suzuki, ¶¶ [0295], [0338]. Suzuki’s electron transport layers have a “high n nature doped with impurities.” *Id.*, ¶ [0333]. Yet, importantly, Suzuki does not say that the ETL has been *n-doped*, but that a material with an already “high n nature” is then “doped with impurities.” *Id.*

⁵ Petitioner’s related blanket citation to Exhibit 1014 is unexplained and should be given no weight. 37 C.F.R. § 42.104(b)(5).

As Dr. Pattison explains, because an ETL is for transporting negative charge carriers (electrons), ETL materials tend to have a high n (or negative charge) characteristic. EX2002, ¶ 59. That is because electron transport requires both a high number of electrons in the ETL and good electron mobility. *Id.* Thus, if there are no electrons in the material, there would be no electron transport. *Id.* This material with its n characteristic may be then doped. *Id.*

Petitioner does not explain what doping with “impurities” means in this context or why a skilled artisan would n -dope (increase the number of electrons) an already high n nature material. A skilled artisan would have been well-aware of impurity doping for other reasons than n -type doping, such as colorant dopants, hole trapping, or hole blocking doping. *Id.*, ¶ 60; *e.g.*, EX1013 (Baldo 1998) at 151 (doping a phosphorescent dye (PtOEP) into an Alq₃ “electron transport material” for red coloring); EX2008 (Adamovich 2003), Abstract (doping a combined “hole blocking and electron transport layer”), 82 (doping FIrpic into wide gap matrix to block holes). Hole blocking or trapping is particularly important, as it can prevent hole leakage from the EML into the adjacent layers, which may then upset hole-electron balance, damage the device, and significantly degrade device performance. EX2002, ¶ 60.

While Petitioner attempts to point to the “applications and publications” cited by Suzuki, Petitioner does not identify them, cite them, or explain how or where they

disclose purported “n-doped electron transport layers.” Pet. 57. Only one of these papers appears to have been made of record (EX1019), yet Petitioner has not pinned or explained how EX1019 supports its conclusory statements for this element. This is a clear violation of the petition’s requirements to explain its evidentiary support under 37 C.F.R. § 42.104(b)(5) and not to incorporate by reference under 37 C.F.R. § 42.6(a)(3). Petitioner’s failure to explain its reliance on EX1019 should be afforded no weight. *See* CTPG at 35-36; *Cisco Systems, Inc. v. C-Cation Techs., LLC*, IPR2014-00454, Paper 12 at 9-10 (PTAB Aug. 29, 2014) (informative). In short, Petitioner has not shown that Suzuki describes n-doping its ETL.

C. Petitioner’s Alleged Motivation and Expectation of Success Related to N-Doped Electron Transport Layers for Both Diekmann and Suzuki Are Legally Insufficient and Conclusory

Acknowledging that Diekmann dopes the wrong layer and Suzuki does not specify the “impurities” dopant it uses with its already high-n nature ETL, Petitioner turns to single reference obviousness. Pet. 25-26, 56-57. But Petitioner’s analysis fails to provide a motivation to modify Diekmann or Suzuki in the claimed manner with a reasonable expectation of success.

A petitioner must “demonstrate both ... [a] motivation to combine” and “a reasonable expectation of success in doing so.” *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1381 (Fed. Cir. 2016) (quoting *Intelligent Bio-Sys., Inc. v. Illumina Cambridge, Ltd.*, 821 F.3d 1359, 1367-68 (Fed. Cir. 2016) (these are “two different

legal concepts” required for obviousness). A petitioner does not satisfy its burden with “mere conclusory statements,” but “must instead articulate specific reasoning, based on evidence of record, to support the legal conclusion of obviousness.” *Magnum Oil*, 829 F.3d at 1380; *Nintendo Co. v. Genuine Enabling Tech LLC*, IPR2018-00543, Paper 7 at 24 (PTAB Aug. 6, 2018) (denying institution because petitioners’ “only support [was] a conclusory statement [from their expert] without any evidentiary support, which has no weight”).

Here, Petitioner first offers a conclusory motivation statement that using “n-doped electron transport layers” was “well-known.” Pet. 25, 56-57. This “well-known” mantra is found throughout its defective obviousness arguments. Such a “conclusory assertion with no explanation is inadequate to support a finding that there would have been a motivation to combine.” *TQ Delta, LLC v. Cisco Sys., Inc.*, 942 F.3d 1352, 1359 (Fed. Cir. 2019). Even then, whether something is “well-known” is not a motivation. *E.g., Virtek Vision Int’l v. Assembly Guidance Sys.*, 97 F.4th 882, 887-88 (Fed. Cir. 2024) (“The fact that the claim elements are known in the prior art ... alone does not show a motivation to combine.”). Petitioner tellingly never proposes a combination with any of this supposed well-known art.

Petitioner’s only evidence for purportedly well-known n-doping is an unexplained blanket citation to a series of exhibits without any specific pin-cite. Pet. 25 (citing without explanation EX1019, EX1029, and EX1030), 57 (citing without

explanation EX1016, EX1019, EX1029, EX1030). For the Suzuki grounds, Petitioner additionally cites seven pages of its expert's testimony, but, again, provides no explanation. Pet. 57 (citing EX1003, ¶¶ 37-42, 195). These are all insufficiently explained and non-specific and a violation of the Board's rules and regulations that require the Petition to provide "a detailed explanation of the significance of the evidence" and to not incorporate arguments by reference. 37 C.F.R. §§ 42.22(a)(2), 42.6(a)(3), 42.104(b)(5). The Board should "give no weight to th[is] evidence" because Petitioner "failed to state its relevance or to identify specific portions of the evidence that support the challenge." § 42.104(b)(5).

Moreover, there was no evidence of any need to n-dope the electron transport layers in Diekmann or Suzuki. For Diekmann, Petitioner alleges that doping the electron transport layer would "lower driving voltage" with "better power efficiency." Pet. 25. For Suzuki, Petitioner alleges that an n-doped electron transport layer would "promote transport of electrons" and "improve electron injection." *Id.* 57. But those are just statements of what electron transport and injection layers do. '425 Patent at 24:59-62 (ETL "transports negative charge carriers—electrons"), 28:12-19 (describing injection layer on electrode for "good electron injection properties" using LiF).

In support, Petitioner again improperly incorporates 8 pages of its expert's background and overview on injection and transport layers without explanation. Pet.

25 (citing EX1003, ¶¶ 32-42), 57 (citing EX1003, ¶¶ 37-42); 37 C.F.R. § 42.104(b)(5); 37 C.F.R. § 42.6(a)(3); CTPG at 35-36; *Cisco Sys.*, IPR2014-00454, Paper 12 at 9-10 (informative). Yet Petitioner never explains how n-doping the electron transport layer would lower drive voltage and power efficiency in comparison to Diekmann's already-doped electron injection layer or why Suzuki would further n-dope the already "high n nature" electron transport layer. Diekmann and Suzuki have already achieved this goal. *See Kinetic Concepts, Inc. v. Smith & Nephew, Inc.*, 688 F.3d 1342, 1369 (Fed. Cir. 2012) (when two references accomplish similar functions, there is "no reason to combine the features of both devices into a single device.").

As evidence of "lower drive voltage and better power efficiency" and "promot[ing] transport of electrons," Petitioner also relies on Ma. Pet. 25 (citing Ma, 810), 57 (citing Ma, 812). Ma has not been shown to be prior art and is not used in combination for element [1g]. *See* Section V.A, *infra*. Yet Ma is also of no help. Ma's purported improvements are to a reference fluorescent Alq₃-based device "without doping." Ma, Abstract, 810-811 (describing the "complete device"); *see id.* at 812, 814 (comparing to Alq₃-based undoped "Device A"). This does not mean that Diekmann or Suzuki with their different layers and materials would experience the same effects. *See* Sections V.C-V.E, *infra*. No attempt has been made to compare Ma to Diekmann's or Suzuki's OLED device. No attempt has been made to show

that Ma's performance improvements to a simple fluorescent stack would even translate to the completely different phosphorescent OLED (PHOLED) stack in Diekmann and Suzuki. *Id.*

For Diekmann only, Petitioner points to Diekmann's disclosure regarding electron injection layer doping as a purported motivation. Pet. 25 (citing Diekmann at 10) ("promote injection of electrons from the cathode and improve transportation of electrons to the light-emitting region"). Diekmann's statement regarding doping its electron injection layer says nothing about a motivation to also n-dope an electron transport layer. Indeed, Petitioner has not pointed to any examples where both EIL and ETL are n-doped.

