

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Hisense USA Corporation
Petitioner

v.

Brightplus Ventures LLC
Patent Owner

Patent No. 8,330,710
Filing Date: October 11, 2011
Issue Date: December 11, 2012
Title: Systems and Methods for Controlling a Solid State Lighting Panel

Inter Partes Review No. IPR2023-01412

**PETITIONER'S OPPOSITION TO PATENT OWNER'S
CONTINGENT MOTION TO AMEND UNDER 37 C.F.R. § 42.121**

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LIST OF EXHIBITS

EXHIBIT	DESCRIPTION
1001	U.S. Patent No. 8,330,710 (“the ’710 Patent”)
1002	Prosecution History of U.S. Patent No. 8,330,710
1003	U.S. Patent No. 8,049,709 (“the ’709 Patent”)
1004	Prosecution History of U.S. Patent No. 8,049,709
1005	Declaration of Rafael Betancourt
1006	Curriculum Vitae of Rafael Betancourt
1007	U.S. 2008/0116818 to Shteynberg (“Shteynberg”)
1008	U.S. 2007/0121320 to Arai (“Arai”)
1009	CN 1750732 to Zhang (“Zhang”)
1010	Certified Translation of Zhang
1011	U.S. 2006/0139954 to Kobori (“Kobori”)
1012	U.S. 2003/0016205 to Kawabata (“Kawabata”)
1013	U.S. 2007/0013647 to Lee (“Lee”)
1014	Counterclaim filed by Patent Owner in <i>Hisense USA Corp. v. Brightplus Ventures LLC</i> , No. 1:22-cv-02774, Dkt. 9 (N.D. Ga. Sep. 16, 2022)
1015	Scheduling Order in <i>Hisense USA Corp. v. Brightplus Ventures LLC</i> , No. 1:22-cv-02774, Dkt. 35 (N.D. Ga.)
1016	Judicial Caseload Profile for the Northern District of Georgia
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1018	Cover Pleading to Patent Owner’s Supplemental Infringement Contentions in <i>Hisense USA Corp. v. Brightplus Ventures LLC</i> , No. 1:22-cv-02774 (N.D. Ga.) served June 21, 2023
1019	Deposition Transcript of William Bohannon (Oct. 8, 2024)
1020	Declaration of Rafael Betancourt in Response to Patent Owner’s Contingent Motion to Amend

I. Introduction

Patent Owner's proposed substitute claims impermissibly introduce new matter and are not patentable over the prior art, in any event. In short, Patent Owner's proposed substitute claims simply amend certain of the Challenged Claims to newly introduce five elements into the claims: (a) a "backlight system for an LCD display"; (b) an "individually determined" drive current for each of a plurality of strings of lighting devices; (c) an "independently determined PWM signal" associated with the drive current for each string of lighting devices; (d) a "luminous intensity" for each string of lighting devices; and (e) synchronization of the "firing" and "luminous intensity" of each string of lighting devices with "periodic operations of the display."

Patent Owner argues that the proposed substitute claims are patentable over the prior art because none of the asserted prior art references *alone* discloses each and every element of the proposed substitute claims. The evidence, however, shows each element was well known in the *collective* prior art years prior to the effective filing date on the '710 Patent. Indeed, the "Background" of the '710 Patent itself concedes that many of these elements were well known in the art prior to the effective filing date on the '710 Patent. And, as testified by Petitioner's expert, Mr. Rafael Betancourt, it would have been obvious to a POSITA to modify the lighting system in Shteynberg, for example, in view of the prior art and the knowledge of a POSITA to arrive at the proposed substitute claims.

II. The Proposed Substitute Claims Impermissibly Introduce New Matter

A proposed amendment under 35 U.S.C. § 316(d) “may not ... introduce new matter.” 35 U.S.C. § 316(d)(3). As such, “[a] motion to amend may be denied where: ... The amendment seeks to ... introduce new subject matter.” 37 C.F.R. § 42.121(a)(2)(ii). “New matter is any addition to the claims without support in the original disclosure.” *Lectrosonics, Inc. v. Zaxcom, Inc.*, IPR2018-01129, Paper 15 at 7 (P.T.A.B. Feb. 25, 2019) (precedential). “Thus, the Board requires that a motion to amend set forth written description support in the originally filed disclosure of the subject patent for each proposed substitute claim.” *Id.* Patent Owner bears the burden of persuasion to show, by a preponderance of the evidence, that its Contingent Motion to Amend complies with these requirements. 37 C.F.R. § 42.121(d)(1).

Patent Owner has failed to carry its burden. Patent Owner has failed to demonstrate written description support under 35 U.S.C. § 112 for its proposed amendments reciting that the “firing order” and “luminous intensity” of each of the strings in the plurality of strings are “synchronized with periodic operations of the display.” Contrary to Patent Owner’s conclusory suggestion, these newly introduced elements have no sufficient written description support in the specification of the ’710 Patent. *See* Contingent Motion to Amend (“MTA”), at 8.

