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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ARNOLD & RICHTER CINE TECHNIK GMBH & CO. BETRIEBS KG,
Petitioner,

v.

ROTOLIGHT LIMITED,
Patent Owner.

Case IPR2021-01496
Patent 10,197,257

DECLARATION OF ERIC BRETSCHNEIDER, PH.D.

ROTOLIGHT 2002
Arnold & Richter v Rotolight
IPR2021-01496

**Rotolight Ex. 2002
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IPR2023-01220
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TABLE OF MATERIALS CONSIDERED

Exhibit Number	Description
1001	U.S. Patent No. 10,197,257 B2 (the “257 Patent”)
1002	File History for U.S. Patent Application Serial No. 15/820,469 which issued as U.S. Patent No. 10,197,257
1003	U.S. Patent Application Publication No. 2012/0044374 A1 to Pohlert et al. (“Pohlert”)
1004	Astera AX10 SpotMax™ User Manual (“Astera” or “Astera Manual”)
1006	Declaration of Mr. Michael Wood (“Wood Declaration”)
1008	Declaration of Simon Canins (“Canins Declaration”)
Paper 1	Petition for <i>Inter Partes</i> Review of U.S. Patent No. 10,197,257 Under 35 U.S.C. §§ 311-319 and 37 C.F.R. § 42.100 <i>et set.</i> (“Petition”)
Paper 8	Decision Granting Institution of <i>Inter Partes</i> Review 35 U.S.C. § 314, 37 C.F.R. § 42.4 (“Institution Decision”)
	<i>Arnold & Richter Cine Technik GmbH & Co. Betriebs KG v. Rotolight Limited</i> , IPR2022-00099, Paper 10 (PTAB April 11, 2022)
2003	<i>Curriculum Vitae</i> of Eric Bretschneider, Ph.D.
2004	Deposition Transcript of Michael Wood dated June 7, 2022
2005	<i>Vitec Production Solutions, Inc. v. Rotolight Limited</i> , IPR2022-00261, Paper 8 (PTAB June 8, 2022)

Exhibit Number	Description
2006	<i>Vitec Production Solutions, Inc. v. Rotolight Limited</i> , IPR2022-00262, Paper 7 (PTAB June 8, 2022)
2007	Deposition Transcript of Simon Canins dated May 20, 2022 in IPR2021-01496 (with Errata Sheet/Witness Acknowledgement Form)
2008	European Patent Application No. EP 17 165 609.3 EP Register File History (downloaded February 16, 2022)
2009	Screen capture of the Google Play store page for the “AsterApp Classic” from Astera LED Technology GmbH updated July 17, 2019
2010	Screen capture of the ApkGk.com site for the AsterApp™ Version 9.111 from Astera LED Technology GmbH updated July 17, 2019
2011	Screen capture of the Google Play store page for the AsterApp™ from Astera LED Technology GmbH as of June 9, 2016 from the Internet Archive site WayBack Machine
2012	Declaration of Nathaniel E. Frank-White
2013	Declaration of Dustin N. Ferzacca
2014	Deposition Transcript of Michael Wood dated June 8, 2022

I, ERIC BRETSCHNEIDER, HEREBY DECLARE:

1. I have been retained by counsel for Patent Owner Rotolight Limited (“Patent Owner” or “Rotolight”) in connection with the above-captioned *Inter Partes* Review (“IPR”) proceeding.

2. I submit this Declaration in the above-captioned proceeding to provide my expert opinion in support of Patent Owner’s Response to the Petition for IPR submitted by Arnold & Richter Cine Technik GmbH & Co. Betriebs KG (“Petitioner”) of U.S. Patent No. 10,197,257 (the “257 Patent”, **EX1001**).

3. I am being compensated at an hourly rate of \$475 for my time spent working on this IPR. My compensation is in no way dependent on the statements I set forth herein or the outcome of this proceeding. I hold no interest in either the Patent Owner (Rotolight Limited) or the Petitioner (Arnold & Richter Cine Technik GmbH & Co. Betriebs KG).

I. EXPERTISE

A. Professional Qualifications And Experience

4. I have almost thirty (30) years of experience with lighting and light emitting diodes (“LEDs”), including a comprehensive background on the full range of LED production technologies, including metal organic chemical vapor phase deposition (“MOCVD”) hardware/process, fabrication, LED chip and package

testing and reliability, optical design, thermal management, color conversion, and solid-state lighting (“SSL”) fixture/lamp design, integration, and reliability.

B. Education

5. I graduated in 1984 from high school at Admiral Farragut Academy as Valedictorian. I was a Battalion Executive Officer from the NJROTC program, was a member of the National Honor Society, participated in various sports and was a member of the school band.

6. In 1989, I graduated from Tulane University with a Bachelor’s Degree in Chemical Engineering. While at Tulane University, I was the Vice President of the AIChE Student Chapter. I was also a member of the Bursar Tau Epsilon Phi fraternity, the office manager of the Tulane University Video Access Center and a Member-at-Large of the Tulane Media Board. As an undergraduate student, I received a merit-based scholarship and received the highest grade in three different graduate level technical elective courses in the department.

7. I earned my Ph.D. in Chemical Engineering from the University of Florida in 1997, where my graduate work focused on development of optoelectronic devices, including novel silicon-based visible LEDs and sulfide-based thin film electroluminescent device (“TFELD”) structures and zinc selenide blue LEDs. While at the University of Florida, I was the President of the Aikido Club, the President of the Isshinryu Club, a Member and the President of the

Sports Club Presidents Council, and a SCUBA Instructor. I also developed the world's first crystalline silicon-based visible LEDs. Additionally, I tested and verified the efficacy of novel precursors for p-type doping of ZnSe materials in LED structures and was responsible for the modification, operation, and maintenance of the MOCVD system for the growth of wide bandgap compound semiconductor materials. I also trained post docs and graduate students in the theory, operation, and maintenance of MOCVD systems.

C. Career Overview

8. I am currently the Chief Technology Officer/Principal Consultant at EB Designs & Technology. In that capacity, I am responsible for, among other things, the design of solid-state lighting technologies for clients ranging from startup companies to Fortune 100 companies.

9. From February 2013 through August 2014, I worked as the Director of Engineering at HeathCo LLC. In that capacity, I was responsible for advanced technology/product development, strategic planning, product launches, product recall management and regulatory compliance related to solid state lighting, sensors, notifications, and control products. Under my leadership, HeathCo transitioned to a LED-based consumer product entity.

10. From October 2011 through January 2013, I was the Chief Engineer, ETi Lighting Research Institute, and VP of Research and Development at ETi

Solid State Lighting Inc. I was responsible for developing all technology and product roadmaps for markets in North America, China, Europe, and Japan.

11. From June 2008 through October 2011, I was employed at Lighting Science Group Corp., first as a Product Development Manager, and then as the Vice President of Research. As the Vice President of Research, I assembled and managed research and development teams for projects related to solid state lighting, including the optical, mechanical, and electrical design. I was directly responsible for modeling and determining product and component lifetimes based on the optical, thermal, mechanical, and electrical analysis with respect to intended operating environments. While at Lighting Science Group, I also served as the company's representative on industry standards committees related to SSL technology (LM79, LM80, TM21, etc.). As a Product Development Manager, I was responsible for developing solid state lighting products and served as the primary technical resource for all OEM customers. I also managed the group responsible for all product certifications and standards requirements including UL, FCC, CE, Energy Star and DLC, as well as IES lighting requirements for outdoor lighting products.

12. Between December 2004 and May 2008, I was employed at Toyoda-Gosei as the Head of Sales, where I was responsible for developing and managing existing LED die and package sales accounts for the Eastern region of North

America. I also served as the primary technical resource for all customers in North and South America, as well as Europe.

13. From December 2003 through November 2004, I was the Director of Solid State Lighting Engineering at Beeman Lighting. My responsibilities included leading the development of solid state lighting systems and materials with a focus on chip and board applications and devices. Additionally, I managed all intellectual property issues and worked with existing and potential customers to ensure new products met or exceeded their requirements and expectations. While at Beeman Lighting, I developed Red-Green-Blue (“RGB”) LED-based landscape lighting with minimal environmental impact.

14. From March 2003 through October 2003, I was employed as the Intellectual Property Manager for the University of South Florida, where I managed the Intellectual Property portfolio of over 100 active patents and patent applications for the University faculty.

15. Between April 1998 and August 2003, I was employed at Uniroyal Optoelectronics. From April 1998 to April 2001, I was the Team Leader of Epitaxial Materials & Characterization. In this capacity, I was responsible for the design and capital equipment selection for the Raw Materials storage and handling areas, Epitaxial Growth areas/facilities and Materials Characterization areas for a full visible spectrum LED fabrication facility. Between April 2001 and August

2003, I was promoted to the Director of IP of University Relations & Government Contracts. My responsibilities included MOCVD hardware modification, epitaxial process design and development, development and testing of new LED chip structures for both AlInGaP and GaN-based material systems. While at Uniroyal Optoelectronics, I developed one of the first commercial Ultraviolet (“UV”)/near UV LED products. In my role as Director of Government Contracts, I also authored a proposal for the DARPA SUVOS (Semiconductor Ultra-Violet Optical Source) program that was ranked second overall out of 34 entries.

16. Between October 1996 and April 1998, I was a Process Engineer at Emcore Corporation. There I was responsible for installation, materials demonstration, and production process qualification and transition into manufacturing of MOCVD systems in an ISO9000 manufacturing environment. Some of the processes that I developed included both Aluminum, Indium, Gallium, and Phosphorous (“AlInGaP”) and Gallium Nitride (“GaN”) based LED structures. I developed the MOCVD industry’s first comprehensive cost and throughput model for epitaxial growth processes. This model significantly reduced production costs and increased throughput across a variety of MOCVD processes.

D. Publications And Patents

17. I am listed as an inventor on at least 40 issued patents, and over 40 pending U.S. and international patent applications, including multiple patents in

the field of LED lighting electrical systems and controls. I have authored 13 publications and presented 34 presentations and seminars. For details thereon, please see the *curriculum vitae* filed concurrently herewith as **EX2003**.

E. *Curriculum Vitae*

18. Additional details of my background are set forth in my *curriculum vitae* (see EX2003), which provides a more complete description of my educational background and work experience.

19. Based on the above education and experience, I believe that I have a detailed understanding of the state of the art during the relevant period, as well as a sound basis for opining on how a person of ordinary skill in the art at that time would understand the technical issues in this case.

20. On the basis of my education and the experience described above, I believe I am qualified to give the opinions set out herein.

