

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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SAMSUNG ELECTRONICS CO., LTD. and SAMSUNG ELECTRONICS  
AMERICA, INC.,  
Petitioner

v.

POLARIS POWERLED TECHNOLOGIES, LLC,  
Patent Owner

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Case IPR2023-00484  
U.S. Patent No. 8,217,887 B2

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**DECLARATION OF THOMAS L. CREDELLE**

***Mail Stop "PATENT BOARD"***  
Patent Trial and Appeal Board  
U.S. Patent and Trademark Office  
P.O. Box 1450  
Alexandria, VA 22313-1450

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I, Thomas Credelle, declare under penalty of perjury as follows:

**I. INTRODUCTION AND BACKGROUND**

1. I have been retained as an expert witness by Polaris PowerLED Technologies, LLC (“Polaris”) and have been asked to provide my expert opinions regarding U.S. Patent No. 8,217,887 (EX1001).

2. In this declaration I provide my independent analysis of the ’887 patent in light of the materials cited below and my knowledge and experience in this field during the relevant time frame. I have been asked to consider what one of ordinary skill in the art at the time of the invention of the ’887 patent (a “POSITA”; refer to Section V below) would have understood from the specification, including scientific and technical knowledge related to the patent. I have also been asked to consider whether certain references disclose or render obvious the invention described by claims 1-21 of the ’887 patent.

3. My findings, as explained below, are based on my study, experience, and background in the fields discussed below, informed by my education in electrical engineering and solid state optics. I have also relied on my review and analysis of the prior art, information provided to me, and information that I have independently reviewed.

4. I am being compensated for my independent analysis as an expert with respect to this *inter partes* review proceeding at my standard hourly rate of

\$500/hour but my compensation is not contingent in any way on the content of my analysis or the outcome of this proceeding. I have no financial interest in Petitioner (Samsung) or Patent Owner (Polaris) and I have no financial interest in the challenged patent.

## II. QUALIFICATIONS

5. Details of my professional qualifications and background are set out in my *curriculum vitae* (EX2002) As shown in my *curriculum vitae*, I have devoted my career to the research and development and product engineering of flat panel displays and materials/optics/electronics for flat panel displays. I have over 20 years of involvement in active-matrix LCD R&D, starting in 1983 at RCA Labs and continuing at GE. I led the product development of active-matrix LCDs for notebook computers at Apple in the early 90's and had close collaboration with many LCD developers in Asia. Later in my career, while at Clairvoyante, I made significant contributions to the design and implementation of new pixel architectures for LCDs and OLEDs; both efforts involved TFT design modifications to achieve the desired goals of high pixel transmission and reduced circuit complexity. More recently, I have been involved in several patent litigation cases which required a detailed knowledge of TFT design and processing.

6. I am currently the President of TLC Display Consulting and split my time between technical consulting and patent litigation support.

7. I received my M.S. degree in Electrical Engineering from the Massachusetts Institute of Technology in 1970, with an emphasis on Electro optics and Solid-State Materials. I received my B.S. degree in Electrical Engineering in 1969 from Drexel University.

8. I was employed by RCA at Sarnoff Labs in Princeton, NJ from 1970 through 1986 at first as a Member of the Technical Staff and later as a Group Manager in charge of all Active Matrix LCD research. During my time at RCA, I participated in research and development projects relating to optical materials and flat panel displays, including LCD devices. In 1983, I established the Thin Film Transistor (“TFT”) LCD Program at Sarnoff Labs. As a Group Manager, I led a project that resulted in the development of the first poly silicon TFT LCD at Sarnoff Labs. I received the Sarnoff Outstanding Achievement Award for Large Area Flat Panel TV Developments.

9. From 1986 to 1991, I was employed by GE as the Manager of TFT LCD Research and Development at the GE Research and Development Center in Schenectady, NY. My duties included contributing to and managing research and development efforts relating to TFT and LCD technology for avionics applications. While employed by GE, I led the team that built the world’s first 1-million-pixel color LCD device. I also led the development of numerous other display devices utilizing LCD technology.

10. From 1991 to 1994, I was employed by Apple Computer as the Manager of Display Engineering. In my role at Apple, I supervised all TFT-LCD design (in-house and at vendors), engineering, and qualification for the first PowerBook notebook computers introduced to market in the United States. A key part of my effort was the evaluation and development of active matrix LCDs with improved performance, such as viewing angle, contrast ratio and uniformity and backlight control.