Finally, Petitioner's explanation for an expectation of success is a single, bare bones sentence that "n-doped electron transport layers were widely used." Pet. 25-26, 57-58. This generic statement is conclusory and does not address specifically doping Diekmann or Suzuki in the claimed manner. *See, e.g., Samsung Elecs. Co. v. LED Wafer Solutions, LLC*, IPR2021-01491, Paper 11 at 15 (PTAB Oct. 26, 2022) (denying institution on rehearing because "Petitioner's showing as to motivation to combine is conclusory and inadequate and a reasonable expectation of success in combining the teachings in the prior art was not shown"). Petitioner does not even specify any particular dopant or host material or how that dopant would or could be

introduced, or how the OLED would still expect to work and emit light in Diekmann or Suzuki's specific OLEDs.

Instead, Petitioner's only support is a barebones citation to its expert testimony that lacks any explanation and merely parrots the petition. Pet. 26 (citing EX1003, ¶¶ 110-111), 58 (citing EX1003, ¶ 195). This should be given no weight. 37 C.F.R. §§ 42.104(b)(5), 42.6(a)(3); CTPG at 35-36; *Cisco Sys.*, IPR2014-00454, Paper 12 at 9-10 (informative); *Xerox Corp. v. Bytemark, Inc.*, IPR2022-00624, Paper 9 at 15 (PTAB Aug. 24, 2022) (precedential); 37 C.F.R. § 42.65(a).

V. PETITIONER'S GROUNDS BASED ON MA AGAINST CLAIMS 2 & 17 ARE FATALLY FLAWED

Two of Petitioner's grounds (II and VII) rely on Ma—a purported publication—for n-doping the electron transport layers in Diekmann and Suzuki with “8-hydroxy-quinolinolato-lithium” (Liq). Pet. 36-38 (Ground II), 69-70 (Ground VII). Yet Petitioner has failed to establish Ma was publicly available prior art to the '425 Patent. And Petitioner has again not provided any cogent motivation for why a skilled artisan would have combined Ma with Diekmann or Suzuki with a reasonable expectation of success.

A. Ma Has Not Been Shown to Be Prior Art

Petitioner has entirely failed to meet its burden to show that Ma was publicly available and thus qualifies as a printed publication no later than December 11, 2008 (*i.e.*, the undisputed priority date for the foreign German application that ultimately

resulted in the '425 Patent) or even December 9, 2009 (the PCT filing date). The *petition* must establish a reasonable likelihood that an asserted reference qualifies as a printed publication. *Hulu, LLC v. Sound View Innovations, LLC*, IPR2018-01039, Paper 29 at 3 (PTAB Dec. 20, 2019) (precedential). Petitioner must, in the petition, “produce sufficient proof of [the article’s] dissemination or that it has otherwise been available and accessible to persons concerned with the art to which the document relates.” *Argentum Pharms. LLC v. Research Corp. Techs., Inc.*, IPR2016-00204, Paper 19 at 9 (PTAB. May 23, 2016) (quoting *In re Wyer*, 655 F.2d 221, 227 (CCPA 1981)). Yet Petitioner has provided no discussion whatsoever or cited any evidence of public accessibility to support any claim that Ma qualifies as prior art. Pet. 5. The Board denies institution in this exact situation where, as here, the petitioner fails to include any argument or evidence of public availability. *E.g.*, *Symantec Corp. v. Trustees of Columbia Univ.*, IPR2015-00371, Paper 13 at 5, 9 (PTAB June 17, 2015) (“The Petition submits that Cardinale was ‘published March 1999’ and is, thus, ‘prior art to the ’907 patent under pre-AIA §§ 102(a) and (b).’ ... We do not find any discussion in the Petition in support of the allegation that Cardinale was published in March 1999”; “[O]n that record, Petitioner has failed to meet its burden of at least a preliminary showing that Cardinale is a printed publication.”).

To the extent Petitioner attempts to rely on a date listed on the face of Ma, such an argument must have been in the petition. And, even then, the Board has

rejected such unsupported hearsay as a basis for proving publication. *See In-Depth Geophysical, Inc. v. Conocophillips Co.*, IPR2019-00849, Paper 17 at 5, 12 (PTAB Mar. 30, 2020) (“Simply pointing to a date, alleged to be a ‘publication date,’ ... without interpretation or explanation, does not meet the threshold standard to show that it is reasonably likely that a reference was public[ly] accessible on that date.”); *Celltrion, Inc. v. Biogen, Inc.*, IPR2016-01614, Paper 65 at 16 (PTAB Feb. 21, 2018) (finding that an exhibit retrieved in 2016 bearing a copyright date of 1997 did not establish that that exhibit *was* publicly accessible as of 1997). Petitioner has done nothing to prove that Ma—its only support for an Liq-doped ETL—is, in fact, prior art in this proceeding.

B. Petitioner Provides No Cogent Reason to Combine Diekmann or Suzuki with Ma with an Expectation of Success

Petitioner alleges that Diekmann and Suzuki would have been combined with Ma “due to the known benefits” of a “Liq-doped electron transport layer.” Pet. 37-38, 70. Petitioner’s only evidence that there were “known” benefits for a Liq-doped electron transport layer is its expert. Pet. 37-38 (citing Ex.1003, ¶¶ 140-143), 70 (citing Ex.1003, ¶¶ 32-42, 225-228). Petitioner’s expert refers to his discussion to Section V.A.4 of his declaration that relates generally to electron injection layer and electron transport layer. EX1003, ¶ 140; *see also id.*, ¶¶ 145, 225. This nested reference is improper as it is an overt attempt to incorporate pages of the expert

declaration without any substantive discussion. *See* CTPG at 35-36; *Cisco Sys.*, IPR2014-00454, Paper 12 at 9-10 (informative); 37 C.F.R. §§ 42.6(a)(3); 37 C.F.R. § 42.104(b)(5). The Board should decline to consider those incorporated-by-reference expert testimony. *Id.* But without those pages of testimony that Petitioner fails to engage, the bare assertion lacks any evidentiary support. This should be given no weight. *See Xerox*, IPR2022-00624, Paper 9 at 15 (precedential); 37 C.F.R. § 42.65(a).

Even if the Board chooses to examine the pages of testimony, the only noted use of Liq in an ETL is Ma's use of Liq in a Bphen matrix. *See* EX1003, ¶¶ 37-42. A single reference—and with no other evidence from before the critical date—does not suggest that it was “well-known” that Liq-doping an electron transport layer would allegedly lead to OLEDs with a high level of efficiency. EX2002, ¶¶ 74-76. On the contrary, Ma contradicts Petitioner in its introduction: “[n]o work has been reported about using Liq-doped BPhen as electron transport layer.” Ma, 810. For its Suzuki grounds, Petitioner offers no additional explanation and merely refers to its Diekmann grounds without any specificity. Pet. 70.

For Diekmann, Petitioner also relies on Ma's background statement that there was an “interest in developing OLEDs with high efficiency.” Pet. 37 (quoting Ma, 810). But this says nothing about using Liq as a general ETL dopant or its benefits. EX2002, ¶¶ 67, 87. In context of Ma, this interest would have been understood with

regard to improving the very low efficiency Alq₃ emitter-based devices with their low internal quantum efficiency and high voltages used in undesirable monochromatic devices. *Id.* But this does not show that using Liq as an ETL dopant in Diekmann's or Suzuki's OLED stack would have been expected to result in high efficiency (or any efficiency) in an entirely different system. *Id.*

Indeed, a skilled artisan would understand that Ma does not suggest that Liq is a panacea for all OLED systems. EX2002, ¶¶ 88-91. Ma's improved performance is specific to its OLED stack with its Bphen host and only in comparison to a device with an undoped version of its OLED stack. *Id.*, ¶ 89. Ma admits it builds off prior efforts to "improve the electron injection and transport" of doping an *emissive* layer, Alq₃, with lithium (Li) or Bphen. Ma, 810. Ma also admits that there were only a "few studies" about Liq even as a separate electron *injection* layer. *Id.* Ma describes tweaking a known, operable undoped OLED stack shown below:

Anode	ITO
HTL	<i>m</i> -MTDATA (40nm)
Interlayer	NPB (10nm)
Emission layer	Alq ₃ (20 nm)
ETL	BPhen (50 nm)
EIL	LiF (1 nm)
Cathode	Al (130nm)

EX2002, ¶ 92; Ma, Abstract, 810-811. Ma then proposes heavily doping Bphen with Liq alongside doping *m*-MTDATA with F₄-TCNQ, surrounding its Alq₃ emission

layer. *Id.* Unlike Diekmann’s Ir-based PHOLED relied on by Petitioner, Ma seeks to find the optimal dopant levels for its Alq₃-based fluorescent OLED, testing power efficiency by comparing an undoped system to its doped variations. *See* Ma, Fig. 3; EX2002, ¶¶ 92-93.

