

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

QUASAR SCIENCE LLC

Petitioner,

v.

COLT INTERNATIONAL CLOTHING, INC. d/b/a COLT LED

Patent Owner

SUPPLEMENTAL DECLARATION OF FRED HOLMES

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Supplemental Declaration of Fred Holmes

I, Fred Holmes, hereby declare as follows:

1. I have submitted a prior declaration in this *inter partes* review (IPR).
(Ex-1003, IPR2023-00614, “First Declaration”).

2. I understand the Patent Owner, Colt International Clothing, Inc., d/b/a Cold LED (“Colt”), has submitted various declarations challenging my opinions in my First Declaration. I submit this Supplemental Declaration in support of my opinions.

I. Materials Considered and Affirmation of Prior Opinions

3. In preparing this Supplemental Declaration, I have considered at least the following documents:

Exhibit No.	Exhibit Description
1001	U.S. Patent No. 10,566,895 to Macias (“the ’895 Patent”)
1002	File History for U.S. Patent No. 10,566,895 (“File History”)
1003	Declaration of Fred Holmes (“Holmes Decl.”)
1004	U.S. Patent No. 7,507,001 to Kit (“Kit”)
1005	U.S. Patent No. 7,350,936 to Ducharme et al. (“Ducharme”)
1006	U.S. Publication No. 2010/0102729 to Katzir <i>et al.</i> (“Katzir”)
1007	WO 2009/063520 to Ianiro (“Ianiro”)
1008	U.S. Patent No. 8,668,361 to Hasnain <i>et al.</i> (“Hasnain”)
1009	U.S. Publication No. 2010/0102960 to Ivey <i>et al.</i> (“Ivey”)
1010	U.S. Publication No. 2010/0315001 to Domagala <i>et al.</i> (“Domagala”)
1011	U.S. Patent. No. 7,049,761 to Timmermans <i>et al.</i> (“Timmermans”)
1012	U.S. Publication No. 2004/0052076 to Mueller <i>et al.</i> (“Mueller”)
1013	International Publication No. 2005/012997 to Morgan <i>et al.</i> (“Morgan”)
1014	“When white light isn’t white” by Mike Wood, 2008
1015	Astera LED-Technology User Manual Wireless Pixel Tube (AL1) v.3.2.20 (July 23, 2010)
1022	U.S. Pat. No. 7,972,022

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Exhibit No.	Exhibit Description
1023	June 3, 2011 B&M Lighting Press Release on Mac Tech
1025	Full deposition transcript of Mr. Todd Csernecky
1033	February 9, 2010 capture of LEDlight.com for the URL http://www.ledlight.com:80/t12-t8-led-tube-light-4foot-15-watt.aspx from The Wayback Machine
1034	February 10, 2010 capture of LEDlight.com for the URL http://www.ledlight.com:80/led-tube-lighting.aspx from The Wayback Machine
1035	February 17, 2010 capture of LEDlight.com for the URL http://www.ledlight.com:80/smt-210-3528-t5-tube-light-fixture-16-watt.aspx from The Wayback Machine
1036	March 24, 2010 capture of LEDlight.com for the URL http://www.ledlight.com:80/led_digital_tube_dmx512_interlinkable_120_vac.aspx from The Wayback Machine
1037	March 5, 2010 YouTube Video of LEDLight.com advertisement at URL https://www.youtube.com/watch?v=8fYKW8SRx6g
1039	Full deposition transcript of Gary Allen, Ph.D., April 19, 2024
1042	Full deposition transcript of Kevin Baxter, April 10, 2024
1043	Full deposition transcript of Ken Scott Fisher, April 12, 2024
1046	Full deposition transcript of Bruce Wonderlick [Confidential - Protective Order Material]
1047	Full deposition transcript of Guillermo Macias [Confidential - Protective Order Material]
1048	Box, Harry C., “ <i>Set Lighting Technician's Handbook: Film Lighting Equipment, Practice, and Electrical Distribution</i> ,” Butterworth-Heinemann, ISBN 0-240-80161-X (1993), pp. 92-104 and 135-144.
1060	Ex. 1060 - Colt LED Tubes - Wamco Webpage
1061	Ex. 1061 - Colt LED Tube Catalog
1062	Ex. 1062 - ROHM Semiconductor, PSL0102 series, PSL0102WBFC Data Sheet (2012)
2041	Declaration of Toss Csernecky
2047	Declaration of Kevin Baxter
2066	Declaration of Fernando Silva
2080	Declaration of Dr. Gary R. Allen
2100	Declaration of Ken Fisher
2109	“Litepanels New 1x1 Bi-Color LED Light,” Press Release, December 22, 2008, from

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Exhibit No.	Exhibit Description
	https://www.studiodaily.com/2008/12/litepanels-new-1x1-bi-color-led-light/ , accessed/printed on February 1, 2024 (“Litepanels 2008 Bi-Color Panel Launch”)
2123	Copy of Provisional Patent Application No. 61/648,554 filed May 17, 2012

4. I hereby reaffirm my prior opinion that a person of ordinary skill in the art (“POSITA”) would have had, at a minimum, a Bachelor of Science degree in electrical engineering, or a closely related field, and two or more years of experience in the design of entertainment lighting systems, along with the design and use of LED lights. (Ex-1003 at ¶32.) However, my opinions would not change if Patent Owner’s/Dr. Allen’s definition of POSITA is adopted, where a POSITA:

“would have had 2 to 4 years’ experience in electrical engineering/design of film and television lighting systems, including the design and use of LED lights, combined with two to three years of work experience as a set lighting technician in television and/or motion picture industry.”

(Ex-2080-Allen at ¶15.)

5. I understand the parties agree that all terms of the claims should be given their plain and ordinary meaning. My analysis in this Supplemental Declaration applies the plain and ordinary meaning to the claim terms.

6. I understand Patent Owner has applied a priority date of May 17, 2013 in its analysis. I adopt that date for my analysis herein, although my opinions would

not change if a priority date to its provisional application of May 16, 2012, was sought.

II. It was well-known to a POSITA that tungsten and daylight were the most widely used color temperatures in the film industry

7. As I explained in my First Declaration, well before the '895 patent, it was well-known to a POSITA that tungsten and daylight color temperatures were widely used for commercial image recordings, i.e., for the film and television industries. (Ex-1003 at ¶50.)

8. I understand that Patent Owner admits that tungsten and daylight were the most widely used white light temperatures in this context:

“The two most frequently used and desired color temperature ranges in the lighting industry for stage and set lighting have been found to be 3050 to 3300 K for tungsten (warm white), and 5400 to 5600 K for daylight white. These ranges represent ideal color temperature ranges for producing ideal lighting for TV, photography and film studio scenarios.” (Ex-1001 at 2:3-9.)

