

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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TOSHIBA CORP. and SAMSUNG DISPLAY CO., LTD.,  
Petitioner,

v.

GOLD CHARM LIMITED,  
Patent Owner.

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Case IPR2015-01497  
Patent 5,790,092

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Before KARL D. EASTHOM, BRYAN F. MOORE, and  
CHARLES J. BOUDREAU, *Administrative Patent Judges*.

BOUDREAU, *Administrative Patent Judge*.

FINAL WRITTEN DECISION  
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

## I. INTRODUCTION

Toshiba Corp. and Samsung Display Co., Ltd. (collectively, “Petitioner”) filed a Petition (Paper 1, “Pet.”) requesting *inter partes* review of claims 1–4, 8, 9, 13, and 14 of U.S. Patent No. 5,790,092 (Ex. 1001, “the ’092 patent”). Pet. 1. Gold Charm Limited (“Patent Owner”) filed a Preliminary Response. Paper 7. The parties also filed additional authorized briefing sought by Patent Owner to address a real party in interest issue. *See* Papers 8, 9, 11. We instituted trial for all challenged claims. Paper 12 (“Decision on Institution” or “Dec. on Inst.”). After institution of trial, Patent Owner filed a Patent Owner Response. Paper 16 (“PO Resp.”). Petitioner filed a Reply. Paper 19 (“Pet. Reply”). The record includes a transcript of the Oral Hearing held in this proceeding on September 28, 2016. Paper 28 (“Tr.”).

We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision is entered pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. Having reviewed the arguments of the parties and the supporting evidence, we conclude that Petitioner has shown by a preponderance of the evidence that claims 1–4, 8, 9, 13, and 14 of the ’092 patent are unpatentable.

### A. *Related Proceedings*

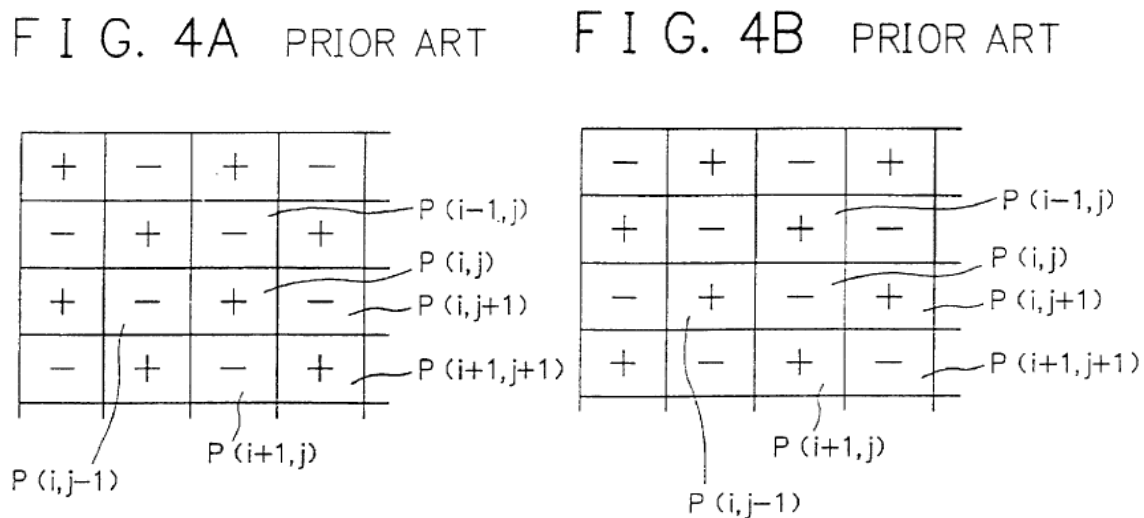
Petitioner indicates that the ’092 patent is “the subject of litigation against multiple defendants in the District of Delaware,” in a case captioned *MiiCs & Partners, America, Inc. v. Toshiba Corp.*, No. 1:14-cv-00803-RGA (D. Del.). Pet. 1; *accord* Paper 5, 2–3.

### B. *The ’092 Patent*

The ’092 patent, titled “Liquid Crystal Display with Reduced Power Dissipation and/or Reduced Vertical Striped Shades in Frame Control and

Control Method for Same,” issued August 4, 1998, from U.S. Patent Application No. 08/506,705, filed July 25, 1995. Ex. 1001, [21], [22], [45], [54]. The '092 patent also claims priority from Japanese Patent Application No. 6-194593, filed July 28, 1994.

The '092 patent generally describes methods for driving a liquid crystal display (LCD) pixel matrix so as to reduce flicker, power consumption, horizontal crosstalk, and the appearance of vertical striped lines. Ex. 1001, Abstract, col. 13, ll. 12–34, col. 15, ll. 23–25. The '092 patent explains that it was known in the art to reverse the polarity of each written image signal “every frame, i.e., every write action thereof, thus driving an associated liquid crystal in an alternating current driven manner, to thereby secure a long service life.” *Id.* at col. 3, ll. 43–47. Moreover, according to the '092 patent, “dot mode polarity reversion” is performed, “every dot every frame, over the extent of the LCD panel” in a conventional display. *Id.* at col. 3, ll. 55–57. Figures 4A and 4B, reproduced below, are illustrative.