Ma narrowly concludes, based on this testing, that any performance enhancement “is attributed to the improved transport conductivity of *both* p-doped HTL and n-doped ETL at a particular doping concentration of F₄-TCNQ into *m*-MTDATA and Liq into Bphen.” Ma, 812. The “certain doping ratio of Liq to Bphen can improve the electron transport ability of the co-deposited layer” in Ma’s Alq₃-based stack. Ma, 813. The performance enhancement is thus tied to the specific layers with the specific dopants in an Alq₃-based fluorescent stack, not a broader general proposition for doping every ETL with Liq. EX2002, ¶¶ 94-97.

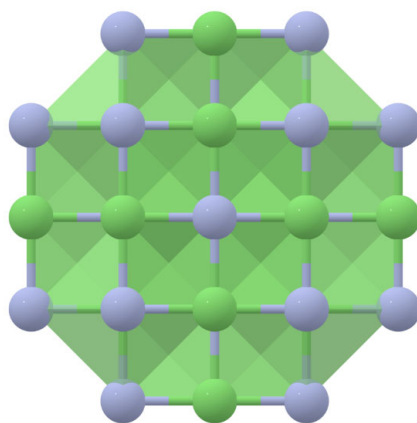
According to Ma, the reason the Liq doping worked was not just because Liq was used. EX2002, ¶ 98. Ma’s doping was correcting a known hole surplus in this specific stack. Ma, 814 (“[W]e have known that in un-doping devices, such as *Device A* [(the reference device)], the number of holes is much more than electrons. So, a surplus of holes at the NPB/Alq₃ interface increases the probability that Alq₃ cations are formed, which are known to be unstable and lead to rapid device degradation.”). This is why Ma proposed doping its Bphen layer with Liq and its *m*-MTDATA layer with F₄-TCNQ—to achieve a “good balance” between holes and

electrons, “leading to the decrease in surplus of holes.” *Id.* Petitioner cites no evidence and does not contend Diekmann or Suzuki have such a surplus of holes to correct anywhere or even at the HTL-emission layer interface, as in Ma’s system. EX2002, ¶ 98.

For instance, in Diekmann, the hole conducting layer (such as aNPB, *see* Diekmann, 4) is separated from the electron transport layer (such as Alq₃, *see* Diekmann, 5) by at least the emissive layer (Diekmann, 4; *see* EX1003, Fig. 3(a), ¶ 34). A skilled artisan would have understood that Ma’s observation about preventing a hole surplus at the NPB/Alq₃ interface cannot be readily applied to Diekmann—there is no NPB/Alq₃ interface and BPhen was not even mentioned as a potential ETL matrix material. *See* Diekmann, 5 (Alq₃, BAlq and TPBi as the ETL material). EX2002, ¶ 99.

For the Diekmann ground only, Petitioner additionally cites Diekmann’s disclosure of a preference for dopants having lower diffusion constants, which is often associated with larger atoms or molecules. Pet. 37-38. Yet Petitioner admits that Diekmann’s preferred dopants are cesium, barium, and lithium fluoride (LiF). *Id.*; Diekmann, 10, 34, 91, 119; EX2002, ¶¶ 79-80. Among these, cesium and barium are large row 6 main group metals. EX2002, ¶ 81. And LiF, although composed of the smallest metal cation Li⁺ and smallest anion F⁻, has a cubic crystal structure in which Li⁺ is bonded by six equivalent F⁻ to form a mixture of corner and edge

sharing LiF_6 octahedra as shown below. *Id.* This reduces the diffusion rate of Li^+ and F^- .



Id.

While Liq might have a larger molecular weight, that does not mean that Liq would have been recognized by a skilled artisan at the time as suitable as a dopant with low diffusion rate in Diekmann's OLED device over cesium, barium, and LiF. For instance, there is no explanation why the small Li^+ cation in Liq would not dissociate from the hydroquinolate anion and diffuse through the organic layers to wreak havoc on the device. *Id.*, ¶ 82. There is no explanation for why a skilled artisan would use Liq in lieu of these already low-diffusion constant, large atom/molecule dopants that were preferable in Diekmann. *Id.* And, again, Diekmann also only disclosed dopants for its electron **injection** layer (*see* Section IV.A, *supra*), which has not been shown by Petitioner to motivate a skilled artisan to n-dope a different, electron **transport** layer. *See* Pet. 37-38. Indeed, Diekmann does not suggest doping

Alq₃, Balq or TPBi, the named electron-transport layer material, or suggest replacing these ETL materials with BPhen. Petitioner has offered no reason to substitute Bphen in Diekmann's system. EX2002, ¶ 83. This is not a dispute of facts, but an absence of competent evidence.

Petitioner's own evidence suggests that the choice of materials in an OLED stack is a delicate balance of material properties. For example, a presentation by NOVALED (which Petitioner acquired) shows that the energy levels of hole-transporting material, the emission material, and the electron-transporting material needs to be matched to facilitate efficient hole and electron transfers. EX1029 at 6. No evidence was presented that this delicate balance would be maintained if Liq-doped BPhen is used in place of Diekmann's or Suzuki's ETL materials. EX2002, ¶¶ 123-131; *see* Section V.D, *infra*.

Petitioner's reliance on Liu (EX1018) for Liq's "good electron injection and transport properties" is unexplained and lacks even a basic pin-cite. Pet. 37-38. This should be disregarded and given no weight. 37 C.F.R. § 42.104(b)(5). And, even then, Liu was discussing using Liq as an electron *injection* layer, not an ETL dopant and, like Ma, also notes that Liq "has not yet been widely investigated." EX1018, Abstract, 211; Ma, 810; EX2002, ¶ 77.

Petitioner provides no evidence on why a skilled artisan would have replaced the listed dopants in Diekmann with Liq or why Liq would be used in Suzuki as an

impurity dopant in Suzuki's already high-n nature ETL. EX2002, ¶¶ 69, 71, 78, 85. And while quenching is not a significant concern for singlet fluorescent emitters like Alq₃ in Ma, quenching is a major concern for Iridium-based triplet PHOLED as required by the claims and proposed combinations. EX2002, ¶¶ 44, 106-107, 115, 121; EX2006 (Oh 2015) at 34-35; *see* Sections V.C-V.D, *infra*.

Finally, Petitioner's short statement of expectation of success explanation is a conclusory statement that this would be "routine" with a "high probability of success." Pet. 38, 70 (citing EX1003, ¶¶ 145-146, 225-228). Such conclusory language is insufficient for a reasonable expectation of success. *See, e.g., Samsung Elecs. Co.*, IPR2021-01491, Paper 11 at 15. Petitioner's statement is entirely lacking any explanation for why a skilled artisan, armed with only a bachelor's degree and three years of industry experience, could reasonably expect success in doping a different, much more complicated OLED stack with different host materials and emissive layers with Liq. EX2002, ¶¶ 84-85. Whether Diekmann and Suzuki supposedly already contemplate an "n-doped electron transport layer" (Pet. 38, 70) likewise does not say how or why a skilled artisan would reasonably expect success in Liq doping the ETL in Diekmann or Suzuki. EX2002, ¶¶ 84-85.