11. From 1994 to 1996, I was employed as the Director of Advanced Product Marketing by Allied Signal, where I was involved with the design and engineering of optical films and custom focusing LED backlight designs for improving the viewing angle performance of LCD devices.

12. From 1996 to 1999, I was employed as the Director of Product Marketing for Motorola's Flat Panel Display Division, where I worked in the development of new flat panel technology, and I also worked closely with Motorola groups responsible for integrating TFT-LCD technology into mobile phone products.

13. From 1999 to 2001, I served as the Vice President of Operations of Alien Technology Corporation. During my time at Alien Technology, I was involved with the design and architecture of drive electronics packaging technology suitable for flexible LCD devices.

14. From 2001 to 2007, I served as the Vice President of Engineering for Clairvoyante, Inc. My responsibilities as the VP of Engineering included managing research, development, engineering, and marketing of technologies for improving the resolution and power consumption of color flat panel displays, which required significant changes to the TFT-LCD layout and LED backlight. During my time at Clairvoyante, I was therefore heavily involved with the design of the active-matrix array and the LCD driving circuitry. My work resulted in the issuance of multiple patents relating to TFT-LCD and TFT-OLED display technology.

15. From 2007 to 2008, I served as the Senior VP of Engineering for Puredepth, Inc. My responsibilities included the design of hardware and software to create 3D images on TFT-LCDs. Hardware included a high-brightness, high power LED backlight source that had to survive in slot machines 24/7. LED backlight controllers were an important part of this development work.

16. From 2008 to 2012, I served as VP Engineering at Display Engineering, a company founded to design and sell high-brightness LED-LCDs for outdoor use. Commercial LCD displays were converted to high brightness through a complete redesign of the LED backlight, LED driving circuits, and LED cooling. LED controllers were selected based on the requirements of the newly engineered LED backlights, which were based on strings of LEDs.

17. From 2012 through 2015, I served as the Vice President of Application Engineering and Device Performance for Innova Dynamics, Inc., a nanotechnology company developing materials to be used in LCDs and touch sensors. In 2008, I founded TLC Display Consulting, a company that provides technical consulting in the areas of flat panel displays, liquid crystal displays, and related electronics. I currently serve as the President of TLC Display Consulting.

18. I have been an active member of the Society for Information Display (“SID”) for over 40 years, having attended every SID Annual Technical Symposium since 1972. I was a member of the Society for Information Display’s Program Committee for 15 years, and the Director of the Society for Information Display’s Symposium Committee for 10 years. In 1984, I was awarded the title of Fellow of the Society for Information Display in recognition of my achievements and contributions to flat panel display technology.

19. I am a named inventor on over 80 US patents relating to flat panel display and LCD technology. I have also authored several articles relating to LCD technology and flat panel displays that were published by industry periodicals such as Information Display and peer reviewed journals such as the Society for Information Display’s Digest of Technical Papers.

20. Because of my background, training, and experience, I am qualified as an expert in the technical areas relevant to the ’887 patent.

### III. MATERIALS CONSIDERED

21. In preparing this declaration, I have considered the claims, specification, and prosecution history of the '887 patent. As part of my analysis for this Declaration, I have considered my own knowledge and experience, including my work and experience with LCDs and LEDs. Additional materials that I have reviewed in preparing this declaration include the following documents:

| <u>Document</u> | <u>Description</u>                                                                                                                            |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Paper 1</b>  | <i>Samsung Elecs. Co. v. Polaris PowerLED Techs., LLC</i> , Case No. IPR2023-00484, Petition for Inter Partes Review (P.T.A.B. Feb. 2, 2023). |
| <b>EX1001</b>   | U.S. Patent No. 8,217,887                                                                                                                     |
| <b>EX1002</b>   | Declaration of Dr. Hatalis                                                                                                                    |
| <b>EX1004</b>   | File history for '887 patent                                                                                                                  |
| <b>EX1005</b>   | Japanese Published Patent Application 2006-18200 to Seo, with certified translation ("Seo")                                                   |
| <b>EX1006</b>   | U.S. Patent Publication No. 2007/0279369 ("Yao")                                                                                              |
| <b>EX1007</b>   | U.S. Patent Publication No. 2008/0180414 to Fung ("Fung")                                                                                     |
| <b>EX1008</b>   | U.S. Patent No. 7,952,556 to Honbo ("Honbo")                                                                                                  |
| <b>EX2003</b>   | U.S. Pub. No. 2010/0073903 to Yun et al.                                                                                                      |
| <b>EX2004</b>   | U.S. Pub. No. 2010/0177258 to Shinozaki et al.                                                                                                |

