

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

LG DISPLAY CO., LTD., :
 :
 Plaintiff, :
 :
 v. : Civil Action No. 06-726-JJF
 :
 AU OPTRONICS CORPORATION; :
 AU OPTRONICS CORPORATION :
 AMERICA; CHI MEI :
 OPTOELECTRONICS CORPORATION; :
 and CHI MEI OPTOELECTRONICS :
 USA, INC., :
 :
 Defendants. :
 :

AU OPTRONICS CORPORATION, :
 :
 Plaintiff, :
 :
 v. : Civil Action No. 07-357-JJF
 :
 LG DISPLAY CO., LTD. and :
 LG DISPLAY AMERICA, INC., :

Gaspare J. Bono, Esquire; R. Tyler Goodwyn, IV, Esquire; Lora A. Brzezynski, Esquire and Cass W. Christenson, Esquire of MCKENNA LONG & ALDRIDGE LLP, Washington, D.C.
Richard D. Kirk, Esquire; Ashley B. Stitzer, Esquire and Stephen B. Brauerman, Esquire of BAYARD P.A., Wilmington, Delaware.

Attorneys for LG Display Co., Ltd and LG Display America, Inc.

Vincent K. Yip, Esquire; Peter J. Wied, Esquire and Terry D. Garnett, Esquire of PAUL HASTINGS JANOFSKY & WALKER LLP, Los Angeles, California.
Ron E. Shulman, Esquire and Julie M. Holloway, Esquire of WILSON SONSINI GOODRICH & ROSATI, Palo Alto, California.
M. Craig Tyler, Esquire and Brian D. Range, Esquire of WILSON SONSINI GOODRICH & ROSATI, Austin, Texas.
Richard H. Morse, Esquire; John W. Shaw, Esquire; Karen L.

Pascale, Esquire and Andrew A. Lundgren, Esquire of YOUNG CONAWAY
STARGATT & TAYLOR LLP, Wilmington, Delaware.

Attorneys for AU Optronics Corporation and AU Optronics
Corporation America.

O P I N I O N

February 16 , 2010

Wilmington, Delaware.

Farnan, District Judge.

These proceedings involve three related patent infringement cases involving 23 patents. In the first-filed action, LG Display Co., Ltd. ("LGD") alleges infringement of nine asserted patents (collectively, the "LGD Patents") against AU Optronics Corporation ("AUO") and Chi Mei Optoelectronics Corporation ("CMO"). AUO and CMO have also brought separate actions against LGD and LG Display America, Inc. ("LGD America") alleging infringement of eight patents asserted by AUO and six patents asserted by CMO.

Proceedings with respect to CMO have been stayed. The Court required the parties to reduce the number of patents and claims asserted to a total of four patents and seven claims per side.¹ As a result, LGD identified the following patents and claims for trial against AUO: U.S. Patent No. 5,019,002 (claim 8); U.S. Patent No. 5,825,449 (claims 10 and 11); U.S. Patent No. 6,815,321 (claims 7, 17 and 19) and U.S. Patent No. 7,218,374 (claim 9). AUO identified the following four patents and claims for trial against LGD and LGD America: U.S. Patent No. 6,778,160

¹ The Court notes that, in contravention of the spirit of the Court's order reducing the number of claims to be tried in this case, the parties chose to assert several dependent claims. In the case of AUO's asserted patents, the assertion of numerous dependent claims has expanded the number of claims asserted from the seven that the Court ordered as a means of streamlining this case to a total of 16 claims. Similarly, LGD's selection has resulted in a total of 11 claims being presented to the Court.

(claims 1 and 3); U.S. Patent No. 6,689,629 (claims 7 and 16); U.S. Patent No. 7,125,157 (claim 1) and U.S. Patent No. 7,090,506 (claims 7 and 17).

A bench trial was held on the claims brought by the parties and was bifurcated into two phases. The first phase of trial was held from June 2-8, 2009, and addressed AUO's infringement claims against LGD. The second phase of trial was held from June 16-22, 2009, and addressed LGD's infringement claims against AUO.

The claims and counterclaims for infringement and declaratory judgment in this case arise under the patent laws of the United States, Title 35, United States Code. Accordingly, the Court has subject matter jurisdiction over this action pursuant to 28 U.S.C. §§ 1331, 1338(a), and 2201(a). Personal jurisdiction over the parties exists pursuant to 10 Del. C. § 3104, the Delaware long-arm statute. D.I. 1170 at 12. Likewise, venue in this district is appropriate under 28 U.S.C. §§ 1391(b), (c) and (d) and 1400. Neither jurisdiction nor venue is contested by the parties.

This Memorandum Opinion constitutes the Court's findings of fact and conclusions of law on the claims brought by the parties.

BACKGROUND

I. The Parties

LGD, formerly named LG Phillips LCD Co., Ltd., is a Korean corporation with a place of business in Korea. D.I. 1170 at Exh.

1, Stipulated Fact No. 1. LGD America is a California corporation with a place of business in San Jose, California. Id., Stipulated Fact No. 2. LGD and LGD America are collectively referred to as "LGD." Id., Stipulated Fact No. 3.

AU Optronics Corporation ("AUO") is a Taiwanese corporation with a place of business located in Taiwan. Id., Stipulated Fact No. 5. AU Optronics Corporation of America ("AUO America") is a California corporation with a place of business located in Santa Clara, California. Id. at Stipulated Fact No. 6. AUO Corp. and AUO America are collectively referred to as "AUO."

II. The Patents And The Technology Generally

The asserted patents relate to liquid crystal display ("LCD") products or methods of producing and assembling such products. Id., Stipulated Fact No. 13. An LCD is a flat panel display device that is used to generate images in a variety of products, including such devices as computer monitors, television screens, notebook computers and mobile phones. Id., Stipulated Fact No. 14.

DISCUSSION

I. Claim Construction

A. The Legal Principles of Claim Construction

Claim construction is a question of law. Markman v. Westview Instruments, Inc., 52 F.3d 967, 977-78 (Fed. Cir. 1995), aff'd, 517 U.S. 370, 388-90 (1996). When construing the claims

of a patent, a court considers the literal language of the claim, the patent specification and the prosecution history. Markman, 52 F.3d at 979. Of these sources, the specification is "always highly relevant to the claim construction analysis. Usually it is dispositive; it is the single best guide to the meaning of a disputed term." Phillips v. AWH Corporation, 415 F.3d 1303, 1312-17 (Fed. Cir. 2005) (citing Vitronics Corp. v. Conceptronic, Inc., 90 F.3d 1576, 1582 (Fed. Cir. 1996)). However, "[e]ven when the specification describes only a single embodiment, the claims of the patent will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using 'words or expressions of manifest exclusion or restriction.'" Liebel-Flarsheim Co. v. Medrad, Inc., 358 F.3d 898, 906 (Fed. Cir. 2004) (quoting Teleflex, Inc. v. Ficosa N. Am. Corp., 299 F.3d 1313, 1327 (Fed. Cir. 2002)).

A court may consider extrinsic evidence, including expert and inventor testimony, dictionaries, and learned treatises, in order to assist it in understanding the underlying technology, the meaning of terms to one skilled in the art and how the invention works. Phillips, 415 F.3d at 1318-19; Markman, 52 F.3d at 979-80. However, extrinsic evidence is considered less reliable and less useful in claim construction than the patent and its prosecution history. Phillips, 415 F.3d at 1318-19 (discussing "flaws" inherent in extrinsic evidence and noting

that extrinsic evidence "is unlikely to result in a reliable interpretation of a patent claim scope unless considered in the context of intrinsic evidence").

In addition to these fundamental claim construction principles, a court should also interpret the language in a claim by applying the ordinary and accustomed meaning of the words in the claim. Envirotech Corp. v. Al George, Inc., 730 F.2d 753, 759 (Fed. Cir. 1984). If the patent inventor clearly supplies a different meaning, however, then the claim should be interpreted according to the meaning supplied by the inventor. Markman, 52 F.3d at 980 (noting that patentee is free to be his own lexicographer, but emphasizing that any special definitions given to words must be clearly set forth in patent). If possible, claims should be construed to uphold validity. In re Yamamoto, 740 F.2d 1569, 1571 (Fed. Cir. 1984).

B. AUO's Patents

The parties dispute a number of claim terms from the asserted patents. The Court has selected for construction those terms that appear most pertinent to the disputes and trial positions argued by the parties in the post-trial briefing.²

² The Court notes that claim construction in this case has been a "moving target." The parties have altered definitions that were advanced and have offered different terms for construction at different times during this litigation. In addition, the post-trial briefing between the parties is inconsistent as to which terms are genuinely in dispute. For example, disputed terms are identified in the post-trial briefing

1. U.S. Patent No. 6,778,160 (the "'160 patent")

AUO asserts claims 1 and 3 of the '160 patent. Claim 3 is a dependent claim that stems from claim 2. Accordingly, the relevant claims of the '160 patent are provided below, in full:

1. A liquid crystal display, comprising: an input logic for inputting a video signal from a host; a storage for storing the previous brightness level of the video signal input through said input logic; a determinator for determining an output brightness level based on the previous brightness level stored in said storage and the next brightness level of the next video signal input to said input logic so as to make a time integration quantity of a brightness change substantially equal to an ideal quantity of light in a stationary state with respect to the next brightness level; and a driver for driving an image displaying liquid crystal cell based on said output brightness level determined by said determination logic.

2. The liquid crystal display according to claim 1, wherein said determinator comprising a table for storing a brightness level determined by the characteristic of a liquid crystal cell according to a relation between the previous brightness level and the next brightness level, and determining the output brightness level by modifying said next brightness level based on the brightness level read from said table.

3. The liquid crystal display according to claim 2, wherein: said video signal input through said input logic comprises a plurality of color signals; and said table in said determinator is provided for each of said color signals.

in claim construction sections, and later, additional terms appear to be added for construction in the infringement sections of the briefs. The parties' inability to agree on the central terms for dispute and succinctly state their positions in a parallel format has enhanced the difficulty of this case.

The parties agree that one of ordinary skill in the art with respect to the '160 patent at the time of its filing is a person with at least a bachelor's degree in electrical engineering and several years experience working with liquid crystal displays, or the equivalent combined education and work experience. D.I. 1388 at ¶ 389; D.I. 1383 at ¶ 122.

a. **a storage for storing the previous brightness level**

The parties agree that the term "storage" refers to a "memory." D.I. 1388 at ¶ 390; D.I. 1387 at 23. The parties dispute the meaning of "brightness level." LGD contends that "brightness level" means a "gray scale value or luminance value" and proposes that the phrase "a storage for storing the previous brightness level" be defined as "memory that temporarily holds the brightness level of the video signal received from the host through input logic for the previous time increment." Id. at ¶ 394. AUO contends that the term "brightness level means "a level of intensity of light," and therefore, the term "a storage for storing the previous brightness level" should be defined as "memory for storing a previous level of light intensity of a video signal input through input logic." D.I. 376 at Exh. M-2.

After reviewing the claim language in light of the specification, the Court concludes that "brightness level" means a "level of intensity of light." This construction is consistent with the specification which explains that brightness "should be

considered in terms of the quantity of light." AUO-5 ('160 patent) at col. 8, ll. 32-35. While it is true that the specification suggests that a "brightness level can be represented as a target brightness by a gray scale," the Court does not read the specification to limit the representation of a video signal's brightness level to "gray scale values." Id. at col. 3, l. 67.

b. determinator for determining an output brightness level

AUO contends that this term means "logic, such as a circuitry, for determining an output brightness value. D.I. 376 at Exh. M-3. LGD contends that this phrase should be defined as "circuit or logic that determines the output brightness level by applying an offset to the next brightness level that is predetermined based on a difference in quantity of light between the actual and ideal response characteristics of the liquid crystal cell. D.I. 1388 at ¶ 395.

The parties are in agreement that this term refers to logic or circuitry. Their disagreement arises from LGD's additional limitations which purport to limit the manner in which the determinator determines the output brightness. The Court has reviewed the claim language in light of the specification, and concludes that such additional limitations are not required. Accordingly, the Court adopts AUO's proposed construction of the phrase "determinator for determining an output brightness level"

as "logic, such as a circuitry, for determining an output brightness value."

