

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TIANMA MICROELECTRONICS CO. LTD.,
Petitioner,

v.

JAPAN DISPLAY INC. and PANASONIC LIQUID
CRYSTAL DISPLAY CO., LTD.,
Patent Owner.

IPR2021-01060
Patent 10,330,989 B2

Before JO-ANNE M. KOKOSKI, KRISTINA M. KALAN, and
ELIZABETH M. ROESEL, *Administrative Patent Judges*.

KOKOSKI, *Administrative Patent Judge*.

DECISION
Denying Institution of *Inter Partes* Review
35 U.S.C. § 314, 37 C.F.R. § 42.4

I. INTRODUCTION

Tianma Microelectronics Co. Ltd. (“Petitioner”) filed a Petition to institute an *inter partes* review of claims 1 and 2 (the “challenged claims”) of U.S. Patent No. 10,330,989 B2 (“the ’989 patent,” Ex. 1001). Paper 2 (“Pet.”). Japan Display Inc. and Panasonic Liquid Crystal Display Co., Ltd. (collectively, “Patent Owner”) filed a Preliminary Response. Paper 7 (“Prelim. Resp.”). With Board authorization, Petitioner filed a Reply to the Preliminary Response (“Reply,” Paper 8), and Patent Owner filed a Sur-reply to Petitioner’s Reply (“Sur-reply,” Paper 10).

Institution of an *inter partes* review is authorized by statute when “the information presented in the petition . . . and any response . . . shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” 35 U.S.C. § 314 (2018); *see also* 37 C.F.R. § 42.4 (2021). For the reasons set forth below, we deny the Petition and do not institute an *inter partes* review.

A. *Real Parties in Interest*

Each party identifies itself as the real party-in-interest. Pet. 99; Paper 6, 1.

B. *Related Matters*

The parties indicate that, pursuant to the district court’s order (Ex. 1022), the ’989 patent is no longer at issue in *Japan Display Inc. v. Tianma Microelectronics Co. Ltd.*, No. 2:20-cv-00283 (E.D. Tex.). Paper 12, 1; Paper 14, 3; Ex. 1023.

C. *The ’989 Patent*

The ’989 patent, titled “Liquid Crystal Display Device, Display Device and Manufacturing Method Thereof,” is directed to “an active matrix type liquid crystal display device which can reduce holding capacity for

holding lighting of pixels for a given time and feeding resistance thereof thus enhancing numerical aperture.” Ex. 1001, code (54), 1:49–53.

The ’989 patent describes a liquid crystal display device that includes: liquid crystal sandwiched between a first substrate and a second substrate; a plurality of gate lines arranged parallel to each other that extend in a first direction; a plurality of drain lines arranged parallel to each other that extend in a second direction that crosses the gate lines; a plurality of switching elements arranged at the crossing portions of the gate lines and the drain lines; pixel electrodes, driven by the switching elements, formed on an inner surface of the first substrate; and pixel regions formed of a plurality of pixel electrodes. *Id.* at 9:2–13. A reference electrode layer that is insulated by a first insulation layer is formed in between an electrode forming layer “which is constituted of the gate lines, the drain lines, the switching elements and the pixel electrodes including the pixel regions of the first substrate and the first substrate side.” *Id.* at 9:14–20. The electrode forming layer includes a gate insulation layer, a passivation layer, and the pixel electrode “in this order over the first insulation layer and further includes a capacitive electrode layer” that is “connected to the pixel electrodes between the first insulation layer and the passivation layer.” *Id.* at 9:28–33. “[H]olding capacities of the pixels are formed among the pixel electrodes, the reference electrode layer, and the capacitive electrode layer.” *Id.* at 9:34–36.

Figure 61 of the '989 patent is reproduced below.

FIG. 61

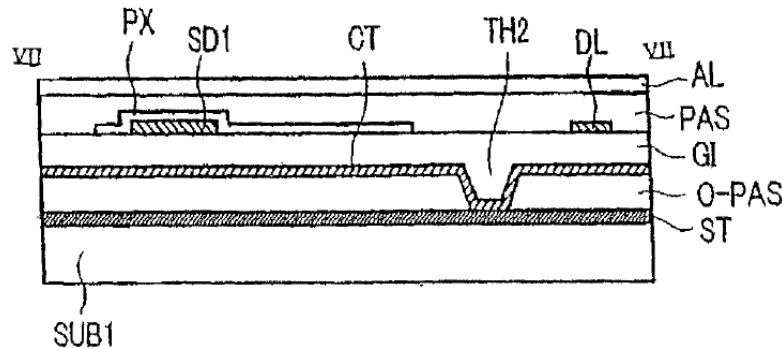


Figure 61 is a cross-section view of a portion of a modified liquid crystal display device described in the '989 patent. *Id.* at 39:41–45. Source electrode SD1 is formed over gate insulation layer GI, and pixel electrode PX overlaps source electrode SD1. *Id.* at 39:47–51. Counter electrode CT is formed over organic insulation layer O-PAS and is connected to reference electrode layer ST via through hole TH2, forming a holding capacity between counter electrode CT and pixel electrode PX. *Id.* at 39:51–55.

The '989 patent teaches that, “[d]ue to such a constitution, the numerical aperture of the pixels can be enhanced” and, because “the area of the reference electrode layer is large, the feeding resistance can be reduced.” *Id.* at 9:37–40. The '989 patent further teaches that the capacitive electrode layer can be formed over the gate insulation layer, and the capacitive electrode layer is connected to the reference electrode layer via through holes which penetrate the gate insulation layer. *Id.* at 10:32–35. In this way, “the holding capacity formed between the reference electrode and the pixel electrodes can be adjusted by changing the area of the capacitive electrode layer connected to the reference electrode layer.” *Id.* at 10:36–39.