II. MATERIALS CONSIDERED

21. For purposes of this Declaration, I have reviewed and, where applicable, relied upon the information and/or teachings of the documents identified in the TABLE OF MATERIALS CONSIDERED following the TABLE OF CONTENTS above.

22. In particular, I have carefully considered the Petition, Declaration of Michael Wood (“Wood Declaration”) (EX1006), and Declaration of Simon Canins

(“Canins Declaration”) (EX1008), and all references cited therein, even if inadvertently omitted from my Table of Materials Considered above.

23. I also base my opinions on my professional and academic experience.

24. The opinions to which I will testify, if asked, are set forth in this Declaration. My opinions in this Declaration are based upon the information that I have received to date.

A. Reservation of Rights

25. My opinions may be supplemented or modified if additional information is received.

26. This Declaration and my opinions are based on knowledge and information currently available to me. I reserve the right to supplement the opinions set forth in this Declaration to the extent that additional information becomes available or if I am asked to consider additional information. Further, I reserve the right to consider and comment on any statements or opinions rendered by any declarants in this matter.

III. LEGAL PRINCIPLES USED IN THE ANALYSIS

27. While I am neither a patent lawyer nor an expert in patent law, I have been informed of the applicable legal standards for patent invalidity. I have relied upon these legal principles, as explained to me by counsel, in forming my opinions set forth in this Declaration.

28. I understand that a petitioner in an *inter partes* review proceeding must prove unpatentability by a preponderance of the evidence. The statements below are my understanding regarding the law. I have used my understanding of these legal principles, as set forth in this section, to analyze the '257 Patent.

29. It is my understanding that a patent can be found invalid for several reasons. It is my understanding that these reasons include, among others: (i) being anticipated by the prior art; or (ii) being obvious in view of the prior art. My understanding of each of these bases for invalidity is discussed in greater detail below.

30. I understand that in undertaking an invalidity analysis, the claims are to be interpreted from the perspective of a person of ordinary skill in the art ("POSITA") at the time of the effective filing date of the patent. The analysis I discuss throughout this report is intended to reflect these parameters even if, *e.g.*, I use the present tense.

A. Anticipation

31. I understand that one way to show that a patent claim is invalid is to show that the claim is anticipated by a prior art reference. I understand this to mean that the patent claim is not new or novel in view of the prior art.

32. I further understand that to determine whether a prior art reference anticipates a patent claim requires a comparison of the claim language to the prior

art on a limitation-by-limitation basis. I have been informed that a prior art reference “anticipates” under 35 U.S.C. § 102 and renders a patent claim invalid if all of the claim’s limitations are expressly or inherently disclosed in that single prior art reference. The disclosure in the prior art reference does not have to use the same words as the claim, but all of the requirements of the claim must be expressly or inherently present.

33. I have been informed of the scope of prior art that can be used in an anticipation analysis as set forth in 35 U.S.C. § 102. In particular, I understand that a patent or publication qualifies as prior art to an asserted patent claim if it was published prior to the invention of the asserted patent claim or more than one year before the filing date of the application of the asserted patent. I further have been informed that a patent issued on a patent application filed before the invention of the asserted patent claim also is prior art to the asserted patent claim.

34. I understand that a prior art reference anticipates a patent claim when the claim limitations are not expressly found in that reference, but the claim limitations are nonetheless inherent in it. I understand that express disclosure means that the subject matter is clearly described in the prior art reference.

35. I understand that a limitation or the entire invention is inherent and in the public domain if it is the natural result flowing from the explicit disclosure of the prior art. I understand that for a claimed element to be inherently present

within a prior art document, it must be necessarily present. That is, the prior art reference must necessarily function in accordance with or include the claimed element. I understand that inherency may not be established by probabilities or possibilities—the mere fact that a certain thing may result from a given set of circumstances is not sufficient.

36. I understand that in some cases, the inherent property corresponds to a claimed new benefit or characteristic of a purported invention otherwise in the prior art. I understand that in such circumstances, the new realization alone does not render the old invention patentable. I further understand that when a prior art method is at issue, the inherent anticipation examines the natural and inherent results in that method without regard to the full recognition of those benefits or characteristics within the art field at the time of the prior art disclosure.

B. Obviousness

37. I have been informed that a patent claim is invalid as being obvious in view of the prior art if the differences between the patented subject matter and the prior art are such that the subject matter as a whole would have been obvious at the time of the invention to a person having ordinary skill in the art. *See* 35 U.S.C. § 103. In making a determination of obviousness, I understand that the following factors are analyzed: (i) the scope and content of the prior art, (ii) the differences,

if any, between the prior art and the claims at issue, (iii) the level of ordinary skill in the pertinent art, and (iv) objective evidence of non-obviousness, if any exists.

38. I have been informed that any of the following rationales are some of the acceptable bases for the conclusion that a claim is obvious: (i) the claimed invention is simply a combination of prior art elements according to known methods to yield predictable results, (ii) the claimed invention is a simple substitution of one known element for another to obtain predictable results, (iii) the claimed invention uses known techniques to improve similar devices (methods, or products) in the same way, (iv) the claimed invention was “obvious to try” because it was a choice from a finite number of identified, predictable solutions, with a reasonable expectation of success, (v) there is known work in one field of endeavor that may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces, if the variations would have been predictable to a POSITA, or (vi) there is some teaching, suggestion, or motivation in the prior art that would have led a POSITA to modify the prior art references or to combine prior art reference teachings to arrive at the claimed invention.

39. I have been informed that in order for a patent claim to be considered obvious, at the time the invention was made, each and every limitation of the claim must be present within the prior art, or within the prior art in combination with the

general knowledge held by a POSITA, and that such a person would have a reasonable expectation of success in combining these teachings to achieve the claimed invention. I also understand that the reason to select and combine features, the predictability of the results of doing so, and a reasonable expectation of success of doing so may be found in the teachings of the prior art themselves, in the nature of any need or problem in the field that was addressed by the patent, in the knowledge of a POSITA in the field at the time, as well as in common sense or the level of creativity exhibited by a POSITA. There need not be an express or explicit suggestion to combine references.

40. I understand that substituting one known element for another known element would have been obvious when it leads to reasonably predictable results.

41. I understand that a combination of elements would have been obvious when a POSITA has a good reason to pursue the combination, which is among a finite number of known options within his or her technical grasp, and leads to reasonably expected results.

42. A prior art reference can be said to teach away when a POSITA would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken in the claimed invention. The mere disclosure of more than one alternative does not constitute a teaching away from alternatives that are not disclosed when the prior art does not criticize,

discredit, or otherwise discourage the solution claimed in the alleged invention.

Similarly, a prior art reference that merely expresses a general preference for an alternative invention does not teach away.

C. Public Accessibility Of Prior Art Reference

43. I understand that in order to be considered as prior art, a reference needs to be publicly accessible before the priority date of the patent-at-issue. I understand that public accessibility requires more than technical accessibility. Specifically, I understand that in some cases, such as cases involving references published online, public accessibility hinges on whether an interested skilled artisan, using reasonable diligence, would have found the resource online. Accordingly, I understand that the critical question for public accessibility is whether a POSITA would have been independently aware of a reference's existence and would have reasonably been able to find the reference. I understand that the burden of showing that a reference was publicly accessible rests with the Petitioner.

44. I have relied upon this understanding of the applicable legal standards in reaching my opinions set forth in this Declaration.

IV. PERSON HAVING ORDINARY SKILL IN THE ART ("POSITA")

45. I understand that an assessment of the claims of the '257 Patent should be undertaken from the perspective of what would have been known or

understood by a POSITA as of the earliest claimed priority date of the patent claims, which I have assumed is April 8, 2016.

46. Counsel has advised me that to determine the appropriate level of one of ordinary skill in the art, I may consider the following factors: (a) the types of problems encountered by those working in the field and prior art solutions thereto, (b) sophistication of the technology in question, and the rapidity with which innovations occur in the field, (c) the educational level of active workers in the field, and (d) the educational level of the inventor.

47. The relevant technical field for the '257 Patent is lighting systems, in particular involving lighting effects used in cinematography. Based on this, and the four factors above, in my opinion a POSITA as of April 8, 2016 would have had the equivalent of a Bachelor's degree in electrical or chemical engineering with 2 to 5 years of working experience in the design of entertainment lighting systems. Additional education, such as a Master's degree in electrical or chemical engineering, could substitute for some of the work experience, and similarly, extensive experience in the field could serve as a substitute for formal education.

48. My opinions regarding the level of ordinary skill in the art are based on, among other things, my extensive experience in the relevant field, my understanding of the basic qualifications that would be relevant to an engineer tasked with investigating the methods and devices in the relevant area, and my

familiarity with the backgrounds of colleagues, co-workers, and employees, both past and present, who work in that area.

49. Although my qualifications and experience exceed those of the hypothetical POSITA defined above, my analysis and opinions regarding the '257 Patent are based on the perspective of a POSITA as of April 8, 2016.

50. Further, I understand that Petitioner and its expert, Mr. Wood, posit that a POSITA “would have had a good working knowledge of electrical engineering and entertainment lighting systems, controls, and effects.” Petition, 8; EX1006, ¶39. The Petition and the Wood Declaration further opine: “[s]he would have gained this through an undergraduate Bachelor’s degree in electrical engineering, or a comparable field, as well as some experience in the field (*e.g.*, in entertainment lighting systems).” Petition, 8; EX1006, ¶39.

51. While I prefer my definition, my opinions herein regarding the understanding of a POSITA and my other opinions set forth herein would remain the same under Petitioner’s definition of a POSITA. Also, I would qualify as a POSITA under Mr. Wood’s definition based on my extensive background in entertainment lighting systems, controls, and effects, including particularly the electrical components and circuitry used in entertainment lighting, and a degree in a comparable field in this area, along with all of my other credentials identified above. *See also* EX2004, 46:1-48:13 (explaining that a particular degree is not

required but a POSITA must have knowledge of the internal workings of the lighting device).

V. U.S. PATENT NO. 10,197,257

52. U.S. Patent No. 10,197,257 (EX1001) (“the ’257 Patent”), entitled “Lighting System and Control Thereof,” which issued on February 5, 2019, was filed as U.S. Patent Application Serial No. 15/820,469 (“the ’469 Application”) on November 22, 2017, which was a continuation of U.S. Patent Application Serial No. 15/481,460 filed on April 7, 2017, which application claims priority to foreign Application GB 1606907.2 (“the ’907 Application”) filed on April 20, 2016, which claims priority to U.S. Provisional Application No. 62/319,809 (the “Provisional Application”) filed on April 8, 2016.