- c. **so as to make a time integration quantity of a brightness change substantially equal to an ideal quantity of light in a stationary state with respect to the next brightness level**

- 1. **substantially equal**

AUO contends that the term "substantially equal" should be construed in accordance with its plain meaning such that "substantially equal" means "a level that is not completely the same but can be accepted as a substantially equal level." LGD contends that the phrase "substantially equal" is indefinite, or in the alternative, should be construed as "a level which is not completely the same but can be accepted as a substantially equivalent level, and includes a level which is closer to an ideal quantity of light than [sic] no preventive measures are taken." D.I. 1388 at 101.

The Court concludes that the term "substantially equal" is not indefinite and should be defined as AUO proposes. This construction is consistent with the plain meaning of the term and the specification, which explains that the "representation 'substantially equal level' refers to a level which is not completely the same but can be accepted as a substantially equivalent level." '160 patent, col. 4, ll. 56-58; col. 9, ll. 19-23 (referring to Fig. 6 and the desire to obtain a "quantity of light (S") . . . which is approximately the same as the

quantity of light (S) . . . [from an LC with] ideal response characteristic[s] (S".S)"; col. 8, ll. 45-47 (quantity of light is "almost the same as" that of an ideal LC). In the Court's view, LGD's construction, improperly imports limitations from the preferred embodiment into the claims.

**2. time integration quantity of a
brightness change/ideal quantity
of light in a stationary state**

AUO contends that the term "time integration quantity of a brightness change" means "a quantity of light equal to the actual brightness level output through a liquid crystal, summed over the rise and fall response time of the liquid crystal." D.I. 376 at M-13. According to AUO, the plain meaning of "integration, in this context, is summing a change value (here, brightness level) over a period of time (here, the response time of the crystal)." Id. AUO also contends that the term "ideal quantity of light in a stationary state" refers to the "quantity of light emitted by a pixel during one time increment in which the pixel is in a non-changing state." Id.

LGD contends that these terms are indefinite. In the alternative, LGD appears to conflate the terms and offer a combined definition as follows: "quantity of light based on the actual response characteristic of the liquid crystal cell when the liquid crystal cell is provided with the next brightness level during the next time increment and the previous brightness

level before and after the next time increment." D.I. 376 at Exh. M-13.

After reviewing the claim language in light of the specification, the Court concludes that the terms are not indefinite and will adopt AUO's proposed construction of these terms. The specification explains that the "[q]uantity of light can be considered as a time integration quantity of a brightness change." '160 patent, col. 4, ll. 53-57. The specification further explains that "brightness of a pixel to the human eye . . . should be considered in terms of the quantity of light, that is brightness change integrated with respect to time." Id. col. 8, ll. 30-34. In the Court's view, this supports AUO's position that the "time integration quantity of a brightness change" is the quantity of light that is emitted due to the change in brightness. LGD's proposed construction adds limitations that are not supported by the specification.

Likewise, the Court will adopt AUO's proposed construction of the term "ideal quantity of light in a stationary state." The specification teaches, by way of example, that an ideal quantity of light is that quantity of light output by an ideal LC over one time increment. Id., col. 4, ll. 42-47, Fig. 4. However, an ideal LC does not exist, id. at col. 8, ll. 63-65, and the specification's example teaches that the ideal quantity of light from a conventional LC is that quantity of light emitted from the

LC during one time increment when the brightness is constant, meaning the image is stationary. Id. col. 8, ll. 37-39 (when the particular pixel or LC is driven at a target brightness for an entire time increment, the pixel or LC may be described as being in a non-changing or "stationary state"). As with LGD's previous construction, its proposed construction of "ideal quantity of light in a stationary state" adds limitations that are not supported by the specification.

2. U.S. Patent No. 6,689,629 (the "'629 patent")

AUO asserts claims 7 and 16 against LGD. Claim 7 is a dependent claim which depends upon claim 4. Claim 4, in turn depends upon claim 2, and claim 2, depends on claim 1.

Similarly, Claim 16 is a dependent claim which depends on claim 13. Claim 13 in turn depends on claim 11. Claim 11 depends on claim 10, and claim 10 depends on independent claim 9.

Accordingly, the relevant claims of the '629 patent are provided below in full:

1. An array substrate for display, comprising:

a layer of an insulating substrate, having an area;

a thin film transistor array formed on the insulating substrate;
a plurality of wiring arranged on the insulating substrate, each wiring having a first end, the wiring in communication with at least one of the transistors in the thin film array;

connections pads, each connection pad contacting the first end of at most one of the plurality of wirings;

pixel electrodes, and

dummy conductive patterns, the dummy patterns comprising at least about 30% of the area of the insulating substrate, the dummy conductive patterns situated between the connection pads and the pixel electrodes such that the dummy patterns are not in contact with any of the wiring.

2. The array substrate for display according to claim 1 wherein at least one of the wirings comprises at least an upper layer and a lower layer of conductive materials.

4. The array substrate for display according to claim 2 wherein the upper layer wiring material is selected from the group consisting of molybdenum, chromium, tantalum, titanium and alloys thereof.

7. The array substrate for display according to claim 4 wherein the upper layer wiring material is selected such that the upper layer wiring material does not become insoluble in an acid or alkaline etchant.

* * *

9. A method for forming an array substrate for display, comprising:

forming a layer of an insulating substrate, having an area;

forming a thin film transistor array formed on the insulating substrate, each wiring having a first end, the wiring in communication with at least one of the transistors in the thin film array;

forming connections pads, each connection pad contacting the first end of at most one of the plurality of wirings;

forming pixel electrodes, and

forming dummy conductive patterns, the dummy conductive patterns comprising at least about 30% of the area of the insulating substrate, the dummy patterns situated between the connection pads and the pixel electrodes such that the dummy patterns are not in contact with any of the wiring.

10. The method for forming an array substrate for display according to claim 9 wherein at least one of the wirings comprises at least an upper layer and a lower layer of conductive materials.

11. The method for forming an array substrate for display according to claim 10 wherein the lower layer wiring materials is selected from the group consisting of aluminum and aluminum alloys.

13. The method for forming an array substrate for display according to claim 11 wherein the upper layer wiring material is selected from the group consisting of molybdenum, chromium, tantalum, titanium and alloys thereof.

16. The method for forming an array substrate for display according to claim 13 wherein the upper layer wiring material is selected such that the upper layer wiring material does not become insoluble in an acid or alkaline etchant.

The parties agree that one of ordinary skill in the art with respect to the '629 patent would be a person with at least a Bachelor's degree in chemical or electrical engineering, chemistry, or physics with 2 or more years experience working with liquid crystal display fabrication processing, or the equivalent combined education and work experience. D.I. 1383 at ¶ 299; D.I. 1388 at ¶ 132; Tr. 118:3-16 (Silzars).

a. dummy conductive patterns

LGD contends that the term "dummy conductive patterns" means "portions of the layer that do not receive or convey voltages or signals." D.I. 1388 at ¶ 133. Refining this construction further, LGD contends that this construction requires that the dummy patterns do not conduct or convey signals "at least during

testing or operation of the display." D.I. 1387 at 6. In this regard, LGD further contends that dummy patterns are structures that are put into the design of a product to aid in the manufacturing of the product, but do not have a function during the operation of the display. D.I. 1388 at ¶ 136-138. LGD contends that AUO has changed its position on the construction of this term, and that this change in position demonstrates that AUO's currently proposed definition should not be accepted.

AUO contends that the term "dummy conductive patterns" refers to "one or more metal patterns in the specified region that are not in contact with any of the wiring." D.I. 1384 at 24. AUO acknowledges that this construction is different than its previously proposed construction which was "a metal pattern that does not conduct signals or current used in the operation of the display." Id. at 25. However, AUO contends that its previous construction was too restrictive. In this regard, AUO contends that the wiring recited in the claims connects the connection pads to the transistors in the TFT array. AUO contends that dummy patterns are not needed for the operation of the transistors of the TFT array, and therefore, they "are not in contact with any of the wiring" that is "in communication with at least one of the transistors in the TFT array." Id., citing '629 patent, col. 8, ll. 14-19. However, AUO maintains that there is nothing in the intrinsic evidence that precludes the dummy

conductive patterns from performing some function, such as conducting a voltage or signal used in the operation of a display, so long as they are not in contact with the TFT wiring. AUO points out that even under its prior construction, nothing required dummy conductive patterns to be unable to receive any voltages or signals, and that the dummy conductive patterns could still be connected to a ground or voltage supply. D.I. 1384 at 24-26.

As the Federal Circuit has recognized, the Court's task in claim construction is not to decide which of the adversaries is correct, but to independently determine the meaning of disputed claims. Exxon Chem. Patents, Inc. v. Lubrizol Corp., 64 F.3d 1553, 1556 (Fed. Cir. 1995). For this reason, the Court does not take AUO's change in its claim construction position to be indicative of the merits of its current argument.

Reviewing the disputed term in light of the claim language and specification, the Court concludes that the term "dummy conductive patterns" is properly construed to mean "conductive patterns in the specified region that are not in contact with any of the wiring." The claim terms expressly state that the dummy conductive patterns must comprise "at least about 30% of the area" and "are not in contact with any of the wiring." '629 patent, col. 8, ll. 13-19, 57-63. The Court does not read the claims or the specification from precluding the dummy conductive

patterns from performing some function, so long as that they are not in contact with the TFT wiring. Accordingly, the Court concludes that LGD's claim construction and AUO's prior claim construction were both too restrictive, and that "dummy conductive patterns" are "conductive patterns in the specified region that are not in contact with any of the wiring."

b. **area**

LGD contends that the term "area" is indefinite because one of ordinary skill in the art would be unable to unambiguously discern the boundaries of the asserted claims. D.I. 1388 at ¶ 168-170. In this regard, LGD contends that there is no disclosure on how the 30% of the area should be calculated. Alternatively, LGD contends that the term "area" refers to "material deposited and patterned on a substrate, such as glass, that covers part of the array substrate surface." *Id.* at ¶ 171.

In response, AUO contends that "area" should be construed according to its ordinary meaning as a "specified region." D.I. 1384 at 23-24. Turning to the context of the claims more specifically, AUO contends that "area" refers to a region of the array substrate, specifically a region containing the dummy conductive patterns.

After reviewing the claim language in light of the specification, the Court concludes that the term "area" is not indefinite and should be construed according to its plain meaning

as a "specified region." In the Court's view, this is consistent with the specification which explains that the substrate coverage "of the dummy conductive patterns themselves [is] 30% or more on an area of a specified surface." '629 patent, col. 5, ll. 55-61. Similarly, the specification explains that "dummy conductive patterns are formed on an area of a specified region where the dummy conductive patterns are formed." Id., col. 6, ll. 1-6. Thus, the Court concludes that an "area" is "a specified region," more specifically, the region where dummy conductive patterns are located.

c. a plurality of wiring / each wiring

LGD contends that the term "each wiring" is indefinite, because it is unclear as to which wiring the term "each wiring" is referring from the plurality of wiring. LGD contends that "[t]o the extent the term 'each wiring' can be construed, the term 'a plurality of wiring arranged on the insulating substrate' should be construed to mean 'portions of the layer that convey voltages or signals from the connection pads to the thin-film transistors in the pixel array.'" D.I. 1407 at ¶ 56.

AUO contends that these terms should be construed in accordance with their plain meaning in the context of the claim element in which they are used. Thus, AUO contends that "a plurality of wiring arranged on the insulating substrate, each wiring having a first end, the wiring in communication with at

least one of the transistors in the thin film array" means "each individual wiring in a plurality of wirings," with the plurality of wirings being a plurality of electrical conductors. D.I. 1383 at ¶ 347. In this regard, AUO points out that the specification explains "this connection of 'each wiring' [by] describing 'wirings such as scan lines and signal lines connected with' the electrodes of the transistors." D.I. 1383 at ¶ 344 (citing '629 patent, col. 1, ll. 17-19, col. 4, ll. 49-51, Fig. 2).