D. Illustrative Claim

Petitioner challenges claims 1 and 2 of the '989 patent. Pet. 1. Claim 1, the only independent challenged claim, is illustrative of the claimed subject matter and is reproduced below.

1. A liquid crystal display device, comprising:
 - [a] a first substrate;
 - [b] a second substrate;
 - [c] a liquid crystal layer between the first substrate and the second substrate, containing liquid crystal molecules;
 - [d] a gate line and a drain line;
 - [e] a pixel electrode and a counter electrode disposed between the first substrate and the liquid crystal layer;
 - [f] a gate insulation layer formed on the gate line; and
 - [g] an organic insulation layer disposed between the first substrate and the liquid crystal layer,
 - [h] wherein the liquid crystal layer is driven by an electric field generated between the pixel electrode and the counter electrode,
 - [i] wherein the pixel electrode is formed between the liquid crystal layer and the organic insulation layer,
 - [j] wherein the counter electrode is a planar shape, and
 - [k] the pixel electrode comprises a slit having a first portion, and the first portion is not parallel with the gate line and the drain line,
 - [l] wherein the counter electrode is connected to a common layer,
 - [m] wherein the organic insulation layer is formed between the counter electrode and the first substrate, and
 - [n] wherein the counter electrode is connected to the common layer via a through hole within the organic insulation layer.

Ex. 1001, 52:8–34 (bracketed material added).

E. References Relied On

Petitioner relies on the references listed below (Pet. 14):

Reference	Date	Exhibit No.
US Patent No. 6,577,368 B1 (“Yuh”)	June 10, 2003	1005
US Patent App. Pub. No. 2001/0009447 A1 (“Ohta”)	July 26, 2001	1006
US Patent No. 6,507,383 B1 (“Abe”)	Jan. 14, 2003	1007
US Patent No. 6,600,541 B2 (“Kurahashi”)	July 29, 2003	1008
US Patent No. 6,580,487 B1 (“Kim”)	June 17, 2003	1009

F. Asserted Grounds

Petitioner asserts that the challenged claims are unpatentable on the following grounds:

Claim(s) Challenged	35 U.S.C. §	References
1, 2	103	Yuh, Ohta, Abe
2	103	Yuh, Ohta, Abe, Kim
1, 2	103	Yuh, Kurahashi
2	103	Yuh, Kurahashi, Kim

Pet. 14. Petitioner relies on the Declaration of Richard Flasck (Ex. 1003) in support of its contentions. Patent Owner submits the Declaration of Thomas L. Credelle (Ex. 2010) in support of its Preliminary Response.

II. ANALYSIS

A. Level of Ordinary Skill in the Art

Petitioner contends that a person having ordinary skill in the art would have had “at least a four-year undergraduate degree in electrical engineering or physics or a closely related field and four years of experience in the design and implementation of flat panel display devices or components thereof.” Pet. 5 (citing Ex. 1003 ¶ 38). Patent Owner’s declarant, Mr. Credelle, testifies that a person having ordinary skill in the art “would

have the equivalent of an undergraduate degree in electrical engineering, materials science, physics, or a related field and at least two years of work experience (or a graduate degree) in LCD display technology.” Ex. 2010 ¶ 28. Mr. Credelle also states that, although he disagrees with Petitioner’s proposed level of ordinary skill in the art, his opinions “apply equally under either proposed level.” *Id.* ¶ 30.

We agree with the parties that a person of ordinary skill in the art would have had the equivalent of a four-year undergraduate degree in electrical engineering or a similar field, and experience in the field of flat panel displays or liquid crystal display technology; this definition appears to be consistent with the level of skill in the art at the time of the invention as reflected in the prior art in this proceeding. Our determination regarding Petitioner’s challenge does not turn on the differences between Petitioner’s and Patent Owner’s definitions, and we note that our conclusion would be the same under either definition.

B. Claim Construction

We construe each claim “in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.” 37 C.F.R. § 42.100(b). Under this standard, claim terms are generally given their plain and ordinary meaning as would have been understood by a person of ordinary skill in the art at the time of the invention and in the context of the entire patent disclosure. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005) (en banc). Only those terms in controversy need to be construed, and only to the extent necessary to resolve the controversy. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017

(Fed. Cir. 2017) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

Neither party proposes an explicit construction for any claim term. *See* Pet. 14; *see generally* Prelim. Resp. For purposes of this Decision, based on the record before us, we determine that no claim term requires an explicit construction.

C. Earliest Effective Filing Date of the ’989 Patent

The ’989 patent issued from US Patent Application No. 15/271,422 (“the ’422 application”), which was filed on September 21, 2016, and, through a series of continuation and divisional applications, claims priority to US Patent Application No. 10/237,911 (“the ’911 application,” Ex. 2007, 139–355), which was filed on September 10, 2002. Ex. 1001, codes (21), (22), (60). The face of the ’989 patent identifies JP 2001-317149 (JP-’149), filed on October 15, 2001, as the foreign application to which the ’989 patent claims priority. *Id.* at code (30).

Petitioner contends that the ’989 patent is not entitled to the October 15, 2001, priority date of JP-’149, titled “Connecting Structure for Steel Pipe Column and PC Board,” because JP-’149 “does not provide §112 written description support for claims 1 and 2.” Pet. 69 (citing Ex. 1010). Therefore, Petitioner contends, “[t]he earliest priority date to which the ’989 patent is entitled is the date of the earliest filed application, namely [the ’911 application] filed on September 10, 2002.” *Id.*

Patent Owner argues that Petitioner “fails to explain that, while the biographical information for the ’989 patent lists (JP) 2001-317149 (JP-’149’) under ‘Foreign Application Priority Data,’ the priority statement in the specification correctly states that the foreign priority claim is to Japanese Patent Application No. 2001-317147 (JP-’147’) filed on October 15, 2001.”