I understand many of Patent Owner’s declarants agree with me that tungsten and daylight color temperatures were widely used for commercial image recordings. (Ex-1039-Allen at 112:9-17 (agreeing with the '895 patent’s admission); Ex-1025-Csernecky at 36:21-37:5 (admitting 3200K and 5600K had been industry standards for decades); Ex-1042-Baxter at 36:4-37:14 (agreeing he worked to make bicolor

LEDs in the tungsten and daylight color temperature ranges); *see also* Ex-1048 at 135.)

III. LED lighting systems in a T12/T8 form factor that produced tungsten or daylight white light were already known

9. As I explained in my First Declaration, LED lighting systems in a T12/T8 form factor were already known. (Ex-1003 at ¶¶54-56, 302.) Indeed, in 2010, a variety of T12/T8 form factor LED lights were available for purchase to the general public. (Ex-1033 through 1037.)

10. In 2011, Mac Tech released an T12 form factor LED light specifically for commercial image recording. (Ex-1023.) Mac Tech's LED lights were capable of achieving "[c]onsistent color temperatures at both daylight and tungsten and almost zero percent green at 93 CRI." (*Id.* at 4.) Many of Patent Owner's declarants agree Mac Tech's products were used for commercial image recording and predate the '895 patent. (Ex-2041 at 12, 16; Ex-2066 at ¶8.)

11. The '895 patent also admits that T12/T8 LED products were already commercially available:

"In order to match the tubular form of a fluorescent bulb, arrays of LEDs may be placed within a tube having the same form factor as a fluorescent lamp, such as a T8 or T12 size fluorescent bulb. One such bulb is made by Dialight and is called DuroSite™. For example, in size T8, the bulb in one form uses SMD LEDs in a four foot long

tube and provides 1500 Lumens of Natural White light, using 17 Watts, 300 LEDs, with 90V-277V, and is ETL/UL Approved.” (Ex-1001 at 2:44-51.)

IV. Bi-Color LED devices were well-known prior to the ’895 patent

12. As I explained in my First Declaration, Bi-Color LED devices specifically targeting tungsten and daylight color temperatures were also well-known. (Ex-1003 at ¶¶80-81, 331, citing Ex-1006.) Indeed, as Patent Owner’s declarant, Ken Fisher, admits, Litepanels made such a device many years prior to the ’895 patent:

The new Litepanels ® 1×1 Bi-Color enables never-before possible utility by providing a single fixture capable of generating a color temperature of either 3200 °K or 5600 °K, or an infinite range of color temperatures in between. The Bi-Color name comes from its design, which incorporates both 3200 °K and 5600 °K LEDs.” (Ex-2109 at 2, cited in Ex-2100 at ¶149.)

Indeed, I note my Litepanels colleagues and I, including Kevin Baxter and Ken Fisher, developed the Bi-Color panel light, which was the subject of several patents and which was commercialized in 2008. (Ex-1022, Ex-2109; *see also* Ex-1042 at 29:17-30:11, 31:19-32:6; and Ex-2100 at ¶149.) This panel light was specifically designed to achieve both tungsten and daylight color temperatures in a single device:

“In a preferred embodiment, as will be described, the bi-color lighting apparatus uses lamp elements having

daylight and tungsten hues (for example, 5200° K and 3200° K color temperatures, respectively). Other bi-color combinations may also be used and, preferably, other combinations of colors which are closely in hue or otherwise complementary in nature.”

(Ex-1022 at 16:44-50; *see also* Ex-1042 at 36:10-38:13; Ex-1043 at 104:19-105:8.)

13. I further note that many of Patent Owner’s declarants agree with me that bi-color lighting products capable of producing both tungsten and daylight color temperatures were available. (Ex-2041-Csernecky at ¶12 (“It was not bicolor, even though bicolor had existed for years in a panel light.”); Ex-1025 at 89:4-91:11 (explaining bicolor functionality of panel light device and agreeing it had been on the market years before the subject patent); Ex-1039-Allen at 67:17-68:2 (reviewing Csernecky declaration, relying on Mr. Csernecky’s expertise, and agreeing LED bicolor functionality existed prior to the subject patent); Ex-1042-Baxter at 37:15-38:14 (agreeing bicolor was known years before the subject patent); Ex-1043-Fisher at 104:14-105:8 (agreeing bicolor was known 10 years before the subject patent).

V. The claim requirements of at least 1000 Lumens with a CRI of at least 90 and with less than 5G/5M were well-known to a POSITA prior to the ’895 patent and a POSITA would readily expect to achieve those requirements

14. As I explained in my First Declaration, limitation 1[j] of the ’895 patent states that a lighting system is suitable for commercial image recording when the emitted light:

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- (i) is at least 1000 lumens when the first LEDs are lit and is also at least 1000 lumens when the second LEDs are lit;
- (ii) is broad-spectrum white light having a color deviation corresponding to less than five points of green and less than five points of magenta (5M, 5G) of color compensation (CC), and
- (iii) has a color rendering index of light emitted from each of the first LEDs or each of the second LEDs, whichever respective plurality of first or second LEDs is lit, that is greater than 90. (Ex-1003 at p. 171-72.)

These requirements were well-known to a POSITA prior to the '895 patent and it was obvious to achieve these requirements prior to the '895 patent as I explained in my First Declaration, and as further evidenced below.

A. A POSITA knew of and would have used LEDs that achieved a CRI higher than 90 for commercial image recording (claim 1, limitation 1[j.iii])

15. As I explained in my First Declaration, prior to the '895 patent, it was well-known to a POSITA that the higher the CRI (color reproduction index) value, the more colors will be rendered faithfully by the LED. (Ex-1003 at ¶57; *see also* Ex-1005 at (explaining CRI has been used since 1965 “as a point of comparison for all different types of light sources....”) As I further explained in my First Declaration, a POSITA would have been motivated to achieve a high CRI in the commercial image recording industry because CRIs in the upper 90s are more likely

to capture high-quality images. (Ex-1003 at ¶144, citing Ex-1005 at 4:1–5, 25:37–44; *see also* Ex-1003 at ¶145 (citing Ex-1007 at 2:25-3:1 and 3:17-19, which explain the benefits of a high CRI for commercial image recording) and ¶¶309-10, 314,319, 348 (explaining high CRI for Ground 2 based on Ducharme).) Accordingly, my First Declaration established that a POSITA would have been motivated to use LEDs that achieved a CRI higher than 90 for commercial image recording applications.

16. I note that Patent Owner’s declarants agree that a POSITA would seek LEDs with a CRI higher than 90 for commercial image recording applications. (Ex-1025 at 34:9-35:9, 37:6-20 (Mr. Csernecky explaining to Mr. Macias that they should seek a goal of 93 CRI to achieve purity of light).)

17. I further note that the Mac Tech LED tube device in a T12 form factor achieved a CRI of >93 tube light in the year 2011. (Ex-1023 at 4; Ex-2041 at ¶16.)