### IV. CLAIM CONSTRUCTION

22. It is my opinion that none of the terms of the '887 patent require explicit construction by the Board in order to resolve the issues presented in the Petition. In forming the opinions provided herein, I have applied the plain meaning of each claim term as it would have been understood by a person of ordinary skill in the art ("POSITA").

**V. PERSON OF ORDINARY SKILL IN THE ART (“POSITA”)**

23. I understand that the teaching of the prior art is viewed through the eyes of a POSITA. Counsel for Polaris has informed me that a person of ordinary skill in the art is a hypothetical person who is presumed to have known the relevant art at the time of the invention. In my opinion, the relevant field of art for the patents-in-suit is that of electrical engineering and display technologies. I have also been informed by counsel for Polaris that the person of ordinary skill is generally familiar with the type of problems encountered in the field and the prior art solutions to those problems and possesses an ordinary level of creativity.

24. In my opinion, a person of ordinary skill in the art of the patent-in-suit would include someone who had a bachelors or graduate degree in electrical engineering or a similar discipline together with knowledge of electrical engineering, display technology, and optics, together with approximately two or three years of experience in the field relating to electrical engineering. The required levels of educational and industry experience are on a sliding scale relative to each other. For example, a person of ordinary skill could potentially have no educational degree but more industry experience or, conversely, could have something higher than an undergraduate degree with fewer years of industry experience.

## **VI. BACKGROUND OF THE '887 PATENT**

### **A. Brief Summary of the '887 Patent**

25. U.S. Patent No. 8,217,887 (the “'887 patent”), entitled “System and method for backlight control for an electronic display,” is directed to methods and apparatuses for control of an electronic display. Claim 1 describes an exemplary embodiment of the invention for controlling the luminosity levels of a plurality of LED strings:

1. A control circuit for an electronic display comprising:
  - a first circuitry for controlling a plurality of pixels for displaying a plurality of image frames of a video;
  - a second circuitry for controlling a plurality of pixels for displaying a plurality of image frames of a video;
  - the second circuitry for displaying each image frame of the plurality of image frames for a predetermined period of time, the second circuitry configured to change a displayed image frame once every cycle of a first clock signal having a first frequency; and
  - the first circuitry for adjusting the luminosity levels of the plurality of strings of LEDs for a plurality of times within the predetermined period of time, the first circuitry configured to adjust the luminosity levels according to a second clock signal having a second frequency that is a multiple of the first frequency and is higher than the first frequency.

26. The '887 patent's claims relate to a specific arrangement of circuitry for controlling the luminosity level of a plurality of LED strings. Namely, the first

and second clock signals, the latter of which is a multiple of the former, are used to adjust the luminosity levels of the plurality of strings of LEDs. This adjustment takes place a plurality of times during a predetermined period of time, which corresponds to the length of time a single frame is displayed by the electronic display. EX1001, 2:36-38. The '887 patent further explains that controlling string luminosity in such a way provides the ability to make a gradual transition between the luminosities of two successive frames, such as, for example, from a bright frame to a dark frame. EX1001, 2:39-42.

## **VII. SUMMARY OF PRIOR ART**

### **A. Japanese Application No. 2006-18200 (“Seo”)**

27. Seo—which is relied on in the Petition as the primary reference in all Grounds, Pet., 3—relates primarily to a method for achieving uniform reduction of flicker and motion artifacts present on an electronic display. EX1005, ¶¶40-41. A known problem in electronic displays with pulsed backlights, “flicker” consists of human-visible artifacts from the pulse of the display backlight, and motion artifacts are a common visual byproduct of pulsing the backlight of a device too slowly. *See* EX1005, ¶33 (explaining that “flicker is suspected of causing dizziness, malaise, vomiting, and epilepsy” and characterizing flicker as “a safety issue”). Seo addresses both issues by controlling the backlight comprising lamps using a looped pulse-width modulation cycle with a higher clock rate than the refresh rate, such