Prelim. Resp. 18. Patent Owner argues that “[t]his discrepancy is easily reconciled” because the prosecution history of the ’989 patent states the priority benefit to JP-’147 in the Continuation/Divisional Application Transmittal, and the prosecution history of the ’911 application establishes the benefit of priority to JP-’147. *Id.* (citing Ex. 1002, 1; Ex. 2006, 362). Patent Owner also argues that JP-’149 was not filed on October 15, 2001, which is, instead, the filing date of JP-’147. *Id.* at 18–19.

We agree with Patent Owner that the record establishes that the ’989 patent claims priority to JP-’147 filed on October 15, 2001. Prelim. Resp. 18. Although the face of the ’989 patent identifies JP-’149 under the “Foreign Application Priority Data” heading, the “Cross-Reference to Related Application” section of the specification identifies and claims priority to JP-’147. Ex. 1001, code (30), 1:41–43. In both instances, October 15, 2001 is listed as the filing date of the foreign application. *Id.* The prosecution history, however, reflects that the claimed priority benefit is to JP-147. In particular, the Continuation/Divisional Application Transmittal form for the ’422 application states that priority is claimed based on JP-’147, filed on October 15, 2001. Ex. 1002, 1. The ’422 application as originally filed also identifies JP-’147 in the “Cross-Reference to Related Application” section of the specification. *Id.* at 12 ¶ 1.

Moreover, the “Request for Priority Under 35 U.S.C. 119 and the International Convention” filed during prosecution of the ’911 application states that “the Applicant claims the priority date of October 15, 2001, the filing date of the corresponding Japanese patent application 2001-317147,” and attaches a copy of JP-’147 reflecting the October 15, 2001, filing date thereto. Ex. 2007, 362–517. In view of the foregoing, and because JP-’149 is not directed to a liquid crystal device and does not appear to have been

filed on October 15, 2001, it appears that the reference to JP-'149 on the face of the '989 patent is a mistake and the correct foreign application priority data is JP-'147. Ex. 1010, 1, 6–8.

Petitioner does not address this discrepancy in the '989 patent. Pet. 69. Instead, Petitioner relies on the reference to JP-'149 on the face of the '989 patent and the title of JP-'149 (“Connecting Structure for Steel Pipe Column and PC Board”) as the only evidence supporting its contention that “the '989 patent is not entitled to the October 15, 2001, priority date.” *Id.* (citing Ex. 1010). Petitioner fails to address the numerous additional citations in the record to JP-'147 as the priority document. Based on the record before us, we find that Petitioner does not come forward with sufficient evidence to show that the '989 patent is not entitled to its asserted October 15, 2001, foreign priority date. Because Petitioner does not address whether JP-'147 provides adequate written description support for claims 1 and 2 of the '989 patent, Petitioner has not made a sufficient threshold showing that claims 1 and 2 lack written description support in JP-'147.

Accordingly, we determine, on this record, that Petitioner has not established a reasonable likelihood that it will prevail in showing that the challenged claims are not entitled to priority based on the October 15, 2001, filing date of JP-'147.

D. Asserted Obviousness over Yuh, Ohta, and Abe (Ground 1)

Petitioner contends that claims 1 and 2 would have been obvious over the combined teachings of Yuh, Ohta, and Abe. Pet. 21–63.

1. Overview of Yuh

Yuh relates to “a liquid crystal display (LCD) . . . having a modified electrode array.” Ex. 1005, 1:8–10. Yuh teaches that a conventional twisted nematic LCD (“TN-LCD”) has disadvantages such as a narrow viewing

angle, and that methods used to compensate have other disadvantages, such as in manufacturing cost, power consumption, and aperture ratio. *Id.* at 2:11–12, 2:25–34. Yuh asserts that the modified electrode array it describes accomplishes the objects of attaining a wide viewing angle, reducing power consumption, and enlarging the aperture ratio. *Id.* at 3:3–10.

In particular, Yuh teaches that “[f]irst electrodes and second electrode insulated from each other are overlapped with each other at least in part,” and “[t]he second electrode forms a continuous plane between the first electrodes.” *Id.* at 3:11–14. “The potential difference between the two electrodes generated by applying voltages to the electrodes yields an electric field,” and “[t]he shape of an electric line of force is semi-ellipse or parabola having a center on a boundary line or a boundary region between the first electrode and the second electrode.” *Id.* at 3:16–22. In this way, Yuh teaches that the liquid crystal molecules on the first and second electrodes and on the boundary region “are re-arranged to have a twist angle and a tilt angle due to the vertical and horizontal components of the electric field,” and, accordingly, “the polarization of the incident light varies by the rearrangement of liquid crystal molecules.” *Id.* at 3:23–28.

Therefore, according to Yuh, “a wide viewing angle may be obtained since the liquid crystal molecules are re-arranged to have both the twist angle and the tilt angle.” *Id.* at 3:29–31. “In addition, power consumption is low since the strength of the electric field is large on the boundary region between the first electrode and the second electrode,” and “aperture ratio may be enlarged since a storage capacitor for obtaining sufficient storage capacity is not additionally required” because “the two electrodes are overlapped via an insulating film with using a thin film transistor (TFT) as a switching element.” *Id.* at 3:38–45.