The Court concludes that the terms "each wiring" and "plurality of wiring" as recited in the claim element "a plurality of wiring arranged on the insulating substrate, each wiring having a first end, the wiring in communication with at least one of the transistors in the thin film array" are not indefinite. The Court further concludes that these terms should be construed according to their plain meaning in the context of the patent, such that a plurality of wiring is a plurality of electrical conductors and "each wiring" is "each individual wiring in a plurality of wiring." '629 patent, col. 8, l. 6, 11, col. 8, ll. 54-55; Tr. 139:10-140:1 (Silzars).

- d. **the upper layer wiring material does not become insoluble in an acid or alkaline etchant**

Although not identified in the parties' claim construction charts, it is apparent from their briefing that disputes exist regarding the proper construction and/or application of this

phrase. Specifically, AUO contends that the solubility issue in claim 7 and 16 must be evaluated in the context of a two layer structure - that is a wiring structure having a lower and upper layer of wiring. D.I. 1384 at 26-27.

LGD contends that AUO's interpretation of this claim improperly imports into the claims limitations contained in the specification. In particular, LGD contends that claim 7 and 16 do not refer to the passivity problem described in the specification and contain no limitation that the insolubility of the upper layer is during the etching process. D.I. 1406 at 17-18.

After reviewing the claim language in light of the specification, the Court concludes that the limitation of claim 7 and 16 must be read in the context of a two layer structure. Fuji Photo Film Co., Ltd. v. International Trade Com'n, 386 F.3d 1095 (Fed. Cir. 2004) ("Claims must be read in the context of the specification of which they are a part.") This reading is consistent with claims 7 and 16 which are dependent upon claims 2 and 10. Claims 2 and 10 expressly contemplate two layer wiring, and therefore, the claim language makes it evident, that it is within the context of two-layer wiring that solubility must be evaluated. In the Court's view, this is also consistent with the purpose of the invention which is to prevent the upper layer from becoming insoluble during etching of the two-layer wiring. Tr.

870:18-871:8, 872:9-13, 873:7-23 (Rubloff); Tr. 1388:20-1391:2 (Silzars). In this regard, the Court agrees with the testimony of Dr. Silzars that whether material would become insoluble if dropped by itself in a vat of etchant is irrelevant to the context of the claimed invention. Tr. 1388:20-24 (Silzars). Accordingly, the Court does not view its construction as importing limitations from the specification as LGD contends, but as an attempt to view the claim in its proper context.

3. U.S. Patent No. 7,125,157 (the "'157 patent")

AUO asserts independent claim 1 of the '157 patent. In full, claim 1 provides:

1. A backlight unit for a liquid crystal display, comprising: a frame; a first supporting portion, disposed on the frame; a second supporting portion, further disposed on the frame; and a film comprising a first constraining portion and a second constraining portion, positioned on the frame by the first supporting portion and the second supporting portion passing through the first constraining portion and the second constraining portion, respectively; when the frame is disposed in a first position, the first supporting portion partially contacts an inner wall of the first constraining portion for positioning the film, and the second supporting portion does not contact the second constraining portion; and when the frame is disposed in a second position, the second supporting portion partially contacts an inner wall of the second constraining portion for positioning the film and the first supporting portion does not contact the first constraining portion.

The parties agree that one of ordinary skill in the art with respect to the '157 patent at the time of its filing "would be a person with a bachelors degree in mechanical engineering or

physics and several years of experience working with aspects of the backlight modules for liquid crystal displays or the equivalent combined education and work experience." D.I. 1383 at ¶ 497; D.I. 1388 at ¶ 678; Tr. 207:24-208:12 (Silzars).

a. **supporting portion**

LGD contends that a "supporting portion" should be construed as a projection from the frame. D.I. 376 at Exh. Q-1. AUO contends that the "supporting portion" should not be limited to a projection, which may be defined to have a specified shape. Id.

The Court adopts AUO's construction of "supporting portion" as "any structure protruding from the frame, (including but not limited to a cylinder or a cuboid) intended to support the optical film." '157 patent, col. 2, ll. 61-62, col. 3, ll. 4-12, col. 4, ll. 17-24, Fig. 2A and 2B; col. 6, ll. 4-8, 31-42 Fig. 3A and 3B; Fig. 3C, col. 7, ll. 39-45, Fig. 4A-4D.

b. **constraining portion**

AUO contends that a constraining portion is "any formation on or in the optical film (including but not limited to a hole or groove) intended to restrict the movement range of the film." D.I. 376 at Exh. Q-2. LGD contends that this term should be defined as "a passage through the film that has a gap in the gravity acting direction after receiving a supporting portion." Id.

In the Court's view, LGD's construction improperly limits the constraining portion "to a passage through the film" and "a gap." This is contrary to the specification which expressly contemplates that a constraining portion may be a "groove" which does not equate with a "gap." '157 patent, col. 2, ll. 27-30, 63-65, col. 4, ll. 7-16.

c. first position / second position

With respect to the first and second orientations described in these terms, LGD argues that the first supporting portion or position must be located near an upper edge of the frame. LGD and AUO generally agree that the second position is determined by reference to the first position, but to the extent LGD's construction of the second position depends from its upper frame requirement of the first position, AUO contends that LGD's construction is incorrect. According to AUO, there is no upper edge location requirement and the first position is simply an initial position. D.I. 1383 at ¶¶ 513-516.

The Court agrees with AUO and concludes that no such upper edge limitation exists in the claim. In the Court's view, adopting LGD's proposal in this regard would improperly limit the claims to the preferred embodiments. Liebel-Flarsheim Co. v. Medrad, Inc., 358 F.3d 898, 906 (Fed. Cir. 2004). Accordingly, the Court concludes that a first position means "an initial position of a liquid crystal display unit" and a "second

position" means "the position determined by reference to the angle of rotation between the first and second position."

d. **does not contact**

LGD contends that the phrase "does not contact" means "does not touch;" however, LGD further explains that this "requires that a supporting portion does not touch a constraining portion when in a non-supporting position, including when the film expands or contracts due to temperature variation." D.I. 1388 at ¶ 681. AUO contends that this phrase should be construed according to its plain meaning and should not include any thermal expansion and contraction limitations. In this regard, AUO points out that such limitations are included in dependent claim 9, and therefore, the doctrine of claim differentiation should preclude claim 1 from being construed to include these additional limitations. D.I. 1384 at 40-41; D.I. 1440 at 17.

Claim differentiation "refers to the presumption that an independent claim should not be construed as requiring a limitation added by a dependent claim." Curtiss-Wright Control Corp. v. Velan, Inc., 438 F.3d 1374, 1380 (Fed. Cir. 2006). However, claim construction positions based on claim differentiation are rebuttable, taking a secondary role if an alternate construction is dictated by the written description or prosecution history. See Regents of the Univ. of Cal. v. Dakocytomation Cal., Inc., 517 F.3d 1364, 1375 (Fed. Cir. 2008).

After reviewing the claim language, specification and prosecution history, the Court concludes that the term "does not contact" should be construed as AUO proposes, according to its plain meaning without the additional temperature and thermal contraction and expansion limitations from claim 9 that inform LGD's proposed claim construction. Claim 9 depends on claim 1 and adds the limitations that "when the frame is disposed in the second position, a first gap is formed between the first supporting portion and the first constraining portion, and the first gap is an allowance for film expansion or contraction due to temperature variation; when the frame is disposed in the first position, a second gap is formed between the second supporting portion and the second constraining portion, and the second gap is an allowance for film expansion or contraction due to temperature variation." '157 patent, col. 9, ll. 16-20. During prosecution of the application for the '157 patent, the Examiner did not require the applicant to combine the elements of claims 1 and 9 into a single claim, and instead determined that claim 1 was separately patentable without any of the limitations of claim 9. AUO-10 at AUO-LGD 0001333, 0001452, 0001487-88; Tr. 1202:21-1203:6 (Smith-Gillespie). LGD points out that the embodiments of the '157 patent refer to thermal considerations, however limitations from the specification should not be read into claims. Claim 1 has no limitation relating to thermal expansion

or contraction, and the Court is persuaded that, consistent with the doctrine of claim differentiation, claim 1 should not be read in a manner so as to incorporate the limitations of claim 9.

4. U.S. Patent No. 7,090,506 (the "'506 patent")

AUO asserts claim 7 and 17 of the '506 patent. Claim 7 is a dependent claim that depends on independent claim 1. Claim 17 is also an independent claim. Accordingly, the relevant claims of the '506 patent provide, in full:

1. A signal transmission device, connecting a display module and a system, comprising: a first flexible printed circuit board, electrically connecting the display module and the system and a second flexible printed circuit board, electrically connecting the display module and the first flexible printed circuit board, wherein the first and second flexible printed circuit boards are joined by hot bar soldering.

7. The signal transmission device as claimed in claim 1, wherein the second flexible printed circuit board transmits a light source signal.

17. A signal transmission device, connecting an display module and a system, comprising: a first flexible printed circuit board, electrically connecting the display module and the system; and a second flexible printed circuit board, electrically connecting the display module and the first flexible printed circuit board, wherein the first flexible printed circuit board has a first alignment mark, and the second flexible printed circuit board has a second alignment mark overlapped with and aligned to the first alignment mark.

The parties agree that a person of ordinary skill in the art of the '506 patent is a person with a bachelors degree in mechanical engineering or physics and several years of experience working with aspects of liquid crystal display, or the equivalent

combined education and work experience. D.I. 1383 at ¶ 571; Tr. 227:12-20 (Silzars).

a. **the first and second flexible printed circuit boards are joined by hot bar soldering**

LGD contends that this term describes a process by which the circuit boards are joined, and is thus, a process limitation.

LGD contends that the term "the first and second flexible printed circuit boards are joined by hot bar soldering" means

both flexible printed circuit boards are connected to each other by a soldering process where the circuit boards are heated with a bar to melt the solder at multiple points simultaneously along each circuit board while pressure is applied to the connection.

D.I. 1388 at ¶ 541.

In response, AUO contends that this term is not a process limitation, but a structural limitation. In this regard, AUO contends that claim 1 does not include any of the typical product-by-process language and is a pure product claim defined solely by structural limitations. Thus, AUO contends that "joined by hot bar soldering" means "joined by solder material."

D.I. 1384 at 45. Alternatively, AUO contends that if this term is construed as a process limitation, it should be construed as

the first and second printed circuits made on flexible film are joined by a soldering process where the solder and flux are applied to the contact area and the contact area is heated with a bar to melt the solder.

D.I. 376 at Exh. O-4. AUO contends that LGD's construction is overly narrow, because hot bar soldering does not require

"pressure" beyond that which is necessary to hold the two items being soldered together and does not require melting solder at "multiple" contact points.

"Courts must generally take care to avoid reading process limitations into an apparatus claim" Baldwin Graphic Systems, Inc. v. Siebert, Inc., 512 F.3d 1338, 1344 (Fed. Cir. 2008). "Even where terms are amenable to interpretation as a procedure of manufacture, apparent 'process' terms should be interpreted as structural limitations when used in an adjective non-process sense and define a physical characteristic of the apparatus." R2 Medical Sys., Inc. v. Katecho, Inc., 931 F. Supp. 1392, 1425 n.5 (N.D. Ill. 1996) (citing 2 Donald S. Chisum, Patents § 8.05[5], at 8-96 (1994)); Biacore v. Thermo Bioanalysis Corp., 79 F. Supp. 2d 422, 456 (D. Del. 1999) ("The mere use in a claim of structural or characterizing terms derived from processes or methods, however, does not prevent a claim from being considered a true product claim.")