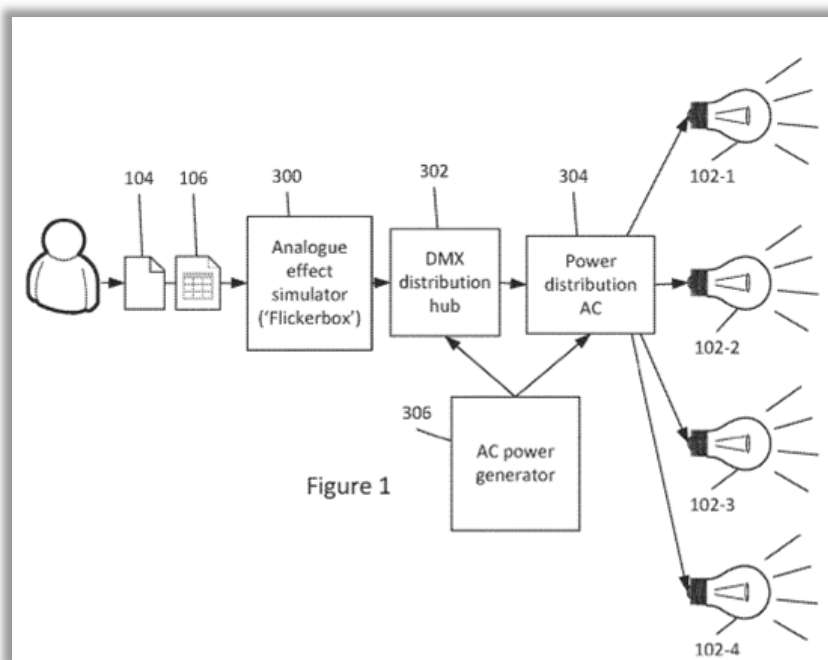
53. I understand that Rotolight Limited is the Assignee of the ’257 Patent and Roderick Allen Gammons, Andrew Francis, Roderick Aaron Gammons, and Stefan Lange are the named inventors.

A. Specification

54. The ’257 Patent generally describes a lighting system and method for controlling the lighting system. *See* EX1001, Abstract. In particular, the ’257 Patent relates to “a lighting system for videography, broadcasting and cinematography.” EX1001, 1:17-20. The ’257 Patent explains that in the film, broadcast and TV industry, there is an apparatus called a “flicker box” which is

provided independently of the lighting device(s) to mimic flickering light such as a fire place, candle, electrical spark or lightning. EX1001, 1:21-26. Use of a flicker box is a “complex, costly and time consuming process that requires the setup, connection and control of multiple pieces of hardware typically including external Digital Multiplex (DMX) and power distribution devices.” EX1001, 1:30-35.

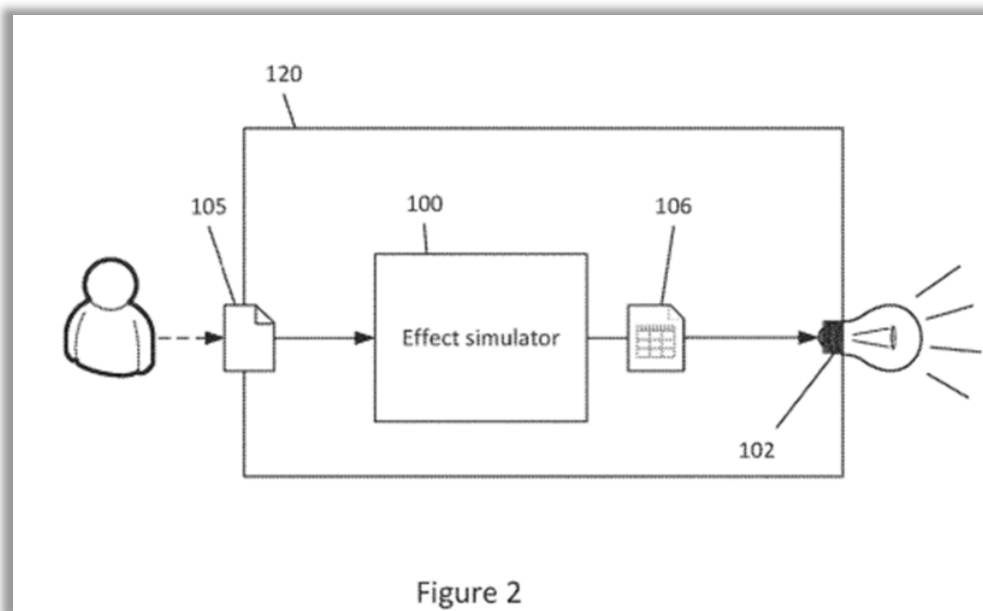
Flicker boxes also require specialists. EX1001, 1:36-38. FIG. 1 of the '257 Patent shows this conventional arrangement:



EX1001, FIG. 1.

55. The '257 Patent discloses an improved lighting system that involves controlling the lighting device to produce a user-customizable lighting effect that is time varying. EX1001, 1:46-51. As shown in FIG. 2, the '257 Patent provides a

single studio lamp device 120 with an integrated light 102 and a lighting effect simulator 100. EX1001, 5:58-67, FIG. 2.



EX1001, FIG. 2.

56. This arrangement allows for the DMX distribution hub and more complex circuitry associated with a “flicker box” to be dispensed with, and yet also provides more flexibility in producing lighting effects. EX1001, 5:58-67.

57. This flexibility is provided in the lighting system by providing a control panel 104 that includes, *e.g.*, buttons, knobs, or a digital interface for user input of parameters for simulating an effect. EX1001, 6:1-5. The lighting system includes an effect simulator integrated into the lamp device 120 for performing calculations such as how the lighting changes over time in order to produce the desired lighting effect. EX1001, 5:65-67, 7:34-44, 9:49-65, FIG. 4. This

combination of a user interface, effect simulator (which calculates the time varying lighting value), and lighting device introduces a simpler, less expensive, and more flexible system. *See* EX1001, 6:11-42.

58. The effect simulator described in the '257 Patent is characterized by its use of random simulation parameters. *See* EX1001, 7:17-20, 7:25-44, 10:4-11. These random simulation parameters are inputs into the effect simulator that allow for the generation of effects with increased realism. *See* EX1001, 7:17-20, 10:9-11. To generate the effects described, the '257 Patent discloses calculating (*e.g.*, using an algorithm) time varying lighting values to generate the lighting effects, with simulation parameters representing inputs into the calculation, and time varying lighting values representing the output therefrom. EX1001, 10:13-56.

B. Prosecution History

59. I have reviewed and analyzed the prosecution history of the '257 Patent. *See generally* EX1002. During prosecution, only one Office Action was issued, rejecting the claims as anticipated by U.S. Publication No. 2008/0129226 ("Dewitt"). EX1002, 429-430. In response, the Applicant amended the claims to specify that the simulation parameter(s) characterize an effect used for "videography, broadcasting, cinematography, studio filming, and location filming." EX1002, 451, 458. On September 26, 2018, the Examiner issued a Notice of Allowance. EX1002, 606-609. In the Notice of Allowance, among other

things, the Examiner pointed to the effect generation capability claimed in the '257 Patent, stating that “an effect simulator adapted to calculate a time varying lighting value based on at least one simulation parameter” is a feature not found in the prior art. EX1002, 607-608 (internal quotation marks omitted).

C. Claims Of The '257 Patent

60. Petitioner has challenged all 21 claims of the '257 Patent, of which claims 1, 15, and 20 are independent claims (the “Challenged Claims”). Independent claims 1, 15, and 20 recite a method for controlling a lighting device, a controller adapted to control a lighting device, and a computer program to customize lighting effects, respectively. EX1001, 11:54-12:3, 12:57-13:8, 14:1-18. Each of the independent claims recites generally similar limitations, though there are a few differences. *Id.* Claims 2-14 and 21 ultimately depend from claim 1, and claims 16-19 ultimately depend from claim 15. EX1001, 11:54-14:21.

VI. GROUND SUMMARY

61. I understand that a Petition for *Inter Partes* Review was filed against claims 1-21 of the '257 Patent on September 3, 2021 (IPR2021-01496, Paper 1), and that on March 16, 2022, the Patent Trial and Appeal Board (“PTAB”) instituted *Inter Partes* Review proceedings (Decision Granting Institution of *Inter Partes* Review in IPR2021-01496 (Paper 8)). I understand that this Petition seeks cancellation of claims 1-21 of the '257 Patent on the following Grounds:

Ground	Basis	Reference(s)	Claims
1	§§ 102 / 103	Astera (EX1004)	1-21
2	§§ 102 / 103	Pohlert (EX1003)	1-21

See Petition, 3-4; Institution Decision, 16.

VII. CLAIM CONSTRUCTION

62. I understand that in interpreting claims, I should consider the literal language of the claim at issue, as well as the language of other claims, the specification, and the prosecution history of the underlying claims. I also understand that the words of a claim should be given their ordinary meaning as understood by those of skill in the art, unless it is clear from the specification or prosecution history (or both) that a different meaning was intended.

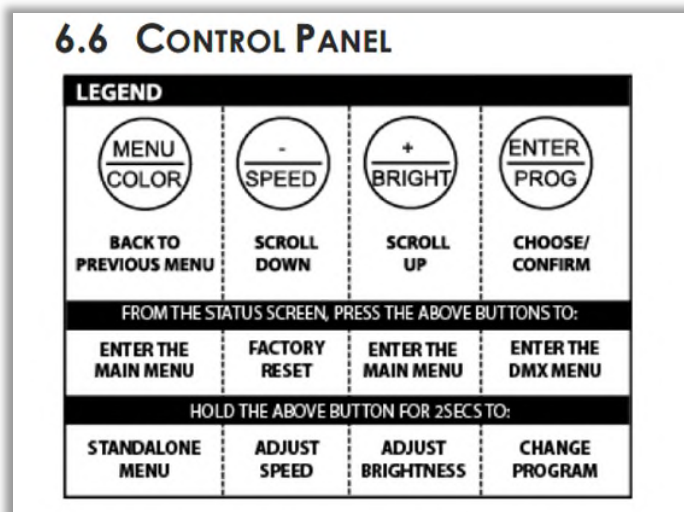
63. I understand that Petitioner takes the position that no claim constructions are necessary. Petition, 7. For purposes of this Declaration and in relation to the invalidity arguments raised by Petitioner, I have analyzed the claims under their ordinary meaning as understood by a POSITA. I do not believe that any formal constructions are necessary to resolve this IPR.