2. *Overview of Ohta*

Ohta “relates to a high picture quality image active matrix system liquid crystal display device having thin film transistor elements.” Ex. 1006 ¶ 2. Ohta teaches that transverse electric field system color LCD devices are constructed such that transparent substrates are disposed with a liquid crystal layer interposed in between, with electrodes for display and reference electrodes provided on the liquid-crystal-side surfaces of one or both transparent substrates that correspond to respective unit pixels. *Id.* ¶ 3. Electric fields are generated between the display and reference electrodes parallel to the surfaces of the transparent substrates so as to modulate light that is transmitted through the liquid crystal layer. *Id.* Ohta teaches that such a device “has been known to have a so-called excellent broad visual field angle” that “allows a person to recognize a clear image even from a position which is at a large angle relative to the display screen,” but also has “a problem in that an unnecessary electric field generated by the drain lines causes fluctuation of an electric field between the” display and reference electrodes, producing “bad image quality in which stripes are produced in a direction along the drain lines.” *Id.* ¶¶ 3, 5. Ohta seeks to provide an LCD device that can suppress the occurrence of these stripes, called longitudinal smear or crosstalk, “and enhance the productivity, while also enabling a low power consumption.” *Id.* ¶ 6.

To achieve these objectives, Ohta describes an active matrix system LCD device that includes: first and second substrates with a liquid crystal composition layer in between; a plurality of drain lines and gate lines formed on the first substrate crossing each other in a matrix form; a plurality of counter lines formed on the first substrate; and a plurality of pixels formed by adjoining the drain lines and the gate lines. *Id.* at code (57). “At least

one counter electrode is formed on one of the drain lines, with an insulating layer therebetween,” and “[a] layer on which one of the counter lines is formed and a layer on which the at least one counter electrode is formed are different,” with “the one of the counter lines and the at least one counter electrode for one of the pixels are connected via a through hole.” *Id.* The LCD device has “pixel electrodes and counter electrodes capable of applying an electric field parallel to substrate surfaces in the pixels, and image signals are supplied to the pixel electrodes from thin film transistors connected to the drain lines and gate lines.” *Id.* ¶ 7. Ohta teaches that “the counter electrodes and the pixel electrodes are formed linearly so as not to overlap each other in a planar condition.” *Id.*

3. Analysis

Petitioner asserts that claims 1 and 2 would have been obvious over the combined teachings of Yuh, Ohta, and Abe. Pet. 15–63. Petitioner contends that Yuh teaches or suggests all of the limitations of claim 1 except elements 1[g], 1[i], 1[l], 1[m], and 1[n], which Petitioner contends Yuh and Ohta teach, and element 1[k], which Petitioner contends Yuh and Abe teach, as follows:

Preamble: “A liquid crystal display device, comprising:” (Pet. 21 (relying on Ex. 1005, 6:29–35));

Element 1[a]: “a first substrate;” (Pet. 22 (relying on Ex. 1005, 6:29–35, Fig. 2; Ex. 1003 ¶¶ 73–74));

Element 1[b]: “a second substrate;” (Pet. 22–23 (relying on Ex. 1005, 6:62–65, Fig. 2; Ex. 1003 ¶¶ 75–76));

Element 1[c]: “a liquid crystal layer between the first substrate and the second substrate, containing liquid crystal molecules;” (Pet. 23–24 (relying on Ex. 1005, 7:1–3, 7:66–8:3; Ex. 1003 ¶¶ 77–79));

Element 1[d]: “a gate line and a drain line;” (Pet. 24–25 (relying on Ex. 1005, 21:39–41, 22:4–6, 23:29–30, Fig. 35A; Ex. 1003 ¶¶ 80–82));

Element 1[e]: “a pixel electrode and a counter electrode disposed between the first substrate and the liquid crystal layer;” (Pet. 26–33 (relying on Ex. 1005, 6:45–54, 7:16–18, 21:27–30, 22:15–17, 39:47–55, Figs. 2, 35A, 35B; Ex. 1003 ¶¶ 83–88));

Element 1[f]: “a gate insulation layer formed on the gate line; and” (Pet. 33–36 (relying on Ex. 1005, 20:8–12, 20:17–26, 20:60–64, 21:22–26, 21:43–63, Figs. 2, 33, 35C; Ex. 1003 ¶¶ 89–93));

Element 1[g]: “an organic insulation layer disposed between the first substrate and the liquid crystal layer;” (Pet. 36–39 (relying on Ex. 1006 ¶ 17, Fig. 2; Ex. 1003 ¶¶ 94–99));

Element 1[h]: “wherein the liquid crystal layer is driven by an electric field generated between the pixel electrode and the counter electrode,” (Pet. 39–40 (relying on Ex. 1005, 3:16–18, 7:16–18, 8:12–16, 10:66–11:2, Fig. 2; Ex. 1003 ¶¶ 100–103));

Element 1[i]: “wherein the pixel electrode is formed between the liquid crystal layer and the organic insulation layer,” (Pet. 40–41 (relying on Ex. 1006 ¶ 17; Ex. 1003 ¶¶ 104–108));

Element 1[j]: “wherein the counter electrode is a planer [*sic*, planar] shape, and” (Pet. 42–43 (relying on Ex. 1005, 6:45–50, 20:17–19, 25:11–13, Figs. 2, 35A; Ex. 1003 ¶¶ 109–110));¹

¹ Although not expressly acknowledged by the parties, we understand “planer” in the context of claim 1 as a misspelling of “planar.” *See, e.g.*, Pet. 1 (“Planar counter electrodes were known before the earliest priority date of the ’989 patent.”).