Considering the claim language in light of the specification and prosecution history, the Court concludes that the limitation "joined by hot bar soldering" does not amount to a process limitation, but instead describes the structural relationship between the first and second flexible printed circuit boards. Claim 1 of the '506 patent was distinguished over the prior art based on the limitation requiring that solder material join the

two flexible printed circuit boards rather than a foldable flat cable. AUO-12 at AUO-LGD 1948. Thus, the Court views the soldering described in this claim as a structural limitation. Accordingly, the Court construes the phrase "first and second printed circuit boards are joined by hot bar soldering" to mean that the "first and second printed circuit boards are joined by solder material."³

b. alignment mark

During the claim construction proceedings in this case, neither party proposed a construction for the term "alignment mark." However, it appears that post-trial the parties are now disputing the meaning of this term. According to LGD, a person of ordinary skill in the art would understand an "alignment mark" to "be a distinctive identifying feature that is provided solely for positioning of the flexible printed circuit boards during assembly." D.I. 1388 at ¶ 544.

In response, AUO contends that alignment marks can have more than one purpose. For example, they can function for both

³ Even if the Court concludes that this phrase is a process limitation, the Court concludes LGD's proposed construction is too narrow. In reaching this conclusion, the Court credits the testimony of Dr. Silzars regarding the hot bar soldering process. Specifically, Dr. Silzars explained that hot bar soldering requires applying a hot bar to a solder joint. However, this does not require that multiple joints be soldered simultaneously, and the Court finds no support for this additional limitation in the patent specification or prosecution history. Tr. 320:19-322:11, 336:11-18 (Silzars).

positioning and bonding. Thus, AUO contends that LGD's definition of alignment marks is too restrictive, and "alignment marks" should be more broadly defined as patterns used for accurate positioning and connection of flexible printed circuit boards. D.I. 1383 at ¶¶ 657-663; D.I. 1384 at 46, 50.

Reviewing this claim term in light of the specification of the '506 patent, the Court concludes that AUO's more expansive definition is correct. The '506 patent discloses more than one type of alignment mark. For example, pad electrodes are disclosed on the first and second printed boards in Figure 3a. These pad electrodes serve as both alignment marks for positioning and as contact pads for bonding or electrically joining two flexible printed circuit boards. '506 patent, col. 2, ll. 26-38. Accordingly, the Court concludes that an alignment mark is a pattern used for accurate positioning and connection of flexible printed circuit boards.

II. Direct Infringement

A. Applicable Law

A patent is infringed when a person "without authority makes, uses or sells any patented invention, within the United States during the term of the patent" 35 U.S.C. § 271(a). A patent owner may prove infringement under either of two theories: literal infringement or the doctrine of equivalents. Literal infringement occurs where each element of at least one

claim of the patent is found in the alleged infringer's product. Panduit Corp. v. Dennison Mfg. Co., 836 F.2d 1329, 1330 n. 1 (Fed. Cir. 1987); Robert L. Harmon, Patents and the Federal Circuit 195 & n. 31 (3d ed. 1994).

"The doctrine of equivalents allows the patentee to claim those insubstantial alterations that were not captured in drafting the original patent claim but which could be created through trivial changes." Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co., 535 U.S. 722, 733 (U.S. 2002). "An element in the accused device is equivalent to a claim limitation if the only differences between the two are insubstantial." Honeywell Int'l v. Hamilton Sundstrand Corp., 370 F.3d 1131, 1139 (Fed. Cir. 2004). To prove infringement by the doctrine of equivalents, a patentee must provide "particularized testimony and linking argument" as to the "insubstantiality of the differences" between the claimed invention and the accused product, or with respect to the function/way/result test. See Texas Instruments Inc. v. Cypress Semiconductor Corp., 90 F.3d 1558, 1567 (Fed. Cir. 1996). "[E]vidence and argument on the doctrine of equivalents cannot merely be subsumed in plaintiff's case of literal infringement." Lear Siegler, Inc. v. Sealy Mattress Co., 873 F.2d 1422, 1425 (Fed. Cir. 1989).

Infringement is a two step inquiry. Step one requires a court to construe the disputed terms of the patent at issue.

Construction of the claims is a question of law subject to de novo review. See Cybor Corp. v. FAS Techs., 138 F.3d 1448, 1454 (Fed. Cir. 1998). Step two requires the fact-finder to compare the accused products with the properly construed claims of the patent. This second step is a question of fact. See Bai v. L & L Wings, Inc., 160 F.3d 1350, 1353 (Fed. Cir. 1998). The party asserting infringement under either the theory of literal infringement or the doctrine of equivalents has the burden of proof and must meet its burden by a preponderance of the evidence. SmithKline Diagnostics, Inc. v. Helena Lab. Corp., 859 F.2d 878, 889 (Fed. Cir. 1988) (citations omitted).

B. Whether LGD Infringes claims 1 and 3 of AUO's '160 Patent

After comparing LGD's accused products with claims 1 and 3 of the '160 patent, the Court concludes that AUO has established by a preponderance of the evidence that LGD literally infringes the '160 patent.⁴ In reaching this conclusion, the Court credits the testimony of Dr. Silzars.

⁴ LCD modules that include the New Monde chip are representative of the accused products. Tr. 169:6-170:18 (Silzars); AUO-1553. For purposes of infringement, the Court finds that there are no relevant differences between the LGD products that Dr. Silzars analyzed. Tr. 169:6-169:11 (Silzars). In addition, the accused LGD products that use overdrive are the same for purposes of infringement, based on Dr. Silzars' examination of the products and his analysis of the specification and the testimony of LGD witnesses. Tr. 169:12-23.

Claim 1 Preamble: A liquid crystal display, comprising

LGD does not dispute that this element of the claims is present in the accused devices, and the Court finds that LGD's accused display modules are liquid crystal displays. AUO-164 at 1/51; AUO-859.

Claim 1: an input logic for inputting a video signal from a host

Page 1 of the New Monde specification shows that the New Monde timing controller chip includes LVDS input logic for inputting a video signal from a host. AUO-165 at 1/51; Tr. 173:19-174:17 (Silzars). All of the timing controllers in the accused LGD modules receive an LVDS input through an input logic, the LVDS interface. AUO-1533; AUO-135 at 1/46; AUO-160 at 1/36; AUO 161 at 1/36; AUO 149 at 1/50; AUO 150 at 1/50; AUO-155 at 2/41; AUO 156 at 2/41; AUO-157 at 1/35; AUO-158 at 1/35; AUO-159 at 2/41; AUO-137 at 1/48; AUO-138 at 1/48; AUO-145 at 1/45; AUO-146 at 1/45; AUO-143 at 1/46; AUO-144 at 1/46; AUO-133 at 1/53; AUO-134 at 1/53; AUO-167 at 1/51; AUO-168 at 1/51; AUO-151 at 1/51; AUO-152 at 1/51; AUO-153 at 2/35; AUO-154 at 2/35; AUO-162 at 2/33; AUO-169 at 1/51; AUO-170 at 1/51; AUO-164 at 1/51; AUO-165 at 1/51; AUO-139 at 1/45; AUO-140 at 1/45; AUO-131 at 1/44; AUO-132 at 1/44; AUO-166 at 2/39; AUO-141 at 1/25; AUO-142 at 1/25; AUO-147 at 1/47; AUO-148 at 1/47.

Claim 1: storage for storing the previous brightness level of the video signal input through said input logic

The Court finds that the accused devices meet this claim element. The frame memory is the "storage for storing." The system block diagram of New Monde includes a "frame memory" identified as the "Frame Memory SDRAM" in the System Block Diagram and as a Field Store, in the Over Driving Scheme Diagram. Tr. 177:14-179:7 (Silzars); AUO-164/165 at 1/51 and 4/51. The frame memory stores the previous level of light intensity of the video signal input through the input logic. The frame memory temporarily holds the brightness level of the video signal received from the host through input logic for the previous time increment. Tr. 178:13-179:7 (Silzars); AUO-165 at 1. Each of the timing controller chips analyzed by Dr. Silzars is used in a system that includes a similar frame memory SDRAM, also called the Field Store in the Over Driving Scheme block diagram. AUO-1533; AUO-1553; AUO-135 at 1/46 and 4/46; AUO-136 at 1/46 and 4/46; AUO-160 at 1/36 and 3/36; AUO-161 at 1/36 and 3/36; AUO-149 at 150 and 4/50; AUO-150 at 1/50 and 4/50; AUO-155 at 2/41; AUO-156-2/41; AUO-157 at 3/35; AUO-158 at 3/35; AUO-159 at 2/41; AUO-137 at 1/48 and 4/48; AUO-138 at 1/48 and 4/48; AUO-145 at 1/45 and 4/45; AUO-146 at 1/45 and 4/45; AUO-143 at 1/46 and 4/46; AUO-144 at 1/46 and 4/46; AUO-133 at 3/53 and 4/53; AUO-134 at 3/53 and 4/53; AUO-167 at 1/51 and 4/51; AUO-168 at 1/51 and

4/51; AUO-151 at 1/51 and 4/51; AUO-152 at 4/51; AUO-153 at 2/35; AUO-154 at 2/35; AUO-162 at 2/33; AUO-169 at 1/51 and 4/51; AUO-170 at 1/51 and 4/51; AUO-164 at 1/51 and 4/51; AUO-165 at 1/51 and 4/51; AUO-139 at 1/45 and 4/45; AUO-140 at 1/45 and 4/45; AUO-131 at 3/44 and 4/44; AUO-132 at 3/44 and 4/44; AUO-166 at 2/39; AUO-141 at 2/25 and 4/25; AUO-142 at 2/25 and 4/25; AUO-147 at 1/47 and 4/47 and AUO-148 at 1/47 and 4/47.

LGD contends that the accused products do not meet this claim limitation, because the accused timing controllers store compressed data that represents a comparison of brightness levels to the average grayscale level of a block of liquid crystal cells. LGD contends that the compressed data is not actual previous brightness levels, nor can it be used to recreate actual previous brightness levels.

However, the Court finds that LGD's contentions are not supported by the record. The compressed data is used to recreate actual brightness levels. This is supported by LDG's presentation, AUO-1538 at page 9, which describes the decompressed data as the "reconstructed previous frame." This is also supported by the testimony of LGD's witness, Mr. Kim, who testified that decompression recovers "the original image or close to the original image" and that ideally the decompressed data is "identical" to the original data but there may be "some small," "acceptable" changes. Tr. 78:5-22 (C.G. Kim); Tr.

179:22-181:22 (Silzars). While it is true that the decompressed data is not used to actually display the images, it is used to look up overdrive values, which in turn display the image. Thus, errors in the decompressed data would impact the quality of the displayed image. Tr. 1363:3-1364:9 (Silzars). In sum, the Court concludes that the timing controllers do store the actual previous brightness levels in compressed form, and therefore, the Court finds that the accused devices meet the "storage for storing the previous brightness level of the video signal input through said input logic" claim element.

Claim 1: a determinator for determining an output brightness level based on the previous brightness level stored in said storage and the next brightness level of the next video signal input to said input logic

The Court concludes that the accused devices meet this claim limitation, because LGD's timing controller chips include a lookup table, which is the determinator for determining an output brightness level. The brightness level output by the lookup table is based on the previous brightness level, which was stored in the frame memory, and the next brightness level. In the example of the New Monde lookup table, the brightness level for the previous frame and the current frame ranges from 0 to 255. Tr. 172:14-173:9 (Silzars); AUO-165 at 26/51. The lookup table is used to compare the video information (i.e. the brightness level) in the previous frame to the brightness information in the current frame and apply a correction. Tr. 171:15-172:13

(Silzars); AUO-165 at 4/51. Each of the timing controllers analyzed by Dr. Silzars includes a similar lookup table.

LGD's argument that this claim limitation is not met relates to its argument regarding the storage of previous brightness levels, which the Court has declined to accept. In addition, LGD argues that the timing controllers in the accused products do not use "offset" values as required by the limitation "a determinator for determining an output brightness level." However, the claim terms do not include the term "offset," and the Court is not persuaded that an "offset" should be read into the accused devices. Accordingly, the Court concludes that the accused devices satisfy this claim limitation.