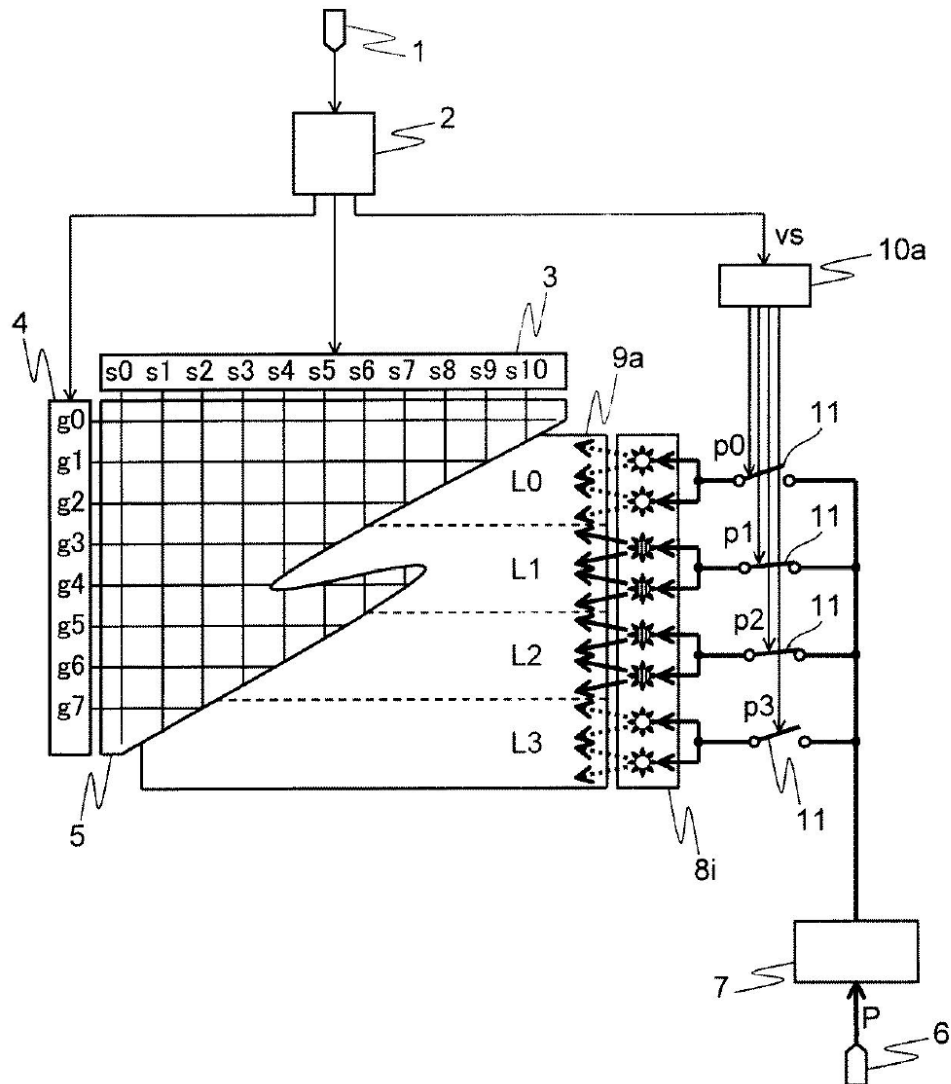
that “flicker can be reduced while keeping the display brightness constant as a whole.” EX1005, ¶41.

28. Seo’s aim is different than that of the ’887 patent. The ’887 patent intends to *make changes* to string luminosity to create a smoother transition from one frame to another. *See* EX1001, 2:40-42 (“... provides the ability to ma[k]e a gradual transition between the luminosities of two successive frames, for example, from a bright frame to a dark frame.”). Seo, by contrast, aims to keep the display brightness *constant*. EX1005, ¶41 (“... flicker can be reduced while keeping the display brightness constant as a whole”). In short, Seo aims to address display artifacts *without* any change in display brightness, while the ’887 patent aims to improve display quality by *making multiple changes* to luminosity levels of LED strings during a frame. Thus, Seo and the ’887 patent are diametrically opposed in this regard.