Figures 4A and 4B are polarity maps of a display area of a conventional LCD that employs a “typical dot mode polarity revision

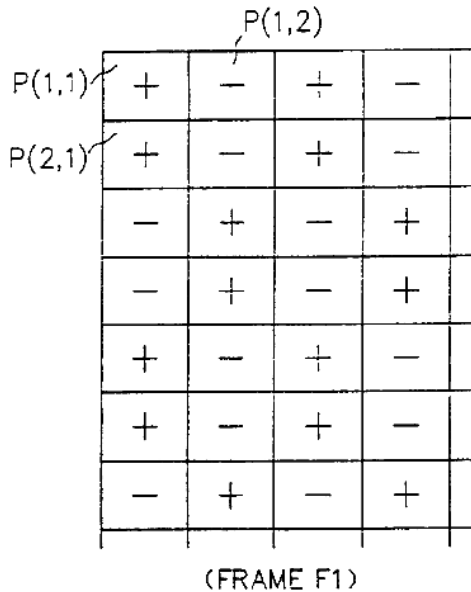
method for driving a pixel matrix thereof.” Ex. 1001, col. 3, ll. 58–62. In this method, as shown in Figure 4A for a certain frame, an arbitrary pixel  $P(i,j)$  has a polarity (e.g., “+”) different from a polarity (i.e., “–”) of each of four pixels  $P(i, j-1)$ ,  $P(i, j+1)$ ,  $P(i-1, j)$  and  $P(i+1, j)$  neighboring thereto in the same row or the same column. *Id.* at col. 4, ll. 1–5. “Respective pixels on extensions of both diagonal lines of the pixel  $P(i,j)$ , such as a one-row one-column off pixel  $P(i+1, j+1)$ , each have the same polarity (i.e., ‘+’) as a matter of course.” *Id.* at col. 4, ll. 5–8. “Then, in a subsequent frame, as shown in FIG. 4B, each pixel has a reversed polarity.” *Id.* at col. 4, ll. 9–10.

According to the ’092 patent, such a typical conventional method provides a high picture quality, as “charge transfers are counterbalanced in the entirety of an LCD panel, without causing a horizontal crosstalk”; “each pixel has a flicker thereof geometrically cancelled by flicker components of neighboring pixels and hence the flicker is inconspicuous”; and “the common electrode has a reduced tendency to discharge to external circuitry, thus permitting a common voltage generator to be less power consumable.” Ex. 1001, col. 4, ll. 11–30. Nonetheless, according to the ’092 patent, because polarity reversion in the conventional method is “performed at intervals of a 1H duration” (i.e., each horizontal scan), this method results in “an insufficient reduction of power dissipation such as at a signal processor and a source driver.” *Id.* at col. 4, ll. 31–38. The ’092 patent thus describes certain other known alternative driving methods, including “line mode polarity reversion accompanying visually inconspicuous dot mode striped shades” and “frame control” (or “FRC”). *Id.* at col. 4, l. 39–col. 5, l. 12; col. 7, ll. 28–31. According to the ’092 patent, however, although the former method is “free from disturbant line mode striped shades,” it

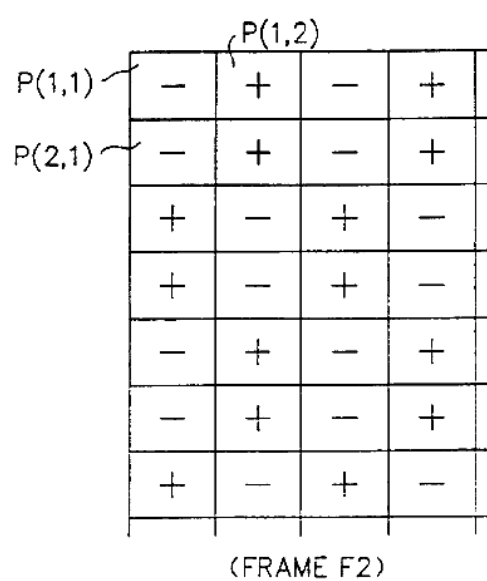
nonetheless suffers from crosstalk due to the fact that, “in an arbitrary  $i$ -th 1H duration, all odd numbered pixels  $P(i, 2s-1)$  in an  $i$ -th row have the TFT’s 4 thereof turned on to receive corresponding image signals of a polarity, without an opposite polarity inserted.” *Id.* at col. 5, ll. 12–18. Frame control has other drawbacks, according to the ’092 patent, including “a conspicuous vertical striped shade . . . between  $2s-1$ -th and  $2s$ -th columns in an FRC display.” *Id.* at col. 7, ll. 58–60.

It is therefore an object of the ’092 patent to provide an LCD “permitting an effectively reduced power dissipation in signal generation and/or effectively reduced vertical stripe shades in frame control, as well as a control method for the same.” Ex. 1001, col. 7, l. 65–col. 8, l. 2. The ’092 patent purports to achieve this object, *inter alia*, by providing an image signal having a polarity reversion period thereof “doubled from a 1H duration to a 2H duration so that the polarity reversion of a tone [sic] representative voltage is extended, thus permitting a reduced power dissipation.” *Id.* at col. 8, ll. 20–24. Figures 13A and 13B, reproduced below, are illustrative.

F I G. 13A



F I G. 13B



Figures 13A and 13B are polarity maps of a display area of the LCD panel of an LCD according to an embodiment of the '092 patent, in first and second frames F1 and F2, respectively. Ex. 1001, col. 10, ll. 55–56, col. 12, ll. 61–63.

As shown in Figure 13A for the frame F1, an arbitrary pair of neighboring pixels  $P(i,j)$  and  $P(i, j+1)$  in a row direction of the pixel matrix have their polarities reversed with respect to each other. Ex. 1001, col. 12, ll. 64–67. In a column direction of the pixel matrix, however, a pixel  $P(2s-1, j)$  at a  $2s-1$ -th row in a  $j$ -th column has the same polarity as a pixel  $P(2s, j)$  at a  $2s$ -th row in the  $j$ -th column. *Id.* at col. 12, l. 67–col. 13, l. 3. “Then, in the second frame F2, as shown in FIG. 13B, each pixel has a reversed polarity.” *Id.* at col. 13, ll. 7–8.