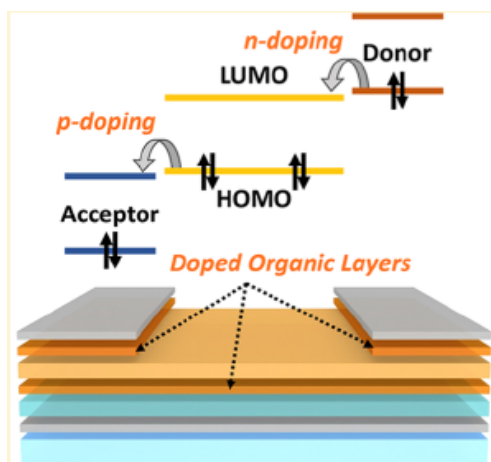
C. Petitioner Fails to Account for the Differences Between Liq-doping Ma's Alq₃-Based Fluorescent System and the Claimed Iridium-Based Phosphorescent System

The challenged claims are directed to an OLED that includes Ir-based emission layer. EX1001, cl. 1. A skilled artisan would have understood that Ir-based compounds are phosphorescent emitters whose emission involves a triplet excitation state. EX2002, ¶ 114. This differs from a fluorescent emitter like Alq₃ used by Ma, which involves only a singlet excitation state. *Id.* Liq, with its relatively low triplet energy potentially “act[s] as a luminance quencher in phosphorescent organic light-emitting diodes (PHOLEDs).” EX2005 (Oh 2015) at 34; EX2002, ¶¶ 38-39, 44, 106-107, 121. Petitioner does not account for this difference and indeed ignores the difference between Iridium-based phosphorescent and Alq₃-based fluorescent emitters entirely.

First, neither Diekmann nor Suzuki mention using Liq as an ETL n-dopant or otherwise. This was for a good reason. As Ma's limited use shows, Liq was only starting to be tested in single, very specific and known fluorescent Alq₃-based OLED stack as a dopant for BPhen. Ma, 810; EX2002, ¶¶ 90, 102. Ma admits that “no work” had previously been done on Liq as an ETL dopant in BPhen. Ma, 810; *see* EX2007 (Sasaki 2023) at 1 (“OLEDs fabricated using Bphen doped with Liq as the ETL have rarely been reported” as of 2023); EX2002, ¶ 109. Ma thus describes itself

as the first use of Liq as a heavy dopant in its Bphen ETL in its fluorescent (Alq₃ emitter) OLED.

Indeed, Ma describes a novel mechanism for this increased conductivity of the Bphen transport layer due to “electron hopping among BPhen and Liq sites.” Ma, 813. This “hopping” mechanism differs from the n-doping mechanism described in the ’425 patent and Diekmann of an “electron donor.” ’425 patent at 26:61-62; Diekmann, 91; *see* Diekmann, 10, 34, 119. No skilled artisan would turn to a heavy dopant using an unproven transport mechanism (electron hopping) as in Ma over a simpler, electron donor dopant that operates at significantly lower concentrations. EX2002, ¶ 110. Indeed, a skilled artisan would be skeptical as to whether Liq is an n-dopant as described by Ma. *Id.*, ¶ 111. Generally, a molecular dopant n-dopes an ETL by transferring electrons from the dopant’s HOMO to the ETL’s LUMO, as illustrated below:



EX2009, Abstract. The HOMO of Liq is 5.8eV while the LUMO of BPhen—according to Ma—is about 3.0eV. EX2002, ¶ 111. A POSITA would have regarded the 2.8eV energy gap as too much by a POSITA for any electron transfer or n-doping to occur from Liq to BPhen. *Id.*, ¶ 112. Thus, although Ma described BPhen as n-doped, Petitioner has not explained why shortening the molecule distance between electron carrier sites is n-doping as opposed to modulating the electron mobility.

Additionally, at the time of filing the '425 Patent, the research into using Liq in OLED devices was nascent and focused primarily on Liq as an injection layer material in fluorescent OLED stacks, not as an ETL dopant in phosphorescent OLED devices. EX2002, ¶¶ 100, 117-118. The use of Liq as a dopant remained almost exclusively on fluorescent OLEDs through at least 2015. EX2005 (Oh 2015) at 34; EX2002, ¶¶ 106-107, 119. Yet, in that time frame and still years after the filing of the '425 Patent, “the reason for the enhanced electron transport property” of Liq in Bphen and Alq₃ and why such high doping (around 30%) concentrations were needed of Liq still “was not well understood.” EX2004 (Kumar 2011) at 1-2; EX2002, ¶¶ 103, 119. “[N]-type doping of organic semiconductors still remain[ed] a challenge” even then. *Id.* And, even as recently as 2022, researchers were still trying to figure out just how Liq works. EX2006 (Kang 2022), Abstract, 1 (investigating the “effect of coordinated structures of electron transporting materials (ETMs) with lithium quinolate (Liq) on charge transport characteristics.”); EX2002,

¶¶ 108, 119. In other words, n-type doping of organic semiconductors was and still is unpredictable. EX2002, ¶ 103; *see id.*, ¶¶ 71, 113, 124.

In contrast to this limited understanding of Liq in fluorescent OLEDs, the embodiments relied on by Petitioner in Suzuki and Diekmann are **phosphorescent** OLEDs, not fluorescent OLEDs. Pet. 26 (relying on Diekmann’s Ir(ppy)₃), 58 (Suzuki’s alleged Iridium complex is a PHOLED); *see* EX1003, ¶¶ 31 (Iridium as a phosphorescent material), 38, 112 (“Ir(ppy)₃, which is an iridium-containing compound which functions as a green light-emitting phosphorescent dopant”), 196 (“Suzuki teaches that in the case of phosphorescent dopants,” “iridium compounds are the most preferable.”); *see* Ex. 1014 (Baldo 1999), 4. Specifically, Petitioner relies on Diekmann’s fac-tris(2-phenyl-pyridyl)iridium complex and Suzuki’s “iridium compound” “phosphorescent dopant.” Pet. 26, 58. There is no iridium-containing emission layer in Ma’s fluorescent system. EX2002, ¶ 120. Instead, Ma uses a single layer of Alq₃—the oldest and most studied emissive layer material in OLED. *Id.* Petitioner makes no effort to explain how or why an Liq dopant tailored for Alq₃ and Bphen would work with either Iridium-based emitters or their other emissive materials in the stack with their different HOMO and LUMO levels as well as other properties and device-specific charge balance problems. *Id.*

Third, OLED emission is known to be quenched by Li⁺ ions from using an Liq layer or an Liq bulk dopant in phosphorescent OLED devices. EX2002, ¶ 121.

Whatever the benefits to a fluorescent Alq₃ OLED, in a phosphorescent OLED, an Liq dopant acts as a “luminance quencher” because of the low triplet energy of Liq (2.0 eV). EX2005 (Oh 2015) at 34 (Liq as a dopant “act[s] as a luminance quencher in phosphorescent organic light-emitting diodes (PHOLEDs).”). Thus, as Oh reports, there was still a need, long after the filing date, of a high triplet energy n-type doping material that suppress triplet exciton quenching in phosphorescent OLEDs. *Id.* at 35. Petitioner ignores the quenching problem. But, more fundamentally, Petitioner never explains why a skilled artisan would have used Liq as a dopant in Diekmann’s or Suzuki’s phosphorescent system with a reasonable expectation of success given these unsolved quenching concerns.

Given the early stages of this research into Liq, a skilled artisan armed with only a bachelor’s degree in physics or chemistry and three years of experience would not and could not just swap materials or dopants into an entirely different stack with a reasonable expectation of success. EX2002, ¶¶ 86, 100-101, 114, 116, 122. That skilled artisan simply lacks the experience and expertise to do so and such efforts would require significant experimentation and a large team of cross-disciplinary scientists with far more advanced experience to even begin to accomplish. *Id.*

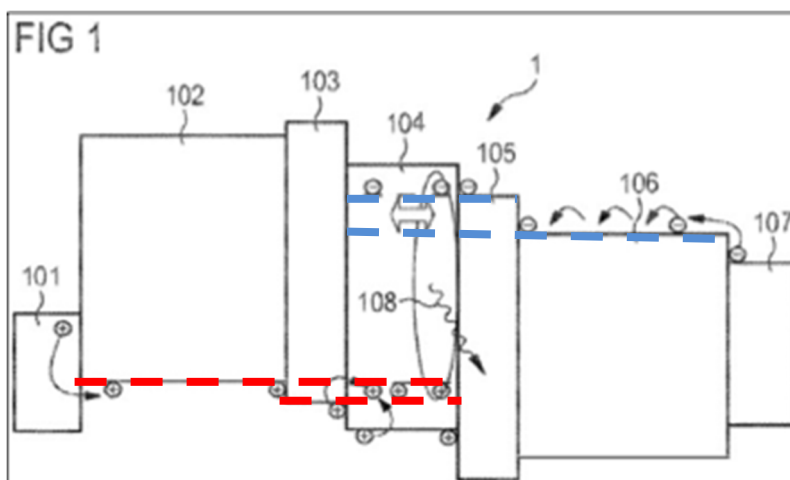
D. Petitioner Does Not Address the Delicate Energy Level Balance Required for the Different Organic Layers in an OLED stack, Wrongly Treating Each Layer as Modular Pieces

There are significant difficulties in using unproven materials in a different OLED stack. To illustrate, the choice of which layers to use, the specific materials for each layer, the dopant and its concentration, if any, for each layer, the size of each layer, the layer order, and the choice of manufacturing processes (deposition, co-evaporation, temperature, and so forth) must be carefully chosen to maintain that balance that still create an operable OLED. EX2002, ¶ 123. Otherwise, there would be no “light emitting device” to qualify as the claimed OLED device that emits EM radiation in the claimed range. *Id.*; *see id.*, ¶¶ 35-36.