Element 1[k]: “the pixel electrode comprises a slit having a first portion, and the first portion is not parallel with the gate line and the drain line,” (Pet. 43–49 (relying on Ex. 1005, 7:16–18, 8:9–16, Fig. 35A; Ex. 1007, Abs., 1:31–40, 19:8–10, 19:14–17, 19:37–54, 36:19–34, 36:35–42; Figs. 2, 29; Ex. 1003 ¶¶ 111–120));

Element 1[l]: “wherein the counter electrode is connected to a common layer,” (Pet. 49–52 (relying on Ex. 1005, 7:18, 8:9–12, 21:1–3, 21:27–38, 21:44–57, Fig. 2; Ex. 1006 ¶¶ 51, 66, 92, 139, Fig. 4; Ex. 1003 ¶¶ 121–127));

Element 1[m]: “wherein the organic insulation layer is formed between the counter electrode and the first substrate, and” (Pet. 53–54 (relying on Ex. 1005, Fig. 2; Ex. 1006 ¶ 17, Fig. 2; Ex. 1003 ¶¶ 128–131));

Element 1[n]: “wherein the counter electrode is connected to the common layer via a through hole within the organic insulation layer.” (Pet. 54–56 (relying on Ex. 1006 ¶¶ 86, 92, Fig. 4; Ex. 1003 ¶¶ 132–137)).

With respect to element 1[g] (“an organic insulation layer disposed between the first substrate and the liquid crystal layer”), Petitioner contends that “*Yuh*’s planar electrode is shown formed directly on the lower substrate,” but that Ohta “recommends forming an ‘organic passivation layer’ between a ‘counter electrode’ and a ‘substrate.’” Pet. 36 (citing Ex. 1006 ¶ 17, Fig. 2; Ex. 1003 ¶ 95). Petitioner contends that a person of ordinary skill in the art “would have been motivated by *Ohta*’s teaching that the organic passivation layer facilitates uniformity in the brightness of an LCD device” to “include an organic passivation layer between the planar electrode and the lower substrate in *Yuh*’s device.” *Id.* at 37–38 (citing Ex. 1003 ¶ 96). Petitioner further contends that a person of ordinary skill in the art “would have recognized that ‘when the organic passivation layer is

coated on’ *Yuh*’s lower substrate, ‘the flatness of the substrate . . . is enhanced,’ and ‘the irregularities of the brightness . . . can be eliminated thus enhancing the uniformity of the brightness’ of *Yuh*’s liquid crystal device.”

Id. at 38 (citing Ex. 1006 ¶ 17; Ex. 1003 ¶ 96). Petitioner contends that a person of ordinary skill in the art

would have found it obvious because including the organic passivation layer between the planar electrode and the lower substrate in *Yuh*’s device would merely have used a known technique—*Ohta*’s technique of enhancing the uniformity of a liquid crystal device’s brightness through the inclusion of an organic passivation layer on a substrate—to improve *Yuh*’s similar liquid crystal device in the same way.

Id. (citing Ex. 1003 ¶ 96).

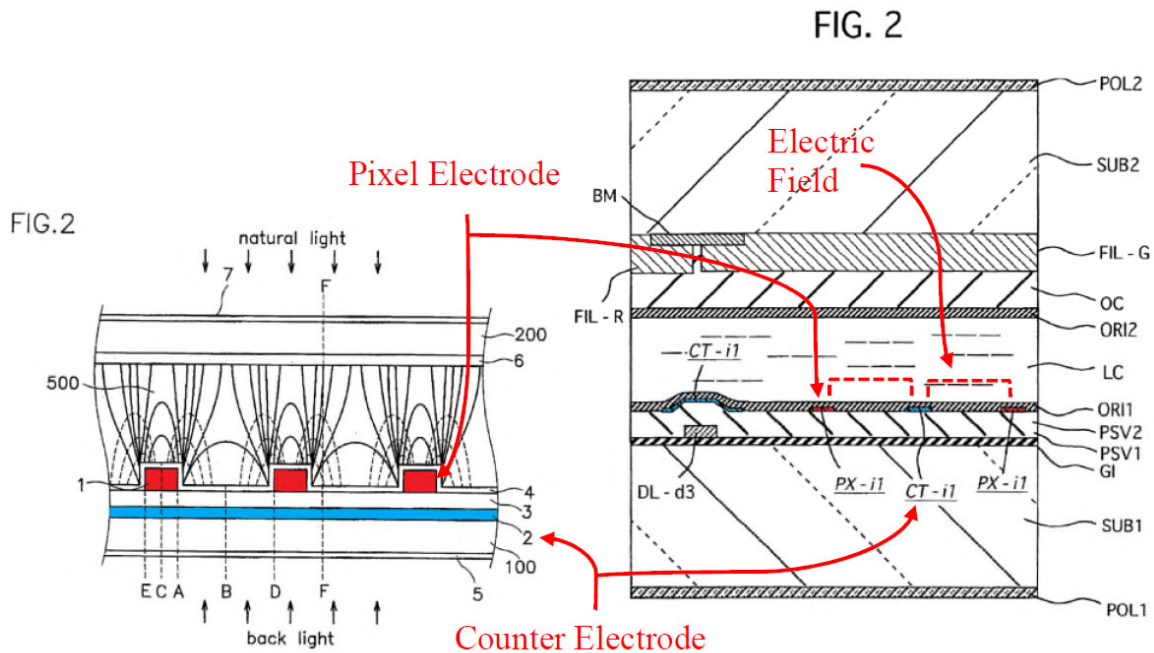
Patent Owner responds that a person of ordinary skill in the art would not look to combine *Yuh* with *Ohta*. Prelim. Resp. 19–22. Patent Owner argues that *Yuh* discloses a modified pixel array where the first and second (pixel and counter) electrodes insulated from each other are overlapped with each other at least in part in a Fringe Field Switching (“FFS”) configuration. *Id.* at 19–20 (citing Ex. 1005, 3:9–12, Fig. 2). Patent Owner argues that “*Ohta*, on the other hand, discloses a pixel configuration where the ‘counter electrodes and the pixel electrodes are formed linearly so as not to overlap with each other in a planar condition’” in an interdigitated IPS configuration. *Id.* at 20 (citing Ex. 1006 ¶ 7, Fig. 2) (emphasis omitted). Patent Owner further argues that “[t]he FFS configuration and the interdigitated IPS configuration produce electric fields with different contours that affect