18. I further note that Dr. Allen agreed that LEDs with more than 90 CRI were known prior to the asserted priority date of the ’895 patent. (Ex-1039 at 62:18-21 (agreeing LEDs with a CRI greater than 90 existed in 2012 but were not typical).)

B. A POSITA knew of and would have used LEDs that with “purity of color,” i.e., with less than 5G/5M (claim 1, limitation 1[j.ii])

19. As I explained in my First Declaration, it was well-known that LED light output should be as close to the black-body line as possible to avoid captured images that have a greenish hue from the light being above the Planckian Locus or having a magenta hue from the light being below the Planckian Locus. (Ex-1003 at

¶50.) It was also further well-known that the 5M and 5G nomenclature used in the '895 patent and the prior art refers to the green/magenta deviation in terms of the color compensation filter needed to correct the hue of the light back to the black body locus. (*Id.* at ¶72.) Of course, prior to the '895 patent, purity of color was sought for several reasons including for high-quality light for image capture and to avoid the use of color correction filters or gels. (*Id.* at ¶¶40, 46, 103, 426, 491.) Accordingly, my First Declaration established that a POSITA would have been motivated to achieve purity of color, i.e., use LEDs that achieved less than 5G and 5M for commercial image recording applications.

20. I further note that the Mac Tech device LED tube device in a T12 form factor achieved “no green” hues, i.e., achieved “less than five points of green” (5G).

21. I further note that Dr. Allen agrees it was well-known to seek purity of color prior to the '895 patent and that LEDs were available that achieved these specifications. (Ex-1039 at 58:17-59:12)

C. A POSITA knew to and would have sought to achieve the Lumen output of a standard fluorescent T12 tube (or higher) and a POSITA could readily achieve an output of more than 1000 lumens prior to the '895 patent (claim 1, limitation 1[j.i])

22. As I explained in my First Declaration, Hasnain discloses the use of 70-100 LPW (lumens per watt) in a replacement T12 LED. (Ex-1003 at ¶¶82-83, 350-351.) This is because Hasnain specifically recognizes that an LED tube replacement

should generate at least the same lumen output as that of its fluorescent tube counterpart:

“As noted above, heat dissipation is an important consideration with high power LED light sources. A T12 or T8 fluorescent tube typically generates 70 to 100 lumens per inch of tube while consuming approximately 0.9 watts of power per inch of tube. Hence, an LED replacement light source needs to generate 70 to 100 lumens per inch of light source.” (Ex-1008-Hasnain at 3:62-66.)

23. As I further explained in my First Declaration, achieving the desired lumen output is a mere design consideration and can be achieved by selecting the right type of LEDs and number of LEDs and applying the appropriate power to the device. (Ex-1003 at ¶¶51-59, 344.) For instance, as I explained in my First Declaration, at only 70 lumens per watt (the minimum disclosed by Hasnain), an output of 1540 lumens is achieved at 22 watts and an output of 3080 lumens is achieved at 44 watts. At 100 lumens per watt (the maximum disclosed by Hasnain), an output of 2200 lumens is achieved at 22 watts and an output of 4400 lumens is achieved at 44 watts. Accordingly, my First Declaration established that a POSITA would have readily expected to achieve at an output of at least 1000 lumens for commercial image recording applications.

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24. I further note that the '895 patent admits that a prior art device called the Durosite™ achieved an output of 1500 lumens at 17 watts, which is 88.2 lumens per watt:

“In order to match the tubular form of a fluorescent bulb, arrays of LEDs may be placed within a tube having the same form factor as a fluorescent lamp, such as a T8 or T12 size fluorescent bulb. One such bulb is made by Dialight and is called DuroSite™. For example, in size T8, the bulb in one form uses SMD LEDs in a four foot long tube and provides 1500 Lumens of Natural White light, using 17 Watts, 300 LEDs, with 90V-277V, and is ETL/UL Approved.” (Ex-1001 at 2:44-51.)

This disclosure is entirely consistent with that of Hasnain, and confirms my opinions that it would be routine to achieve 70-100 lumens per watt in a T12 or T8 form factor LED tube prior to the '895 patent.

25. I further note that the provisional application from which the '895 patent claims priority discloses additional Durosite™ devices, all of which have a lumen output of at least 1450 lumens:

“In order to match the tubular form of a fluorescent bulb, arrays of LEDs are placed on a tube having the same form factor as a fluorescent bulb, such as a T8 or T12 size fluorescent bulb. One such bulb is made by Dialight and is called DuroSite™. For example, in size T8, the bulb in one

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form uses SMD LEDs in a four foot long tube – 1500 Lumens, Natural White light, 17 Watt, 300 LED, 90V-277V, ETL/UL Approved. There are four different color temperature renderings available:

Warm White:	3700 Kelvin; ~ 1450 lumens	- Yellowish Light
Natural White:	4500 Kelvin; ~ 1500 lumens	- Natural White Light
Daylight White:	5500 Kelvin; ~ 1550 lumens	- Pure White
Cool White:	7000 Kelvin; ~ 1600 lumens	- Bluish Light

(Ex-2123 at 5.)

26. I further note that, in 2010, a variety of T12/T8 form factor LED lights were available for purchase to the general public. (Ex-1033 through 1037.) These devices routinely achieved an output of more than 1000 lumens in a T12 or T8 form factor.

27. These disclosures confirm my original opinions that a POSITA would have expected to readily achieve an output of at least 1000 lumens in a T12 or T8 form factor LED device prior to the '895 patent. (Ex-1003 at ¶¶314-315, 347-350.)

D. A POSITA would have simply selected the right type and number of LEDs to achieve the desired LED light quality and output for any particular T12/T8 form factor LED lighting tube

28. As I explained in my First Declaration, it was well within the skills of a POSITA to select the right type of and number of LEDs for any given application. (Ex-1003 at ¶¶51-59.) For commercial recording applications, it was simply a matter of selecting the correct LEDs to achieve the desired color temperature, CRI, purity

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of color, and lumen output, which requirements are all disclosed by the prior art, as explained in my First Declaration and further confirmed above. (Ex-1003 at ¶¶57-59.) The '895 patent confirms that simply selecting the correct LEDs was its approach as well:

*“To create the LED lamps, in each of the above examples, LEDs in the desired color ranges **are selected** which provide at least about 1000 lumens. The LEDs are tested to provide the desired light, e.g., with CRI of at least about 90 percent or more, flux of at least about 1000 lumens or more, and purity of color. Preferably, purity of light includes no more than about three percent green, no more than about three percent yellow and no more than about three percent magenta tones.”* (Ex-1001 at 11:39-48.)

Indeed, once the light output requirements are known, it is just a matter of identifying a suitable manufacturer to make the LEDs and configuring the device in a suitable manner through routine and known methods. (Ex-1003 at ¶¶51-59.)