The specification of the ’710 Patent is *devoid* of any reference to any “periodic operations” of a display. *See generally* ’710 Patent. None of the portions of the

specification cited by Patent Owner as allegedly providing support for this amendment contain any description of, or even reference to, any “periodic operations” of any display. *See* ’710 Patent, 8:11–15, 9:33–47, 15:22–16:7, Figs. 2, 14; *see also* MTA at 8. Column 8, lines 11–15, simply describe that a “synchronization signal” may be received by a “display controller” in some embodiments. ’710 Patent, 8:11–15. And Columns 15 and 16 describe embodiments illustrated in Figures 14 and 15 of the ’710 Patent wherein a solid state lighting panel is generally “synchronized” with an LCD display. *Id.* at 15:22–54 (Figure 14), 15:55–16:7 (Figure 15).

These portions of the specification fail to provide written description support for Patent Owner’s *particular* proposed amendments. With reference to Figure 14, the specification discloses that the “display device 1400” includes a “solid state backlight panel 1420,” which includes “multiple strings of solid state light emitters,” “configured to provide light to be selectively transmitted through the shutters of the LCD panel 1410.” *Id.* at 15:34–41. The specification discloses that an “LCD controller 1430 may control the output image 1460 by varying on/off values of the LCD shutters corresponding to different color pixels.” *Id.* at 15:28–31. In particular, “the LCD controller 1430 may be configured to refresh the pixels at a predetermined refresh rate.” *Id.* at 15:31–33. And with respect to the solid state backlight panel 1420, the specification discloses “[v]arying the output of a string may be

accomplished, for example, by firing the string for a portion of a period, which may be controlled by a backlight controller 1440.” *Id.* at 15:41–44. And the specification discloses that, “[i]n some embodiments, the **refresh rate** of the LCD controller 1430 may be synchronized with the **firing** of the solid state backlight panel 1420 by sending a synchronizing signal from the LCD controller to the backlight controller 1440.” *Id.* at 15:44–48 (emphasis added).

Likewise, with reference to Figure 15, the specification discloses that “[a] LCD panel 1510 is controlled by a display controller 1530, which refreshes the pixels in the LCD panel 1510 at a predetermined refresh rate.” *Id.* at 15:58–61. A “solid state backlighting panel 1520”—“controlled by a backlight controller 1540 that can drive multiple strings of solid state light emitters using a current driver 1560”—“provid[es] luminance through the LCD panel 1510.” *Id.* at 15:61–66. And “[t]he display controller 1530 may send a synchronizing signal 1550 to the backlight controller 1540 such that the **firing rate** of the strings corresponds to the **refresh rate** of the LCD display 1520.” *Id.* at 16:1–4 (emphasis added).

Thus, at most, these portions of the specification of the ’710 Patent describe only that the “firing [rate]” of a plurality of strings in a solid state backlighting panel may be synchronized with a “refresh rate” of an LCD display. ’710 Patent, 15:22–16:7, Figs. 14–15. These portions thus fail to describe synchronizing a “firing **order**”

of a plurality of strings with any “*periodic operations of the display*,” as recited in the proposed substitute claims.

Additionally, these portions fail to describe synchronizing the “*luminous intensity* of each of the strings” in the plurality of strings with any “periodic operations of the display,” as recited in the proposed substitute claims. At most, the specification only generally describes that strings of solid state light devices may be “controlled” to achieve a desired “luminous intensity” (or “brightness”). ’710 Patent, 9:33–47, 15:38–41. The specification, however, never discloses controlling the luminous intensity of each of the strings so that it is *synchronized* with any “periodic operations of the display,” as recited in the proposed substitute claims. *See id.*

III. The Elements Newly Introduced in Patent Owner’s Proposed Substitute Claims Were Each Well Known in the Art Prior to the ’710 Patent

A. The Use of Lighting Systems as Backlighting Systems for LCDs Was Well Known in the Art Prior to the ’710 Patent

Patent Owner proposes amending the preamble of certain claims to recite a “backlight system for an LCD display” (as opposed to a “lighting system”). The use of lighting systems as backlights for LCDs, however, was well known prior to the alleged May 8, 2007, priority date of the ’710 Patent. The “Background” of the ’710 Patent acknowledges that “[s]olid state lighting panels are commonly used as backlights for [] LCD display screens.” ’710 Patent, 1:32–34; Ex. 1019, at 13:7–12.