VIII. SCOPE AND CONTENT OF PRIOR ART RELIED ON BY PETITIONER

A. Summary Of Astera

64. Astera (“Astera” or “Astera Manual”) is a user manual for the Astera AX10 SpotMax™ LED (“AX10”) spotlight. EX1004, cover. Astera discloses that

the AX10 can be controlled using a local control panel, an ARC1 infrared remote control, the AsteraApp™, or CRMX wireless DMX. EX1004, 9-11. The local control panel includes a simple interface for selecting between menus:



EX1004, 11.

65. As I understand it, the local menu allows a user to input basic things like increased brightness or to select a “predefined program[]” for a single lighting device. EX1004, 20-21. The pre-defined programs in Astera are shown here:

6.16.1 Predefined Programs	
The predefined programs may use more than one pixel. To display these effects properly with your light, it is first necessary to group them into Flow-Sets and control them by the AsteraApp™ (see chapter 7.4).	
If several lights are grouped into a Flow-Set, they form a virtual big light with several pixels.	
Name	Pattern
ONE COLOR STATIC	A static color is displayed on the whole virtual light.
TWO COLOR STATIC	The virtual light is split into two halves and two colors are displayed.
THREE COLOR STATIC	The virtual light is split into three parts and three colors are displayed.
FOUR COLOR STATIC	The virtual light is split into four parts and four colors are displayed.
ONE COLOR FADE	For all FADE programs, the whole color palette of four colors is used. Those colors are faded in and out one by one. Here, the whole virtual light shows the same color.
TWO COLOR FADE	The virtual light is split and shows two colors at a time.
THREE COLOR FADE	The virtual light is split and shows three colors at a time.
FOUR COLOR FADE	The virtual light is split and shows four colors at a time.
SIMPLE RUNNING	A running light; the background and the running pixels color can be set.
DOUBLE RUNNING	Two pixels are running in opposite direction.
TWO COL RUNNING	The two pixels are of different color even.
FLAG RUNNING	A three color flag is running over the background color.
DOUBLE FLAG RUNNING	Two flags are running over background in opposite direction.
SPIRAL 4 COLORS	The color is changed pixel by pixel. All four colors are used one after the other.
SPIRAL 2 COLORS	The color changes between color 1 and 2 from the outside to the inside, pixel by pixel.
RAINBOW	A rainbow effect is displayed.
FIRE	The fire effect is a random flicker between two colors, background and flickering color.

EX1004, 21.

66. The Astera Manual explains that “[y]our light has a built in standalone engine. It can display static colors or replay a number of predefined effect patterns with a customizable color palette.” EX1004, 24. I understand that the “standalone engine” is within the lighting device, although I note that no further details of its components or functionality are particularly provided in Astera.

67. My understanding is that using the AsteraApp™ (which runs from a mobile device, such as a smart phone or tablet), expands the functionality.

EX1004, 23 (“[t]he buttons of the AX10 only allow a basic operation of the light.

To gain full control over all features, the AsteraApp™ should be used.”)

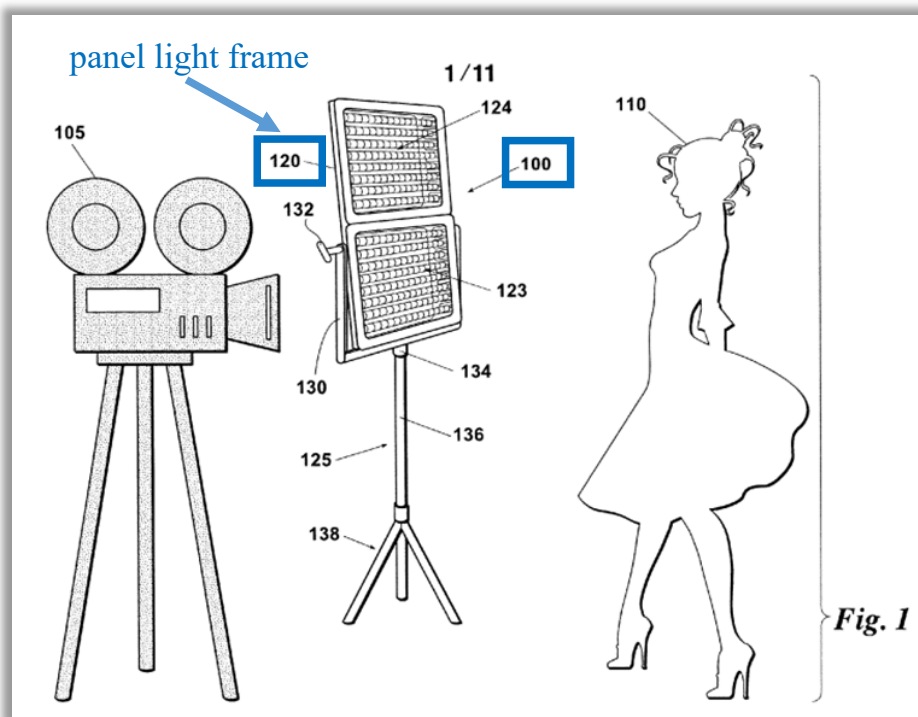
Specifically, Astera discloses that lighting “effects can be created and be sent to the light.” EX1004, 24. Once selected, “[t]he effects are ... triggered and then each light replays them autonomously until a new effect is sent.” *Id.*

68. Astera discloses customizability of the effects within the AsteraApp™. EX1004, 27. Specifically, aspects of the effect like “speed”, “crossfade”, and “brightness” can be adjusted to customize the lighting effect. *Id.*

69. While the effects may be customized, they are based on pre-defined patterns. In particular, Astera discloses that “[t]he effects’ patterns are pre-defined and cannot be modified by the user. They are pre-programmed inside of each light. Still they can be parameterized.” EX1004, 28. Essentially, Astera discloses two capabilities: (1) the ability to replay, on a loop, a series of pre-programmed effect patterns, and (2) the ability to modify the playback parameters of the effect pattern, *e.g.*, the playback speed. However, this modification of the playback parameters of Astera’s effects does not change the underlying effect pattern and it does not involve a calculation, as further explained below.

B. Summary Of Pohlert

70. Pohlert discloses a lighting apparatus with a panel light frame. *See* EX1003, Abstract. FIG. 1 shows an embodiment of the “inventive” light 100:



EX1003, FIG. 1 (annotated), ¶[0052].

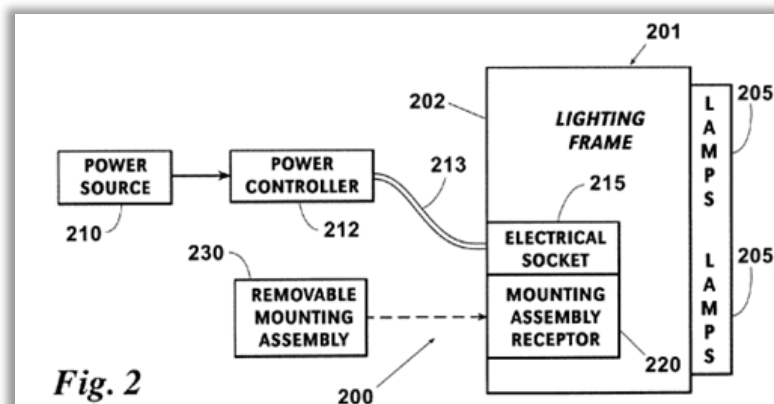
71. As shown in FIG. 1, “a video camera 105 might be directed toward a subject 110 that is being illuminated by inventive light 100.” EX1003, ¶[0052].

“[T]he camera 105 might use film, video tape, or solid-state image capture circuitry (e.g., CCDs) and may be a still photography camera, a motion picture camera, or some combination of the two.” *Id.*

72. Pohlert discloses the inventive light 100 preferably utilizes a panel light frame 120 that includes LED lights or other light elements. *See* EX1003, Abstract, ¶¶[0050], [0052]. This “panel-type arrangement” of lighting elements is preferred to provide even lighting on the subject. *See* EX1003, ¶[0056]

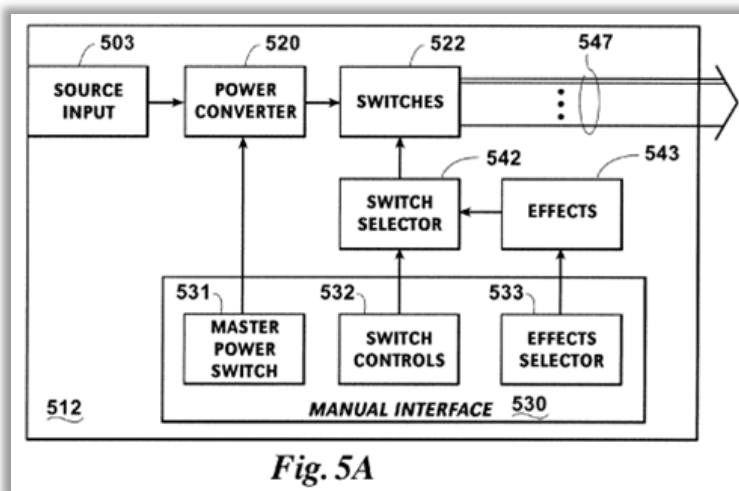
(explaining the relatively even lighting in the context of FIG. 4, which is preferred to uneven lighting).

73. FIG. 2 provides the general diagram of the lighting effects system:



EX1003, FIG. 2.

74. Pohlert provides “the LEDs or other low power lamps 205 may be...powered by a power source 210 controlled by a power controller 212” as shown in FIG. 2. EX1003, ¶[0057]. FIGS. 5A and 5B of Pohlert provide additional details of two types of power controllers. EX1003, ¶[0058]. FIG. 5A is reproduced here for convenience of explanation:



EX1003, FIG. 5A.

75. Pohlert explains that FIG. 5A shows one type of power controller. EX1003, ¶[0058]. This controller includes a power source input 503, power converter 520, and a plurality of switches 522, “which may be solid state devices (e.g., transistors) or analog devices (e.g., relays)” to control the power output via wires 547. “A switch selector 542 controls the on/off state [of] each switch (or group) in the set of switches 522,” and “[a] manual interface 530 is provided to allow operation of the switches.” EX1003, ¶[0058]-[0059]. The manual interface may include manual switches, buttons, knobs, or other manual input means for controlling each switch or groups of switches. EX1003, ¶[0059]. For example, a manual input such as a knob could select between different groups of light segments 325, 330, 335, 340, 345, 350, 355, 360. *See id.*; *see also id.*, FIG. 3B (showing the LED light segments).