display performance characteristics, including transmittance and viewing angle.” *Id.* (citing Ex. 2009,² 1).

In particular, Patent Owner argues that “the FFS configuration produces a parabolic electric field with both vertical and horizontal components, whereas the interdigitated IPS configuration produces electric fields that are parallel to the surface (i.e., mainly horizontal components).” Prelim. Resp. 20–21 (citing Ex. 2009, 1–2, Fig. 2; Ex. 1005, 3:18–22; Ex. 1006 ¶ 3). Patent Owner argues that “[t]he different electric field shapes result from different electrode configurations and, in particular, the distance between the electrodes.” *Id.* at 22 (citing Ex. 2010 ¶ 36).

Patent Owner provides a side-by-side annotated comparison of Figure 2 from Yuh and Figure 2 from Ohta, reproduced below, to illustrate its argument. Prelim. Resp. 21.

² S. H. Lee *et al.*, *16.4L: Late-News Paper: A novel Wide-Viewing-Angle Technology: Ultra-Trans View™*, Hyundai Electronics Industries 1 (1999 SID).



Yuh, Fig. 2 (FFS, annotated) Ohta, Fig. 2 (Interdigitated IPS, annotated)

Annotated Yuh Figure 2, on the left, depicts a cross-sectional view of Yuh’s LCD that shows equipotential lines and lines of electrical force between the upper and lower substrates. Ex. 1005, 3:62–65. Annotated Ohta Figure 2, on the right, is a cross-sectional view of a pixel of one embodiment of the LCD described in Ohta. Ex. 1006 ¶ 19. Patent Owner’s annotations include identification of the pixel and counter electrodes in each figure, and, in Ohta Figure 2, the addition of dotted lines parallel to and between the left pixel electrode and the counter electrode, and parallel to and between the right pixel electrode and the counter electrode, which Patent Owner identifies as “Electric Field.” Prelim. Resp. 21.

Referring to its annotated comparison of Yuh Figure 2 and Ohta Figure 2, Patent Owner argues that “a FFS device differs from an IPS device in significant ways” including “requiring (1) the electrode configuration and spacing, (2) an insulating layer between the electrodes, and (3) an accounting for the capacitance created between the electrodes.” *Id.* at 22

(citing Ex. 2010 ¶ 37; Ex. 2009, 1, Fig. 2). According to Patent Owner, the differences between FFS and IPS devices “specifically impact the number and size of insulation layers required for these devices,” such that one of ordinary skill in the art “would not readily look to an interdigitated IPS structure to improve upon an FFS structure, especially with regard to the types of insulation layers used.” *Id.* (citing Ex. 2010 ¶ 37).

To support a showing of obviousness, there has to be articulated reasoning with rational underpinning to support a motivation to combine the prior art teachings, and the analysis should be explicit. *KSR Int’l Co. v. Teleflex, Inc.*, 550 U.S. 398, 418 (2007) (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) (“[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with rational underpinning to support the legal conclusion of obviousness.”)). A petitioner must demonstrate “that a skilled artisan would have been motivated to combine the teachings of the prior art references to achieve the claimed invention, and that the skilled artisan would have had a reasonable expectation of success in doing so.” *ActiveVideo Networks, Inc. v. Verizon Commc’ns, Inc.*, 964 F.3d 1312, 1327 (Fed. Cir. 2012) (quoting *Pfizer, Inc. v. Apotex, Inc.*, 480 F.3d 1348, 1361 (Fed. Cir. 2007)).

Having considered the parties’ arguments, we are not persuaded, on this record, that Petitioner sufficiently establishes that a person of ordinary skill in the art would have attempted to modify Yuh’s LCD with Ohta’s organic passivation layer, and would have had a reasonable expectation of success in doing so. Petitioner fails to account for fundamental differences between the structure and function of the LCD devices taught by Yuh and Ohta and to explain sufficiently why a person of ordinary skill in the art

would have considered an organic passivation layer, as taught by Ohta, to have been applicable to and an improvement upon Yuh's device.