29. Seo’s LCD has an edge-type backlight structure, with the lamp(s) 8i (light source) connected in parallel groups, arranged on the edge of the display, and provide light to a light guide plate 9a in order to distribute the light to the liquid crystal panel. *See, e.g.,* EX1005, ¶¶16-19, FIG. 1 (showing lamps arranged on edge of display and light guide plate 9a); *see also* EX2003, ¶7 (Samsung application explaining that “[t]he backlight unit may be divided into a direct type and an edge type depending on the position of a light source. The direct type backlight unit

includes a light source disposed under the liquid crystal panel, [...] the edge type backlight unit includes a light source disposed on a side surface of the liquid crystal panel.”); EX2004, ¶21 (explaining that a “direct-lighting type backlight” has a “configuration [that] is different from a side-lighting type backlight”).

FIG. 1



EX1005, FIG. 1.

**B. U.S. Application No. 2008/0180414A1 (“Fung”)**

30. Fung—which is relied on in the Petition in combination with Seo, Pet., 3—concerns a system with strings of LEDs and the ability to modulate the light output of individual strings. Fung, unlike Seo, utilizes a *direct-type* backlight structure. Specifically, Fung’s backlight 106 utilizes LED strings located directly behind the liquid crystal panel 102, as opposed to the edge lighting scheme of Seo. EX1007, ¶19 (“BLU 106 . . . is [] behind and in correspondence with the LCD unit 102.”), FIG. 1; *see also* EX2003, ¶7. Fung’s LCD thus uses a fundamentally different type of backlight than Seo.