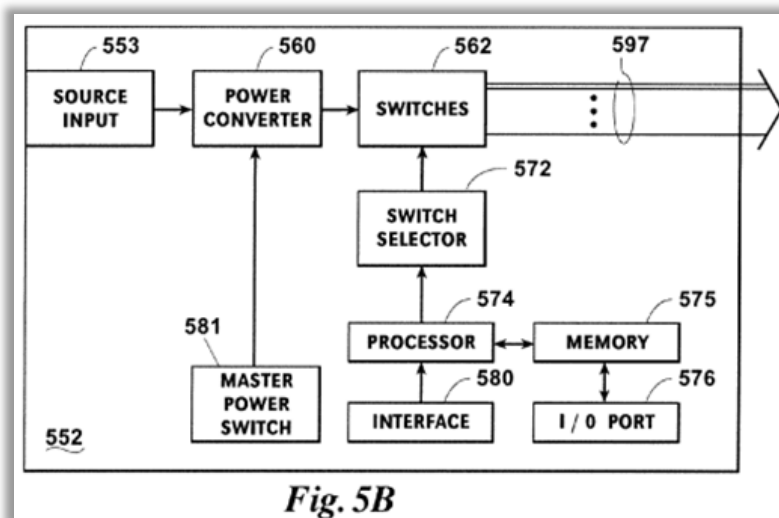
76. Pohlert discloses an effects generator 543 that may optionally be included along with an effects selector 533, which is part of the manual interface. EX1003, ¶[0061]. The effects generator 543 can provide various lighting effects such as dimming, strobing, or pattern generation. *Id.*

77. Pohlert explains that dimming may be accomplished using a manual control knob or a multi-position switch on the effects selector 533. EX1003, ¶[0061].

78. Pohlert explains that strobing may be accomplished “by generating an oscillating signal and applying it as a control signal either upstream or downstream from the switch selector 542.” EX1003, ¶[0062]. The frequency of oscillation may be selectable via a manual knob as part of the effects selector 533. *Id.*

79. Pohlert explains pattern generation “may be accomplished by, e.g., manual selection from a number of predefined patterns or else through an interface allowing different pattern sequencing.” EX1003, ¶[0063]. Patterns may include strobing or flashing different groups of light segments 325-360 in a pre-defined sequence or a pseudo-random sequence. *Id.*

80. FIG. 5B of Pohlert shows “another example” of a power controller 552 that may be used in Pohlert’s lighting system. EX1003, ¶[0065].



EX1003, FIG. 5B.

81. The FIG. 5B embodiment does not include the effects simulator 533 or effects generator 543, but instead includes a processor 574 and a switch selector 572. EX1003, FIGS. 5A-5B, ¶¶[0065]-[0066]. The processor 574 interfaces with memory 575 to access programming instructions. EX1003, ¶[0066]. An interface 580 is provided for programming or otherwise interfacing with the processor, or manually selecting various lighting effects. *Id.* The processor 574 “reads instructions from the memory 575 and executes them in a conventional manner,” which controls the switch selector 572 and ultimately the downstream lights. EX1003, ¶[0067].

82. Notably, Pohlert describes that the processor 574 is specifically pre-programmed to provide dimming, strobing, or pattern generation using pre-defined or pseudo random sequences. EX1003, ¶[0067].

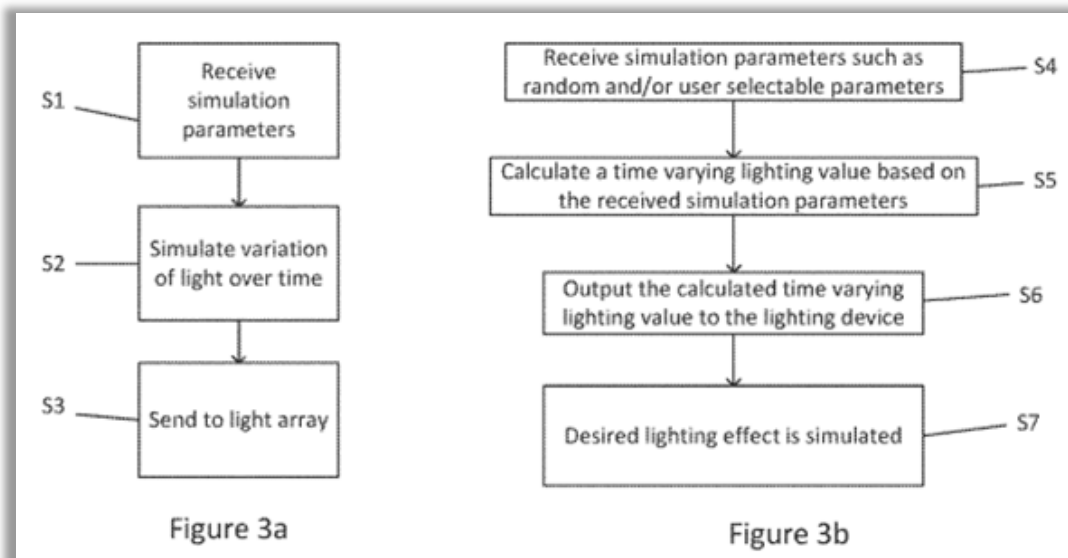
**IX. THE '257 PATENT IS VALID OVER ASTERA AND POHLERT
BECAUSE PETITIONER FAILS TO PROPERLY ADDRESS THE
CALCULATING LIMITATION**

83. Before turning to the specific Grounds and a more detailed explanation of particular claim limitations relative to the prior art, there is one important claim recitation that I believe merits an initial, collective discussion as it distinguishes over both the Astera and Pohlert Grounds.

84. Each of independent claims 1, 15, and 20 of the '257 Patent requires a variation of “calculating[,] using an effect simulator[,] a time varying lighting value based on at least one simulation parameter.” EX1001, cls. 1 and 20; *see also id.*, cl. 15 (“an effect simulator adapted to calculate a time varying lighting value based on at least one simulation parameter”).

85. I do not believe that this limitation is present in Astera or Pohlert. In my opinion, the Petition and Wood Declaration fail to address the plain meaning of this phrase as it would have been understood by a POSITA in view of the specification and drawings of the '257 Patent.

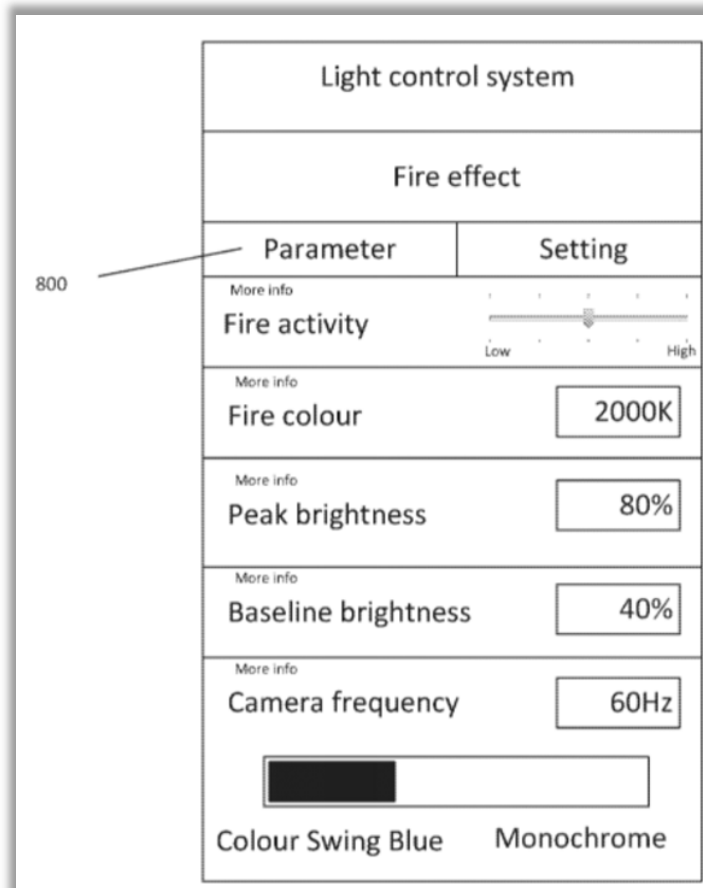
86. The specification of the '257 Patent describes the calculating step, stating that “the simulation calculates how the lighting changes over time in order to produce the desired lighting effect.” EX1001, 7:39-40. This calculating step is further embodied in the flow charts in FIGS. 3a and 3b:



EX1001, FIGS. 3a and 3b.

87. As shown above, the lighting device first receives simulation parameters, including user selectable parameters and/or random parameters, and simulates the variation of light over time by “calculat[ing] a time varying lighting value based on the received simulation parameters.” *Id.* Critically, this ties the “calculating” step (and claimed “calculating” requirement) directly to input of a received simulation parameter (*i.e.*, the calculating is “based on at least one simulation parameter”) and to the output of a “time varying” lighting value.

88. FIG. 6 of the '257 Patent illustrates an embodiment of a control panel that receives user input of a parameter to customize a lighting effect, which is helpful to illustrate the meaning of the “calculating” limitation of the independent claims:



EX1001, FIG. 6.

89. In the example shown in Figure 6, the “customized lighting effect” is a “Fire effect.” The user is able to input a “simulation parameter,” such as fire color or peak brightness. The “time varying lighting value” is calculated by the lighting effect simulator 100 based on at least that simulation parameter. EX1001, 8:36-38.

90. The '257 Patent discloses and claims an effect simulator that *calculates a time varying lighting value* based on at least one simulation parameter. EX1001, 8:25-45; cls. 1, 15, 20. In the context of the above, as an example,

assume that the “simulation parameter” is “peak brightness” and the user input is “80%.” This means that the effect simulator uses the simulation parameter to calculate a time varying lighting value, *i.e.*, uses the “80% brightness” as a simulation parameter input to a calculation that outputs a time varying lighting value. Notably, recalling a pre-stored lighting pattern or replaying a pre-defined lighting effect does not satisfy this claim language. I should also note that in the example I am discussing here regarding the 80% peak brightness, the simulation parameter is input by a user, but in other embodiments (including those claimed in the '257 Patent) the simulation parameter may be a “random” parameter. For example, the effect simulator may generate a random brightness (*e.g.*, between user inputs of a baseline brightness and a peak brightness) and use that random brightness in the calculation of the time varying lighting value.