Claim 1: so as to make a time integration quantity of a brightness change substantially equal to an ideal quantity of light in a stationary state with respect to the next brightness level

The Court concludes that the accused products meet the limitations of this claim element. The determinator must provide an output brightness level that achieves the claimed results: a time integration of a brightness change that is substantially equal to an ideal quantity of light. Dr. Silzars tested the accused products, measuring the brightness change and noting that the brightness change was within 20% of the ideal response. See e.g. AUO-1075; Tr. 193:17-195:8; 1370:23-1372:9 (Silzars).

LGD contends that Dr. Silzars's test results are inaccurate for several reasons, including that Dr. Silzars's calculations

did not reflect the "total amount of light" that would be emitted from the liquid crystal cell. Based on the Court's claim construction, however, the claims do not refer to the total amount of light that would be emitted by an ideal liquid crystal cell. Rather, the claims are directed to the amount of light that would be emitted due to the brightness change. Further, the Court credits Dr. Silzars's test results, and concludes, based on his testimony, that a brightness change within 20% is substantially equal to an ideal quantity of light in a stationary state with respect to the next brightness level.

LGD's argument that this claim element is not met in the accused devices is premised on the notion that "substantially equal" should also represent an improvement in the context of the "ideal quality of light." However, the Court has not included this additional language in its construction of the relevant terms, and therefore, the Court concludes that an improvement is not necessary to establish this claim element.

In sum, the Court finds that AUO has established by a preponderance of the evidence, that the accused LGD products meet the elements of claim 1 of the '160 patent. Accordingly, the Court concludes that LGD infringes claim 1 of the '160 patent.

Claim 2: The liquid crystal display according to claim 1, wherein said determinator comprising a table for storing a brightness level determined by the characteristic of a liquid crystal cell according to a relation between the previous brightness level and the next brightness level, and determining the output brightness level by modifying said next brightness level based on the brightness level read from said table.

The Court concludes that the limitations described in claim 2 are met in the accused devices. The determinator in LGD's timing controller chips comprises a table for storing a brightness level. This table is the lookup table, which stores a brightness level. Tr. 204:11-16, 172:14-173:18 (Silzars); AUO-165 at 26/51. The lookup table stores brightness levels that vary according to the relation between the previous brightness level and the next brightness level. Id. The lookup table values are determined by the characteristics of the liquid crystal cell. They are determined by trial and error using measurements of the response of the liquid crystal cell. A person makes the measurements using a photodiode, which measures light, and an oscilloscope. Tr. 79:24-80:24 (C.G. Kim).

Claim 3: The liquid crystal display according to claim 2, wherein: said video signal input through said input logic comprises a plurality of color signals; and

The Court concludes that this claim element is met in the accused devices. The video signal input includes a plurality of color signals. In particular, the LVDS video signal includes three separate colors: red, green and blue. Tr. 204:17-205:4;

434:24-435:10 (Silzars); AUO-165 at 1/51. The LVDS receiver, which inputs the LVDS signal, converts the LVDS data stream back into 28 bits or RGB, that is red, green and blue data. AUO-165 at 3/51, 4/51.

Claim 3: said table in said determinator is provided for each of said color signals.

The Court concludes that this claim element is also met in the accused devices. The lookup table includes three separate lookup tables, one each for red, blue and green data. Specifically, there are three Arithmetic LUTs, or lookup tables, in the block diagram for the New Monde chip. The Arithmetic LUTs each output 8 bits of red, green and blue, respectively. Tr. 205:5-10 (Silzars); AUO-165 at 3/51, 14/51; Tr. 958:12-23 (Eccles).

In sum, the Court concludes that AUO has established by a preponderance of the evidence, that the accused LGD products meet the elements of claim 3 of the '157 patent. The LGD LCD modules containing the New Monde controller chip include every element of claim 3 of the '160 patent. Further, the LGD modules containing the New Monde timing controller chip, which infringe claim 1 are representative of the accused products containing the timing controller chips identified in AUO-1553, the listing of timing controller chips analyzed for infringement. Tr. 169:6-23, 170:8-18 (Silzars). Each of these products therefore also infringes claim 3. Accordingly, the Court concludes that LGD infringes

claim 3 of the '160 patent.

C. Whether LGD Infringes claims 7 and 16 of AUO's '629 Patent

1. AUO's standing to assert the '629 patent

As a threshold matter, LGD contends that AUO lacks constitutional standing to assert the '629 patent against LGD, because AUO was not the owner of the '629 patent at the time this action was filed. LGD contends that the inventors of the '629 patent assigned their rights in the patent to IBM Japan, but IBM Japan never assigned its rights to International Business Machines Corporation (US) ("IBM USA") before IBM USA assigned its rights to AUO in June 2005. Thus, LGD contends that the June 2005 assignment could not have included the '629 patent. In addition, LGD contends that AUO cannot cure this standing defect through the retroactive application of the Patent Assignment Form filed with the PTO in May 2007 (LGDTX 931), which purported to assign the rights in the '629 patent from the named inventors to IBM USA.

In response, AUO contends that the '629 patent issued naming IBM USA as the assignee on the face of the patent, and IBM USA received title to the '629 patent through a succession of assignment agreements. As a result, AUO contends that the June 2005 Patent Assignment Agreement, in which IBM USA transferred and assigned to AUO "all right, title and interest in and to" certain specified patents, including the '629 patent "along with

any and all damages for infringement of any of the assigned patents before, on and after" June 30, 2005, "and the sole right to sue therefor under the assigned patents," was sufficient to transfer title of the '629 patent from IBM USA to AUO.

In a patent case, as in all federal actions, a plaintiff must have standing to sue before a claim can be brought. Sicom Sys. v. Agilent Techs., Inc., 427 F.3d 971, 975 (Fed. Cir. 2005). The burden to establish standing rests on the party bringing suit. Id.

The assignation on the face of a patent is "not a conclusive indication" of patent ownership.⁵ U.S. Philips Corp. v. Iwasaki Elec. Co., 505 F.3d 1371, 1375 (Fed. Cir. 2007). Rather, the plaintiff must demonstrate that it is the owner/patentee, assignee, or grantee of the patent-in-suit. See 35 U.S.C. § 281; Morrow v. Microsoft Corp., 499 F.3d 1332, 1339 (Fed. Cir. 2007); Fairchild Semiconductor Corp. v. Power Integrations, Inc., 2007 U.S. Dist. Lexis 93711, *13-14 (D. Del. 2007).

⁵ There is some authority, however, suggesting that the ownership data provided on the face of a patent creates a presumption of ownership. Arachnid v. Merit Indust., Inc., 939 F.2d 1574, 1578 n.2 (Fed. Cir. 1991); Board of Trustees of the Leland Stanford Junior Univ. v. Roche Molecular Sys., Inc., 487 F. Supp. 2d 1099, 1111 n.4 (N.D. Cal. 2007). Regardless of whether the Court views the naming of IBM USA as the assignee on the face of the patent as a presumption of ownership or not, the Court concludes that assignment to IBM USA has been demonstrated either affirmatively by AUO or by the fact that LGD has not overcome the presumption that legal title to the '629 patent vested in IBM USA as the assignee.

On the record presented, the Court concludes that AUO has demonstrated by credible chain of title evidence that it is the assignee of the '629 patent.⁶ LGD contends that the inventors assigned their rights to the invention claimed in the '629 patent to IBM Japan in 2000, and there was no direct conveyance of rights between IBM Japan and IBM USA prior to IBM USA's assignment to AUO. However, LGD's argument ignores the assignment documents predating 2000. Specifically, IBM USA and IBM World Trade ("World Trade") entered into an agreement dated January 1, 1963, in which IBM USA acquired any patents that World Trade had or thereafter acquired. AUO-302 at IBM 300004. Thereafter, IBM Japan and World Trade executed two agreements in which IBM Japan granted to World Trade the right to all of IBM's patent applications and patents in countries other than Japan. The first agreement dated June 25, 1981, amended a previous 1960 agreement and provided that IBM Japan grants "to World Trade and/or its designees, in respect to inventions owned or controlled by IBM Japan, the right in countries other than Japan to file or have filed on its behalf or on behalf of such designees, and to own such applications for patents and the patents issuing thereon . . ." AUO-303 at IBM 3000014-300015. The 1981 agreement was extended by the December 1990 letter

⁶ LGD's objections to the admission of this evidence are addressed by a separately issued Memorandum Opinion and Order.

agreement which provided that the 1960 agreement, as amended, would not terminate until December 31, 2000. AUO-304.

The inventors transferred their ownership interests to IBM Japan in August 2000, prior to the termination of the 1960 agreement between IBM Japan and IBM World Trade, as amended by the 1981 and 1990 agreements. AUO-258, AUO-P-963. Thus, by operation of these agreements and the earlier 1963 agreement between World Trade and IBM USA, title of the '629 patent flowed from IBM Japan to IBM USA through World Trade's designation of IBM USA as its designee. Accordingly, the Court concludes that IBM USA held title to the '629 patent on the date of its issuance and in 2005 when IBM USA assigned the '629 patent to AUO, and therefore, AUO was the rightful owner of the '629 patent at the time it commenced this action.

2. Infringement of Claim 7 and Claim 16

After comparing LGD's accused products with claims 7 and 16 of AUO's '629 patent, the Court concludes that AUO has established by a preponderance of the evidence that LGD literally infringes the '629 patent.

Claim 1 Preamble: An array substrate for display

The Court finds that this claim element is met in the accused devices. An array substrate, in the context of liquid crystal display modules, is an insulating substrate carrying one or more arrays of components such as thin film transistors. '629

patent, col. 1, 11.8-20; Tr. 142:20-143:3 (Silzars). LGD does not appear to object to this characterization of an array substrate, yet LGD appears to take issue with whether this limitation is met in the accused products. In the Court's view, LGD's argument here is apparently based on semantics rather than on substance. Based on the representation demonstrated in court by Dr. Silzars, the Court finds that the LGD's accused products include a substrate made from a layer of glass and an array of thin film transistors among the components formed on the glass substrate. Tr. 142:11-143:3, 128:11-129:4 (Silzars); AUO-1571.

Claim 1: a layer of an insulating substrate, having an area

The Court concludes that this claim element is met in the accused devices. Glass is a suitable insulating material, and the array substrate of the representative accused product, LC320W01, includes a layer of glass as the insulating material. Tr. 142:11-143:3 (Silzars); Tr. 843:22-845:8, 864:16-21 (Rubloff). In addition, that layer of glass has an area or specified region where the dummy conductive patterns are located, as discussed more fully below. Tr. 143:4-145:5 (Silzars); AUO-1567.

Claim 1: a thin film transistor array formed on the insulating substrate

The Court concludes that this element is met in the accused devices. LC320W01 includes a thin film transistor array. AUO-

1567; AUO-774-1; Tr. 140:16-141:9 (Silzars). The thin film transistor array is formed on an insulating substrate when manufactured. Tr. 140:16-141:9, Tr. 128:11-129:4, 129:13-131:2 (Silzars); AUO-1568-1574. Dr. Rubloff did not dispute Dr. Silzars's testimony that the accused products meet this claim element. LGD-1084 at 629-009.

Claim 1: a plurality of wiring arranged on the insulating substrate, each wiring having a first end, the wiring in communication with at least one of the transistors in the thin film array

The Court concludes that the accused products include a plurality of wiring as the Court has construed that term. The plurality of wiring in LC320W01 is labeled in AUO-1567. As shown in AUO-1567, the plurality of wiring is formed and arranged on the device's insulating substrate in a fan-out pattern between the connection pads and the edge of the thin film transistor array. Tr. 125:1-15, 140:11-15 (Silzars); AUO-P-1479-02, AUO-P-1479-39; AUO-P-1479-45; AUO 1568; AUO-1570; AUO-1571. The plurality of wiring also extends between, on a first end, connection pads, and on a second end, the thin film transistors of the TFT array. Tr. 125:1-126:7 (Silzars). The wiring of the LC320W01 communicates with the thin film transistors of the TFT array. Tr. 125:16-129:4, 139:10-140:15 (Silzars); AUO-1567; AUO-1568; AUO-1570; AUO-1571. Dr. Rubloff did not dispute Dr. Silzars' testimony that this claim element was met in the accused products. LGD-1084 at 629-009.