For instance, maintaining the proper energy level balance between the layers is extremely difficult and necessary to solve before potentially expecting to build an operable OLED system that emits any electromagnetic radiation. *Id.*, ¶¶ 124-126. As Petitioner’s expert admits, efficient injection of electrons and holes requires “relative energy level alignment between adjacent layers of the organic stack as well as the electrical conductivity of each layer.” EX1003, ¶ 32; *See* EX2004 (Kumar 2011) at 1 (matching the “HOMO” value “of the donor molecule” to the “LUMO” value “of the host molecule.”). This is accomplished by matching the LUMO and HOMO levels of the various OLED layers so that the electrons and holes can traverse from the cathode or anode, respectively, to the emissive layer. EX2002, ¶¶ 125-126. Ma

repeatedly emphasizes the need for maintaining this charge balance in the emission zone. Ma, Abstract, 810, 813-814; EX2002, ¶ 130.

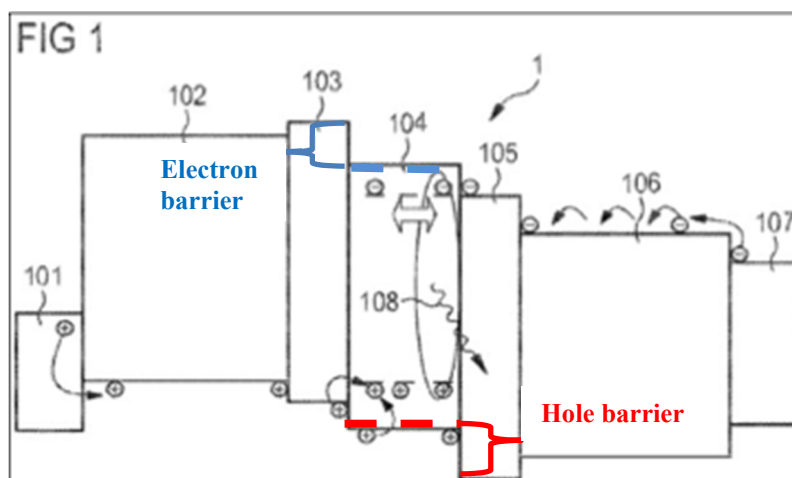
Figure 1 of the '425 Patent is an energy level diagram, showing the LUMO (blue) and HOMO (red) balance in the '425 Patent's stack:



'425 Patent, Fig. 1 (annotated); EX2002, ¶ 127. The gap between neighboring levels must be sufficiently close to permit the injected electrons and holes to move (transport) from the electrode toward the emissive layer. EX2002, ¶ 127. Yet, at the same time, a charge balance must also be maintained to prevent holes from crossing into the ETL and to prevent electrons from passing into the HTL to avoid quenching and degradation of the OLED. *Id.*

The HOMO and LUMO levels on the other side of the emissive layer must be sufficiently lower than the hole (p-) or electron (n-) side to avoid the holes entering the electron side or the electrons entering the hole-side. *E.g.*, EX2003 (Kim 2011) at 54 (higher mobility of holes results in “non-emissive cationic species” in the

emission layer, obstructing “hole-electron recombination” and forming “dark spots, luminance decay[,] and subsequent low efficiency”), 56 (depicting charge levels for Liq doping), 57 (Liq has “poor electron transportation properties”), 58 (“heavy doping of Liq (15%~50%) causes unbalanced holes and electrons in EML due to excess or insufficient electrons and decreases the device efficiency.”); EX1029 at 6; EX2002, ¶ 128. The ’425 Patent’s embodiment below illustrates this by the large band gaps on the electron blocking layer (103) and hole barrier layer (105):



’425 Patent, Fig. 1 (annotated); EX2002, ¶ 129. There is only a narrow range of permissible LUMO and HOMO levels for each layer and dopant to create an operable OLED. Adding Liq as a dopant—especially as a heavy 30%+ dopant as in Ma—would greatly throw off this delicate charge balance in Diekmann and Suzuki. EX2002, ¶ 129.

Tellingly, significant work continued well after the filing date in trying to determine the correct energy band levels to dope materials with Liq for an operable

system even when just based on Bphen as in Ma. EX2003 (Kim 2011), Abstract, 59 (testing multiple configurations of an ETL with doping concentrations of 5-65% of Liq in Bphen, reporting efficiency points as low as 5% and as high as 65% depending on configuration); EX2002, ¶¶ 104-105, 131. Petitioner makes no effort to explain how this would even be reasonably expected to work within the LUMO and HOMO level constraints of the neighboring layers in Diekmann or Suzuki.

E. Petitioner Offers No Evidence that Diekmann and Suzuki Would Have Gained Any Benefit from Using an Liq-doped ETL

Ma's performance enhancement due to Liq was to correct a known hole surplus. Ma, 814. Yet, Petitioner does not contend Diekmann or Suzuki have such a surplus of holes to correct. And, without that surplus, Liq would have been expected to create an *electron surplus*, breaking charge carrier balance for generating excitons and degrading the emitter molecules. EX2002, ¶¶ 132-133.

A skilled artisan would have expected that doping Liq into Diekmann and Suzuki as proposed by Petitioner would thus only create charge balance problems. *Id.*, ¶ 133; *see* EX2003 (Kim 2011) at 54 (charge imbalance leads to "dark spots, luminance decay[,] and subsequent low efficiency," 56 (Liq "reduces carrier transportation because it is an insulator which has a high dielectric constant"). A skilled artisan, reading Ma, would not willingly throw off the carrier balance by creating an electron surplus. EX2002, ¶ 134. This is directly contrary to Ma and the

extremely important need to maintain the charge balance. *See* Sections V.C-V.E, *infra*; EX2002, ¶ 133. Ma expressly teaches away from creating such charge imbalances. Ma, 814 (“good carrier balance” is “one of the most important factors in getting excellent performance in OLEDs”); *see id.* at Abstract, 810 (emphasizing the need for maintaining “efficient charge balance in the emission zone”), 813 (“current efficiency” depends “on the carrier balance”), 814 (discussing “good balance” between electrons and holes with “efficient charge balance” in the emission layer); EX2002, ¶ 134.

Petitioner does not specify how much Liq to dope the ETL layers in Diekmann or Suzuki and thus cannot show a reasonable expectation of success. This is not a scenario where more is better. EX2002, ¶¶ 135-136. Ma illustrates this difficulty. Ma proposed *heavily* doping its BPhen layer with 33% Liq. Ma, Abstract. But Ma reported reduced conduction as the ratio increases to 50% Liq “attributed to the effect of carrier quench and generation of defects.” Ma, 813. Heavy doping of Liq turns Liq into more of a host material given the significant amount used, leading to the effects of Liq as a bulk material to become more present. EX2002, ¶ 136.

For instance, even 5 nm of Liq, risked “significantly affecting the EL properties” similar to LiF’s instability and emission blocking at 1.0 nm. EX1018 (Liu), Abstract, 214 (“Liq layers should be under 5 nm” to avoid “significantly affecting the EL properties”); *see id.* at 213 (“When the LiF thickness is increased

to 1.0 nm, the EL efficiency deteriorates. When the thickness of LiF is 5 nm, the device is very unstable, and when it reaches 10 nm, the device does not give emission at all.”). That uncertainty about the amount of doping remained even for Liq doping BPhen in 2011. *See* EX2003 (Kim 2011), Abstract, 59 (testing multiple configurations of an ETL with doping concentrations from 5-65% of Liq in Bphen, reporting variety of efficiency depending on layer configuration and thickness); EX2002, ¶¶ 104-105, 137.