91. Figure 7 demonstrates an example with the brightness varying over time generated algorithmically by the effect simulator disclosed in the '257 Patent. EX1001, 10:40-56. In particular, the '257 Patent provides an example of a fire-effect-generating algorithm that calculates such a brightness-over-time pattern:

Fire is simulated as a series of “sparks”. Each spark has the following random parameters:

Interval: New sparks are generated at an interval which varies randomly between a defined maximum and minimum interval.

Peak: The peak luminance of each spark varies randomly between a defined minimum and maximum.

Ramp-up time: The luminance of each spark ramps up to the peak at a randomly generated rate.

Fade-down time: The fade from the peak is linked to the ramp-up time but is much slower—simulating the gradual decline in luminance of a burning ember.

EX1001, 9:51-62.

92. A series of sparks is generated sequentially to produce a realistic fire simulation, according to an algorithm like the one described below:

At the end of a spark up and down period:

Reset duration for next spark to between 2.5 s to 5 s

Generate new brightness targets for the next spark between 12.5% and 100% of current maximum brightness setting.

Offset the random brightness targets by the requested brightness floor value

Set the new peak brightness target for the new spark

Ensure the new targets are greater than the existing faded brightness value to prevent downward jumps

Set the fade direction to UP

Start new animation frame:

Calculate brightness fade step sizes:

Fade up fast, progressively larger fade step sizes

Change fade direction at peak

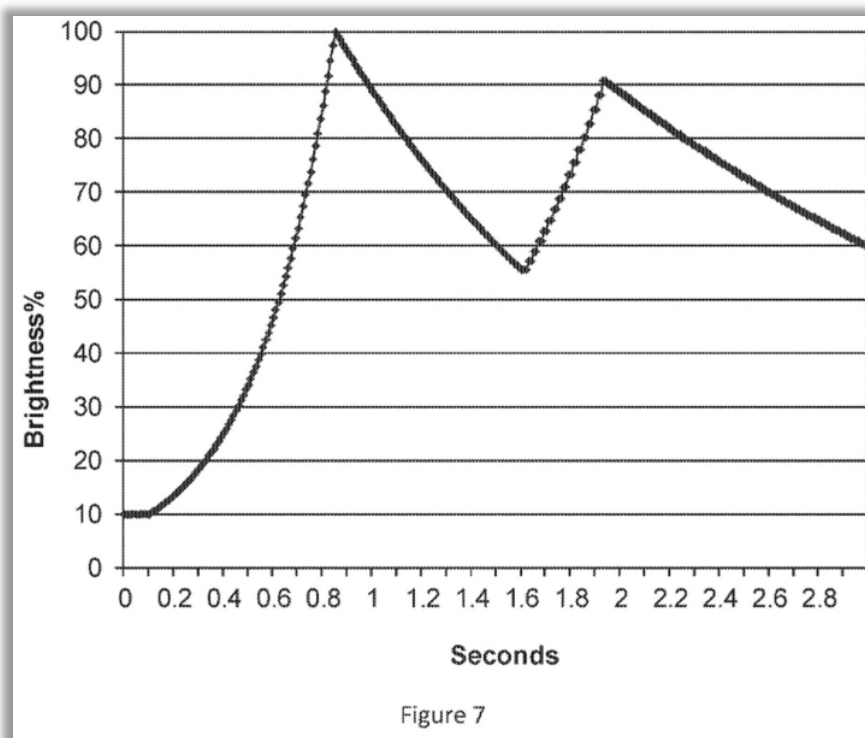
Fade down slow, progressively smaller fade step sizes

Set the frame rate for the new spark to a random value

prevent the curtailment of a long fade by a new short pulse: if the faded brightness is still >25% of max then don't allow new FramePeriod to be less than old.

EX1001, 10:19-39.

93. The above algorithm provides an example demonstrating how the effect simulator *calculates a time varying lighting value* based on the various simulation parameters. The '257 Patent also provides an example of time varying lighting values, calculated by the effect simulator, in Figure 7:



EX1001, FIG. 7.

94. The '257 Patent further explains “[t]he lighting effect simulator 100 typically cycles round a loop calculating new lamp brightness and colour values.”

EX1001, 9:66-67.¹

95. Performing a calculation in this manner using an algorithm generates more controllable and realistic-looking fire effects than replaying a pre-recorded set of values chosen to mimic a fire. In particular, “[g]enerating the light output

¹ Unless noted otherwise, I added the emphasis in quotations throughout this Declaration.

with the simulation provides a greater level of user adjustment and control than that produced by simply sampling the intensity of a real flame and replaying it at different speeds.” EX1001, 10:13-16. An effect generated by the algorithm described in the ’257 Patent is characterized by a continuous stream of sparks, where “each spark has a different speed, duration, and peak – simulating the look of a real flame.” EX1001, 10:10-11.

96. Critically, the ’257 Patent is not simply recalling a stored lighting value or set of stored lighting values and adjusting them to create variations of effects. When the effect simulator disclosed in the ’257 Patent generates a lighting effect, it does so by *actively calculating time varying lighting values* based on a simulation parameter, not by *passively replaying* an existing lighting effect stored in memory.

97. Further, the ’257 Patent explicitly describes the advantages of an actively simulated fire effect over a passively replayed fire effect: controllability and realism. EX1001, 10:9-16. Here, the ’257 Patent compares the disclosed fire effect algorithm with “sampling the intensity of a real flame and replaying it at different speeds.” *Id.*

98. In contrast, in the Astera and Pohlert references, pre-defined lighting effect patterns are stored and then recalled. There is no “calculating” by an effect simulator, let alone a calculation “based on” at least one simulation parameter.

The specifics of these references are discussed in more detail below, but I believe it is noteworthy that the '257 Patent is fundamentally different than these prior art techniques because of the “calculating” limitation that appears in each of the independent claims.

99. Further, even where a device includes the option to customize or modify a pre-recorded set of lighting values, a POSITA would have understood that parametrizing or customizing those pre-recorded values does not involve a “calculation.” Parameterizing a pre-recorded lighting scheme does not require calculating anything; it simply involves adjusting the pre-recorded parameters. For example, if a fire special effect is pre-recorded and the playback speed is increased, there is no “calculating” within the meaning of the '257 Patent claims—the pre-recorded lighting effect is simply played slower or faster. The same holds true for a brightness adjustment, *i.e.*, pre-recorded time varying lighting values for the fire are replayed and the overall brightness may change, but there is no “calculating” of the time varying lighting values (nor a calculation “based on” the adjusted brightness).

100. As an analogy, compare a live jazz performance to a mp3 recording of a jazz song. When the listener plays the recording, the mp3 player is not calculating a time varying musical signal, it is simply recalling a pre-defined pattern of musical notes. Conversely, at the live jazz performance, the musician is

actively choosing which notes to play next. In this analogy, the jazz musician takes the place of the “effect simulator,” the notes she plays are the time varying musical signal, and her choice of which notes to play next is her calculation thereof – the algorithm she uses to choose each note. On the other hand, the mp3 player is a passive system that merely replays a pre-defined musical pattern. While the user may adjust parameters of that signal (*e.g.*, the volume, the playback speed, etc.), the musical signal is not “calculated,” it is simply recalled.

101. While the mp3 player and the jazz musician may both output a nearly identical song, the method at which each arrived at that output is entirely different. In particular, the mp3 player will consistently play the same exact song, but it will never give the user a “concert” experience. That realism is only achievable with a live musician actively choosing (in a sense, calculating) the next notes. The ’257 Patent recognizes that realism in lighting effects is not achievable by layering customized parameters over a pre-recorded pattern.

102. In my opinion, Mr. Wood takes an overly broad view with respect to what the “calculating” limitation encompasses. For example, I reviewed Mr. Wood’s deposition transcript, and he seems to believe that *any* analog circuit that receives a user input and outputs lighting values is performing a “calculation.” EX2004, 70:2-71:21, 95:8-100:1, 158:4-159:3, 156:13-14, 158:20-22, 369:13-17. Further, Mr. Wood seems to believe that *any* conversion from a manual input to a

lighting output involves a “calculation.” EX2004, 110:3-112:4 (increasing the volume of a radio involves a calculation), 112:17-114:9 (a Super Strobe from the 1980s receiving a manual input of a flash rate and converting it to an output performs a calculation). I understood Mr. Wood to argue that receiving a manual input (*e.g.*, of a brightness increase) and converting it to an LED signal using PWM requires a calculation. EX2004, 145:6-146:18, 149:7-150:19, 154:12-155:18, 343:5-7, 427:16-21.

103. Finally, and perhaps most notably, I see that Mr. Wood takes the position that replaying pre-defined effect patterns includes calculating. EX2004, 200:22-201:22 (“Q: So is it your position that the replaying of a number of predefined effect patterns includes calculating? A: Absolutely. ... So, yeah, this absolutely requires calculation.”). I disagree that the claimed “calculating” of the ’257 Patent is as broad as Mr. Wood seems to understand it. Mr. Wood’s view would encompass every light that allowed, *e.g.*, a user input to increase brightness, a digital light that received a signal to change color, or any digital light that is merely capable of receiving a signal. EX2004, 337:9-11 (“Q: Is the light listening for new commands calculating? A: Absolutely.”) Further, Mr. Wood’s view would encompass the mere “replaying” of a *pre-defined* lighting pattern. EX2004,

200:22-201:22. That is simply not how a POSITA would have understood “calculating” in the context of the ’257 Patent, as I have explained above.²

X. CLAIMS 1-21 ARE VALID OVER THE ASTERA MANUAL

A. Astera Is Not Prior Art

1. Petitioner Has Not Shown that Astera Was Publicly Available to a POSITA Prior to April 8, 2016

104. In my opinion, Petitioner has not shown that Astera was publicly available before the priority date of the ’257 Patent. First, Astera’s date of publication is ambiguous based on Astera’s typical date format convention. Second, there is no evidence that the Astera manual was available to POSITAs—the Petitioner at most established that *customers* could access the manual but is

² Additionally, I have also reviewed institution decisions regarding IPR petitions for the ’257 Patent and family member U.S. Patent No. 10,197,258. *See* EX2005 (IPR2022-00261, Paper 8) and EX2006 (IPR2022-00262, Paper 7). I observe there that the Board found a prior art reference’s disclosure of searching a library of pre-packaged effects (EX2006, 24) and modifying the pre-packaged effects (EX2005, 19) do not involve “calculating a time varying lighting value.” I concur and this finding underscores the same flaw in Petitioner’s arguments.

missing the link that customers are POSITAs as defined by either myself or by their expert, Mr. Wood.