The '092 patent cites similar benefits for the embodiment of Figures 13A and 13B as for the conventional dot mode polarity reversion method,

including counterbalancing of charge transfers in the entirety of an LCD panel without causing horizontal crosstalk, geometric offsetting of pixel flicker by flicker components of neighboring pixels, and limited charge transfer between neighboring pixels, permitting a common voltage generator to consume less power than other methods. *Compare* Ex. 1001, col. 13, ll. 9–25, *with* Ex. 1001, col. 4, ll. 11–30. Additionally, however, with respect to the embodiment of Figures 13A and 13B, “polarity reversion is performed at intervals of a 2H duration to achieve an increased reduction of power dissipation such as at a signal processor and a source driver,” and “[i]n this concern, an experiment showed a 1.0 W power consumption for a conventional signal processor, and a 0.8 W power consumption for a signal processor in a liquid crystal display according to the invention.” *Id.* at col. 13, ll. 26–33.

*C. Illustrative Challenged Claims*

Of the challenged claims, claims 1, 8, and 13 are independent. Independent claim 1 and its dependent claims 2–4 are directed to an LCD; independent claim 8 and dependent claim 9 are directed to a control method for driving an LCD comprising a matrix of pixels; and independent claim 13 and dependent claim 14 are directed to a method of driving a matrix of pixels in a display device. Independent claims 1 and 8 are illustrative of the challenged claims and are reproduced below:

1. A liquid crystal display, comprising:
  - a display comprising a matrix of pixels each having a common reference potential; and
  - a drive means for driving the display wherein,

every other one of said pixels in a row direction of the matrix are driven by a signal having a reversed polarity relative to the reference potential, and

every other pair of said pixels in a column direction of the matrix are driven by said signal having a reversed polarity relative to the reference potential, and

the polarity of the signal supplied to each of the pixels is reversed every frame.

8. A control method for driving a liquid crystal display including a display comprising a matrix of pixels, comprising the steps of:

developing a common reference potential in each of the pixels;

driving the display in a row direction so that every other pixel in the row direction of the matrix is driven by a signal having a reversed polarity relative to the reference potential;

driving the display in a column direction wherein every other pair of pixels in the column direction of the matrix are driven by a signal having a reversed polarity relative to the reference potential; and

reversing the polarity of the signal potential in each of the pixels every frame.

Ex. 1001, col. 15, ll. 38–50, col. 17, ll. 1–16.

#### *D. Evidence of Record*

Petitioner relies on the Declaration of Dr. Aris Silzars (Ex. 1002, “Silzars Declaration”); Japanese Patent Application Publication H05-173512 A (July 13, 1993) (Ex. 1004, “the ’512 Publication”);<sup>1</sup> and

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<sup>1</sup> References in this Decision to the ’512 Publication are to the certified English-language translation at pages 7–16 of Exhibit 1004.

admitted prior art described at column 1, line 15, to column 7, line 60, and Figures 1–9 of the '092 patent (“APA”). See Pet. iii, 3, 4. Petitioner also relies on a Rebuttal Declaration of Dr. Silzars. Ex. 1007 (“Silzars Rebuttal Declaration”). Patent Owner relies on the Declaration of Willem den Boer, Ph.D. (Ex. 2024, “den Boer Declaration”).

*E. Instituted Ground of Unpatentability*

We instituted an *inter partes* review of claims 1–4, 8, 9, 13, and 14 of the '092 patent under 35 U.S.C. § 103(a) over the combination of the '512 Publication and the APA.

II. ANALYSIS

*A. Claim Construction*

Although not brought to our attention by either party, we observe that the '092 patent expired no later than July 25, 2015, twenty years from the filing date of the '705 application from which the '092 patent issued. 35 U.S.C. § 154(a)(2). In an *inter partes* review, we construe claims of an expired patent according to the standard applied by the district courts. See *In re Rambus Inc.*, 694 F.3d 42, 46 (Fed. Cir. 2012). Specifically, we apply the principles set forth in *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–17 (Fed. Cir. 2005) (en banc). Under that standard, the words of a claim are generally given their ordinary and customary meaning, which is the meaning the term would have to a person of ordinary skill at the time of the invention, in the context of the entire patent including the specification. See *Phillips*, 415 F.3d at 1312–13.

In the Petition, Petitioner proposed two alternate constructions for the claim 1 term “a drive means for driving the display,” depending on whether that term is properly construed as a means-plus-function limitation under

35 U.S.C. § 112, sixth paragraph. Pet. 26–28. Patent Owner responds that neither of Petitioner’s proposed constructions is proper, but that, “for purposes of this proceeding only,” Patent Owner relies upon those constructions. PO Resp. 22–23. According to Patent Owner, “even if one of Petitioners’ proposed constructions were adopted by the Board, the Petition nevertheless fails to a [sic] establish a *prima facie* case of obviousness.” PO Resp. 23.

In our Decision on Institution, we concluded on the record then before us that it was not necessary for our determination of whether to institute an *inter partes* review to construe expressly any terms of the challenged claims. Dec. on Inst. 8. Because this Final Written Decision does not turn on the construction of “a drive means for driving the display” or of any other specific claim term, we again conclude that it is unnecessary to construe expressly any term of the challenged claims. *See Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (holding that “only those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy”).

*B. Obviousness over the ’512 Publication and the APA*

We have reviewed the Petition, Patent Owner Response, and Petitioner’s Reply, as well as the relevant evidence discussed therein. For the reasons that follow, we determine that Petitioner has shown by a preponderance of the evidence that claims 1–4, 8, 9, 13, and 14 are unpatentable under 35 U.S.C. § 103(a) over the combined teachings of the ’512 Publication and the APA.