Petitioner's rationale for why a person of ordinary skill in the art would have had reason to combine the teachings of Yuh and Ohta is based on Petitioner's contention that Ohta teaches that placing an organic passivation layer between a counter electrode and substrate "facilitates uniformity in the brightness of an LCD device." Pet. 36 (citing Ex. 1006 ¶ 17; Ex. 1003 ¶ 95). In Ohta's LCD, pixel electrodes and counter electrodes are formed linearly "so as not to overlap each other in a planar condition," and "are capable of applying an electric field parallel to substrate surfaces in the pixels." Ex. 1006 ¶ 7. An insulating film is formed on Ohta's drain line, and the counter electrodes are formed on the insulating film so that they cover the drain lines. *Id.*; *see also id.* ¶ 15 ("Reference electrodes are formed on an organic insulating film in such a manner that the reference electrodes are completely overlapped on drain lines."). Ohta further teaches that the organic insulating film (also referred to as an organic passivation layer) drastically reduces "the capacitance between the drain line and counter electrode which is overlapped on the drain line," such that "the load to the drain line is drastically reduced" and "the drive circuit for driving the drain lines can be minimized." *Id.* ¶¶ 16, 85. Ohta also teaches that the organic passivation layer "has an excellent flatness so when the organic passivation layer is coated on the uppermost layer of the substrate which constitutes an active element, the flatness of the substrate which constitutes the active element is enhanced," and "irregularities of the gap between the substrates can be eliminated thus enhancing the uniformity of the brightness." *Id.* ¶ 17.

Yuh's electrode configuration, however, is different than Ohta's. In contrast to Ohta, Yuh Figure 35A shows that the common electrode and data (drain) line do not overlap. *See* Pet. 17 (annotated Figure 35A of Yuh); *see also* Pet. 25 (equating drain lines and data lines). In further contrast to Ohta, Yuh teaches that the pixel and counter electrodes "insulated from each other are overlapped with each other at least in part," and the potential difference between the two electrodes yields an electric field that has the shape of a "semi-ellipse or parabola having a center on a boundary line or a boundary region between the first electrode and the second electrode, whereby the electric field on the electrodes has the vertical and horizontal components." Ex. 1005, 3:16–22. In Yuh, the counter (planar) electrode "is covered with an insulating film" and "a plurality" of narrow pixel (linear) electrodes "which are parallel to each other and elongated in the longitudinal direction are formed on the insulating film." *Id.* at 6:45–54.

Patent Owner's declarant, Mr. Credelle, testifies that the devices in Ohta and Yuh differ "in significant ways," such as in the electrode configuration and spacing, whether there is an insulating layer between the electrodes, and how to account for the capacitance created between the electrodes that "specifically impact the number and size of insulation layers required for these devices." Ex. 2010 ¶ 37. Mr. Credelle further testifies, with evidentiary support, that in a device like Ohta's LCD, the distance between the electrodes is larger than the cell gap and the width of the electrode, whereas in a device like Yuh's LCD, the distance between the electrodes is zero or smaller than the cell gap and the width of the electrode is such that the electric field lines are formed in the whole area. Ex. 2010 ¶ 36 (citing Ex. 2009, 1, Fig. 2). This is consistent with Ohta's description

of parallel electrodes that do not overlap (Ex. 1006 ¶ 7) and Yuh's description of electrodes that do overlap (Ex. 1005, 3:11–15).

The record also supports Patent Owner's contention that the differently-shaped electric fields affect display performance in different ways. Prelim. Resp. 20. The objective evidence of record shows that a cell in which the electric field has vertical and horizontal components, like that in Yuh, has advantages over a cell with a parallel electric field, like that in Ohta, including high transmittance and lack of crosstalk (i.e., longitudinal smear). Ex. 2009, 1–2. Therefore, the record indicates that crosstalk or longitudinal smear (the problem Ohta addresses (Ex. 1006 ¶¶ 5, 6, 15)) is not a problem in Yuh's device.

Patent Owner and Mr. Credelle provide an additional persuasive argument for why a person of ordinary skill in the art would not have had a reason to modify Yuh with Ohta's organic passivation layer. Mr. Credelle testifies that Ohta teaches using an organic passivation layer to smooth out (planarize) the substrate after the TFTs are formed thereon. Ex. 2010 ¶ 41. Mr. Credelle's testimony is consistent with Ohta's Figure 3, which shows a TFT with the organic passivation layer (PSV2) formed on the source and drain electrodes (SD1-d3, SD2-d3), semiconductor layer (AS), and gate insulating film (GI). Ex. 1006 ¶ 60, Fig. 3. In contrast, Petitioner proposes to add an organic passivation layer directly on Yuh's lower glass substrate, but provides no evidence that this lower substrate is in need of an additional planarizing layer. Pet. 39 (Yuh Figure 2 modified by Petitioner to include organic passivation layer between lower substrate and planar electrode); Prelim. Resp. 23–24; Ex. 2010 ¶ 41 (a person of ordinary skill "would understand that the glass substrate [in Yuh] is a flat surface without need of an additional 'planarizing' layer"). Patent Owner and Mr. Credelle correctly

point out that Petitioner fails to show how the proposed organic passivation layer would be added to and function in the TFT region of Yuh's device.

Prelim. Resp. 25; Ex. 2010 ¶¶ 42, 43. Although Petitioner provides a modification of Yuh's Figure 2 that shows the addition of an organic passivation layer in the pixel region (Pet. 39), Petitioner does not show how the organic passivation layer would carry into the TFT region, as depicted, for example, in Yuh's Figure 33. *See* Pet. 35 (Yuh's Figure 33 colored and annotated to show gate insulation layer and gate line, but not an organic passivation layer).

Given the numerous differences between Yuh's LCD and Ohta's LCD devices, Petitioner provides insufficient reasoning as to why a person of ordinary skill in the art would have expected that modifying Yuh with Ohta's organic passivation layer would have improved Yuh in the same way it improved Ohta, namely, by enhancing the uniformity of the brightness of Ohta's LCD. In particular, Petitioner's analysis lacks a persuasive explanation of why a person of ordinary skill would understand that Yuh's device has irregularities in or problems with brightness that a person of ordinary skill in the art would look to a reference like Ohta to resolve.