105. ***Petitioner Failed to Establish a Publication Date Prior to the '257***

Patent. Petitioner argues, somewhat ambiguously, that Astera was publicly available in May or June of 2015. Petition, 8. I characterize Petitioner's argument as ambiguous, because Petitioner states that "Astera bears a date of May 7, 2015, and was made publicly available ... at least in June of 2015." Petition, 8. Further, in an IPR regarding a family member to the '257 Patent (IPR2022-00099), Petitioner argued that "[t]he Astera Manual on its face bears a date of May 7, 2015" and that public availability was "in this timeframe." *Arnold & Richter Cine Technik GmbH & Co. Betriebs KG v. Rotolight Limited*, IPR2022-00099, Paper 10, 2 (PTAB April 11, 2022). Accordingly, it is unclear what weight and significance Petitioner is giving the May 7, 2015 date appearing on the face of the Astera Manual, since Petitioner appears to concede that Astera may not have been publicly available until after May 7, 2015.

106. Despite Petitioner seeming to assign the May 7, 2015 date at least some significance, that date, in my opinion, does not have any bearing on public availability. Specifically, Mr. Canins testified that the date on the face of the Astera Manual was "the date [Astera] finalized this document." EX2007, 39:21-

40:1. Accordingly, the May 7, 2015 date does not indicate when, if ever, the manual was made publicly available.

107. Instead, Petitioner relies on the “Quick Start Guide” to establish when customers of Astera first had access to the Astera Manual. Mr. Canins testified that Astera does not include a physical copy of the Astera Manual in the box with its product. EX1008, 2; EX2007, 34:14-18. Rather, Astera included only a Quick Start Guide with a QR code and a link to an electronic version of the Astera Manual. EX1008, 2; EX2007, 34:14-18, 35:4-6. Thus, the earliest date Petitioner can establish that Astera customers were directed to the electronic copy of the Astera Manual is the date on the Quick Start Guide.

108. Mr. Canins testified that Astera typically uses the Chinese date format (Year-Month-Day). EX2007, 40:1-6. Specifically, Mr. Canins personally uses this date format because it is “the best date format” for electronic records filing; Mr. Canins stated that Year-Month-Date is “the most common [date format] we use in the company.” EX2007, 40:15-17; 40:11-13. Moreover, Mr. Canins was personally involved in drafting the Quick Start Guide. EX2007, 21:21-22:7.

109. The Quick Start Guide bears a “Date of Issue” of “16/06/15.” EX1008, ¶6, Exhibit B at 1. While Mr. Canins asserted (without any further explanation) in his declaration that this date indicates June 16, 2015, his deposition testimony regarding commonly used date formats suggests the actual date of issue

is June 15, 2016. EX1008, ¶¶2, 6. In particular, Mr. Canins testified that the (Year, Month, Day) format was most commonly used by Astera and that he personally used this format. EX2007, 40:7-13, 40:18-22. The date “16/06/15” is at best ambiguous, but, given Mr. Canins testimony about date formats, likely indicates **June 15, 2016**.

110. The priority date of the ’257 Patent is April 8, 2016. EX1001, cover. As such, a June 15, 2016 publication date of the Quick Start Guide does not pre-date the priority of the ’257 Patent.

111. As a separate, additional point, I observe that Mr. Canins asserts that the Quick Start Guide directed customers to the Astera Manual. EX1008, ¶7. This assertion does not help Petitioner meet the burden of showing to *which version* of the Astera Manual the Quick Start Guide was linked.

112. ***Petitioner Failed to Establish Public Accessibility by a POSITA.***
Even if the Quick Start Guide was on the Astera website in 2015 – which Petitioner has not shown – Petitioner has not submitted sufficient evidence that the Astera Manual constitutes a publicly available printed publication for the purposes of establishing the reference as prior art.

113. I understand that in order to be considered a printed publication, a reference published online needs to have been accessible by a POSITA applying reasonable diligence. *See* Section III.C., *supra*. Here, Petitioner has only

presented evidence that Astera customers had access to the Quick Start Guide, and thus the link to the electronic version of the Astera Manual. *See* EX1008, ¶4; EX2007 34:14-18. But, Petitioner has not submitted any evidence that customers who purchased the Astera AX10 were POSITAs. Specifically, Petitioner argues that a POSITA “would have had a good working knowledge of electrical engineering” gained “through an undergraduate Bachelor’s degree in electrical engineering.” Petition, 8. However, Petitioner has not shown that Astera AX10 *customers* were electrical engineers with engineering Bachelor’s degrees. Mr. Canins testified that the “most important” customers are “rental companies” – companies that invest in Astera lighting devices and rent them out to end-users. EX2007, 35:7-16. In addition to rental companies, Mr. Canins testified that customers and end-users work in “film and TV ... and events.” EX2007, 36:20-37:1. Likewise, Mr. Wood testified that the typical end user of the types of lighting devices at issue is a lighting operator working at the direction of a lighting designer, neither of whom were established to be POSITAs. EX2004, 50:22-52:22. Neither Mr. Canins, nor Petitioner, submitted any evidence showing that these customers and end-users of the Astera AX10 meet the credentials of a POSITA as defined by either Petitioner or Patent Owner. Accordingly, Petitioner has not shown that Astera’s customers were POSITAs.

114. Further, Petitioner has not submitted evidence that the website containing the link to the Astera Manual was known to POSITAs, or that a POSITA would have been able to access the Astera Manual by applying reasonable diligence. Petitioner did not submit any evidence of anyone accessing the Astera Manual. Mr. Canins admitted that he did not submit any evidence of customers or end-users *actually accessing* the electronic version of the Astera Manual. EX2007, 38:9-15. At most, Petitioner only established that *customers* could access the manual; Petitioner has not shown that customers actually did, let alone that *POSITAs could have* reasonably found the Astera Manual.

115. Therefore, the evidence presented by Petitioner is insufficient to show that a POSITA could have, through an exercise of reasonable diligence, located the Astera Manual.

2. Astera Discloses Features that Petitioner Has Not Shown to Have Been Available Prior to April 8, 2016

116. As I have just discussed, in my opinion, Petitioner has not met its burden of showing that the Astera Manual is prior art to the '257 Patent. Therefore, it is also my opinion that the Astera Manual cannot anticipate and/or

render obvious the Challenged Claims of the '257 Patent.³ In addition to the lack of evidence of public availability, I am also of the opinion that the Astera Manual discloses features that were apparently not available as of the asserted public availability date. In order to form this opinion, I reviewed the Astera Manual, the Declaration of Simon Canins, and various documents relating to the publication of the Astera Manual. *See* EX1004; EX1008; EX2013; EX2011; EX2008, 87, 102-107; 122-123.

117. As discussed above, the priority date of the '257 Patent is April 8, 2016. EX1001, cover. I understand that Petitioner asserts that the Astera Manual was publicly available at least as of June 2015, based on the declaration of Simon Canins. *See* EX1004; EX1008, ¶6; Petition, 8. Mr. Canins, the R&D Director for Astera, asserts that the reference is the “true and correct copy” of the Astera AX10 User Manual “distributed to customers from at least June 2015 through at least June 2017.” EX1008, ¶6.

³ I am aware that the European Patent Office considered the release date of the Astera Manual and EX2011, and came to the same conclusion I have – namely, that there is not sufficient evidence to show that Astera is prior art to a family member of the '257 Patent. EX2008, 87, 102-107, 122-123.

118. However, the Astera Manual is a user manual that discloses features of the Astera AX10 product. As detailed below, the Astera Manual includes disclosure of features that were not released before the priority date of the '257 Patent, let alone as of the asserted June 2015 public availability date. Because these features appear to have been implemented only after the priority date of the '257 Patent, it is my opinion that Petitioner has not met its burden of showing that the May 7, 2015 date is the actual publication date of the Astera Manual. Further, because the relevant features were not available until after the priority date of the '257 Patent, as discussed in more detail below, in my opinion, the Astera Manual is not prior art to the '257 Patent.

119. It is my opinion that a user manual would not have been publicly released describing certain product features until those product features were in the released product. I form this opinion based on my extensive experience working with companies in the lighting industry as outlined above. *See* Section I.A-D. In particular, I have been personally responsible for generating and distributing user manuals at Uniroyal Optoelectronics, Beeman Lighting, Lighting Science Group Corp., ETi Lighting Research Institute, HeathCo and QuarkStar. In my experience, companies do not release user manuals until a product is publicly available. This timing is adhered to in the industry because, for example, releasing manuals regarding unreleased features causes consumer confusion and raises

concerns that consumers have a defective or deficient product. In addition, releasing a manual prior to public launch of a product risks the perception of the product being perceived “vapor ware” – that is to say a fake product that is used as a marketing ploy to increase short term interest in a company.

120. Turning to the Astera Manual specifically, Petitioner has failed to establish that the user manual was publicly available prior to April 8, 2016 (the effective filing date of the '257 Patent) because features in the user manual were not present until a software version released in June 2016. As described in the Astera Manual, the relevant functions are only accessible to users through the mobile app. EX1004, 23. Specifically, the Astera Manual states “[t]he buttons of the AX10 only allow a basic operation of the light. To gain full control over all features, the AsteraApp™ should be used.” *Id.* From this, I understand that some of the features of the Astera AX10 product are only accessible via the AsteraApp™.

121. Two such features are the “anti-flicker” and “theft alarm” described in Sections 7.12 and 7.13 of the Astera Manual. EX1004, 32-33. The “anti-flicker” and “theft alarm” features were not released until at least the summer of 2016. To reach that conclusion, I reviewed a screenshot of the Google Play store page for the AsteraApp™, which lists “theft alarm” and “anti-flicker” features as added in version 9 of the app. EX2008, 102-103 (listing “theft alarm” and “anti-flicker”

under features of version 9; “AsteraApp™ v9 with Talkback+ is now online!”); *see also* EX2009 (confirming the v9.111 release date) and EX2010, 2 (confirming functionality including “theft alarm” and “anti-flicker” were apparently added in v9). Specifically, the context in which the features at issue are presented in the exhibit demonstrates that the features were new to that version of the app.

EX2010; EX2008, 102. The exhibits show the Google Play Store page when AsteraApp™ v9 was introduced. EX2010; EX2008, 102.