Petitioner also ignores the significant technical barriers to phosphorescent OLED fabrication in even attempting to utilize a new, unproven dopant from a different OLED layer stack that are well-beyond the limited level of ordinary skill proposed by Petitioner. EX2002, ¶ 138. Liq doping could “retard[]” and “weaken” charge transport, for example. EX2006 (Kang 2022), Abstract, 6 (theorizing the formation of an ETL-Liq complex); EX2003 (Kim 2011) at 54 (charge imbalance leads to “dark spots, luminance decay[,] and subsequent low efficiency”).

Because of the complexity and potential for significant problems of malfunction and inoperability without a shown benefit over Diekmann and Suzuki’s existing structure, a skilled artisan “would have lacked [a] motivation to combine the references and modify them” to use Liq as an ETL dopant in Diekmann and Suzuki. *Provisur Techs., Inc. v. Weber, Inc.*, No. 2021-1851, 2022 WL 17688071, at *5 (Fed. Cir. Dec. 15, 2022). This is not an issue of a “best” or “optimal”

configuration, but a lack of motivation entirely. *See In re Fulton*, 391 F.3d 1195, 1120 (Fed. Cir. 2004) (“[T]he question is whether there is something in the prior art as a whole to suggest the *desirability*, and thus the obviousness, of making the combination.”). The complexity in using Liq as a dopant in an entirely new system, the disadvantages of Liq in an iridium-based PHOLED, and the charge balance concerns raised Ma would not have been counterbalanced by any shown improvement over Diekmann and Suzuki’s existing structure. This would have been such an “unappetizing” combination that there would have been no motivation to use Liq in a Diekmann’s or Suzuki’s ETL layers. *See Henny Penny Corp. v. Frymaster LLC*, 938 F.3d 1324, 1331-32 (Fed. Cir. 2019) (affirming Board’s finding of no motivation because art dissuaded combination, combination would “introduce ‘additional ... complexity’” and “lead to ‘decreased efficiency,’” and the art already addressed the problem in a different manner).

VI. PETITIONER HAS NOT SHOWN THAT GESTURE CONTROL WOULD HAVE BEEN OBVIOUS (CLAIM 12)

A. Petitioner Has Not Shown Either Diekmann or Suzuki’s OLED “Device” is “Drivable By” Harada’s Hand Gesture

Claim 12 specifies that “the device is drivable by means of a gesture control.” Petitioner has not shown that the OLED “device” is “drivable by” gesture control. The ’425 Patent’s “device” driven by gesture control in claim 12 is the device comprising the OLED device in claim 1. ’425 Patent at 87:61-62 (“1. A device

comprising: an organic light-emitting diode comprising: ...”). The ’425 Patent describes its gesture control as generating commands that control the OLED, to affect the device’s operating states. ’425 Patent at 18:36-37 (“A switch-on, switch-off or other changes of operating states can then be effected by means of gesture control.”). Yet Petitioner never explains how Harada’s gesture recognition drives the OLED device. Petitioner’s analysis of Harada’s “gesture recognition” (Pet. 49-50, 77) describes recognizing a hand shape or movement (Harada, [0071]) and then providing a command to a “personal computer.” *Id.*, [0073]. Acting effectively as a keyboard or mouse input to a separate personal computer is not driving a device comprising the OLED as required by claim 12.

B. Petitioner’s Motivations and Expectations of Success for Adding Gesture Control to Diekmann and Suzuki Are Conclusory

Petitioner again relies on bare allegations that gesture control was “well known,” citing the entirety of Harada without explanation. Pet. 51 (as expectation of success), 78 (as motivation). The blanket citation to Harada should be given no weight as a motivation because it violates 37 C.F.R. § 42.104(b)(5). The mere existence of Harada is neither a motivation to combine nor evidence something is “well known.” And whether something is “well known” is legally not a motivation anyway. *See Virtek Vision*, 97 F.4th at 887-88.

Petitioner states that Harada's gesture control allows the user "to operate the device in more natural ways." Harada, ¶ [0073]. Petitioner provides no explanation for what "more natural ways" means or even a basis for comparison with Diekmann or Suzuki. Pet. 51, 77 (citing Harada, ¶ [0073]). And the cited paragraph in Harada is not referring to operating the device comprising an OLED "in more natural ways," but controlling a separate "personal computer apparatus" by "changing a command" using image recognition. Harada, ¶ [0073] (a "zoom in" instruction sent to the computer).

For Petitioner's Diekmann ground, Petitioner relies on Diekmann's existing user control (*i.e.*, on/off, brightness, color) and sensors (*i.e.*, photodiodes or photodetectors for brightness). Pet. 50-51 (citing Diekmann, 45-50, 53, 64, 70, 137-140, 142-143). But that does not explain why a skilled artisan would add the gesture control in Harada to Diekmann. The photodetector, photodiodes, and sensors in Diekmann are for detecting the brightness and color of the neighboring organic layer stack and ambient light or body functions, not user control or user operation. Diekmann, 45-50, 53, 64, 70, 137-140, 142-143. If anything, Petitioner has established that Diekmann already has robust user controls and automated brightness sensors—as evidenced by the 15 pages of Diekmann Petitioner cites for these features—suggesting that there was no need for further, complicated gesture-based mechanisms. *Kinetic Concepts*, 688 F.3d at 1369. Nor has Petitioner explained or

suggested that these existing functions—on/off, brightness, color—would or could be operated by gesture control.

For Petitioner’s Suzuki ground, Petitioner relies on Harada supposedly teaching that gesture control “can be applied to OLEDs.” Pet. 77 (citing Harada, ¶ [0003]). But whether Harada “could” be combined is not evidence that a skilled artisan “would” combine Suzuki with Harada. *See Personal Web Techs., LLC v. Apple, Inc.*, 848 F.3d 987, 993-94 (Fed. Cir. 2017). And, even then, Harada’s disclosure does not apply to controlling OLEDs, but controlling an attached personal computer. Harada, ¶ [0073].

Finally, in both grounds, Petitioner’s expectations of success are again conclusory, labeling gesture control “well-known” and “routine” with blanket cite the entirety of EX1032 and Harada without explanation. Pet. 51, 78 (adding conclusory statement of no “unpredictable results.”). Such conclusory obviousness arguments and blanket citations should be given “no weight.” 37 C.F.R. § 42.104(b)(5); *Johns Manville Corp. v. Knauf Insulation, Inc.*, IPR2018-00827, Paper 9 at 13-14 (P.T.A.B. Oct. 16, 2018) (conclusory “assertion[s] that it would have been so” and “unsupported statement[s]” that the combinations are “within the skill” of a skilled artisan and “well-known and predictable” do not meet Petitioner’s burden); *see Hulu, LLC v. Sound View Innovations, LLC*, IPR2018-00582, Paper 34

at 28-31 (PTAB Aug. 5, 2019) (informative) (also refusing to consider untimely reply arguments); *Samsung Electronics Co.*, IPR2021-01491, Paper 11 at 15.

To any extent Petitioner is again relying on its unexplained expert testimony, this improperly incorporates material in violation of Board rules on incorporation by reference and unexplained evidence. *See* CTPG at 35-36; 37 C.F.R. § 42.6(a)(3); *Cisco Sys.*, IPR2014-00454, Paper 12 at 9-10 (informative); 37 C.F.R. § 42.104(b)(5). Petitioner's expert mostly parrots the petition and reiterates Petitioner's flawed "well known" gesture controls and Diekmann's existing non-touch sensors. EX1003, ¶ 178. Regurgitating attorney argument without support is unhelpful and not competent evidence. *See Xerox*, IPR2022-00624, Paper 9 at 15 (precedential); 37 C.F.R. § 42.65(a).

VII. PETITIONER HAS NOT PROVIDED A COGENT RATIONALE FOR ABANDONING DIEKMANN'S AND SUZUKI'S ENCAPSULATION WITH A REASONABLE EXPECTATION OF SUCCESS (CLAIM 4)

Petitioner's grounds against claim 4 seek to combine Lee's encapsulation into Diekmann and Suzuki. Pet. 38-41, 71-72. But, as Petitioner repeatedly admits, Diekmann and Suzuki already had encapsulation layers. Pet. 11-12, 21, 26-27, 31, 35, 38-39, 41, 54-55, 58-60, 63-65, 68-69, 71-72. Petitioner provides no reason for a skilled artisan to go through with the complex redesign to utilize Lee's encapsulation.