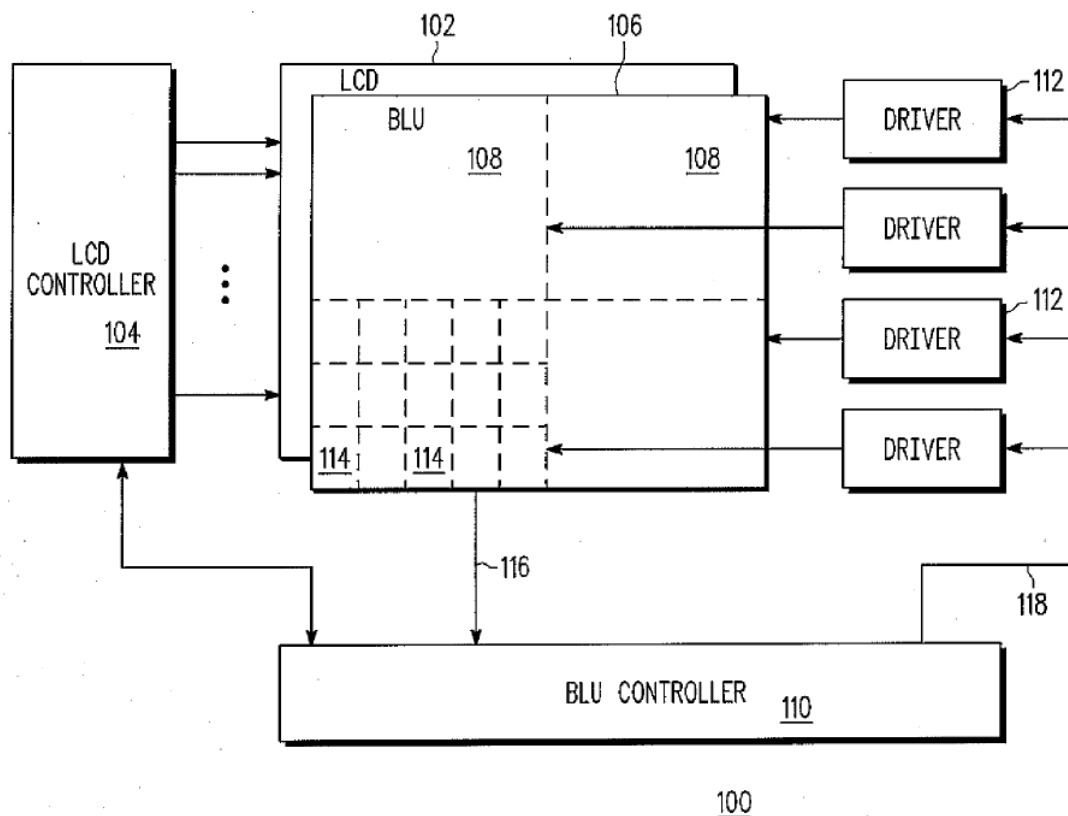


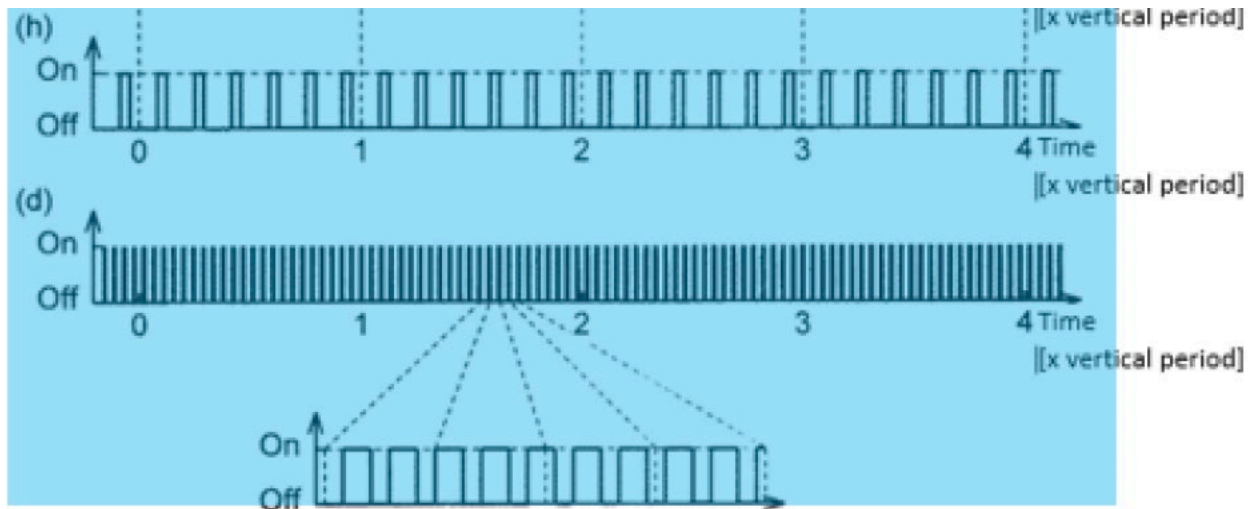
**FIG. 1**

EX1007, FIG. 1.

**VIII. THE SEO-BASED COMBINATIONS DO NOT RENDER CLAIMS 1-21 OF THE '887 PATENT OBVIOUS**

31. It is my opinion that, contrary to the claims made in the Petition, Seo does not disclose adjusting or adjustment of the luminosity levels of a plurality of strings of LEDs, let alone multiple times during a frame, as claimed in the '887 patent's independent claims 1, 13, and 17. It is also my opinion that Seo does not disclose or render obvious a plurality of strings of LEDs, as required by the independent claims. It is thus my opinion that Seo cannot disclose or render obvious claims 1-21, either alone or in combination with the other references asserted in the Petition.

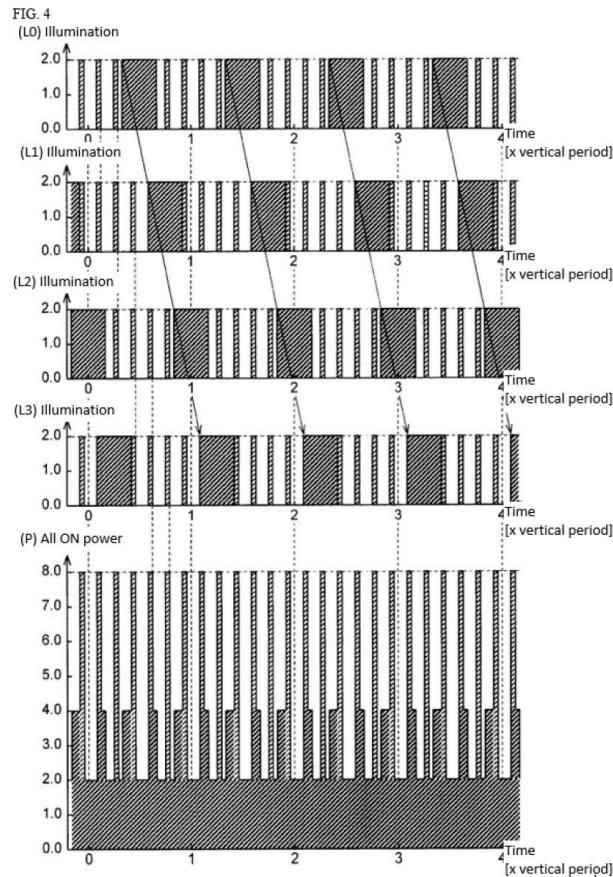
32. A POSITA would not consider what is described in the Petition or by Petitioner's Expert, Dr. Hatalis, to be "adjustment" of luminosity levels of LED strings for several reasons. *First*, the Petition incorrectly conflates the usage of pulse width modulation ("PWM") with an "adjustment" of luminosity of LED strings. Petitioner points to Figure 9 of Seo (reproduced below) as allegedly showing multiple adjustments of luminosity per frame.