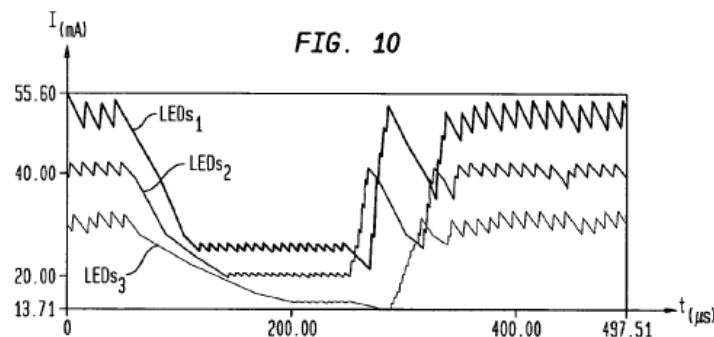
Moreover, Shteynberg expressly states that one of the many “functional purposes” of its LED display system is “backlighting.” Ex. 1007, [0079]. And Patent Owner’s expert, Mr. Bohannon, testified that a POSITA would have understood the term “backlighting” to refer to “providing a lighting source for an LCD panel.” Ex. 1019, at 16:11–18:4. Additionally, numerous other of the asserted prior art references teach the use of their disclosed display systems as backlights for LCDs. For example, Arai teaches that its “backlight device” (*e.g.*, “backlight unit 3”) can be used in a “liquid crystal panel unit 2” to deliver display light to a “liquid crystal panel 1.” Ex. 1008, [0024], [0027]. Zhang likewise teaches that its illumination method with respect to “backlight modules” may be “applied to liquid crystal displays (LCD).” Ex. 1010, 1:6–8, 5:2–5. Kawabata “relates to a lighting unit for use as a backlight in a liquid crystal display device.” Ex. 1012, [0002]. Lee discloses an improved LED light source for use as a “backlight unit for a liquid crystal display (LCD).” Ex. 1013, [0003]. And Kobori similarly teaches that its invention relates to “techniques and equipment to perform image formation by applying a light flux from a light source to a ... liquid crystal panel.” Ex. 1011, [0002].

B. The Use of Individually Determined Currents for a Plurality of Light Sources Was Well Known in the Art Prior to the ’710 Patent

Patent Owner proposes amending certain claims to recite that “on-state drive currents” supplied to a “plurality of strings of solid state lighting devices” are “individually determined for each string.” Determining current supplied to lighting

devices in a group of lighting devices, such as LEDs, on an individual basis was well known prior to the alleged May 8, 2007, priority date of the '710 Patent.

Shteynberg discloses a “LED array driver circuit 100” that selectively supplies on-state drive currents to LED “strings” 110₁, 110₂, 110₃, through 110_N in Shteynberg’s lighting system. Ex. 1007, [0043], [0044], [0047], [0048], [0051]. Shteynberg discloses that “each” string of LEDs 110₁, 110₂, 110₃, through 110_N is “provided with a selected and *independent current level.*” Ex. 1007, [0054] (emphasis added). The independent and varied nature of such current levels across the LED strings is illustrated in Figure 10 of Shteynberg, for example:



Ex. 1007, Fig. 10; *see id.*, [0037], [0104].

Additionally, Kawabata discloses a “lighting unit 100” that “includes a lighting controller 30 that is made up of a plurality of control circuits 3 connected to the respective light-emitting elements 2.” Ex. 1012, [0061]. “The lighting controller 30 controls the emission states of the light-emitting elements 2 *independently by supplying drive signals (e.g., currents []) of substantially different types* to the respective light-emitting elements 2.” *Id.* (emphasis added); *see id.* (disclosing that

“as long as the lighting controller 30 can control the emission states of the respective light-emitting elements 2 independently, the lighting controller 30 does not have to be made up of multiple control circuits 3 ... but may be a single controller that is connected to the respective light-emitting elements 2”).

C. The Use of Pulse Width Modulation (PWM) Signals to Control Current Drive to Light Sources Was Well Known in the Art Prior to the '710 Patent

Patent Owner proposes amending certain claims to recite that “drive currents” supplied to “strings of solid state lighting devices” comprise an “independently determined PWM signal.” Controlling current supplied to lighting devices in a group of lighting devices via PWM signals was well known prior to the alleged May 8, 2007, priority date of the '710 Patent. Indeed, the “Background” of the '710 Patent readily acknowledges “[o]ne common method for controlling the current driven through the solid state lamps to achieve desired intensity and color mixing is a Pulse Width Modulation (PWM) scheme.” '710 Patent, 2:11–15; *see id.* at 10:44–46 (“One common method for controlling the current driven through the strings is a Pulse Width Modulation (PWM) scheme.”); *see also* Ex. 1019, at 46:10–24.

Likewise, Shteynberg discloses that it is well known that “pulse-width modulated (‘PWM’) signals” may be used “[f]or driving an array of LEDs” in a lighting system. Ex. 1007, [0003]. For example, Shteynberg states: “Multistring LED Drivers with PWM regulation are known.” *Id.*, [0004]. Shteynberg illustrates

such a system in its Figure 1, wherein a “LED light source 15” is controlled by a “*PWM 20 driving scheme*.” *Id.* (emphasis added). In particular, “[t]he color control system is implemented in a DSP controller 25 [], which supplies the PWM turn-on and turn off signals for the power supply.” *Id.* Shteynberg also discloses that it is well known to control LED strings in an LED array “by a [] current regulator with a processor ... using *pulse-width modulated signals*.” *Id.*, [0008] (emphasis added).

Moreover, Kobori discloses a lighting system wherein a “lamp driver 3” generates different “drive signal waveforms 3a to 3d for each of the LEDs 4-7.” Ex. 1011, [0027], [0029], Figs. 1, 3. Kobori discloses that “the drive current amount is indicated by an amplitude value AMP and the drive/stop interval is indicated by the drive cycle *PWM*.” *Id.* at [0027] (emphasis added); *see id.*, [0029].