A. Petitioner's Alleged Motivations Are Legally Insufficient

Petitioner first alleges encapsulation generally was “well-known.” Pet. 40-41, 71-72. This is not a motivation to combine. *See Virtek Vision*, 97 F.4th at 887-88. Whether encapsulation generally is well known does not say why a skilled artisan would use Lee’s specific encapsulation approach. Petitioner’s related blanket citation to the entirety of Exhibits 1020 and 1021 are not explained and should be given no weight. 37 C.F.R. § 42.104(b)(5).

Next, for Diekmann, Petitioner points to Lee’s statements about protecting cathodes from air and the “multi-layer” encapsulation in Lee as decoupling the adjacent “inorganic layers” to prevent “defects” and “block water and oxygen permeation into the OLED.” Pet. 40 (citing Lee, ¶¶ [0005], [0020]). And for Suzuki, Petitioner ostensibly points back to protection from “outside materials ... for the same reasons discussed above in §VIII.C.1” regarding Diekmann. Pet. 71. Petitioner refers broadly to the entire eight-page of analysis for claim 4 in the Diekmann ground. This is an improper incorporation by reference and woefully nonspecific. 37 C.F.R. §§ 42.6(a)(3), 42.104(b)(5); CTPG at 35-36; *Cisco Sys.*, IPR2014-00454, Paper 12 at 9-10 (informative). Yet, procedural violations aside, both of Petitioner’s statements about protection from outside materials and blocking water and oxygen permeation are merely, again, describing what encapsulation generally does and are not tailored to Lee’s specific form of encapsulation.

Indeed, Diekmann and Suzuki already encapsulate their OLED devices for these same reasons and thus have no need for further encapsulation. *See Kinetic Concepts*, 688 F.3d at 1369; *see* Diekmann at 30-31, 94, 109, 120, Figs. 2A (thin film encapsulation 6), 3, 17A; Suzuki, ¶¶ [0004] (describing problem of permeation), [0067] (addressing that problem with “barrier film ... has a high density and low gas and moisture vapor permeability”), [0115] (“silicon oxide is particularly preferable from the perspective of moisture permeability, light permeability”).

As for Lee’s claim of “improved lifetime” (Pet. 40, 71) from annealing its semi-crystalline, parylene-based polymer barrier, Lee is clear that this improved lifetime was “compared to prior OLEDs having polyacrylate or amorphous parylene **barrier** layers,” as Petitioner admits. Pet. 40 (citing Lee, [0020]) (emphasis added). Neither Diekmann nor Suzuki use polyacrylate or amorphous parylene **barrier** layers.

To illustrate, Petitioner points to Diekmann’s “intermediate polymer layers,” labelling this “the precise prior art structure that Lee’s encapsulation is intended to improve upon.” Pet. 40 (citing Diekmann, 15; Lee, ¶ [0008]). Petitioner points to the wrong layer. Diekmann’s intermediate layer is a single **buffer** layer, sandwiched between the Diekmann’s two barrier layers as part of “thin film encapsulation 6.” Diekmann, 15, 94, Fig. 3. Diekmann’s two barrier layers are not made of

polyacrylate or parylene, but are silicon oxide and silicon nitride layers, as Petitioner admits and relies on elsewhere. Pet. 21, 26-27 (citing Diekmann, 94, Fig. 3). Petitioner has provided no explanation for how Lee's annealing of parylene-based polymer barriers would improve the lifetime of Diekmann's device with its non-parylene-based barrier layers of silicon oxide and silicon nitride barriers layers.

To the extent that Petitioner is suggesting replacing one of the silicon oxide or silicon nitride layers with the parylene layer, Petitioner has not explained why a skilled artisan would do so or that the resulting structure would have good interlayer adhesions and compatibility to provide the required reliability. Nor has Petitioner explained whether in the resulting structure, the annealed parylene would have a different amorphicity than silicon oxide or silicon nitride to satisfy the claimed requirement that "the volume structure of the second encapsulation layer has a higher amorphicity than the volume structure of the first encapsulation layer."

Petitioner's Suzuki ground is even more threadbare. Petitioner never identifies a specific barrier layer in Suzuki to implement Lee or explains how Lee would improve Suzuki's lifetime. *See* Pet. 71. Instead, Petitioner refers back to its Diekmann analysis with little explanation. *Id.* (alleging motivation "to protect the OLED from outside materials and improve the lifetime of the device for the same reasons discussed above in §VIII.C.1 with regards to Diekmann."). Petitioner makes

no allegation that Suzuki uses a polyacrylate or an amorphous parylene barrier layer. Nor could it.

Petitioner previously relied on Suzuki’s “gas barrier thin film laminate 9” comprising “buffer film 3,” “a barrier film 4,” and another “buffer film 3.” Pet. 54 (citing Suzuki, Fig. 9, ¶¶ [0273]-[0274]). As Petitioner recognizes, barrier film 4 is a “dense intervening layer” with “low water vapor transmission” comprising “a ceramic composition with low or no carbon content and having at least Si and O atoms.” Pet. 59 (citing Suzuki, ¶ [0117]); *see* Pet. 59-60 (citing Suzuki, ¶¶ [0068]-[0069]) (alleging barrier and buffer films are made of silicon oxide, silicon oxide nitride, or silicon nitride). This is not polyacrylate or parylene. Petitioner has not identified any motivation to use Lee’s annealing of parylene-based polymer barriers in Suzuki.

B. Petitioner’s Expectations of Success are Conclusory

Once again, Petitioner’s expectations of success are also conclusory. First, Petitioner provides only unsupported attorney argument for its alleged expectation of success for Diekmann and Suzuki “already contemplating” encapsulation and its “mere replace[ment]” theory. Pet. 41, 71-72 (no cited support beyond Petitioner’s expert parroting identical language in EX1003, ¶¶ 151, 233). Mere replacement is not a reason for why a skilled artisan would reasonably expect success using Lee’s

encapsulation.⁶ And Petitioner again ignores the tremendous considerations needed in OLED systems: is the replacement material going to be compatible with the rest of the materials to provide good adhesions and the right mechanical support to provide a desired reliability? Petitioner provides no analysis.

Second, Petitioner again states that encapsulation using alternating organic and inorganic layers was “well-known.” Pet. 41, 71 (citing EX1003, ¶¶ 43-44, 151, 231-232; EX1020, EX1021). That says nothing about expected success using the specific encapsulation in Lee of a semi-crystalline, parylene-based polymer barrier and an annealed, highly crystalline, parylene-based polymer barrier. Increasing the crystallinity of one of the encapsulation layers will logically only make the encapsulation even more brittle. Again, Petitioner’s blanket citation to the entirety of Exhibits 1020 and 1021 are not explained and should be given no weight. 37 C.F.R. § 42.104(b)(5).

Third, Petitioner closes with a statement that this modification was within the ability of a skilled artisan. Pet. 41, 72. This conclusory and unexplained statement

⁶ Petitioner has neither alleged “mere replacement” as a motivation nor has established the prerequisite for a “simple substitution” motivation, including that the substitution be “simple,” the elements “known,” and the results be “predictable.” *See* MPEP 2143.

is, again, legally insufficient. *See, e.g., Samsung Electronics Co.*, IPR2021-01491, Paper 11 at 15. Petitioner's cited expert testimony just parrots the same line. *See* EX1003, ¶¶ 151, 233. This is not helpful expert testimony. *See Xerox*, IPR2022-00624, Paper 9 at 15 (precedential); 37 C.F.R. § 42.65(a).

VIII. PETITIONER HAS NOT OFFERED A SUFFICIENT MOTIVATION OR EXPECTATION OF SUCCESS TO ADD TOUCH-SENSITIVE ELEMENTS (CLAIMS 9-11)

Petitioner does not provide a substantive motivation or expectation of success to support its Diekmann-Koshihara and Suzuki-Caldwell combinations on touch-sensitive elements against claims 9 to 11. Pet. 43-45, 74. Petitioner simply never explains *why* a skilled artisan would use a touch sensitive element in the first place.