Pet., 33 (figure annotated by Petitioner).

33. Regarding the figure above, Petitioner claims that the signals “h” and “d” show adjustments to the luminosity. Pet., 33. The Petition specifically argues that “h” will “adjust the luminosity 6 times in a single ‘vs’ period” and “d” “will adjust the luminosity even more times than ‘h’ within the same ‘vs’ time period.” Pet., 33. But this is not accurate. Both “h” and “d” are only PWM *clock signals* that control the ON duration of the LED at a constant brightness across all four frames shown in the figure. PWM is simply a known technique for accomplishing brightness control in electronic displays—and is openly acknowledged by the ’887 patent. EX1001, 1:47-56. Seo’s pulsing of a backlight in a fixed pattern over the time period of a frame results in constant display brightness over the period of the frame. Seo’s clock signals “h” and “d” thus do not show *any* adjustments to the luminosity levels of the plurality of LED strings in the “vs” time period.

34. **Second**, the “luminosity” of the LEDs is not changed in Seo. A review of Seo’s disclosures confirms that the intent, as compared to the ’887 patent, is to “keep[] the display brightness constant as a whole,” while reducing flicker. EX1005, ¶41. Critically, not only does Seo identify this as a chief aim of the invention, it is also made clear in Seo’s diagrams.



EX1005, FIG. 4.

35. Figure 4 of Seo, above, shows the waveform of a system embodying the invention described in Seo and relied on in the Petition. As shown at the bottom, labeled “(P) All ON power,” the PWM cycle of Seo’s backlight lamps

generates a consistent display brightness over each of the four frames shown.

Across the time period of a frame, each lamp L0-L3 shown in Figure 4 maintains a constant illumination using only a repeated PWM pattern that is designed to emit a set amount of light during the frame. And, as shown in Seo, this pattern of illumination is not modified during any of the frames. Rather, each lamp emits a consistent amount of light across each of the four frames.

36. Because each light source has a constant, repeating PWM waveform over *each frame*, a POSITA would not consider Seo to teach or suggest that the luminosity levels of the light sources of Seo are adjusted—let alone multiple times within the time period of a frame.

37. ***Finally***, Seo does not disclose or render obvious “strings” of LEDs as required by the independent claims. Seo mentions that LEDs may be used as the light source (lamp 8i) of the backlight but Seo makes no disclosure of how the LEDs are electrically connected. As I explained above, Seo’s LCD has an edge-type backlight structure, with the lamp(s) 8i (light source) appear to be connected in parallel (not as strings in series), arranged on the edge of the display, and provide light to a light guide plate 9a in order to distribute the light to the liquid crystal panel. *See*, e.g., EX1005, ¶¶16-19, FIG. 1 (showing lamps arranged on edge of display and light guide plate 9a). The Petition claims that “Seo’s multi-LED light sources in each zone (L0 through L3) are coupled to a power supply on one

end ... and to ground on the other end,” but the Petition does not appear to cite any actual disclosure from Seo supporting this claim. Pet., 23; EX1002, ¶82. Seo simply does not teach or suggest the usage of strings of LEDs.

38. For the *reasons* enumerated above, it is my opinion that Seo does not disclose independent claim 1, 13, or 17 of the '887 patent, and as such also does not disclose any dependent claim of the '887 patent.

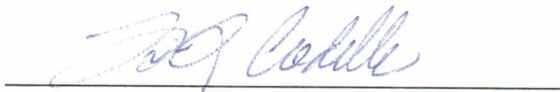
**IX. ADDITIONAL REMARKS**

This declaration reflects my opinions as currently held. However, my analysis may continue such that I may consider additional information that may result in additional observations.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the U.S. Code.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Executed on May 23, 2023 in Powell Butte, OR.



Thomas L. Credelle