*1. Principles of Law*

To prevail in challenging claims 1–4, 8, 9, 13, and 14 of the '092 patent, Petitioner must demonstrate by a preponderance of the evidence that those claims are unpatentable. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d). In an *inter partes* review, “the petitioner has the burden from the onset 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) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”)). This burden never shifts to Patent Owner. See *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (citing *Tech. Licensing Corp. v. Videotek, Inc.*, 545 F.3d 1316, 1326–27 (Fed. Cir. 2008)) (discussing the burden of proof in *inter partes* review). Furthermore, Petitioner cannot satisfy its burden of proving obviousness by employing “mere conclusory statements.” *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016).

Petitioner has asserted each of the challenged claims is unpatentable under 35 U.S.C. § 103(a) over the combined teachings of the '512 Publication and the APA. A patent claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are “such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). “When there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known

options within his or her technical grasp.” *Id.* at 421. “If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense,” and “[i]n that instance the fact that a combination was obvious to try might show that it was obvious under § 103.” *Id.* The question of obviousness is resolved on the basis of underlying factual determinations, including (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) objective evidence of nonobviousness, i.e., secondary considerations such as commercial success, long felt but unsolved needs, and failure of others.<sup>2</sup> *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

## 2. *Level of Ordinary Skill in the Art*

In determining whether an invention would have been obvious at the time it was made, 35 U.S.C. § 103 requires us to resolve the level of ordinary skill in the pertinent art at the time of the invention. *Graham*, 383 U.S. at 17. “The importance of resolving the level of ordinary skill in the art lies in the necessity of maintaining objectivity in the obviousness inquiry.” *Ryko Mfg. Co. v. Nu-Star, Inc.*, 950 F.2d 714, 718 (Fed. Cir. 1991). The person of ordinary skill in the art is a hypothetical person who is presumed to have known the relevant art at the time of the invention. *In re GPAC, Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995). Factors that may be considered in determining the level of ordinary skill in the art include, but are not limited to, the types of problems encountered in the art, the sophistication of the

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<sup>2</sup> The record in this proceeding does not include any evidence of such secondary considerations.

technology, and educational level of active workers in the field. *Id.* In a given case, one or more factors may predominate. *Id.* Generally, it is easier to establish obviousness under a higher level of ordinary skill in the art. *Innovation Toys, LLC v. MGA Entm't, Inc.*, 637 F.3d 1314, 1323 (Fed. Cir. 2011) (“A less sophisticated level of skill generally favors a determination of nonobviousness . . . while a higher level of skill favors the reverse.”).

Petitioner’s declarant, Dr. Silzars, testifies that one of ordinary skill in the art as of the July 28, 1994, the earliest claimed priority date of the ’092 patent, “would generally have had at least a Bachelor’s of Science degree in electrical engineering or physics, or equivalent, and several years of relevant experience relating to the design and fabrication of liquid crystal displays,” or, “[a]bsent a formal degree, a person of ordinary skill in the art would have additional years of work experience.” Ex. 1002 ¶¶ 13, 33; see Pet. 24 (citing Ex. 1002 ¶ 13). Patent Owner’s declarant, Dr. den Boer, essentially agrees, opining that one of ordinary skill in the art as of July 28, 1994, would have been “someone with at least a Bachelor’s of Science degree in a relevant field, such as electrical engineering, and with several years of experience in the field of design, development and fabrication of liquid crystal displays,” and stating “[i]n this specific regard, I agree with Dr. Silzars.” Ex. 2024 ¶ 9; see PO Resp. 9 (citing Ex. 2024 ¶ 9). Dr. Silzars and Dr. den Boer also agree that the person of ordinary skill in the art would understand the prior art as discussed herein. Ex. 1002 ¶ 13; Ex. 2024 ¶ 9.

We determine that the differences in the declarants’ assertions are negligible and that both assessments are consistent with the ’092 patent and

the referenced prior art. For the purposes of the analysis below, we adopt Dr. den Boer's assessment.

### 3. Scope and Content of the Prior Art

#### a. Overview of the '512 Publication

The '512 Publication, titled "Liquid Crystal Display Device Driver Method," discloses a method of driving an LCD that includes "pixels 2 . . . arranged in a matrix." Ex. 1004, [54], ¶ 21. Figure 1 of the '512 Publication is reproduced below.

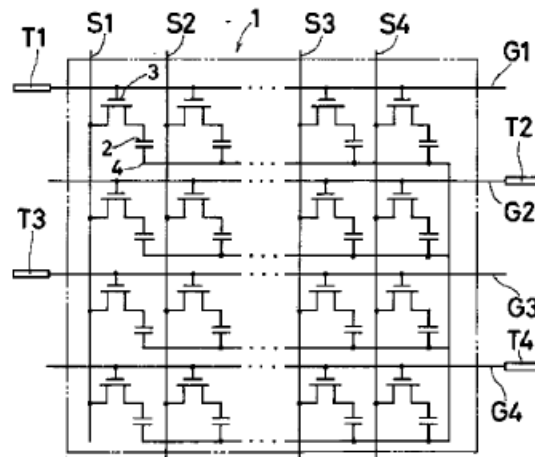


Figure 1 is a schematic diagram of a display panel in a display device in which an embodiment of the invention of the '512 Publication is implemented. *Id.* ¶ 20. As illustrated in Figure 1, voltages are applied to odd-numbered scanning signal lines G1, G3, etc. via input terminals T1, T3, etc., disposed to the left of the display panel; and voltages are applied to even-numbered scanning signal lines G2, G4, etc. via input terminals T2, T4, etc., disposed to the right of the display panel. *Id.* ¶ 23.