Claim 1: connection pads, each connection pad contacting the first end of at most one of the plurality of wirings

LGD does not appear to dispute that this claim element is met in the accused devices. The parties agreed that the claim term "connection pads" means "conductive patterns on the substrate that electrically connect the plurality of wiring to circuits located external to the substrate." Tr. 138:5-139:9 (Silzars). The Court concludes that this claim element is found in LC320W01. In LC320W01, the connection pads are identified in AUO-1567 and AUO-1568 and are located along at least one edge of the insulating substrate of the LC320W01. Tr. 123:19-124:22 (Silzars).

Claim 1: pixel electrodes

LGD does not appear to dispute that this claim element is met in the accused devices. Pixels or picture elements are included on a thin film transistor array. Tr. 310:5-311:3 (Rubloff - Phase II). Pixels include pixel electrodes that operate to allow the passage of light. Tr. 310:5-311:3 (Rubloff - Phase II). The Court concludes that pixel electrodes are present in the array substrate of the LC320W01. Specifically, the LC320W01 includes a plurality of transparent electrodes which, in a completed product, store and apply a driving voltage to a pixel in an LCD. AUO-1567; Tr. 141:10-142:10 (Silzars).

Claim 1: dummy conductive patterns, the dummy patterns comprising at least about 30% of the area of the insulating substrate, the dummy conductive patterns situated between the connection pads and the pixel electrodes such that the dummy patterns are not in contact with any of the wiring

The Court concludes that this claim element is present in the accused devices. LGD refers to the accused dummy conductive patterns as "line-on-glass" or LOG patterns. Tr. 831:11-832:23 (Rubloff). These patterns are located near the edge of the insulating substrate, between the connection pads and pixel electrodes. They are not in contact with any of the wiring. Tr. 131:3-23, 144:5-145:5, 146:19-22 (Silzars); AUO-1567, AUO-1569. These patterns cover more than 50% of the area or specified region in which they are situated. Tr. 146:11-18 (Silzars).

LGD's noninfringement argument regarding this claim element is two-fold. First, LGD contends that the accused devices do not have "dummy conductive patterns" that are meant to aid during etching and do not convey signals. More specifically, LGD's argument suggests that after the completed array substrate has been combined with a number of components to form a completed LCD module there is an indirect connection to the wiring and the accused dummy patterns convey signals. LGD's argument, however, is based upon claim construction limitations that the Court has not accepted. In addition, the claim language does not prohibit indirect electrical connection or communication between dummy conductive patterns and the wiring. Rather, the claims only

require that the dummy conductive patterns do not contact the wiring. Furthermore, that the accused dummy patterns may transmit signals after the accused array substrates have been assembled into an LCD module is not relevant to the claims asserted here, because those claims are directed to "an array substrate" alone, not an LCD module including an array substrate. See e.g., Gemtron Corp. v. Saint-Gobain Corp., 572 F.3d 1371, 1377-1379 (Fed. Cir. July 20, 2009) (claim directed to a shelf required the shelf to have the claimed characteristics before it was assembled into a finished product).

LGD's second argument focuses on the term "area." Specifically, LGD contends that any alleged dummy conductive patterns in its accused products do not comprise at least about 30% of the area of the insulating substrate. As with its previous argument, however, LGD's argument concerning the term "area" depends upon a claim construction which the Court has not adopted. Further, the Court credits the testimony of Dr. Silzars that the accused dummy conductive patterns in each of the accused products covers more than 50% of the region in which they are situated. Accordingly, the Court concludes that this claim element is met in the accused devices.

Claim 2: The array substrate according to claim 1 wherein at least one of the wirings comprises at least an upper layer and a lower layer of conductive materials

LGD does not appear to dispute that this claimed element is present in the accused devices, and the Court finds this claim element to be present in LC320W01. The wiring of LC320W01 is made from a lower layer of aluminum with neodymium, an aluminum alloy, and an upper layer of molybdenum. Both neodymium and molybdenum are conductive materials. Tr. 858:4-9 (Rubloff); Tr. 138:21-139:9, 291:9-15 (Silzars); Tr. 101:16-102:1 (I.D. Song).⁷

Claim 4: The array substrate according to claim 2 wherein the upper layer wiring material is selected from the group consisting of molybdenum, chromium, tantalum, titanium, and alloys thereof.

LGD does not appear to dispute that this claim element is present in the accused device, and as discussed above, the Court has found that the upper layer wiring material in the accused devices is molybdenum. Tr. 291:9-15 (Silzars); Tr. 101:16-102:1 (I.D. Song). Accordingly, the Court concludes that this claim element is met in the accused devices.⁸

⁷ Claims 2 and 10 recite the same claim limitation. Because the LC320W01 includes the limitation of claim 2, it includes the limitation of claim 10. Further, claim 11 requires the wiring of the LC320W01 to include a lower layer of aluminum with neodymium, an aluminum alloy. As explained with respect to claim 2, the limitation of claim 11 is met here, as well.

⁸ This claim limitation is also asserted in claim 13. Because the LC320W01 includes the limitation of claim 4, the Court concludes it also meets the same limitation as set forth in claim 13.

Claim 7: The array substrate for display according to claim 3 wherein the upper layer wiring material is selected such that the upper layers wiring material does not become insoluble in an acid or alkaline etchant.

The Court concludes that the accused devices satisfy this claim element. In LC320W01, the wiring of the array substrate is formed using an acid etchant. Tr. 98:3-8 (I.D. Song). During the wet etching process, the upper layer wiring material is etched at a faster rate than the lower layer wiring material. Tr. 102:7-13 (I.D. Song); Tr. 148:24-149:17 (Silzars). This confirms that the upper layer material in the wiring of the LC320W01 array substrate remains soluble through the etching process, because if the upper layer of conductive material in the wiring of the accused products were to become insoluble, the etching of the upper layer would have been slowed or stopped altogether.⁹ Tr. 148:24-149:17; Tr. 147:24-148:15 (Silzars).

Claim 9 Limitations

Claim 9 corresponds essentially to claim 1. Tr. 826:17-827:4 (Rubloff). Because the Court has concluded that the representative accused product, LC320W01, includes the limitations of claim 1, the Court also concludes that it includes the limitations of claim 9.

⁹ This claim limitation is also asserted in claim 16. Because the LC320W01 includes the limitation of claim 7, the Court concludes it also meets the same limitation as set forth in claim 16.

In sum, the Court finds that AUO has established by a preponderance of the evidence, that the accused LGD products meet the elements of claims 7 and 16 of the '629 patent. Accordingly, the Court concludes that LGD infringes claims 7 and 16 of the '629 patent.

D. Whether LGD Infringes claim 1 of AUO's '157 Patent

After comparing LGD's accused products with claim 1 of the '157 patent, the Court concludes that AUO has established by a preponderance of the evidence that LGD directly infringes the '157 patent. In reaching this conclusion, the Court credits the testimony of Dr. Silzars.

Claim 1 Preamble: A backlight unit for a liquid crystal display, comprising

LGD does not dispute that this claim element is met in the accused products, Tr. 1103:23-1104:14 (Smith-Gillespie), and the Court finds the element to be present in the accused devices as shown in the engineering drawings of the backlight assembly.

Claim 1: a frame

Although LGD's expert witness Mr. Smith-Gillespie initially disputed in his expert report that the accused products had a frame, LGD did not raise this argument at trial. In any event, the Court finds that all of the accused products include a frame. The frame is comprised of a metal portion, denoted as a "cover bottom" in LGD's engineering drawings and a white "tray," denoted as a "supporter side" in LGD's engineering drawings. Tr. 215:13-

216:3 (Silzars).

Claim 1: a first supporting portion, disposed on the frame

Claim 1: a second supporting portion, further disposed on the frame

As defined by the Court, a "supporting portion" is "any structure protruding from the frame, (including but not limited to a cylinder or cuboid) intended to support the optical film." The Court finds that all of the accused products meet this limitation because they have pins that protrude from two edges of the frame. AUO-541-543; Tr. 216:4-217:10 (Silzars). The Court further finds that all of the accused products have a first and second supporting portion, and it is arbitrary whether the pins protruding from the (i) left vertical edge or (ii) the top horizontal edge are referred to as the "first" or "second" supporting portion.

Claim 1: a film comprising a first constraining portion and a second constraining portion

The Court concludes that the accused products meet this claim limitation because they all have optical films with holes on two different edges, the top horizontal edge or the left vertical side, constituting the first and second constraining portions. Tr. 218:13-219:6 (Silzars); 1102:9-1103:4, 1104:15-20 (Smith-Gillespie). Consistent with the Court's discussion of the first and second orientation above, the determination of which holes are the first constraining portion and which holes are the

second constraining portion depends upon which set of protrusions is deemed the first or second supporting portion.

Claim 1: a film comprising a first constraining portion and a second constraining portion, position on the frame by the first supporting portion and the second supporting portion passing through the first constraining portion and the second constraining portion, respectively

The Court concludes that this element is met in all of the accused products. The optical film in the accused products is positioned on the frame by having the protrusions on the edge of the frame pass through the respective holes in the optical film. Tr. 219:19-221:17 (Silzars); AUO 545, 546; Tr. 92:11-94:22 (Moon); Table 1.

Claim 1: when the frame is disposed in a first position, the first supporting position partially contacts an inner wall of the first constraining portion for positioning the film, and the second supporting portion does not contact the second constraining portion

The Court concludes that each of the accused products has the aforementioned element. When the frame is disposed in a first position, for example, the landscape orientation, there are pins protruding from the top horizontal edge of the frame that pass through and support the optical films. In this position, the second set of vertical pins on the side edge do not contact the holes. AUO-563; Tr. 222:18-223:3 (Silzars). This conclusion is consistent with Mr. Moon's testimony explaining that LC420WX5 is designed so that there are gaps on all sides between the pins

and the holes in the optical film through which the pins pass. Tr. 94:4-22 (Moon). As Dr. Silzars explained, the dimensions of the gaps change when the film is disposed in different orientations, essentially, the film "floats" within the frame. Tr. 223:17-224:6 (Silzars); AUO 563-565, Table 1.

LGD contends that the accused products do not meet the "does not contact" requirement of this claim because there is contact when the film expands or contracts due to temperature variations. However, Mr. Smith-Gillespie admitted that at room temperature, when in a first position of landscape orientation, there is a "clearance" between the holes and the pins on the vertical side edge. LGD 1090 at LGD 157-030, LGD 157-031; LGD-837; LGD-840; Tr. 1109:7-16, 1204:20-23 (Smith Gillespie). LGD contends that this evidence is insufficient to establish infringement, because "claim 1 requires that thermal expansion and contraction of the film be accounted for so that the supporting portions do not contact the constraining portions when in a non-supporting position during the entire temperature range of the backlight unit." D.I. 1407 at ¶ 233. In this regard, LGD maintains that it was unnecessary for the patent to expressly include a specific temperature range for the accommodation of film expansion and contraction, because "[i]f the thermal expansion and contraction requirement applied to an amount less than the entire temperature range as suggested by AUO, this requirement would be meaningless

because it could read on standard engineering tolerances (clearance) or fit clearances." Id. However, the Court has concluded that the "does not contact" requirement does not include any thermal expansion or contraction limitation and neither the patent nor the prosecution history specifies any temperatures over which thermal expansion or contraction must be accommodated. Accordingly, the Court declines to accept Mr. Smith-Gillespie's infringement opinion which is predicated upon a claim construction that was not adopted by the Court, and therefore, the Court concludes that the aforementioned claim element is met in the accused devices.