D. Controlling the Luminous Intensities of a Plurality of Light Sources Was Well Known in the Art Prior to the '710 Patent

Patent Owner proposes amending certain claims to recite that the “luminous intensity” of “strings of solid state lighting devices” is determined and/or controlled (in addition to the “drive currents” supplied to the strings of solid state lighting devices). The “Background” of the '710 Patent, however, readily acknowledges that “[s]olid state lamps, such as LED’s, are current-controlled devices in the sense that the intensity of the light emitted from an LED is related to the amount of current driven through the LED.” ’710 Patent, 2:8–11; *see also* Ex. 1019, at 33:9–34:6.

Controlling the luminous intensity of a group solid state lighting devices was thus well known prior to the alleged May 8, 2007, priority date of the '710 Patent.

For example, Shteynberg discloses that it is well known to control LED strings in an LED array “by a [] current regulator with a processor, to alter the **brightness** and/or color of the generated light using pulse-width modulated signals.” Ex. 1007, [0008] (emphasis added); *see* Ex. 1020, ¶22 (explaining that a POSITA would have understood “brightness” as another term for “luminous intensity”).

Additionally, Shteynberg also discloses that its invention “provide[s] a multistring LED driver which controls current independently for each series of LEDs of the array, for corresponding effective color and **brightness control**.” Ex. 1007, [0011] (emphasis added). In particular, Shteynberg discloses that its “controller 125” sets a “duty cycle” for the time-division modulation control of the LED array driver circuit 100. *Id.*, [0080]. A POSITA would have understood that such control of the “duty cycle” for the current supplied to each LED string in Shteynberg has corresponding control of the “brightness” (or “luminous intensity”) of each LED string in Shteynberg. Ex. 1020, ¶23; *see* Ex. 1007, [0019] (“[T]he controller may be [] adapted ... to adjust an output brightness of the plurality of series of light-emitting diodes by modifying each corresponding period of time of current switching to each of the series of light-emitting diodes.”). *Cf.* '710 Patent, 9:33–36 (disclosing that

“brightness” of light emitted by each string is controlled by “duty cycle of current supplied to each string”).

Kawabata also discloses that, in its “lighting unit 100” wherein “lighting controller 30 controls the emission states of the light-emitting elements 2 independently by supplying drive signals (e.g., currents or voltages) of substantially different types to the respective light-emitting elements 2,” “the emission *intensities* of the light-emitting elements are also controllable by getting the magnitudes of the currents or voltages, supplied or applied to the light-emitting elements, ... adjusted by the lighting controller.” Ex. 1012, [0061], [0097] (emphasis added).

E. The Synchronization of a Firing Order and Luminous Intensities of a Plurality of Light Sources With Respect to a Display Operation Was Well Known in the Art Prior to the '710 Patent

Patent Owner proposes amending the certain claims to recite that both the “firing order” and “luminous intensity” of each string in a “plurality of strings of solid state lighting devices” is “synchronized” with “periodic operations of the display.” As noted above, these amendments impermissibly introduce new matter into the claims, including, but not limited to, because the specification of the '710 Patent is devoid of any reference to “periodic operations of the display.” *Supra* Section II. Patent Owner, however, suggests that disclosures in the specification of the '710 Patent with respect to synchronization of solely the “firing rate” of strings with the “refresh rate of the LCD display” provide written description support for

these amendments. *See* MTA at 8 (citing '710 Patent, 15:22–16:7); *see also supra* Section II. At least based on Patent Owner's apparent interpretation of these amendments, the elements were well known in the art prior to the '710 Patent.

Kawabata discloses a “lighting unit 100” wherein a “lighting controller 30 that is made up of a plurality of control circuits 3” controls emission states of “light-emitting elements 2 independently by supplying drive signals (e.g., currents []) of substantially different types to the respective light-emitting elements 2.” Ex. 1012, [0061]. When the lighting unit 100 is used in connection with a “liquid crystal panel 300,” Kawabata discloses that its “light-emitting regions 4” (corresponding to light-emitting elements 2) may be arranged in a “vertical scanning direction” of the liquid crystal panel 300, such that “as the pixels of the liquid crystal panel 300 are sequentially rewritten in the vertical scanning direction [], light can be emitted from one of the light-emitting regions 4 of the lighting unit 100 after another.” *Id.*, [0066]; *see id.*, [0060].