The '512 Publication discloses that, in the described driving method, "the polarity in a video signal that is inputted to driver voltage reverse circuit 10 is reversed in every two sections of the horizontal scanning period, and

furthermore, is outputted as a driver voltage  $\pm v_s$  that reverses every perpendicular period.” *Id.* ¶ 30. Based on driver voltage  $\pm v_s$  sequentially being applied to pixels 2 that correspond to each single row in display panel 1 from data-side driver circuit 5, the application voltage  $V_{lc}$  that applies to each row of pixels 2 is shown in Table 1. *Id.* ¶ 31. Table 1 is reproduced below.

[Table 1]

|    | n Field                                   | (n+1) Field                               |
|----|-------------------------------------------|-------------------------------------------|
| G1 | <p>+</p> $V_s + \Delta V_{pa} - V_{com}$  | <p>-</p> $-V_s + \Delta V_{na} - V_{com}$ |
| G2 | <p>+</p> $V_s + \Delta V_{pb} - V_{com}$  | <p>-</p> $-V_s + \Delta V_{nb} - V_{com}$ |
| G3 | <p>-</p> $-V_s + \Delta V_{na} - V_{com}$ | <p>+</p> $V_s + \Delta V_{pa} - V_{com}$  |
| G4 | <p>-</p> $-V_s + \Delta V_{nb} - V_{com}$ | <p>+</p> $V_s + \Delta V_{pb} - V_{com}$  |

Table 1 shows, *inter alia*, the polarity (i.e., “+” or “-”) of the application voltage for four rows of pixels 2 of the LCD matrix, controlled by scanning signal lines G1–G4, respectively, for two frames (i.e., “n Field” and “(n+1) Field”). *Id.* ¶¶ 19, 33–36. More particularly, the ’512 Publication explains:

In table 1, the upper stages within each boundary shows the polarity of the application voltage  $V_{lc}$  in the pixels 2, and the lower stages show the application voltage  $V_{lc}$ . In addition, voltage  $\Delta V_{pa}$  and  $\Delta V_{na}$  display the voltage caused by the voltage application characteristics in each row of the pixels 2 corresponding with the scanning signal lines G1 and G3, which assume the same voltage application characteristics, and voltage  $\Delta V_{pb}$  and  $\Delta V_{nb}$  display the voltage caused by the voltage application characteristics in each row of the pixels 2

corresponding with scanning signal lines G2 and G4 which assume identical but separate voltage application characteristics differing from the previous voltage application characteristics.

Namely, four rows of the pixels 2 are made into one group, the pixel 2 rows that correspond with scanning signal lines G1 and G3 are assigned to a first group, the pixel 2 rows that correspond to the remaining scanning signal lines G2 and G4 are assigned to a second group, and the polarity of application voltage V<sub>lc</sub> in the row of the pixels 2 that correspond to scanning signal line G1 within the same rows of the first group, and the polarity of application voltage V<sub>lc</sub> in the row of the pixels 2 that correspond to scanning signal line G3 are driven to vary.

Similarly, among the same rows of the second group, the polarity of application voltage V<sub>lc</sub> in the row of the pixels 2 that correspond to scanning signal line G2 and the polarity of application voltage V<sub>lc</sub> in the row of the pixels 2 that correspond to the scanning signal line G4 are driven to vary.

Moreover, in response to the application voltage V<sub>lc</sub> in each row of the pixels 2 in the n field, the application voltage V<sub>lc</sub> in the next (n+1) field are driven to become a reverse polarity.

*Id.* ¶¶ 33–36.

*b. Overview of the APA*

The APA is discussed in the above overview of the '092 patent. See *supra* section I.B.

*4. Discussion*

In support of its contention that the challenged claims are unpatentable over the '512 Publication and the APA, Petitioner argues that, during prosecution and in the section of the '092 patent describing the prior art, “the patentee acknowledged that only a single concept contained within independent claims 1, 8, and 13 is inventive -- the concept of providing the same polarity to pairs of pixels in a column direction.” Pet. 28 (citing Ex. 1001, col. 1, l. 15–col. 7, l. 60, Figs. 4A, 4B, 7A, 7B; Ex. 1002 ¶ 47)).

In particular, Petitioner asserts, the patentee acknowledged that “the other features of the independent claims (such as, for example, ‘every other one of said pixels in a row direction . . . are driven by a signal having a reversed polarity’ and ‘the polarity of the signal supplied to each of the pixels is reversed every frame’) were previously known.” *Id.* (citing Ex. 1003, 147–48 (Amendment dated Aug. 11, 1997, at 13–14)). According to Petitioner, however, “even the allegedly ‘inventive’ concept . . . was disclosed before the earliest possible priority date of the ’092 Patent,” as “[t]he ’512 Publication discloses the same polarity signal generating circuit taught by the ’092 Patent for producing the pixel pairs with matching polarity in a column direction, and the combined teachings of the ’512 Publication and the APA disclose the other features of the independent claims.” *Id.* at 28–29.