29. LEDs for achieving the color temperature, CRI and purity of color requirements of the claims were known before the '895 patent. In addition to the prior art I cited in my First Declaration showing the commonality of the requirements, I further note that the information submitted by Dr. Allen shows that LEDs in the tungsten temperature range with at least 90 CRI were already available for purchase. (Ex-2081 at 2-3 (CREE specifying LEDs at 3000K achieving at least

90 CRI); *see also* Ex-1039 at 65:9-23 (agreeing such LEDs were available for purchase.) I was also aware of other manufacturers who produced LEDs at 5000K with 90 CRI. For instance, a ROHM Semiconductor PSL0102WBEC1 LED was available in 2012 with a CCT of 5000K and a minimum CRI of 90. (Ex-1062). As for purity of color, as explained previously, this was simply a matter of the LED manufacturer producing the LED with a light output as close to the black body line as possible at the desired color temperature. Again, Dr. Allen agrees the LEDs that achieved less than 5G and 5M were known at the time. (Ex-1039 at 58:17-59:12.) Indeed, it was my experience that, once a POSITA knew the desired specifications, it was simply a matter of having the LED manufacturer produce the LEDs to the desired standards.

30. I note that Dr. Allen admits:

A POSITA would not have a reasonable expectation of success without knowing the photometric and chromaticity specifications of the LEDs.” (Ex-2080 at ¶31.)

This proves my point—a POSITA would have had a reasonable expectation of success if they did know the photometric and chromaticity specifications of the LEDs. As shown above, such requirements were well-known to a POSITA. It is just a matter of having an LED manufacturer produce the LEDs to the desired specifications. Dr. Allen agrees:

“I am confident that a POSITA would understand that since this inventor has achieved it and [he] has told us that the method that he used to achieve it was **selecting high performance LEDs**, providing an aluminum housing and solving the thermal issues, as a POSITA I would have high confidence that I could reproduce that result. I don't need all the detail guidance.” (Ex-1039 at 90:16-23.)

31. I further note that Mr. Macias did not invent any LEDs; he simply found a manufacturer that could meet the specifications Mr. Csernecky told him to meet. (Ex-1025 at 34:9-38:14, 52:1-19, 65:11-24, 70:11-24 (explaining to Mr. Macias the necessary lighting requirements to meet); Ex-1047 at 238:24-242:9 (Mr. Macias explaining he would keep asking for batches of LEDs until they met the standard commercial image recording specifications).) This further confirms my opinion that there is nothing inventive about the claims of the '895 patent—those claims merely recite a known combination of elements, arranged in a known manner to achieve a known and predictable effect.

VI. Patent Owner's Heat and Lumen Penalty Arguments are Incorrect

32. Patent Owner's declarant, Dr. Allen, argues a POSITA would not reasonably expect the combination of Ducharme, Ianiro, Katzir, and Hasnain to achieve a bi-color, T12 or T8 form factor light capable of achieving at least 1000 lumens in both tungsten and daylight while achieving a CRI of at least 90 and with little or no green or magenta hues, i.e., <5G/5M. (Ex-2080 at §§I-III.) Other

declarants make similar arguments. (Ex-2047-Baxter; Ex-2100-Fisher.) Dr. Allen points to an alleged heat issues and lumen penalties that I allegedly ignored. (Ex-2080 at §§I-III.) Mr. Baxter makes generalized comments without specifically addressing the prior art of Ducharme, Ianiro, Katzir, and Hasnain. Mr. Fisher only cursorily addresses the combination of Ducharme, Ianiro, Katzir, and Hasnain, arguing I did not consider the lighting system as a whole. (Ex-2100 at ¶¶181-184.) He is wrong. Indeed, for the below reasons, my initial analysis was correct and the disclosures of the '895 patent itself confirm my analysis was correct.

A. The '895 patent does not concern itself with heat issues and neither would a POSITA

33. Dr. Allen argues heat would be an issue that could not be overcome at the time of the '895 patent. (Ex-2080 at ¶¶35-61.) Fundamentally lacking from Dr. Allen's analysis is any analysis of how the '895 patent overcame such alleged heat issues. This is because heat generation would have been nothing more than a trivial concern or a routine design consideration to a POSITA at the time of the '895 patent.

34. The '895 patent contains no disclosure whatsoever about heat or thermal issues or how to overcome them. A POSITA, therefore, would recognize that heat would not have been anything more than a trivial design issue at the time of the '895 patent. Indeed, when asked how the parent patent to the '895 patent was allegedly able to achieve a 40,000 hour lifetime due to good "thermal design," I note that Dr. Allen could not point to anything other than using an aluminum housing:

Q Okay. Can you point to me in the '582 patent where you see good thermal management design?

A There is possibly, as I recall, one instance that is in the claims where we have a limitation of an aluminum housing and an aluminum housing would enable, I should not use the word enable, would be required for very good thermal management.

Q So Mr. Macias overcame all of these thermal penalties by using an aluminum housing?

MR. HOFFMAN: Objection. Form.

A Well, he does not tell us the dimensions, shape, functionality of that heat sink. He does tell us that it is an aluminum housing, and I, as an expert who have done this, a POSITA who understands, the POSITA would know that that aluminum housing enables me to dissipate heat by means of lots of different techniques which Mr. Macias does not specify.

Q So aside from an aluminum housing, is there anything else in the '582 patent that teaches a POSITA how to overcome all the thermal management issues described in your declaration?

MR. HOFFMAN: Objection. Form. Scope.

A Should I answer?

Q You should.

A Most significantly the results of especially example two in my opinion and the statement of 40,000 hour life and the guidance of an aluminum housing give a POSITA high confidence that without undue experimentation these results can be reproduced.

Q There is no designs described in example two, correct?

MR. HOFFMAN: Objection.

Q Thermal dissipation designs, correct?

MR. HOFFMAN: Objection.

A I provided two guidelines. The question is already answered regarding thermals. The one is the indication of 40,000-hour life by which the inventor is telling me that I have solved the thermal problems. Mr. POSITA, the thermal problems are solvable. I solved them. He is in possession of that solution.

Secondly, the claims indicate to us that part of that solution was an aluminum housing.

Q So sitting here today, other than the 40,000 hours and the aluminum housing, there is nothing that you can point to that talks about how heat dissipation results?

MR. HOFFMAN: Objection. Characterization. Vague. Scope.

A I am confident that a POSITA would understand that since this inventor has achieved it and has told us that the method that he used to achieve it was selecting high performance LEDs, providing an aluminum housing and solving the thermal issues, as a POSITA I would have high confidence that I could reproduce that result. I don't need all the detail guidance. (Ex-1039 at 88:18-90:23.)