Put another way, Kawabata discloses “the lighting controller 30 is so constructed as to sequentially **turn ON and OFF** the respective light-emitting elements 2 **synchronously with the input of** the vertical sync signal to the **liquid crystal panel** 300.” *Id.*, [0069] (emphasis added). And, to this end, Kawabata discloses “[a] drive signal (i.e., ... a current signal) to be supplied to each of the light-emitting elements is a **periodic signal**, of which one period is **as long as** one

vertical scanning period of the liquid crystal panel 300.” *Id.*, [0069] (emphasis added). A POSITA would have understood that this means the firing rate of light-emitting elements 2 is synchronized with the refresh rate of the liquid crystal panel 300. Ex. 1020, ¶27. A POSITA would have understood that “vertical scanning period of the liquid crystal panel 300” described in Kawabata is the inverse of a “vertical scanning frequency,” which is also referred to as “refresh rate” in the art. *Id.*

Additionally, Kobori discloses a lighting system wherein a “lamp driver 3” generates different “drive signal waveforms 3a to 3d for each of the LEDs 4-7.” Ex. 1011, [0027], [0029], Figs. 1, 3. In particular, “the lamp driver 3 generates the drive signal waveforms 3a to 3d for each of the LEDs 4-7 so as to turn ON and OFF the LEDs 4 to 7.” *Id.*, [0029]. Kobori discloses “the luminiferous level of the LED which is ON is determined by the drive power.” *Id.*, [0029]. In an embodiment wherein Kobori’s lighting system is applied to a “display system having an image display panel,” Kobori discloses that the display panel receives light generated by the LEDs 4-7 in accordance with a “video display signal.” *Id.*, [0040]–[0041]. In such an embodiment, Kobori discloses that “the *luminiferous level* of the LED is corrected/controlled” “in *synchronization* with the *image refresh cycle of the input video signal*”—“thereby realizing luminiferous level control linking with the video signal.” *Id.*, [0043] (emphasis added).

IV. The Proposed Substitute Claims Are Not Patentable Over the Prior Art

A. Proposed Substitute Claims 58–61 Are Obvious Under § 103 Over the Combination of Shteynberg, Arai, Kawabata, and Kobori

As set forth in Ground 4 of the Petition, and as supported by the Reply, original claims 1 and 17 of the '710 Patent are obvious under § 103 over the combination of Shteynberg, Arai, and Kawabata in view of the knowledge of a POSITA. *See* Petition at 61–72; Reply at 19–21. Proposed substitute claim 58 (in place of claim 1) and proposed substitute claim 59 (in place of claim 17) are obvious under § 103 for the same reasons—in further view of Kobori. In particular, each of the new elements sought to be added to claims 58 and 59 (as well as dependent claims 60 and 61) were well known, including as disclosed in Shteynberg, Kawabata, and Kobori. And a POSITA would have been motivated to combine those references, with a reasonable expectation of success, to arrive at the claimed systems and methods for the reasons stated in the Petition and the Reply. *See* Petition at 61–62, 73–74; Reply at 21. Additional motivations are also set forth below.

1. Proposed Substitute Claim 58: “A Backlight System for an LCD Display”

“Generally, the preamble does not limit the claims.” *Allen Eng’g Corp. v. Bartell Indus., Inc.*, 299 F.3d 1336, 1346 (Fed. Cir. 2002). And Patent Owner has failed to demonstrate that its amendment to the preamble of proposed substitute claim 58—so as to recite a “backlight system for an LCD display,” as opposed to a

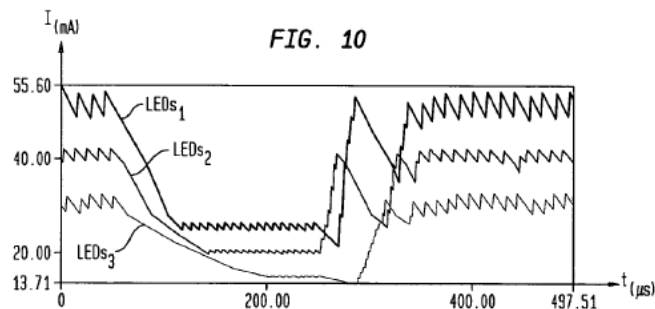
“lighting system”—is limiting. In any event, the preamble here “only [] state[s] a purpose or intended use for the invention” and is thus “not a claim limitation.” *Georgetown Rail Equip. Co. v. Holland L.P.*, 867 F.3d 1229, 1236 (Fed. Cir. 2017).

To the extent the amended phrase “backlight system for an LCD display” in the preamble of proposed substitute claim 58 is nonetheless determined to be a limitation, however, Shteynberg discloses, or alternatively renders obvious, the limitation. Shteynberg discloses a “lighting system” (*e.g.*, Ex. 1007, [0021]) and expressly states that one of the many “functional purposes” of its lighting system is “backlighting.” Ex. 1007, [0079]. And Patent Owner’s expert conceded that a POSITA would have understood the term “backlighting” to refer to “providing a lighting source for an LCD panel.” Ex. 1019, at 16:11–18:4.

The “Background” of the ’710 Patent also readily acknowledges that “[s]olid state lighting panels are commonly used as backlights for [] LCD display screens.” ’710 Patent, 1:32–34. Moreover, Arai teaches that a “backlight device” can be used in a “liquid crystal panel unit 2” to deliver display light to a “liquid crystal panel 1.” Ex. 1008, [0024], 0027]. Kawabata similarly teaches that its lighting unit can be used “as a backlight in a liquid crystal display device.” Ex. 1012, [0002]. As such, a POSITA would have found it obvious to use Shteynberg’s lighting system—which Shteynberg describes as being designed for a “backlighting” purpose—as a “backlight system for an LCD display.” Ex. 1020, ¶¶31–32; *see id.*, ¶¶11–12.