Indeed, Petitioner asserts, the ’512 Publication itself discloses all limitations of each of claims 1, 2, 8, 9, 13, and 14 of the ’092 patent, except for explicit disclosure of “every other one of said pixels in a row direction of the matrix [being] driven by a signal having a reversed polarity relative to the reference potential,” as recited in claim 1, and corresponding limitations recited in claims 8 and 13. Pet. 29–40, 49–59 (citing Ex. 1002 ¶¶ 61–80, 82–86, 91–99, 112–114, 120, 122, 124–126, 131–134; Ex. 1004 ¶¶ 6, 17, 19–36, 39, Table 1, Figs. 1, 2, 4(3)). We agree. As to that remaining limitation, Petitioner contends that “[a] person having ordinary skill in the art would have understood that the driving method of the ’512 Publication would operate with every other pixel in a row direction having a reversed polarity from the next to avoid image artifacts and horizontal crosstalk.” *Id.* at 31 (citing Ex. 1002 ¶ 87), 49–50 (citing Ex. 1002 ¶ 115), 55–56 (citing

Ex. 1002 ¶ 127). “While the ’512 Publication does not explicitly disclose reversing the polarity of every other pixel in a pixel row, this was a commonly used polarity inversion<sup>[3]</sup> pattern and is specifically disclosed in the APA.” *Id.* at 31–32 (citing Ex. 1001, col. 2, ll. 50–55, Figs. 3, 4A, 4B; Ex. 1002 ¶ 87), 50 (citing Ex. 1002 ¶ 115), 56 (citing Ex. 1002 ¶ 127).

Therefore, according to Petitioner,

it would have been obvious to a person of ordinary skill in the art to improve the driving method of the LCD device of the ’512 Publication by driving the pixels such that each pixel within a row is driven with an alternate polarity with respect to its neighboring pixel in the row.

*Id.* at 33 (citing Ex. 1002 ¶ 90), 51–52, 57 (citing Ex. 1002 ¶ 130). The person having ordinary skill in the art would have done so, according to Petitioner, “because, as admitted in the ’092 Patent, this type of row polarity pattern was commonly known to reduce crosstalk, flicker, and image non-uniformities in LCD devices of the type disclosed in the ’512 Publication.” *Id.* at 33 (citing Ex. 1001 at col. 4, ll. 13–25; Ex. 1002 ¶ 90), 52 (citing Ex. 1001 at col. 4, ll. 13–25; Ex. 1002 ¶ 118), 57 (citing Ex. 1001 at col. 4, ll. 13–25; Ex. 1002 ¶ 130).

Petitioner asserts further that a person having ordinary skill in the art “would have understood that the ’512 Publication’s disclosure of an LCD panel would necessarily include all of the additional features of dependent claim 3.” Pet. 40 (citing Ex. 1002 ¶ 100). Illustrative of this, according to

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<sup>3</sup> We understand the terms “inversion” and “reversion” to be used interchangeably in the present context. See Pet. Reply 2 n.1 (“As noted previously, and not contested by Patent Owner, reversion is synonymous with inversion.” (citing Pet. 11)).

Petitioner, “is the fact that the APA discloses each and every element of claim 3, often using the exact terminology recited in the claim, and the Applicant admitted as much during prosecution of the ’092 Patent.” *Id.* at 40 (citing Ex. 1001, col. 1, ll. 20–65, Fig. 1; Ex. 1003, 146–149 (Amendment dated Aug. 11, 1997, at 12–15)); *see also id.* at 40–48 (citing Ex. 1001, col. 1, ll. 48–55; Ex. 1002 ¶¶ 101–110; Ex. 1004 ¶¶ 4–6, 18, 20–23, 39, Figs. 1, 3(b), 4(2)). Lastly, as to claim 4, which depends from claim 3 and further recites “the thin film transistor [TFT] is made of one of amorphous silicon and crystalline silicon,” Petitioner argues that, although the ’512 Publication does not explicitly disclose that its TFTs are made of amorphous silicon, “the APA discloses that it was known to use TFTs ‘made of an amorphous silicon or the like,’” and

a person of ordinary skill in art therefore would have used amorphous silicon to make the TFT of the ’512 Publication in light of these known properties in order to implement an efficient manufacturing process in which the silicon is readily deposited at temperatures that do not damage other components of the system.

*Id.* at 48 (citing Ex. 1001, col. 1, ll. 30–33; Ex. 1002 ¶ 111).

In response to Petitioner’s contentions, Patent Owner raises two principal arguments, both of which relate essentially only to Petitioner’s proposed combination of the teachings of the ’512 Publication and the APA. First, Patent Owner contends, one of ordinary skill in the art seeking to improve image quality for the ’512 Publication device would have merely adopted the dot mode polarity technique taught by the APA in its entirety. PO Resp. 2, 25–29. Petitioner’s expert, Dr. Silzars, “himself recognized that image quality was the most important driver of display development in the early nineties,” according to Patent Owner, and “the dot mode polarity

technique taught by the APA was recognized as providing the highest quality image.” *Id.* at 2. “Since the dot mode polarity inversion technique of the APA itself also addresses the problems that the ’512 Publication technique was designed to handle, it would make the most sense to one of ordinary skill in the art simply to adopt the superior dot mode polarity invention technique.” *Id.* at 24. Second, Patent Owner contends that the record does not support that power saving would have been a reason to combine the elements. *Id.* at 3, 29–32. According to Patent Owner, “adopting portions of the APA techniques as suggested would likely have little, if any positive effect on the power consumption by the ’512 Publication display.” *Id.* at 3. To the contrary, Patent Owner contends, “power consumption may actually be exacerbated by this combination.” *Id.* Further, according to Patent Owner, “Petitioner[’s] expert acknowledges that power dissipation was not considered a concern in display development at the time of the invention.” *Id.*

Based on the record before us, we are persuaded that Petitioner explains sufficiently how the ’512 Publication and the APA together teach each limitation of each of the challenged claims (*see* Pet. 29–59 and evidence cited therein), as well as the reasons that a person of ordinary skill in the art would have combined those teachings (*see id.* at 33, 41–42, 48, 51–52, 57 (citing, e.g., Ex. 1002 ¶¶ 90, 101, 111, 118, 129, 130)), so as to meet its burden to demonstrate by a preponderance of the evidence that the subject matter of the claims would have been obvious over the proffered combination. Patent Owner’s arguments to the contrary are not persuasive.