35. Of course, using an aluminum housing in an LED lighting system at the time of the '895 patent was well-known to a POSITA, as I explained in my first Declaration. (Ex-1003 at ¶359, citing Ducharme at 11:54–12:2 (“Body section (362), conductive sleeves (368) and (374) and enclosure plate (378) are preferably made from a material that conducts heat, such as aluminum.”).) Indeed, it was common to use an aluminum housing prior to the '895 patent as the Mac Tech T12 LEDs from 2011 evidence. (Ex-1023 at 2 and 4 (“The fixtures are assembled in Sun Valley from 100% recyclable aluminum.”).)

36. However, I do agree with Dr. Allen that a POSITA does not need “detail[ed] guidance” to make an T12 form factor LED light and achieve a suitable thermal balance while also achieving the necessary specifications for commercial

image recordings. (Ex-1039 at 90:16-23.) As Dr. Allen states, it is a simple matter of a POSITA selecting high performance LEDs and using an aluminum housing.

37. I note that Dr. Allen testified that LED numbers and spacing may contribute to improved heat dissipation.

Q Does anything about using 576 LEDs tell you anything about thermal management?

A Yes. If I were a POSITA reading this, I would understand that the inventor was probably using as many LEDs as possible. When you use a high number of LEDs, then each LED has to carry less current. And so it is not challenging, it is specified current and therefore has longer life and it has higher performance, and it has better color and it has better efficacy.
(Ex-1039 at 128:15-24.)

38. These statements by Dr. Allen's confirm that any potential heat penalties are nothing more than a marginal and routine design consideration. As noted previously, the '895 patent discusses a prior art Durosite™ LED device in the T12 form factor, and the '895 patent specifically states that this device included 300 LEDs for a single color. (Ex-1001 at 2:44-51.) In designing a Bi-Color device (which devices were admittedly known), a POSITA would immediately consider doubling the amount of LEDs in the Durosite™ device, with roughly 300 LEDs being used for a first color and roughly 300 LEDs being used for a second color. This is exactly what happened with the '895 patent. As explained in Examples 1-3 of the '895 patent, 576 LEDs were used in the example Bi-Color devices, or 288

LEDs per color. There is nothing inventive about using 288 LEDs per color as evidenced by the 300 LEDs used for the single color Durosite™ device.

39. There is also nothing unexpected about the thermal efficiency achieved by the LEDs of Examples 1-3 of the '895 patent. What Dr. Allen apparently failed to consider is that only one set of LEDs is active at a time in a Bi-Color device, i.e., only 288 LEDs would have been active at any one time in the devices of the '895 examples. This means that both the Durosite™ device, which used 300 active LEDs, and the devices of Examples 1-3 of the '895 patent, which used 288 active LEDs, had generally the same thermal efficiency, i.e., these devices were able to operate with 300 active LEDs with no thermal issues.

40. Dr. Allen's testimony also confirms my opinion that heat generation would have been nothing more than a trivial concern or a routine design consideration to a POSITA at the time of the '895 patent. Specifically, Dr. Allen states "[w]hen you use a high number of LEDs, then each LED has to carry less current. ... so it is not challenging." In other words, Dr. Allen's testimony confirms that a POSITA would have had not expected any meaningful thermal issues in the prior art devices, which would admittedly use "a high number of LEDs," so "then each LED has to carry less current. ... so it is not challenging." Accordingly, Dr. Allen's admission further confirms my opinion that heat generation would have been

nothing more than a trivial concern or a routine design consideration to a POSITA at the time of the '895 patent.

B. Dr. Allen's heat analysis is faulty

41. Dr. Allen argues my analysis of Hasnain was incorrect. (Ex-2080 at §II.) Not so. It is Dr. Allen's analysis that is defective. As I noted in my First Declaration:

“Hasnain further discloses that by September 2010, there existed ‘white light sources based on GaN blue emitting LEDs [that] generate 70 to 100 lumens per watt.’” (Ex-1003 at ¶¶83, 350.)

This is the same general light output of a standard T12 or T8 fluorescent light:

“As noted above, heat dissipation is an important consideration with high power LED light sources. A T12 or T8 fluorescent tube typically generates 70 to 100 lumens per inch of tube while consuming approximately 0.9 watts of power per inch of tube. Hence, an LED replacement light source needs to generate 70 to 100 lumens per inch of light source.” (Ex-1008-Hasnain at 3:62-66.)

42. Dr. Allen argues my analysis was faulty because Hasnain's results are due to testing without a diffusion cover. (Ex-2080 at ¶¶49-60.) I disagree.

43. First, my analysis was based on the fact that the at least 1000 Lumens requirements of the claims of the '895 patent appears to be based on the results of

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Examples 2-3 of the '895 patent. (Ex-1001 at 10:46-11:38 (citing Lumen results).)

As the '895 patent specifically notes:

“To create the LED lamps, in each of the above examples, LEDs in the desired color ranges are selected which provide at least about 1000 lumens. *The LEDs are tested* to provide the desired light, e.g., with CRI of at least about 90 percent or more, flux of at least about 1000 lumens or more, and purity of color.” (Ex-1001 at 11:39-44.)

As the '895 patent specifically notes, it is *the LEDs* that are tested, not the lighting device. Thus, it was and still is my opinion that the results indicated in Examples 2-3 of the '895 patent are based on testing without a diffusion cover. For this reason alone, my opinions are correct while Dr. Allen's opinions are incorrect.

44. Second, irrespective of whether the results in Examples 2-3 of the '895 patent were based on a device having a diffusion cover, and as I explained in the First Declaration, Hasnain makes clear that thermal heat management issues were not problematic and were readily overcome, with or without a diffusion cover due to a potential variety of heat dissipating structures. (Ex-1003 at ¶350 (“Hasnain teaches that additional heat-dissipating surface on the backside of the light source can be utilized to dissipate more heat if required.”).)

45. First, Hasnain discloses the use of diffusion covers with its LED devices:

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“Fluorescent tubes, in contrast, are broad linear sources. Hence, in some applications, additional optics may be necessary to give the appearance of a fluorescent tube-like light source. Since the individual LEDs are of order 2 or 3 mm, a cylindrical lens that is located one or two inches above the LEDs can transform the collection of point sources into a linear source that is collimated or that diverges at a predetermined angle. Such an arrangement is shown in FIG. 5, which is a cross-sectional view of another embodiment of a light source according to the present invention. In light source 60 a cylindrical lens 61 is mounted above the LEDs. It should be noted that most fluorescent tube enclosures have a depth of a few inches, since the enclosures must accommodate fluorescent tubes that are typically 1.5 inches in diameter. Hence, the LEDs appear as point sources at the lens.” (Ex-1008 at 6:48-58.)