2. Proposed Substitute Claim 58: “Wherein the On-State Drive Current Is Individually Determined for Each String”

Shteynberg discloses this limitation. In particular, Shteynberg discloses a “LED array driver circuit 100” that selectively supplies on-state drive currents to LED “strings” 110₁, 110₂, 110₃, through 110_N in Shteynberg’s lighting system. Ex. 1007, [0043], [0044], [0047], [0048], [0051]; *see* Petition at 27–29. Shteynberg discloses that “each” string of LEDs 110₁, 110₂, 110₃, through 110_N is “provided with a selected and *independent current level*.” Ex. 1007, [0054] (emphasis added). The independent and varied nature of such current levels across the LED strings is illustrated in Figure 10 of Shteynberg, for example:



Ex. 1007, Fig. 10; *see id.*, [0037], [0104]. A POSITA would thus have understood that Shteynberg discloses that the drive currents supplied to LED “strings” 110₁, 110₂, 110₃, through 110_N in Shteynberg’s lighting system are “individually determined for each string.” Ex. 1020, ¶34.

Additionally, and/or alternatively, Kawabata discloses this limitation. Kawabata discloses a “lighting unit 100” that “includes a lighting controller 30 that is made up of a plurality of control circuits 3 connected to the respective light-

emitting elements 2.” Ex. 1012, [0061]. “The lighting controller 30 controls the emission states of the light-emitting elements 2 *independently by supplying drive signals (e.g., currents []) of substantially different types* to the respective light-emitting elements 2.” *Id.* (emphasis added); *see id.* (disclosing that “as long as the lighting controller 30 can control the emission states of the respective light-emitting elements 2 independently, the lighting controller 30 does not have to be made up of multiple control circuits 3 ... but may be a single controller that is connected to the respective light-emitting elements 2”).

And a POSITA would have been motivated to apply Kawabata’s teachings with respect to supplying “different types” of “drive signals” to different light sources to Shteynberg’s lighting system. Ex. 1020, ¶35. Kawabata discloses that, as a direct result of such a technique, “the lighting unit as a whole can emit light having a uniform luminance without causing the unwanted variation in luminance.” Ex. 1012, [0025]. And Kawabata makes clear that “the ‘drive signal’ may [] be either a voltage or a current itself that is applied to a light-emitting element and changes its level or amount with time.” Ex. 1012, [0025]. This comports with Shteynberg’s teaching that the current supplied to its string of LEDs 110₁, 110₂, 110₃, through 110_N is varied over time. Ex. 1007, [0043], [0044], [0047], [0048], [0051], [0054]. As such, a POSITA would have been motivated to and had a reasonable expectation of success in combining Shteynberg’s and Kawabata’s teachings to achieve

improved uniform luminance, and such combination was likewise well within the technical ability of a POSITA at the time. Ex. 1020, ¶35.

3. Proposed Substitute Claim 58: “The Control System Further Being Operable to Determine a Luminous Intensity of Each of the Strings in the Plurality of Strings”

Shteynberg discloses, or, at minimum, renders obvious this limitation. As a general matter, Shteynberg discloses that it is well known to control LED strings in an LED array—such as in Shteynberg’s lighting system—“by a [] current regulator with a processor, to alter the *brightness* and/or color of the generated light using pulse-width modulated signals.” Ex. 1007, [0008] (emphasis added). A POSITA would have understood “brightness” as another term for “luminous intensity.” Ex. 1020, ¶39. And the ’710 Patent itself even concedes that “the intensity of the light emitted from an LED is related to the amount of current driven through the LED.” ’710 Patent, 2:8–11. And Kawabata likewise discloses that, in its “lighting unit 100,” “the emission *intensities* of the light-emitting elements are also controllable by getting the magnitudes of the currents or voltages, supplied or applied to the light-emitting elements.” Ex. 1012, [0061], [0097] (emphasis added).

Additionally, Shteynberg discloses that its own lighting system “provide[s] a multistring LED driver which controls current independently for each series of LEDs of the array, for corresponding effective color and *brightness control*.” Ex. 1007,

[0011] (emphasis added). Again, a POSITA would have understood “brightness” as another term for “luminous intensity.” Ex. 1020, ¶40.

In particular, Shteynberg discloses that its “controller 125” “sets a “duty cycle” for the time-division modulation control of the LED array driver circuit 100. Ex. 1007, [0080]. A POSITA would have understood that such control of the “duty cycle” for the current supplied to each LED string has corresponding control of the “brightness” (or “luminous intensity”) of each LED string in Shteynberg. Ex. 1020, ¶40. Indeed, similar to the ’710 Patent’s disclosure, Shteynberg teaches that the “output brightness of the plurality of series of light-emitting diodes” is modified by “each corresponding period of time of current switching to each of the series of light-emitting diodes” (*i.e.*, the duty cycle). Ex. 1007, [0019]. *Cf.* ’710 Patent, 9:33–36 (’710 Patent disclosing that the “brightness of the light emitted by a string of solid state lighting devices “can be controlled” “by selectively controlling the amount and/or duty cycle of current supplied to each string”).