As Patent Owner points out, the ’512 Publication “uses a variation of a row polarity inversion technique . . . in order to reduce flicker[] caused by

voltage application characteristic deviations . . . result[ing] from the specific alternating gate terminal arrangement described in the '512 Publication.”

PO Resp. 10. At the hearing, Patent Owner’s counsel further argued as follows:

The '512 [Publication], as [Petitioner’s counsel] explained, is addressing a problem that’s caused by a particular type of display which is where you have the gates arranged -- gate terminals arranged on both sides of the display region and so they interlace with gate rows so that row 1, the gate terminal, would be on the left-hand side and row 2, the gate terminal, will be on the right-hand side.

And as [Petitioner’s counsel] further explains there’s a drop in voltage that occurs and so what you get is your voltage -- what the '512 publication calls the voltage characteristics, also referred to as delta VP and delta VN in the publication. These in a normal situation where you would have all the gate terminals on one side, the voltage characteristics will all be the same.

Now that you are interlacing and driving from both sides of the display, you are, again, causing differences in the voltages across the row and what this results in is what’s called flicker. In the normal situation the '512 publication describes where polarity inversion is all of your pixels are one polarity in one frame and the next frame they're all reversed.

In the situation where you have the gate terminals all on one side, you’re going to get flicker unless you compensate for the delta VP and delta VN and that’s compensated by taking the voltage on the opposite electrode, the common electrode, and adjusting that by an average of your delta VP and delta VN and that reduces your flicker. The problem is you can’t compensate in this way when your voltage characteristics are differing row to row.

So what the '512 publication provides is that you take all your gate terminals on the left hand side and you say this is group 1 and you take all the gate terminals on the right hand side and this is group 2. And for group 1 they drive each row by an opposite polarity, so your first row will have all positive, second row will have all negative. And you do the same thing in group

2, the first row have all positive and the second row will have all negative and it all switches.

And as a result of the interlacing is why you have these two rows. You have two rows of positive and two rows of negative in your first frame and, again, it switches.

Tr. 11:7–12:19.

Although Patent Owner contends that, “[c]onfronted with the task of improving the display quality for the ’512 Publication device, one of ordinary skill in the art would have merely adopted the APA technique in its entirety as this was known to provide the best image quality” (PO Resp. 2), we draw the opposite conclusion from Patent Owner’s explanations of the ’512 Publication’s teachings. We are instead persuaded by Petitioner’s contention that one of ordinary skill in the art, starting with the ’512 Publication and having knowledge of the APA, would have kept the double row polarity reversion technique taught by the ’512 Publication and adopted only the column polarity reversion of the APA, rather than adopting dot mode polarity reversion in its entirety. *See, e.g.*, Pet. Reply 9–10.

First, despite Patent Owner’s arguments that “it’s been clear through the evidence that one of ordinary skill in the art would not have made the proposed combination that Petitioners are suggesting and, instead, would have gone directly to the dot mode inversion taught by the APA and implemented that in the ’512 publication” (Tr. 16:1–6), and that Dr. den Boer has testified that the dot mode reversion method of the APA would solve the same problems as the ’512 Publication, particularly flicker and spatial averaging of differences in voltage (*id.* at 16:12–20 (citing Ex. 2024 ¶ 41)), we are not persuaded that adopting the dot mode reversion of the APA would solve the problems identified by the ’512 Publication if

incorporated into that publication's display having alternate rows driven from opposite sides of the panel. We instead are persuaded that if dot mode polarity reversion were adopted in its entirety, as Patent Owner suggests, that would run counter to the solution that the '512 Publication describes. As described in Section II.B.3.a *supra*, pixels in odd-numbered rows in the '512 Publication display panel are driven by terminals on one side of the panel, and pixels in even-numbered rows are driven by terminals on the other side of the panel. See Ex. 1004 ¶¶ 21, 23, Fig. 1. The double row reversion pattern described by the '512 Publication as reducing flicker results from alternating the polarity of the driving voltage after each row driven from a particular side of the panel. *Id.* ¶¶ 19, 33–35, 38, 39. In particular, if row 1 is driven by positive voltage  $\Delta V_{pa}$ , then row 3—i.e., the next row driven from the same side of the panel as row 1—is driven by negative voltage  $\Delta V_{na}$ , row 5 is again driven by positive voltage  $\Delta V_{pa}$ , and so on. *Id.* ¶¶ 33–34. Similarly, if row 2 is driven by positive voltage  $\Delta V_{pb}$ , then row 4—the next row driven from the same side of the panel as row 2—is driven by negative voltage  $\Delta V_{nb}$ , row 6 is again driven by positive voltage  $\Delta V_{pb}$ , and so on. Ex. 1004 ¶ 35. This results in the + + – – pattern down the first column of the display, as illustrated for signal lines G1–G4 in the n Field in Table 1 of the '512 Publication as well as in Figure 13A of the '092 patent. If dot mode reversion instead were adopted as suggested by Patent Owner, however, we understand that would require all odd rows to be driven with one polarity and all even rows to be driven with the other polarity, in order to produce the + – + – charge pattern down the first column, as depicted in Figure 4A of the '092 patent. To achieve that pattern with the gate terminal arrangement of the '512 Publication would require

that all rows driven from a given side of the panel be driven with the same polarity, an arrangement we understand to be contrary to the teachings of the '512 Publication. *See, e.g.*, Ex. 1004 ¶ 15.