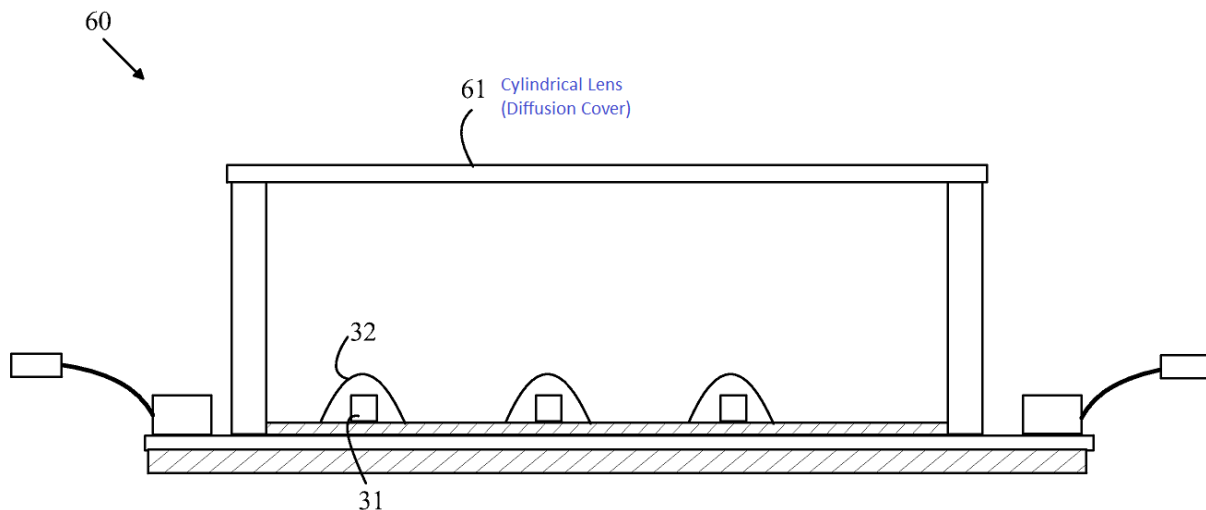


FIGURE 5

A POSITA would understand that the cylindrical lens 61 of FIG. 5 of Hasnain is a type of diffusion cover because it “transform[s] the collection of point sources into a linear source that is collimated....”

46. Second, Hasnain provides various thermal management solutions for ensuring proper LED temperatures are maintained:

“In one aspect of the present invention, the LEDs are distributed on heat-dissipating structure 36 such that the surface area presented by the heat-dissipating structure is sufficient to dissipate a significant fraction of the heat of each LED to the surrounding air without the use of finned heat radiators or direct connections to larger heat-radiating surfaces.... It has been determined experimentally, that if the LEDs are spaced apart along the length of heat-dissipating structure 36, between 0.5 and 1 watt of heat per square inch of surface area can be dissipated without raising the temperature of the LEDs by more than 30°C above ambient.” (Ex-1008 at 23:41.)

“Referring to FIG. 3, if additional heat dissipation is required, an additional heat-dissipating surface 47 on the backside of the light source can be utilized. In one aspect of the present invention, light source 30 includes a metallic layer 39 that is separated from heat-dissipating structure 36 by insulating layer 33. In one aspect of the invention, a metal layer is connected to heat-dissipating structure 36 by vertical heat-conducting areas such as the metal filled via

shown at 45. In another aspect of the invention, heat-dissipating structure 36 is part of metal layer 39. In this case, insulating layer 33 is absent from the area under heat-dissipating structure 36.” (*Id.* at 23:51.)

“Light source 50 could also be supplied with a heat-conducting adhesive that is applied prior to making the attachment of light source 50 to surface 25. The adhesive is applied over a significant area, and hence, the thermal resistance of the adhesive is less of an issue. To simplify the attachment, light source 50 could be supplied with the adhesive already applied to surface 58 and protected by a peel-off strip. While this method can be practiced by low-skilled personnel, the method presents problems if the light source must be removed at a future date due to failure or the desire to further upgrade the light source.” (*Id.* at 5:20-30.)

“In another aspect of the invention, a heat-conducting grease is applied to surface 59 to assure good thermal contact between the two surfaces. This grease also facilitates the movement of light source 50 on surface 25 during the positioning of light source 50 on the surface. Since the surface area of enclosure 21 is much greater than the area available on the heat-dissipating surface of the replacement light source, considerably higher power dissipation levels can be accommodated. As a result, a replacement light source that is significantly brighter than

the fluorescent tube being replaced can be provided.” (*Id.* at 5:41-50.)

“In one aspect of the present invention, the replacement LED light source has a plurality of LEDs mounted on a heat-dissipating substrate that has a width that is less than or equal to the diameter of the fluorescent tube that the light source is designed to replace. The substrates are metal clad printed circuit boards in which the metal cladding provides the heat-radiating surface. The LEDs are mounted in a spaced apart arrangement such that the heat generated on any 1 square inch section of the substrate is less than a predetermined design power value that depends on the manner in which the substrate dissipates the heat to the surrounding environment. The goal of the LED placement is to provide sufficient heat dissipation to limit the temperature of the LEDs to less than 75°C above ambient.” (*Id.* at 5:52-64.)

“If the heat-dissipating surface is increased by utilizing the surface 47 shown in FIG. 3 in addition to the surface of heat-dissipating structure 36 then the density of LEDs can be increased further. For example, if light source 30 were mounted such that air circulated on both sides of light source 30, this additional surface area could be utilized to dissipate heat thereby doubling the power density on the substrate.” (*Id.* at 6:15-21.)

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“Typically, the LED dies are of order 1 to 2 mm and dissipate between 1 and 2 watts. In one aspect of the present invention, the dies are mounted directly on the heat-dissipating structure, as opposed to mounting packaged LED dies on the heat-dissipating structure.” (*Id.* at 6:35-38.)

As shown, a variety of heat dissipating techniques are disclosed by Hasnain, any one of which could readily be used in a T12 form factor LED light, as expressly recognized by Hasnain. Thus, if thermal management were an issue in any particular device, a POSITA would simply have implemented any of Hasnain’s heat dissipation designs and with a reasonable expectation of maintaining the 70-100 LPW results Hasnain achieved without a diffusion cover:

“As noted above, heat dissipation is an important consideration with high power LED light sources. A T12 or T8 fluorescent tube typically generates 70 to 100 lumens per inch of tube while consuming approximately 0.9 watts of power per inch of tube. Hence, an LED replacement light source needs to generate 70 to 100 lumens per inch of light source. In addition, the LED replacement light source must have a ‘footprint’ that is no wider than the fluorescent tube. Currently, white light sources based on GaN blue emitting LEDs generate 70 to 100 lumens per watt.” (Ex-1008 at 3:61-4:3; *see also* Ex-1003 at ¶83, 350.)