4. Proposed Substitute Claim 58: “Wherein the Control System is Configured to Receive a Synchronization Signal from a Display Controller Configured to a Display and Wherein the Firing Order of the Plurality of Strings and the Luminous Intensity of Each of the Strings ... Are Synchronized With Periodic Operations of the Display”

The combination of Shteynberg, Arai, Kawabata, and Kobori renders obvious this limitation in view of the knowledge of a POSITA. Ex. 1020, ¶¶42–48.

Kawabata discloses a “lighting unit 100” wherein a “lighting controller 30” controls emission states of “light-emitting elements 2 independently by supplying drive signals (e.g., currents []) of substantially different types to the respective light-emitting elements 2.” Ex. 1012, [0061]. And Kawabata discloses that, in an LCD embodiment, the “drive signal (i.e., ... a current signal) [] supplied to each of the light-emitting elements is a periodic signal, of which one period is as long as one vertical scanning period of the liquid crystal panel 300.” *Id.*, [0069].

A POSITA would have understood that this means the firing rate of light-emitting elements 2 is synchronized with the refresh rate of the liquid crystal panel 300. Ex. 1020, ¶43; *see id.*, ¶¶26–27. In particular, the controller 30 “turn[s] ON and OFF the respective light-emitting elements 2 **synchronously** with the **input** of the vertical sync signal to the liquid crystal panel 300.” Ex. 1012, [0069] (emphasis added). In order to achieve this, a POSITA would have understood that the controller 30 receives some type of signal that is synchronized with the “vertical sync signal”—*i.e.*, the claimed “synchronization signal.” Ex. 1020, ¶43. And as such, “each light-emitting element 2 should start to emit light synchronously with the input of a video signal to a predetermined display area of the liquid crystal panel 300.” Ex. 1012, [0070]; *see* Ex. 1020, ¶43.

Additionally, Kobori discloses a lighting system wherein a display panel receives light generated by the LEDs 4–7 driven by a “luminiferous control circuit

1” in accordance with a “video display signal.” Ex. 1011, [0040]–[0041]. In particular, Kobori discloses that an “image processor 13” receives a “input video signal” and thereby controls both “display panel 14” as well as “the luminiferous level received by the luminiferous control circuit 1 in a linking relation with the brightness and color components of the input video signal.” *Id.*, [0042], Fig. 4. As such, “the luminiferous level of the LED is corrected/controlled” “in *synchronization* with the image *refresh cycle* of the input video signal.” *Id.*, [0043]. A POSITA would have understood that the luminiferous control circuit 1 receives a “synchronization signal” from the image processor 13 to achieve this described “synchronization.” Ex. 1020, ¶44.

A POSITA would thus understand that, collectively, Kawabata and Kobori disclose “synchroniz[ing]” both a “firing” rate of light sources (“sequentially turn ON and OFF the respective light-emitting elements 2) and the “luminous intensity” of the light sources (“the luminiferous level of the LED”) with a “vertical scanning period” (*i.e.*, “refresh rate”) / “image refresh cycle” of a display panel based on an “video signal” input. Ex. 1012, [0069]–[0070]; Ex. 1011, [0040]–[0041], [0043]; *see* Ex. 1020, ¶¶43–44.

Kawabata teaches that its disclosed synchronization results in “a lighting unit causing substantially no luminance variation.” Ex. 1011, [0074]. And Kobori expressly teaches that its disclosed synchronization similarly eliminates any

“uncomfortable feeling” in viewing the display. Ex. 1011, [0043]. Petitioner’s expert, Mr. Betancourt, testified that this “uncomfortable feeling” sought to be avoided in the prior art is the same “unwanted effects due to the interference of non-synchronized processes” that the ’710 Patent sought to solve via its described synchronization of the “firing” rate of a backlight panel with the “refresh rate” of an LCD. Ex. 1020, ¶46; *see* ’710 Patent, 15:44–50.

A POSITA would thus have been motivated to modify the display system in Shteynberg to introduce the synchronization described and taught in Kawabata and Kobori to alleviate any “uncomfortable feeling” caused by the various drive currents delivered to LED “strings” 110₁, 110₂, 110₃, through 110_N in Shteynberg’s lighting system in any “backlighting” implementation of Shteynberg’s lighting system. Ex. 1020, ¶¶45–48; *see* Ex. 1007, [0079] (Shteynberg disclosing “backlighting” as one of the “functional purposes” of its lighting system). And a POSITA would have had a reasonable expectation of success in combining these disclosures in view of the skill in the art as Kawabata’s and Kobori’s detailed teachings. Ex. 1020, ¶47.

5. Proposed Substitute Claim 59: “In a Backlight System for an LCD Display”

To the extent the amended phrase “in a backlight system for an LCD display” in the preamble of proposed substitute claim 59 is limiting, Shteynberg discloses, or alternatively renders obvious, the limitation for the reasons discussed above with respect to the similar amended preamble of Claim 58. *Supra* Section IV.A.1.