Claim 1: when the frame is disposed in a second position, the second supporting portion partially contacts an inner wall of the second constraining portion for positioning the film, and the first supporting portion does not contact the first constraining portion

The Court likewise concludes that this element is satisfied in all of the accused products. When the frame is disposed in a second position, for example moving from the landscape to portrait orientation, there are pins protruding from the top horizontal edge of the frame that pass through and support the optical films while the second set of vertical pins on the side edge do not contact the holes. AUO-563. The "does not contact" limitation here is satisfied for the same reasons discussed in connection with the previous claim element. To the extent that "incidental contact" occurs, the Court notes that the patent

discloses the possibility of "incidental contact," and as Dr. Silzars explained, such incidental contact is the nature of what is taught in the patent when film is not securely fixed to the frame. Tr. 225:8-10; Tr. 224:24-225:1 (Silzars).

With respect to this and other claim elements, LGD contends that not all of its displays are intended to be displayed in both landscape and portrait orientation, and therefore, they cannot meet claim elements which require orientation in a second position. However, the evidence demonstrates that all LGD public displays can support viewing in both landscape and portrait orientations, AUO-81; Tr. 213:2-24 (Silzars), and the other LGD non-public display products are capable of being used in portrait orientation at least temporarily, even if LGD does not guarantee the quality or lifetime of a non-public display unit used in that orientation. Tr. 90:24-91:11, 92:7-10 (Moon).

In sum, the Court finds that AUO has established by a preponderance of the evidence, that the accused LGD products meet the elements of claim 1 of the '157 patent. Accordingly, the Court concludes that LGD infringes claim 1 of the '157 patent.

E. Whether LGD Infringes Claims 7 and 17 of the '506 Patent

After comparing LGD's accused products with the claim 7 and 17 of the '506 patent, the Court concludes that AUO has established by a preponderance of the evidence that LGD literally infringes the '506 patent. In reaching this conclusion, the

Court finds LB035Q02 to be representative of the accused products. Tr. 228:13-229:3 (Silzars).

Claim 1 Preamble: A signal transmission device connecting a display module and a system

The Court finds that the accused products include a signal transmission device connecting a display and module and a system. "The LB035Q02 is a Color Active Matrix Liquid Crystal Display with a white LED backlight assembly." AUO-61 at 4/35; AUO-64 at 4/31; AUO-66 at 4/33. "This LCD employs one interface connection for the operation of [the] module, LED B/L [backlight] and TSP (touch screen panel)." AUO-61 at 6/35. The signals received over the 60-pin flexible printed circuit board is described in the pin configuration for the connector. AUO-61 at 6/35-7/35.

Claim 1: a first flexible printed circuit board, electrically connecting the display module and the system and a second flexible printed circuit board, electrically connecting the display module and the first flexible printed circuit board

Although AUO advances arguments and terms for claim construction related to this claim element, LGD does not appear to offer a response to those arguments. Further, it appears to the Court that LGD does not genuinely dispute the presence of this element in the accused devices, but instead focuses its argument on evidentiary based objections to the drawings and specifications used by AUO to support its argument.¹⁰ D.I. 1407

¹⁰ The parties have separately briefed any evidentiary objections that were maintained, and the Court has addressed

at ¶¶ 253-255. The Court finds that this element is met in the accused products. AUO-1575; Tr. 229:4-232:8 (Silzars); Tr. 86:6-17 (J.D. Kim); AUO-61 at 31/35; AUO-62; AUO-331 through AUO-340; AUO-63; AUO-64 at 27/31; AUO-65; AUO-66 at 30/33; AUO-67; AUO-340; AUO-341; AUO-P-1491; AUO-P-1492; AUO-425; AUO-426.

Claim 1: wherein the first and second flexible printed circuit boards are joined by hot bar soldering

In light of the Court's construction of the phrase, "hot bar soldering," the Court concludes that each of the accused products meets this claim limitation. The first and second flexible printed circuit boards of LB035Q02, which is representative of the accused products, are joined by soldering material. Tr. 233:22-234:5 (Silzars); Tr. 1316:20-1317:23 (J.D. Kim); Tr. 1120:6-1130:6, 1132:8-1133:8 (Smith-Gillespie); AUO at 16/23, 18/23.

Claim 7: The signal transmission device as claimed in claim 1 wherein the second flexible printed circuit board transmits a light source signal

LGD does not appear to dispute that the accused products meet this claim limitation and again focuses its argument on certain evidentiary issues. D.I. 1407 at ¶ 276. The Court finds that this element is met in the accused devices. By way of example, the Court points out that LB035Q02 has a white LED

those objections that were briefed by the parties in their evidentiary briefs by separate Memorandum Opinion and Order.

(light emitting diode) backlight assembly connected to the main or first flexible printed circuit board through an LED flexible printed circuit board. Tr. 85:6-11, 87:16-89:2 (J.D. Kim); AUO-63.

Claim 17: A signal transmission device, connecting an [sic] display module and a system, comprising: a first flexible printed circuit board, electrically connecting the display module and the system; and a second flexible printed circuit board, electrically connecting the display module and the first flexible printed circuit board

With regard to the above claim element, the Court notes that claim 17 is identical to portions of claim 1. For the reasons discussed in the context of claim 1, the Court finds that the accused products meet these claim elements.

Claim 17: wherein the first flexible printed circuit board has a first alignment mark, and the second flexible printed circuit board has a second alignment mark overlapped and aligned to the first alignment mark

The Court concludes that the accused products meet this claim element. The accused products include both holes as alignment marks, Tr. 232:9-233:18 (Silzars); Tr. 83:5-85:5, 86:18-87:5, 1319:5-1320:6 (J.D. Kim); AUO-67 ("4"), and extended pad electrodes. Tr. 232:23-233:18, 240:15-241:12 (Silzars). Prior to the soldering process, an operator assembling the accused product visually observes and aligns the pad electrodes of the first and second flexible printed circuit boards. Tr. 81:20-82:22 (J.D. Kim); Tr. 233:5-13 (Silzars).

In sum, the Court finds that AUO has established by a preponderance of the evidence, that the accused LGD products meet the elements of claims 7 and 17 of the '506 patent. Accordingly, the Court concludes that LGD infringes claims 7 and 17 of the '506 patent.

III. Invalidity

A. Whether Claims 1 and 3 of the '160 Patent Are Invalid

1. Indefiniteness

LGD contends that claims 1 and 3 of the '160 patent are invalid because the terms "time integration quantity" and "substantially equal" are indefinite. The Court has concluded, in the context of its claim construction rulings, that these terms are not indefinite. Accordingly, the Court concludes that LGD cannot establish invalidity of the '160 patent on the basis of indefiniteness.

2. Anticipation and/or obviousness in light of the Mori, Kido and Johnson references

LGD contends that claims 1 and 3 of the '160 patent are invalid and/or obvious in light of the Mori JP '532 publication reference, which is disclosed in the background section of the '160 patent, and the Kido and Johnson references. According to LGD, Mori discloses a liquid crystal display with a conventional overdrive circuit and each of the claimed elements of the '160 patent. While the Mori reference does not explicitly teach that the overdrive circuit is applied to each of red, green and blue

signals, LGD contends that it would have been obvious to apply the overdrive circuit to each red, green and blue signals, as evidenced by the Kido and Okumura references. With respect to the Kido and Johnson references, LGD also makes arguments independent of the Mori reference, that Kido and Johnson render the '160 patent invalid as anticipated and/or obvious.

In response, AUO contends that Mori, Johnson and Kido do not mention improving the quantity of light, and that even if one uses a conventional prior art overdrive system such as Mori, Kido or Johnson that seeks to improve response time, the pixel may emit, but will not necessarily emit, a quantity of light that approaches the ideal. Thus, AUO maintains that Mori, Johnson and Kido do not inherently disclose an output brightness level so as to make a time integration quantity of a brightness change substantially equal to the ideal. In addition, AUO contends that Kido does not disclose "a determinator for determining an output brightness level," a "determinator for comprising a table for storing brightness level," and a "table in said determinator [] provided for each of said color signals." AUO further contends that Johnson does not disclose "a determinator for determining an output brightness level," and a "determinator for comprising a table for storing brightness level."

After reviewing the prior art references in light of the testimony and evidence adduced at trial, the Court concludes that

LGD has not established by clear and convincing evidence that the Mori, Kido and Johnson references invalidate the '160 patent. The Court is persuaded that none of the cited references disclose the time integration quantity of a brightness change that is substantially equal to an ideal quantity of light. These references do not mention improving the quantity of light, Tr. 1003:6-24 (Eccles), and both experts who testified at trial agreed that using these prior art systems to improve response time does not necessarily result in the pixel emitting a quantity of light that is substantially equal to the idea. Tr. 1380:9-23, 1377:9-23, 1381:8-1382:20 (Silzars); Tr. 1002:2-11; 1025:17-1026:3 (Eccles); LGD-245 (Mori); LGD-297 (Kido); LGD-318 (Johnson).

In addition, the Court concludes that Kido and Johnson do not disclose the required determinator and table elements. LGD's expert Mr. Eccles testified that the ROM discussed in Kido is the required "table for storing a brightness levels." As Dr. Silzars explained, however, the ROM stores coefficient values K1 and K2, which are used to create the compensating waveform. These are not brightness levels, but abstract mathematical concepts. Tr. 1384:10-1385:8 (Silzars); LGD-297 (Kido) at col. 7, ll. 61-68, col. 9, ll. 27-33; Tr. 1029:23-1032:2 (Eccles). As for the Johnson reference, LGD's expert, Mr. Eccles, identified the required determinator and table as Table 1 disclosed in Johnson.

LGD-318 (Johnson) at col. 4, l. 6 - col. 5, l. 14. However, Johnson expressly indicates that the disclosed table pertains to voltages. LGD-318 (Johnson) at col. 4, ll. 47-64; Tr. 991:11-992:2 (Eccles). A voltage is not the same as a brightness level. Tr. 1028:19-1029:2 (Eccles). Accordingly, the Court concludes that the '160 patent is not invalid as anticipated or obvious in light of Mori, Kido and Johnson, alone or in combination with each other.

B. Whether Claim 1 of the '157 Patent Is Invalid

1. Anticipation by the Shimizu reference

LGD contends that claim 1 of the '157 patent is invalid because it is anticipated by U.S. Patent No. 7,380,972 issued to Shimizu (the "Shimizu reference"). LGD contends that the Shimizu reference qualifies as prior art under Section 102(e) because it was filed on August 19, 2003, as PCT Application No. PCT/jp03/10458. LGD further contends that the Shimizu reference discloses each and every limitation of claim 1 of the '157 patent.

In response, AUO contends that the Shimizu reference is not prior art to the '157 patent, because the earliest date for which the Shimizu patent could be relied upon as prior art is March 11, 2004, the publication date of PCT Pub. No. WO2004/020899. Because the '157 patent was invented by February 6, 2004 as evidenced by the invention disclosure form for the '157 patent,

AUO contends that it cannot be invalidated by the Shimizu reference.

Section 102 provides, in pertinent part, that a "person shall be entitled to a patent," unless

(e) the invention was described in . . . (2) a patent granted on an application for patent by another filing in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for the purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

35 U.S.C. § 102(e) (emphasis added). Article 21 provides that "[t]he language . . . of the international publication is governed by the Regulations," which in turn require that "[i]f the international application is published in a language other than English, . . . the title of the invention, the abstract and any text matter pertaining to the figure or figures accompanying the abstract shall be published both in that language and in English. D.I. 1403 at Exh. G (Article 21); Exh. H (PCT Regulation 48.3(c)). Thus, the abstract and text relating to the figures in the abstract are required to be in English regardless of what language the application was published in.

In this case, only the abstract and characters accompanying the figures are in English as required by Article 21, but the remaining application, consisting of more than 45 pages, is in Japanese. The biographical data for the international

application confirms that the application was not published in English because it states that the "Publication Language" is "Japanese." D.I. 1403, Exh. I. Accordingly, the Court concludes that the earliest publication date for the Shimizu reference is the English document, PCT Pub. No. WO2004/020899, which is dated March 11, 2004. Because the '157 patent was invented before this date, the Court concludes that the Shimizu reference is not prior art, and therefore, LGD cannot establish that the '157 patent was invalid as anticipated by the Shimizu reference.