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47. Dr. Allen effectively ignores all of the above heat dissipating techniques in his analysis, merely waiving them off as potentially ineffective. (Ex-2080 at ¶¶67-68; Ex-1039 at 101:20-103:25.) I disagree. As Hasnain discloses, such techniques are readily implemented and would be expected to provide additional and sufficient heat dissipation to maintain the LEDs at a proper temperature.

48. As noted above, one of Hasnain's heat dissipating techniques is to mount the LEDs such that air flow on the back side of the LEDs device. (Ex-1008 at 6:18-21.) Dr. Allen ignores this feature of Hasnain and also ignores that I used FIG. 5A of Ducharme in my combination. (Ex-1003 at ¶¶303, 325.) But as Dr. Allen specifically recognized during cross-examination, FIG. 5A of Ducharme includes air slots for allowing air to flow through Ducharme's T12 form factor LED device:

“What is shown in here is air slots. I know it to be ineffective. They provide some cooling, an order of magnitude factor of less than 10, less than good thermal management heat.” (Ex-1039 at 107:4-9.)

Dr. Allen did not consider these features in his analysis. (*Id.* at 105:7-106:13.) It is my opinion that such slots would allow for airflow through Ducharme's T12 LED tubes, which would further enhance heat dissipation, as Dr. Allen recognizes.

49. For at least the above reasons, my opinion remains that Hasnain provides a reasonable expectation of successfully achieving an output of 70-100 LPW with or without a diffusion cover.

C. Dr. Allen's lumens penalty analysis is faulty

50. Dr. Allen testifies that a variety of lumen penalties were missed in my analysis. (Ex-2080 at ¶¶17-34.) Dr. Allen further testifies that a POSITA would “would typically consider these luminaire factors as significant but they are not considered in the Holmes declaration.” (*Id.* at ¶22.) I note that these factors are not addressed in the '895 patent. Dr. Allen's list of possible lumen losses that would need to be considered, include “Diffusion losses,” “CRI losses,” “Green index rating losses,” “Color temperature losses,” “Thermal droop losses,” “Current droop losses,” and “Driver/circuitry losses.” Again, these losses are also not addressed or accounted for in the '895 patent. I further note that Dr. Allen concedes that these losses depend on the LED's specifications, amount of power to driver current per LED, the LED p-n junction temperature, and other factors. (*Id.* at ¶¶21-33). Accordingly, Dr. Allen concedes that these are design specific considerations that a POSITA would need to consider in designing each particular LED light.

51. First, Dr. Allen argues that there are lumen or heat penalties for filters or gels to compensate for lack of purity of color. (Ex-2080 at ¶¶26-27, 57.) This argument is non-sensical because the prior art discloses LEDs that achieve less than

5G and 5M, and those LEDs would not need filters or gels. (Ex-1003 at ¶354.) Dr. Allen expressly conceded as much on cross-examination. (Ex-1039 at 61:6-17.)

52. Second, Dr. Allen argues that there are current droop penalties for excessively driving the LED Driver. (Ex-2080 at ¶23.) But this analysis assumes LEDs would not be able to achieve 1000 Lumens at conventional power levels. As explained previously, it was commonplace to achieve much more than 1000 Lumens using as little as 17 Watts. Moreover, there would not be any thermal issues, as explained previously, so the LEDs would operate well within their normal operating temperature and excess current would not be required. Dr. Allen is also wrong because a POSITA would design an LED fixture to drive each LED at or below the manufacturer's specified current. The lumen per watt value provided by the manufacturer is given at this current value. Therefore any current droop is **built-in** to the lumen output provided by the manufacturer. There is no additional penalty for current droop in a properly designed fixture.

53. Third, Dr. Allen argues that there would be lumen penalties due to a diffusion cover. (Ex-2080 at ¶¶21-22.) As previously explained, Hasnain already accounted for a diffusion cover and a POSITA would still expect to realize 70-100 LPW with a diffusion cover in view of the express disclosures of Hasnain. I further note that the '895 patent allows for clear diffusion covers, which would have a little or no minimum lumen penalty, as Dr. Allen agrees. (Ex-1001 at 6:31-33; Ex-1039

at 51:12-52:20.) I further note that the prior art does not address lumen penalties from a diffusion cover because a POSITA knew that those lumen penalties are readily overcome. As explained previously, the '895 patent admits that the Durosite™ device readily achieved 1450-1600 lumens of output, which device almost certainly had a diffusion cover. (Ex-1001 at 2:44-51.) Thus, Dr. Allen's diffusion cover concerns are misplaced.

54. Fourth, Dr. Allen argues there would be penalties due to using LEDs that achieved at least 90 CRI and less than 5G/5R. (Ex-2080 at ¶¶24-32.) Again, such LEDs were already known in the art and a POSITA could drive those LEDs with as much power as required to achieve the desired lumen output. Indeed, a POSITA would rely on a manufacturer's LED datasheet in designing a fixture and would stay within the design parameters required by the LED datasheet. Thus, when considering an LED for commercial image recording purposes, a POSITA would simply select the proper LEDs for color quality and purity of color, and a POSITA would also select how many LEDs to use to achieve the desired lumen output. There are no additional penalties when using the LEDs within the manufacturer's specifications. This is confirmed by the CREE datasheet provided by Dr. Allen (Ex-2081) and the PSL0102 series datasheet I provide herewith (Ex-1062), both of which show a POSITA could purchase LEDs that achieved a 3000K or 5000K color temperature at 90 CRI or better, and having a luminous output between 70 and 100

LPW. A POSITA would further expect those LEDs to achieve less than 5G/5M because, as I explained previously (Ex-1003 at ¶¶48-49), it was well known to a POSITA that LEDs should be as close to the black body curve as possible to achieve purity of color.

55. Mr. Fisher argues my lumens analysis was defective. (Ex-2100 at ¶¶180-184.) Mr. Fisher's analysis is conclusory and adds nothing beyond what was argued by Dr. Allen. Thus, for the reasons shown above, my original analysis was proper and showed that a POSITA would have readily expected to achieve at least 1000 lumens with the combination of Ducharme, Ianiro, Katzir, and Hasnain.

D. Even under Patent Owner's analysis, a POSITA would reasonably expect to achieve at least 1000 lumens

56. Even assuming *arguendo* Dr. Allen's assertion that a 35% penalty would be realized (it would not) due to CRI and purity of color penalties, Dr. Allen's analysis ignores the vast majority of the conventional art showing achievement of 1500+ lumens was commonplace at only 17W, such as the Durosite™ device which realized a LPW of 88.2. See §V.C, *supra*. With the alleged 35% penalty, a device would reasonably be expected to achieve at least 975 Lumens, which is essentially the same as 1000 Lumens. But 35% is the maximum penalty alleged by Dr. Allen. It is unlikely that such a penalty would occur. Even at a 30% penalty, a POSITA would reasonably expect to achieve 1070 Lumens, which meets the requirements of the claims. Moreover, if a POSITA wanted extra light output, they would know they

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could apply more power. For instance, increasing from 17W (per Durosite) to 18W at 88.2 LPW would result in a device that realized 1588 Lumens. Even assuming the maximum 35% penalty, such a device would achieve more 1000 Lumens ($1588 * 0.65 = 1032$ Lumens).