6. Proposed Substitute Claim 59: “Wherein the Firing Order and Luminous Intensity of Each of the Strings Are Synchronized with Periodic Operations of the Display”

The Shteynberg-Arai-Kawabata-Kobori combination discloses or renders obvious this limitation for the reasons discussed above with respect to the similar amended limitation of Claim 58. *Supra* Section IV.A.4.

7. Proposed Substitute Claims 60–61: “Wherein Each Drive Current [] Comprises an Independently Determined PWM Signal”

Shteynberg discloses, or, at minimum, renders obvious this limitation. As discussed, Shteynberg discloses supplying drive currents to LED “strings” 110₁, 110₂, 110₃, through 110_N, wherein “each” string is “provided with a selected and independent current level.” Ex. 1007, [0054]; *see id.*, [0043], [0044], [0047], [0048], [0051]; *see also* Petition at 27–29. And Shteynberg notes that it is well known in the prior art that “pulse-width modulated (‘PWM’) signals” may be used “[f]or driving an array of LEDs” in a lighting system like Shteynberg’s. Ex. 1007, [0003]; *see id.*, [0008] (disclosing that it is well known to control LED strings in an LED array “by a [] current regulator with a processor ... using pulse-width modulated signals”); *see also id.*, [0004] (describing prior art system wherein “LED light source 15” is controlled by a “PWM 20 driving scheme”).

As such, a POSITA would have understood, or at least found it obvious, that the independently determined drive currents supplied by the “LED array driver

circuit 100” in Shteynberg’s lighting system may comprise PWM signals. Ex. 1020, ¶¶51–53. As expressly acknowledged by Shteynberg (above), the use of PWM signals to this end is a common technique well known in the art. Ex. 1020, ¶52. Even the ’710 Patent readily acknowledges “[o]ne common method for controlling the current driven through the solid state lamps ... is a Pulse Width Modulation (PWM) scheme.” ’710 Patent, 2:11–15; *see id.* at 10:44–46 (“One common method for controlling the current driven through the strings is a Pulse Width Modulation (PWM) scheme.”); *see also* Ex. 1019, at 46:10–24.

Patent Owner’s claim that Shteynberg “distinguished” its lighting system “from pulse-width modulation” (MTA at 18) is incorrect and misleading. Shteynberg simply notes—at the end of its overall disclosure—an alternative “variation” of the time-division modulation discussed throughout Shteynberg, wherein the “power converter” is “shut[] down ... for a determined number of cycles” as opposed to “changing a duty ratio of each switching cycle of [the] power converter ... as is done with pulse-width modulation.” Ex. 1007, [0115].

B. Proposed Substitute Claims 58–61 Are Obvious Under § 103 Over the Combination of Shteynberg, Arai, Kawabata, Kobori, and Zhang

To the extent Patent Owner argues proposed substitute claims 58–61 are not obvious over the combination of Shteynberg, Arai, Kawabata, and Kobori because those references do not disclose or render obvious the claimed “firing logic

configured to determine a firing order of the plurality of strings” (claim 58) and/or the claimed “non-spatially-sequential firing order” (claim 59), the proposed substitute claims are obvious under § 103 over the combination of Shteynberg, Arai, Kawabata, Kobori, and Zhang in view of the knowledge of a POSITA.

As set forth in Ground 1 of the Petition, and as supported by the Reply, original claims 1 and 17 of the ’710 Patent are obvious under § 103 over the combination of Shteynberg, Arai, and Zhang in view of the knowledge of a POSITA. *See* Petition at 22–49; Reply at 4–16. Proposed substitute claim 58 (in place of claim 1) and proposed substitute claim 59 (in place of claim 17) are obvious under § 103 for the same reasons, in further view of Kawabata and Kobori. In particular, each of the new elements sought to be added to claims 58 and 59—as well as dependent claims 60 and 61—were well known, including as disclosed in Shteynberg, Kawabata, and Kobori, as discussed above (*supra* Section IV.A). And a POSITA would have been motivated to further modify the lighting system of Shteynberg to incorporate the “firing logic” and “firing order” disclosed in Zhang—including the “non-spatially-sequential firing order” disclosed in Zhang—for the reasons stated in the Petition and the Reply. *See* Petition at 23–24, 33–38, 47–49; Reply at 4–6.

V. Conclusion

For all these reasons, Patent Owner’s Contingent Motion to Amend should be denied.

Respectfully submitted,

By: /s/ *Matias Ferrario*
Matias Ferrario
Registration No. 51,082

CERTIFICATE OF SERVICE

The undersigned hereby certifies that on the date below a copy of this
**PETITIONER'S OPPOSITION TO PATENT OWNER'S CONTINGENT
MOTION TO AMEND** has been served via email on the following:

hni@nilawfirm.com
twang@nilawfirm.com
nmassand@nilawfirm.com

Dated: October 17, 2024

By: /s/ Matias Ferrario
Matias Ferrario
Registration No. 51,082