While Petitioner states that touch sensitive elements were “well known,” that is legally not a motivation. Pet. 45, 74. *See Virtek Vision*, 97 F.4th at 887-88. Petitioner's only evidence that the touch sensitive elements were “well known” is citing to Caldwell and Koshihara. Pet. 45, 74 (citing Caldwell, ¶¶ [0004]-[0007] and Koshihara, ¶¶ [0030]-[0031]). The mere existence of the prior art is not evidence that the prior art is well known. To hold otherwise would effectively eliminate the need for any Petitioner to establish a motivation to combine and expectation of success. And whether touch sensitive elements were well known does not establish that Caldwell's or Koshihara's specific touch sensitive elements configurations were well known.

Next, Petitioner focuses on purported cost savings and thinner profiles of using a touch sensor integrated into an OLED. Pet. 45, 74 (citing Caldwell, ¶¶ [0006]-[0007], EX1024 at 3:2-7). But Petitioner’s purported cost savings and thinner profiles are in contrast to a device with a *separate* touch sensor. Caldwell, ¶¶ [0006] (“a separately constructed touch sensor involves extra material and other manufacturing costs”), [0007] (reducing the “cost and complexity” by reducing “the extra material and manufacturing costs associated with the separate touch sensor and lighting assemblies”); EX1024 at 1:29-33 (“[T]he touch screen is made separately”), 1:44-46 (“Moreover, the additional step of integrating the [separate] components raises manufacturing costs for the complete device.”), 3:2-7 (integration of touch sensor directly into OLED “reduces ... costs” and “size”). Petitioner’s expert admits that these references are merely describing the “benefits” from “integrating” an existing “touch sensor directly into [the] OLED” instead of using a “separate touch sensor device.” EX1003, ¶ 242; *see id.*, ¶ 166 (similar). Neither Diekmann nor Suzuki have existing, separate touch-sensitive elements. Petitioner provides no motivation to use a touch sensitive element in the first place. And *adding* a touch sensitive element onto of the OLED without a touch sensor would only *increase* thickness (adding layers) and cost (adding components and redesigning for added traces and controllers).

Petitioner provides no additional rationales for its Suzuki ground and thus has not established any motivation to combine for Suzuki-Caldwell. And for the Diekmann-Koshihara ground, Petitioner's only other argument relies on Diekmann's existing user control (*i.e.*, on/off, brightness, color) and sensors, none of which involved touch sensing. Pet. 44-45 (citing Diekmann, 45-50, 53, 64, 70, 137-140, 142-143). But Diekmann's existing user controls do not explain why a skilled artisan would **add** touch-sensitive operating elements in addition to Diekmann's existing controls. On the contrary, Diekmann's existing user control means that Diekmann has no need of additional controls. *See Kinetic Concepts*, 688 F.3d at 1369.

While Petitioner contends that Koshihara allows a user to “manually input instructions,” this is conclusory. Pet. 45 (citing Koshihara at 4; EX1003, ¶¶ 165-166). Diekmann can already manually input instructions with its existing user control. *See Kinetic Concepts*, 688 F.3d at 1369. And to the extent Petitioner suggests that Koshihara's touch sensor integrated with the sealing substrate would “prevent oxidation” of the light emitting layer (Pet. 45), this says nothing about why a skilled artisan would add touch sensors and, even then, Diekmann already prevents oxidation by surrounding its light emitting layer with a protective encapsulation and substrate, as Petitioner relies on elsewhere. *See* Pet. 21-22 (citing Diekmann, 91-92,

94 & Fig. 2A (encapsulation 6 and substrate 1)). Petitioner provides no reason to complicate Diekmann further.

Finally, for both grounds, Petitioner's expectations of success are once again conclusory statements that a skilled artisan would have "expected success" and implementing the touch sensor was "routine." Pet. 45, 74. These conclusory statements are unsupported by any specific evidence and should be given no weight. 37 C.F.R. § 42.104(b)(5); *Johns Manville*, IPR2018-00827, Paper 9 at 13-14; *see Hulu*, IPR2018-00582, Paper 34 at 28-30 (informative). Such conclusory language is insufficient for a reasonable expectation of success. *See, e.g., Samsung Electronics Co.*, IPR2021-01491, Paper 11 at 15.

To any extent Petitioner is again relying on its unexplained expert testimony, this improperly incorporates material in violation of Board rules. *See* CTPG at 35-36; 37 C.F.R. § 42.6(a)(3); *Cisco Sys.*, IPR2014-00454, Paper 12 at 9-10 (informative); 37 C.F.R. § 42.104(b)(5). Moreover, Petitioner's expert mostly parrots the petition and merely reiterates its flawed arguments about "well known" touch sensors and Diekmann's existing non-touch sensors. EX1003, ¶¶ 167, 243; *see Xerox*, IPR2022-00624, Paper 9 at 15 (precedential); 37 C.F.R. § 42.65(a). His testimony should be given no weight.

IX. THE BOARD SHOULD EXERCISE ITS DISCRETION TO DENY INSTITUTION OF THIS PROCEEDING UNDER SECTION 314(A)

The Board should also exercise its discretion to deny institution under 35 U.S.C. § 314(a) and *Fintiv*, IPR2020-0019, Paper 11 (precedential).

Patent Owner has statutorily disclaimed claims 1, 3, 5-8, 13-16, and 18-19 to simplify the issues. Voluntary disclaimer of challenged claims should weigh heavily in favor of discretionary denial because it promotes the “efficien[cy] and streamlin[ing]” goals of the AIA and avoids “unnecessary and counterproductive litigation costs.” H.R. Rep. No. 112-98, pt. 1, at 40 (2011), 2011 U.S.C.C.A.N. 67, 69; *see* S. Rep. No. 110-259, at 20 (2008).

Next, Petitioner has not requested a stay in the co-pending litigation *Pictiva Displays Int’l Ltd. v. Samsung Elecs. Co. Ltd.*, Case No. 2:23-cv-0495 (E.D. Tex.) (Gilstrap, J.). There is no evidence that Judge Gilstrap would grant a stay if a trial is instituted. Judge Gilstrap frequently denies stays. *Netlist, Inc. v. Micron Tech., Inc.*, Civ. No. 2:22-cv-00294- JRG, Dkt. 72 (E.D. Tex., Mar. 12, 2024) (denying motion to stay pending instituted IPRs); *Netlist, Inc. v. Samsung Elec. Co.*, Civ. No. 2:22-cv-00293- JRG, Dkt. 180 (E.D. Tex., Oct. 17, 2023) (denying motion to stay pending instituted IPRs); *Netlist, Inc. v. Samsung Elec. Co.*, Civ. No. 2:22-cv-00293- JRG, Dkt. 689 (E.D. Tex., Mar. 11, 2024) (same).

Trial is scheduled for August 4, 2025, (Pet. 78; EX1035), more than five months before the projected statutory deadline of late January 2026 for a final written decision here. And August 4, 2025, is about 21.6 months from October 19, 2023, the date when Pictiva filed its complaint against Samsung, which is less than the median time-to-trial in the Eastern District of Texas. *See* EX2013 at 35.

On the current schedule, by the projected institution date, the parties would have filed their joint claim construction statement and have invested in claim construction discovery. *See* EX1035 at 5. The *Markman* hearing would be mere days afterwards. *Id.*

Moreover, there is significant overlap between this proceeding and the parallel district court action given that Samsung has also asserted the same art in the district court (*see* EX2014 at 38-39) and has not filed any *Sotera* stipulation regarding the use of the references that it has raised or could have reasonably raised in the district court.

Finally, Petitioner admits that the named defendants in the parallel district court case—its parent company, Samsung Electronics Co., Ltd., and its sibling company, Samsung Electronics America, Inc.—are real parties-in-interest. Pet. 2.

Additionally, as demonstrated in this preliminary response, the petition lacks compelling merits and is full of significant substantive and procedural defects. For these additional reasons, the Board should exercise its discretion to deny institution.

X. CONCLUSION

The petition should be denied.

Dated: October 28, 2024

Respectfully submitted,

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CERTIFICATE OF WORDCOUNT

I hereby certify, pursuant to 37 C.F.R. § 42.24, that the foregoing Patent Owner's Preliminary Response contains 13,513 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.

/Blair A. Silver/
Blair A. Silver

CERTIFICATE OF SERVICE

I hereby certify, pursuant to 37 C.F.R. § 42.6, that on October 28, 2024, a complete copy of the **PATENT OWNER'S PRELIMINARY RESPONSE** and **EXHIBITS 2001-2014** were served upon the following, by ELECTRONIC MAIL:

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