57. As explained in my First Declaration, my combination of Ducharme, Ianiro, Katzir, and Hasnain relies on Hasnain's disclosure of:

“As noted above, heat dissipation is an important consideration with high power LED light sources. A T12 or T8 fluorescent tube typically generates 70 to 100 lumens per inch of tube while consuming approximately 0.9 watts of power per inch of tube. Hence, an LED replacement light source needs to generate 70 to 100 lumens per inch of light source. In addition, the LED replacement light source must have a ‘footprint’ that is no wider than the fluorescent tube. Currently, white light sources based on GaN blue emitting LEDs generate 70 to 100 lumens per watt.” (Ex-1008 at 3:61-4:3; see also Ex-1003 at ¶83, 350.)

As I also explained in my First Declaration:

“[A] POSITA armed with the teachings of Hasnain would know that even assuming using LEDs capable of emitting 70 lumens per watt, an LED-based lamp having an elongated forty-four inch long and one-inch-wide circuit board would be able to produce 1,540 lumens from just 22

watts, and up to 3,080 lumens at 44 watts.” (Ex-1003 at ¶351.)

Accordingly, my analysis showed that at only 70 LPW the combination of Ducharme, Ianiro, Katzir, and Hasnain would generate 1,540 lumens at 22 watts (54% greater than the claimed amount of 1000 lumens), and could generate 3,080 lumens at 44 watts (208% greater than the claimed amount of 1000 lumens). Even with a 35% penalty (which I disagree is proper), and with only 70 LPW output, the proposed combination of Ducharme, Ianiro, Katzir, and Hasnain would realize an output of 1001 Lumens at 22 Watts and an output of 2002 lumens at 44 watts, both of which meet the requirements of the claims. These are conservative estimates because Hasnain discloses that 100 LPW is also achievable. Using 100 LPW and 22 Watts or 44 Watts means a device would achieve 2200 lumens or 4400 lumens, respectively, without any penalties. With a 35% penalty (which I disagree is proper), the proposed combination of Ducharme, Ianiro, Katzir, and Hasnain would realize an output of 1430 Lumens at 22 Watts and an output of 2480 lumens at 44 watts, both of which are well above the minimum requirement of the claims. Thus, even under Dr. Allen’s improper assumptions, my analysis showed that a POSITA would expect the combination of Ducharme, Ianiro, Katzir, and Hasnain to readily exceed an output of 1000 lumens, and likely to exceed 1500 lumens, or more, as was conventional.

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58. My above analysis is confirmed by the '895 patent's admissions. As explained previously, the '895 patent admits a device called the Durosite™ achieved 88.2 lumens per watt. At 22 watts, a POSITA would expect to achieve 1940 lumens based on 88.2 LPW or 2200 lumens at 100 LPW. At 44 watts, a POSITA would expect to achieve 3881 LPW or 4400 LPW at 44 watts. Even with gross penalties exceeding the 35% value offered by Dr. Allen, such devices would easily achieve more than 1000 Lumens. These admission by the '895 patent further show that my original opinions were correct.

59. I note that during his deposition, Dr. Allen argued a diffuser cover would incur an additional 20% lumen penalty. (Ex-1039 at 51:4-11.) Again, even with this assumption, which I disagree with, a POSITA would expect the combination of Ducharme, Ianiro, Katzir, and Hasnain would readily exceed an output of 1000 lumens, and likely to exceed 1500 lumens, or more. At Hasnain's minimum of 70 LPW and 44 Watts, and with an alleged 55% penalty (20% for diffusion cover; 35% for CRI and purity of color losses), which I disagree with, the expected lumen output would be 1386 lumens for the combination of Ducharme, Ianiro, Katzir, and Hasnain. At Hasnain's maximum of 100 LPW and 44 Watts, and with an alleged 55% penalty (20% for diffusion cover; 35% for CRI and purity of color losses), which I disagree with, the expected lumen output would be 1980 lumens.

VII. Patent Owner's Advertises Numerous Unclaimed Features for the Colt Bi-Color LED Tube

60. Patent Owner markets its Colt Bi-Color LED Tube as providing numerous key features, many of which are not recited in the Challenged Claims. For example, on May 13, 2024, I reviewed the online catalog for Wamco, a large retailer for professional lighting, at the following URL:

<https://www.wamcoinc.com/assets/pdf/Colt%20LED%20Tube%20Catalog.pdf>.

A true and correct copy of a printout of the online catalog is provided herewith as Exhibit [insert], and the online catalog advertises the Colt Bi-Color LED tube. As shown in Exhibit [insert], Patent Owner advertises its Colt Bi-Color LED tube as having: (1) “no pulse width modulation,” (2) “power run[ing] through a semiconductor controlled rectifier (SCR),” (3) “constant voltage,” and (4) “Dimmable to 1%.” (Ex-1061). None of these four features are covered by the Challenged Claims.

61. Additionally, on May 13, 2024, I reviewed Wamco's webpage advertising the Colt Bi-Color LED tube at the following URL: <https://www.wamcoinc.com/products/sstv/tubes/>. A true and correct copy of a printout of the online catalog is provided herewith as Exhibit [insert]. As shown in Exhibit 1060, Wamco's webpage for the Colt Bi-Color LED tube summarizes the “**Colt LED Tube Benefits**” as follows: “Dimmable to 1% Flicker Free, Constant Voltage | No Pulse Width Modulation . . . No Complicated Electrical | Grounding

on Board.” (Ex-1060). Similar to the features listed in the catalog, none of the above features the Colt Bi-Color LED tube described on the Wamco website as “**Colt LED Tube Benefits**” are covered by the Challenged Claims.

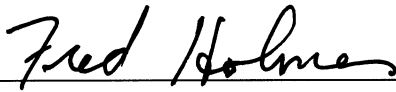
62. A POSITA would understand the unclaimed features of the Colt Bi-Color LED tube as critical features that materially impact the functionality of the product. As the Wamco webpage describes, these are the “Benefits” of the Colt LED Tube. (Ex-1060) . For example, the ability for the Colt Bi-Color LED tube to be dimmed to 1% without flicker is critical for commercial image recording. Furthermore, the ability to provide an LED tube light with “no pulse width modulation,” “power run[ing] through a semi-conductor controlled rectifier (SCR),” and “constant voltage” is critical and that materially impacts the functionality of the product.

63. 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 United States Code.

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Executed this 16th day of May 2024.

Sincerely,



A handwritten signature in black ink, reading "Fred Holmes", is written over a horizontal line.

Fred Holmes