2. Obviousness with regard to the Fukayama and Sakamoto patents

LGD contends that either Fukayama alone, or in combination with Sakamoto renders claim 1 of the '157 patent obvious. The parties' dispute regarding these references primarily centers on whether the Fukayama reference, alone or in combination with Sakamoto, discloses the "does not contact" limitation in the various claim elements of the '157 patent.

LGD's expert, Mr. Smith Gillespie, contends that the "does not contact" limitation is met, because Figure 13 of Fukayama discloses that the second supporting portion "does not contact" the second constraining portion. Specifically, Mr. Smith Gillespie relies on the sentence in the Fukayama patent which explains: "Although this embodiment is similar to the first embodiment, as described in conjunction with Fig. 1, with respect to the holding of other sides of the optical sheet OPS and the

other constitutions, the columnar member may be replaced with an insertion member having a pin shape with a head which is similar to the above-mentioned insertion member BT having the pin shape with the head which is loosely engaged with a through hole formed in the optical sheets." LGD-332 at col. 18, ll. 34-43; Tr. 1121:3-13 (Smith-Gillespie).

However, the Court credits the testimony of Dr. Silzars over the testimony of Mr. Smith Gillespie with respect to this issue. As Dr. Silzars's explained, "loosely engages" and "does not contact" are not synonymous terms. Further, the Fukayama patent is directed to the secure holding of optical films. As Figure 1 shows, the optical film is "firmly fixed" by the use of adhesive tape. LGD-332 at Fig. 1, col. 15, ll. 5-7; Tr. 1412:6-16 (Silzars). While the "other sides" referred to in the sentence relied upon by Mr. Smith-Gillespie may be "loosely engaged," there is nothing in that sentence suggesting that the "firmly fixed" side may be loosely engaged.

To the extent rotation of a display device is an issue, the Court concludes that Fukayama does not disclose rotation, Tr. 1224:21-1225:6 (Smith-Gillespie), and there is no reason to combine Fukayama with Sakamoto, which does disclose rotation. Tr. 1412:6-8 (Silzars). Moreover, the '157 patent acknowledges that rotatable LCDs were known in the prior art, and this prior art including, Fukayama, was before the Examiner when he

concluded that the claims were not obvious in light of Fukayama. AUO-09 ('157 patent) at col. 1, ll. 11-12; Tr. 1222:11-1224:9 (Smith-Gillespie); Tr. 1417:1-13 (Silzars). Accordingly, the Court concludes that LGD has not established by clear and convincing evidence that the '157 patent is invalid as obvious in light of Fukayama, alone or in combination with Sakamoto.

C. Whether Claims 7 and 17 of the '506 Patent Are Invalid

LGD contends that the '506 patent is invalid as anticipated or obvious by Hewlett Packard prior art identified as HP iPAQ h2210 and h2215. LGD contends that these devices raise an on-sale bar to the '506 patent, because they have the same design as tens of thousands of products with the same product numbers sold in the United States prior to August 19, 2003. With respect to the HP iPAQ h2215 specifically, LGD presents a sales receipt which evidences that the device was sold in the United States by at least November 22, 2003. LGD contends that the '506 patent was not invented until December 16, 2003, and therefore, the HP devices constitute prior art.

In response, AUO contends that the invention date for the '506 patent was not December 16, 2003, but January 15, 2003, and the invention was diligently reduced to practice thereafter. Although AUO acknowledges that the operative date for an on-sale bar is August 19, 2003, one year prior to the filing of its United States application on August 19, 2004, AUO contends that

there is no evidence that the identified HP products were sold or offered for sale prior to August 19, 2003.

After considering the evidence presented on this issue, the Court cannot conclude that LGD has established by clear and convincing evidence that the identified HP devices are prior art that was on sale before August 19, 2003. The only concrete evidence LGD has presented concerning the sale of these specific devices is the sales receipt dated November 22, 2003. This evidence post-dates the on-sale bar.

Further, the Court is persuaded that the '506 patent is entitled to an invention date of January 15, 2003, and that the invention was diligently reduced to practice thereafter. Tr. 1469:7-1474:24, 1475:1-1479:18, 1484:4-18 (Sung); AUO-1544 to AUO-1546; AUO-1611 to AUO-1614; AUO-235; AUO-222. Therefore, the Court cannot conclude that the HP devices are prior art that anticipated or rendered obvious the invention claimed in the '506 patent.

D. Whether Claims 7 and 16 of the '629 Patent Are Invalid

LGD contends that claims 7 and 16 of the '629 patent are invalid as anticipated in light of European Patent Publication No. 887695 (the "Hirabayashi reference") and invalid as obvious in light of U.S. Patent No. 5,850,275 ("Watanabe"). LGD also raises an argument concerning the on-sale bar based upon U.S. sales of LGD Display's LT060VI and LT071VI.

1. Anticipation/Obviousness in light of Hirabayashi and Watanabe

After considering the evidence presented on this issue, the Court cannot conclude that LGD has established by clear and convincing evidence that claims 7 and 16 are invalid in light of Hirabayashi or Watanabe. To the extent LGD's argument is premised on the allegation that Hirabayashi discloses the claimed "area," the Court cannot accept LGD's argument because it is based upon a claim construction that the Court has not adopted. Further, the claims upon which claims 7 and 16 depend require the upper layer wiring material to be selected from the group consisting of molybdenum, chromium, tantalum, titanium and alloys thereof. However, Hirabayashi discloses an upper layer of TiN, which is a ceramic compound, not a conductive material or a titanium alloy.

In addition, the Court is persuaded that the claimed invention when viewed in the context of the specification must be considered from the perspective of a two-layer structure in which the upper layer material of the dual-layer wire material does not become insoluble in an acid or alkaline etchant. Neither the Watanabe nor the Hirabayashi references expressly disclose the problem or, or solution to, an upper layer of wiring material of a dual-layer wire becoming insoluble in an acid or alkaline etchant. Indeed, Watanabe discloses only single layer wiring, Tr. 885:20-886:2 (Rubloff); Tr. 1403:7-10, 1405:20-1406:23

(Silzars), and LGD's expert agreed that the dummy patterns disclosed in the Watanabe and Hirabayashi references do not necessarily prevent the upper layer material from becoming insoluble in an acid or alkaline etchant. Tr. 880:1-881:1, 885:5-887:5 (Rubloff); Tr. 1402:3-17 (Silzars). Because the Hirabayashi and Watanabe references do not expressly or inherently disclose use of etchants that will solve the passivity problem addressed by claims 7 and 16 of the '629 patent, the Court concludes that neither Watanabe nor Hirabayashi render the claims of the '629 patent invalid.

2. On-Sale Bar

LGD contends that the '629 patent is subject to the on-sale bar in light of two LGD products, LT060V1 and LT071V1. The Court has considered the evidence presented by LGD in connection with its on-sale bar argument, and concludes that LGD cannot establish by clear and convincing evidence that the on-sale bar applies to the '629 patent. First, the Court is not persuaded that LGD has presented clear and convincing evidence that these two products were, in fact, on sale more than one year before the application resulting in the '629 patent was filed. In addition, LGD's correlation chart shows mask files associated with the identified LGD products, which differ from the mask file used by Dr. Rubloff in his analysis of these products. The mask files associated with these products confirm that the GDS data for these two

products was modified after the priority date of the '629 patent, which would not make these patents prior art to the '629 patent. However, regardless of which mask filed is used, the Court credits the testimony of Dr. Silzars, that none of the mask files associated with the identified LGD products include dummy conductive patterns that comprise at least 30% of the area in which they are situated. Tr. 1397:8-16, 1398:10-1400:13 (Silzars); AUO-1594. Accordingly, the Court concludes that LGD has not established by clear and convincing evidence invalidity based upon the on-sale bar.

IV. Inducement of Infringement

A. Applicable Law

To establish liability for inducing infringement, a patent holder must prove that "there has been direct infringement, and second, that the alleged infringer knowingly induced infringement and possessed specific intent to encourage another's infringement." MEMC Elec. Materials, Inc. v. Mitsubishi Materials Silicon Corp., 420 F.3d 1369, 1378 (Fed. Cir. 2005) (quotations omitted). That the defendant merely had knowledge of the acts alleged to constitute infringement is not enough. Rather, the "plaintiff must establish that the defendant possessed specific intent to encourage another's infringement." Power Integrations, Inc. v. Fairchild Semiconductor Int'l, Inc., 589 F. Supp. 2d 505, 511 (D. Del. 2008). In this regard, the

plaintiff has the burden of showing that the alleged infringer's actions induced infringing acts and that he knew or should have known his actions would induce actual infringement. These requirements may be shown by direct or circumstantial evidence. See Metabolite Labs., Inc. v. Lab. Corp. of Am. Holdings, 370 F.3d 1354, 1365 (Fed. Cir. 2004).

B. Whether AUO Has Established Inducement Of Infringement

Having concluded that LGD's products directly infringe the asserted patents, the Court further concludes that LGD's customers, distributors and sales representatives have directly infringed the asserted patents. The record contains an abundance of evidence in this regard, but by way of example, the Court points out Mr. Putnam's unrebutted testimony that LGD sold millions of dollars of accused products in the United States. Tr. 764:17-765:2 (Putnam); AUO-284.

In addition, the Court concludes that LGD possessed the requisite intent to induce infringement. In this regard, the Court finds that LGD actively targets the U.S. market and encourages its sales representatives and distributors to build their U.S. market¹¹ and maintains multiple U.S. locations¹²,

¹¹ See e.g., AUO-246, AUO-247; Tr. 628:8-14, 18-22, 629:3-19 (Joo Sup Kim); Tr. 490:16-24, 493:16-494:9 (Catalyst/T. Griffin); Tr. 536:22-537:7 (Avnet/S. Gereb); Tr. 548:5-21 (Dell/S. Peana); AUO-125 at Centric 000165.

¹² See e.g. AUO-819 at AUO-LGD 0013940-41; AUO-27 at Catalyst 001044; AUO-119 at AVNET007544.

employees dedicated to key customers in the U.S. and a vast U.S. sales network¹³, a technical support, warranty and repair service for its U.S. customers¹⁴, and regular contact and communication with its U.S. customers.¹⁵ LGD also provided product information and marketing materials to its U.S. customers for the purpose of encouraging U.S. sales. AYO-249, AYO-306; AYO-596; AYO-31; AYO-27; AYO-126; Tr. 499:17-503:8 (Catalyst/T. Griffin). In addition, the Court finds that the evidence demonstrates that LGD touted AYO's patented features to LGD's U.S. customers, and that based on the foregoing findings, LGD knew its customers were selling the infringing devices in the U.S. Tr. 559:8-12 (Centric Sales/Edwards); AYO-126; Tr. 545:20-547:19 (Dell/S. Peana); AYO-27 at Catalyst 001064-65; AYO-89 at LGD 190503-05. Accordingly, the Court concludes that AYO has established that LGD induces infringement of the asserted patents.

CONCLUSION

For the reasons discussed, the Court has defined the disputed terms in the asserted patents as set forth in this

¹³ See e.g. Tr. 493:1-15 (Griffing/Catalyst); Tr. 610:3-5, 601:22-603:1 (H. Lee); AYO-228 at LGD 2080258; AYO-27 at Catalyst 001043, AYO-819, AYO-974, AYO-123, AYO-20.

¹⁴ See e.g. AYO-33; AYO-255; Tr. 541:20-542:6; AYO-27; AYO-70, AYO-71; Tr. 589:16-590:16, 591:22-592:8 (Jacobson/Jabil).

¹⁵ See e.g. AYO-309; AYO-321; AYO-982; AYO-1524; AYO-249; AYO-24; Tr. 532:23-533:22 (Avnet/S. Gereb); Tr. 588:10-21 (D. Woo/Westinghouse); Tr. 539:24-540:2; AYO-315.

Memorandum Opinion. In addition, the Court concludes that AUO has established by a preponderance of the evidence that LGD literally infringes the patents asserted by AUO in this action, and that LGD has not established by clear and convincing evidence that the asserted patents are invalid.

The Court will withhold entry of a Final Judgment Order until the Phase II trial is completed.