Ex. 1006 ¶ 17. Neither Petitioner nor its declarant, Mr. Flasck, directs us to any objective evidence that supports the contention that Yuh's LCD would benefit from the addition of Ohta's organic passivation layer. Petitioner also does not direct us to, nor do we discern, statements in Yuh with respect to problems with the brightness of Yuh's LCD, any lack of flatness of Yuh's lower substrate, or the need to reduce the capacitance between Yuh's drain line and counter electrodes, which do not overlap. On the contrary, Yuh addresses the problem of image quality deterioration in a different way by describing an electrode array that provides a wide viewing angle.

Ex. 1005, 3:29–45; *see also id.* at 2:11–24 (explaining that, when the viewing angle is narrow, “the contrast, which is defined as the luminance of the brightest state divided by that of the darkest state, abruptly decreases” and “gray inversion phenomenon also occurs” such that “image quality is abruptly deteriorated when viewed at an angle larger th[a]n the viewing angle”). Yuh also teaches that its planar (counter) electrode “is formed on the inner surface of a lower substrate 100 made of a transparent insulating material such as glass or quartz,” which supports Patent Owner’s argument that Yuh’s substrate is already flat, and there would be no need to enhance its flatness as Ohta teaches. Ex. 1005, 4:45–48; Prelim. Resp. 24.

Petitioner “has the burden from the outset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016); *see also SAS Inst., Inc. v. Iancu*, 138 S.Ct. 1348, 1355 (2018) (“in an inter partes review, the petitioner is master of its complaint”). Based on our review of the record, we find that there is insufficient explanation and insufficient supporting evidence that a person of ordinary skill in the art would have been motivated to modify Yuh’s LCD device to address irregularities in brightness by adding an organic passivation layer as taught by Ohta. Therefore, Petitioner does not establish a reasonable likelihood that the combination of Yuh and Ohta discloses an LCD device that includes “an organic insulation layer disposed between the first substrate and the liquid crystal” that “is formed between the counter electrode and the first substrate” as required by claim 1 of the ’989 patent.

For these reasons, we determine that Petitioner has not sufficiently established that the combined teachings of Yuh, Ohta, and Abe disclose or suggest all of the limitations of independent claim 1, and we determine that

Petitioner does not show a reasonable likelihood of prevailing on its assertion that the subject matter of claim 1, and claim 2 that depends therefrom, would have been obvious over the combined teachings of Yuh, Ohta, and Abe.³

E. Asserted Obviousness over Yuh, Ohta, Abe, and Kim (Ground 2)

Petitioner contends that the combined teachings of Yuh, Ohta, Abe, and Kim teach or suggest all of the limitations of claim 2. Pet. 66–69. Claim 2 depends from claim 1, and further recites that “wherein the common layer is a planer [*sic*, planar] shape, and faces plural of the pixel electrode.” Ex. 1001, 52:35–37. Specifically, Petitioner contends that “[t]o the extent that *Yuh* and *Ohta* do not teach ‘wherein the common layer is a planar shape,’ *Kim* teaches this.” *Id.* at 66.

For the reasons set forth above, we are not persuaded that Petitioner has sufficiently shown that claim 1 would have been obvious over the combined teachings of Yuh, Ohta, and Abe. *See* Section II.D.3, *supra*. Petitioner does not rely on Kim to remedy the deficiencies in Petitioner’s arguments identified above with respect to claim 1. Accordingly, we determine that Petitioner does not establish a reasonable likelihood that it would prevail in showing that claim 2 would have been obvious over the combined teachings of Yuh, Ohta, Abe, and Kim.

F. Obviousness Grounds Including Kurahashi (Grounds 3 and 4)

Petitioner contends that claims 1 and 2 would have been obvious over the combined teachings of Yuh and Kurahashi, and claim 2 would have been

³ Patent Owner argues that Abe is not prior art to the ’989 patent. Prelim. Resp. 17–18. We need not reach that argument to resolve the parties’ dispute.

obvious over the combined teachings of Yuh, Kurahashi, and Kim. Pet. 69–99.

Petitioner contends that Kurahashi, which was filed on October 16, 2001, “constitutes prior art at least under pre-AIA 35 U.S.C. § 102(b).” Pet. 69. Petitioner’s contention is based on its argument that “the earliest priority date to which the ’989 patent is entitled is the date of the earliest-filed U.S. application, namely, U.S. Patent App. Serial No. 10/237,911 filed September 10, 2002,” because the Japanese application to which the ’989 patent claims priority does not provide written description support for claims 1 and 2.⁴ *Id.* As set forth above in Section II.C, we determined that Petitioner has not established a reasonable likelihood that it will prevail in showing that the challenged claims are not entitled to the October 15, 2001, filing date of the Japanese application. Because Kurahashi was filed after October 15, 2001, Petitioner does not establish, on this record, that Kurahashi is prior art to the ’989 patent.

Accordingly, Petitioner does not demonstrate a reasonable likelihood of establishing that claims 1 and 2 would have been obvious over the combined teachings of Yuh and Kurahashi, or that claim 2 would have been obvious over the combined teachings of Yuh, Kurahashi, and Kim.

III. CONCLUSION

Based on the arguments in the Petition, Preliminary Response, Reply, and Sur-reply, and the evidence of record, we determine that Petitioner has not established a reasonable likelihood that it would prevail on its challenge that claims 1 and 2 of the ’989 patent are unpatentable.

⁴ As Patent Owner points out (Prelim. Resp. 19 n.1), even if the effective filing date of the ’989 patent were September 10, 2002, Kurahashi would be prior art under pre-AIA § 102(e), not § 102(b) as Petitioner contends.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that the Petition is *denied* and no trial is instituted.

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