Second, we are persuaded that a person of ordinary skill in the art would have adopted column reversion from the APA. Patent Owner does not dispute that dot mode reversion solves both crosstalk and flicker. *See* Tr. 17:17–18 (“The only evidence in the record is dot mode solves crosstalk and flicker.”). Although, as Patent Owner has pointed out (Tr. 17:15–17), the APA does not state that dot mode eliminates those defects “because” it combines row and column reversion (Tr. 17:15–18), Patent Owner’s declarant, Dr. den Boer, points out that the SID92 Digest paper cited at column 3, lines 60–62, of the '092 patent compared measurements of cross-talk and flicker using three drive methods: “Type A – source line inversion which is the same as column inversion,” “Type B – gate line inversion which is the same as line or row inversion,” and “Type C – dot inversion or dot mode polarity inversion”; and “[t]hey observed flicker on the panel when using column inversion,” “[t]hey observed cross-talk on the panel when using row inversion,” and they “did not observe either cross-talk or flicker when using the dot mode polarity inversion method.” Ex. 2024 ¶¶ 23–26. We also credit the rebuttal testimony of Dr. Silzars that “single dot inversion is row inversion combined with column inversion” and that “the APA indicates the specific advantages of column reversal stating that ‘the polarity reversion between a pair of neighboring source lines does not need a charge transfer from either of an associated pair of neighboring pixels or another beyond the other. . . . Accordingly, charge transfers are counterbalanced in

the[] entirety of an LCD panel, without causing a horizontal cross talk.””  
Ex. 1007 ¶ 31 (quoting Ex. 1001, col. 4, ll. 11–20).

Further, Dr. den Boer opines that because the authors of the SID92 Digest paper “concluded that only the dot mode polarity inversion method addresses and solves both the flicker and cross-talk problems,” “a person of ordinary skill in the art and familiar with the prior art of [the] ’092 [patent] and the SID92 Digest paper would employ dot mode polarity inversion over column inversion and row inversion, because it provides the best image quality.” Ex. 2024 ¶¶ 26–27. Irrespective of whether dot mode reversion would provide a *still better* image, however, we are persuaded that a person of ordinary skill in the art would have had reason, based on the APA, to add column polarity reversion to the ’512 Publication technique, in order to improve that technique in the same manner that the APA taught dot mode reversion provided an improvement over row polarity reversion. As the Supreme Court explained in *KSR*, “if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.” 550 U.S. at 417. As cited above, the APA taught that row polarity reversion eliminated crosstalk, but still suffered from flicker, whereas dot mode reversion, which effectively combines row polarity reversion with column polarity reversion, eliminated *both* crosstalk and flicker. We are persuaded, therefore, that a person of ordinary skill in the art would have had reason to add column polarity reversion of the APA to the *double* row polarity reversion of the ’512 Publication, to result in the driving method claimed in the ’092 patent.

We further agree with Petitioner (*see* Tr. 7:7–14) that Patent Owner’s arguments that “adopting portions of the APA techniques as suggested would likely have little, if any positive effect on the power consumption by the ’512 Publication display” (PO Resp. 3) and that “power consumption may actually be exacerbated by this combination” (*id.*) focus on the wrong comparison and do not address our finding in the Decision on Institution that one of ordinary skill in the art would have had reason to pursue a combination of the ’512 Publication’s teachings with the APA in an attempt to solve the problem of excessive power dissipation by the APA’s dot mode polarity reversion (*see* Dec. on Inst. 17–18). Whereas Patent Owner’s argument focuses on a comparison of power consumption between the ’512 Publication display and a display having column inversion added to the ’512 Publication (Tr. 19:25–20:2), we agree with Petitioner (*see* Pet. Reply 20) that the relevant comparison is instead between the combination and the dot mode polarity reversion scheme of the APA. Nonetheless, because we are persuaded by Petitioner’s arguments and evidence, for the reasons set forth above, that a person of ordinary skill in the art would have had reason to combine the teachings of the APA with those of the ’512 Publication in the manner proposed by Petitioner rather than adopting dot mode polarity reversion in its entirety, and that such a combination would have rendered the subject matter of each of claims 1–4, 8, 9, 13, and 14 of the ’092 patent obvious, we need not reach Petitioner’s further argument that a desire to reduce power consumption would have provided additional reason to make that combination.

### *5. Conclusion*

For the foregoing reasons, we conclude that Petitioner has shown by a preponderance of the evidence that the subject matter of claims 1–4, 8, 9, 13, and 14 of the '092 patent would have been obvious to a person of ordinary skill in the art at the time of the invention and that those claims are, therefore, unpatentable.

### *C. Motion for Observations*

Patent Owner filed a Motion for Observation regarding Dr. Silzars's cross-examination. Paper 23 ("Obs."). Petitioner, in turn, filed a Reply to Patent Owner's Motion for Observation. Paper 25 ("Obs. Resp."). To the extent Patent Owner's Motion for Observation pertains to testimony purportedly impacting Dr. Silzars's credibility, we have considered Patent Owner's observations and Petitioner's Reply in rendering this Final Written Decision, and accorded Dr. Silzars's testimony appropriate weight in view of Patent Owner's observations. *See* Obs. 1–7; Obs. Resp. 1–6.

## III. CONCLUSION

Based on the evidence and arguments, Petitioner has demonstrated by a preponderance of the evidence that claims 1–4, 8, 9, 13, and 14 of the '092 patent are unpatentable under 35 U.S.C. § 103(a) over the combined teachings of the '512 Publication and the APA.

## IV. ORDER

Accordingly, it is

ORDERED that claims 1–4, 8, 9, 13, and 14 of U.S. Patent No. 5,790,092 have been shown to be unpatentable; and

FURTHER ORDERED that, because this is a final written decision, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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Patent 5,790,092

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