122. The first line reads “AsteraApp v9 with Talkback+ is now online!” EX2008, 102. Below, “Theft Alarm” and “Anti-Flicker” are listed as highlighted features, along with “Talkback+”. *Id.*, 102-103. Taken together, the exhibits demonstrate “Talkback+,” “theft alarm,” and “anti-flicker” were features new to v9. According to the same Google Play store page, as of July 17, 2019, the current version of the app was version 9.111. EX2008, 103; *see also* EX2010, 1 (confirming the v9.111 release date).

123. Additionally, I reviewed a copy of the same Google Play store page, obtained using the WayBack Machine archive. *See* EX2011; EX2012. The page was archived on June 9, 2016, two months after the priority date of the ’257 Patent. EX2011, 1. As of that date, the current version of the AsteraApp™ was version 8.43. EX2011, 2. Accordingly, the WayBack Machine archive shows that version 9 was not released until after June 9, 2016, and consequently, after the priority date

of the '257 Patent. In my opinion, this is consistent with the Google Play store screenshot, which shows that version 9.111, presumably an early software patch to version 9, was launched on July 17, 2019, a full three years after the priority date of the '257 Patent. EX2008, 103; *see also* EX2010, 1 (confirming the v9.111 release date).

124. Based on the above, my opinion is that the “anti-flicker” and “theft alarm” features – new to version 9 of the AsteraApp™ – do not appear to have been available before the priority date of the '257 Patent.

125. Consequently, in my opinion, Petitioner has not shown sufficient facts to meet its burden of showing that the Astera Manual is prior art to the '257 Patent. The Astera Manual's disclosure of features and functionalities not available until after the priority date of the '257 Patent is at odds with the date identified on the reference's cover.

126. The Declaration of Simon Canins that Petitioner asserts supports the claimed May 7, 2015 publication date, does nothing to rebut the above evidence, and contains only conclusory assertions that the publication date is “true and correct.” EX1008, ¶6.

127. Specifically, Mr. Canins references sales of the AX10 devices in the United States and worldwide, and cites to the “Quick Start Guide” included with

each AX10. EX1008, ¶¶4-5. Neither of these two pieces of evidence help Petitioner meet its burden of showing that the Astera Manual is valid prior art.

128. Mr. Canins' testimony that AX10s were sold worldwide in 2015 does not bolster Petitioner's argument that the Astera Manual was available before the priority date of the '257 Patent. All Mr. Canins' statements support is that some version of the AX10 device was sold prior to the '257 Patent with a quick start guide linking to a user manual, but that does not address the specific challenge here—*i.e.*, that *the version Petitioner has submitted as the Astera Manual* was not available until after the priority date of the '257 Patent. See ¶¶105-112 *supra*. Petitioner has failed to tie the sales of AX10s to this particular version of the Astera Manual (*i.e.*, including the version with anti-flicker and theft alarm functionality). Indeed, these features were not released until later, as explained above.

129. Finally, I note that in the European Patent Office proceedings (EX2008) mentioned above, a key issue was whether or not the Astera Manual was prior art to the '257 Patent's family member application. The European Patent Office concluded the Astera Manual was not shown to be prior art. EX2008, 87. The basic reasoning was the same as I discuss above, *e.g.*, functionality such as the “anti-flicker” and “theft alarm” for the AsteraApp™ discussed in the Astera Manual was not released until after the effective filing date of the '257 Patent,

calling into question the date listed on the cover of the Astera Manual. *Id.* The Petition and Declaration of Mr. Canins do not squarely address this functionality release discrepancy, instead only focusing on the release/sale dates of the general AX10 product. Therefore, the Petitioner had notice of this particularly problematic discrepancy and yet failed to address it, further demonstrating the failure to show that the Astera Manual is prior art by a preponderance of the evidence.

130. In my opinion, the Astera Manual is not prior art because the Astera Manual appears to be improperly dated, while the evidence shows that the features relevant to this analysis and described in the Astera Manual were not publicly available until after the priority date of the '257 Patent. Thus, the Astera Manual could not have been available before the priority date of the '257 Patent, and does not qualify as prior art under the relevant statute.

B. Astera Does Not Anticipate Independent Claims 1, 15, And 20

131. Even if Astera qualified as prior art, which, in my opinion, it does not, Astera does not anticipate the independent claims of the '257 Patent. Claims 1, 15, and 20 are the only three independent claims of the '257 Patent. EX1001, cls. 1, 15, 20. Claim 1 is directed to a method for controlling a lighting device, claim 15 is directed to a controller for a lighting device, and claim 20 is directed to software for controlling a lighting device. *Id.* The three independent claims share similar limitations, including a limitation drawn to calculations performed by an effect

simulator based on at least one simulation parameter and a limitation defining the simulation parameter as at least one of three “random” parameters. *Id.* Because these claims share materially similar limitations at least with respect to the distinguishing points over Astera, my analysis of specific claim elements of claim 1 should be understood as also applying to the corresponding limitations found in claims 15 and 20, even if I only use the language of claim 1.

1. Astera Does Not Disclose “calculating, using an effect simulator, a time varying lighting value”

132. In my opinion, Astera does not disclose the “calculating” limitation because Astera only discloses replaying pre-defined lighting values. As discussed above, replaying pre-defined patterns is distinct from, and thus does not anticipate, “calculating ... a time varying lighting value.” EX1001, cl. 1; *see* Section IX. Specifically, Astera discloses a lighting system capable of “display[ing] static colors or replay[ing] a number of predefined effect patterns with a customizable color palette.” EX1004, 24. While Astera discloses customizing the available lighting effects using the AsteraApp™, such customizing does not alter the underlying pre-defined pattern, and is therefore distinct from the “calculating” limitation required by the claims of the ’257 Patent. *Id.*, 27.

133. While Astera discloses lighting effects, in my opinion, a POSITA would not understand Astera to disclose *calculating* those effects. Astera explicitly states that “[t]he effects’ patterns are pre-defined and cannot be modified

by the user. They are pre-programmed inside of each light.”⁴ EX1004, 28.

Accordingly, a POSITA would understand that Astera merely recalls and replays pre-defined effects, or time varying lighting values, rather than *calculating* those time varying lighting values.

134. Returning to the above Jazz analogy, Astera describes the lighting equivalent of a mp3 player. While it can play songs – time varying patterns of sound – it does not *generate* or *calculate* those songs like a musician can. A user may be able to modify the volume, or playback speed, but those modifications do not constitute *calculating* the time varying pattern of sound. The pattern itself is pre-defined. Likewise, to the extent that the effects disclosed in Astera constitute “time varying lighting value[s],” they are pre-defined and stored in the Astera SpotMax™. Astera discloses only recalling and replaying the pre-programmed “time varying lighting value;” no “calculating” functionality is described. Accordingly, Astera does not disclose “calculating, using an effect simulator, a time varying lighting value.”

⁴ Mr. Wood’s interpretation of Astera’s “predefined effect patterns” is contrary to this explicit description. See EX2004, 184:21-186:22, 200:22-201:14, 204:11-12.

2. Petitioner Has Not Met Its Burden of Showing that Astera Discloses “calculating, using an effect simulator, a time varying lighting value”

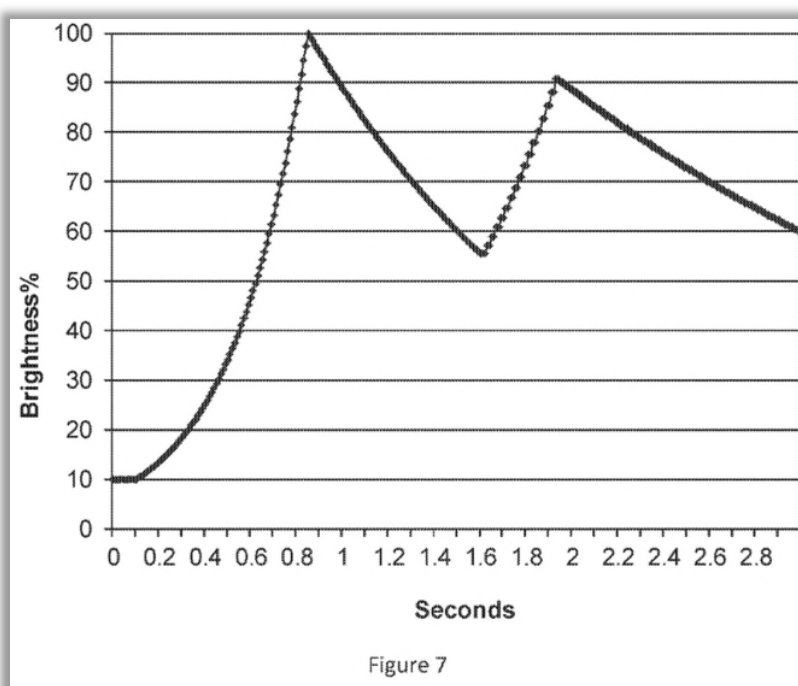
135. My analysis above shows why Astera does not disclose the “calculating” limitation of the independent claims. The above analysis alone is sufficient, in my opinion, to rebut Petitioner’s contentions regarding anticipation of the ’257 independent claims by Astera. For the sake of completeness, however, I next address in more detail why Petitioner’s and Mr. Wood’s analysis falls short of showing that Astera discloses the “calculating” limitation.

136. *Petitioner and Mr. Wood mischaracterize Astera’s pre-recorded effects as “creating” data.* In my opinion, Petitioner has not met its burden of showing that Astera anticipates the “calculating” limitation of independent claim 1 of the ’257 Patent.

137. The Wood Declaration quotes the ’257 Patent as disclosing an “effect simulator” that “creates data 106 characterizing a lighting effect.” EX1006, ¶58 (citing EX1001, 7:45-50). In so describing, Mr. Wood admits the difference between Astera’s disclosure of lighting effects and the “calculating” limitation of the ’257 Patent. Specifically, the effect simulator, in “calculating ... a time varying lighting value,” *creates data* that is later output to generate a lighting effect. Astera, on the other hand, merely recalls and replays effects that are “pre-programmed inside of each light.” EX1004, 28. The effects disclosed in Astera

are not *created* by the light's controller – they are pre-defined effects that have already been programmed and loaded onto the light. *Id.* (“The effects’ patterns are pre-defined and cannot be modified by the user. They are pre-programmed inside of each light.”)

138. Turning to the example discussed above, compare how Astera outputs a fire effect with how the '257 Patent outputs a fire effect. Assume that FIG. 7, reproduced below, shows the time varying brightness output of a lighting device simulating a fire effect:



EX1001, FIG. 7.

139. When Astera outputs the fire effect, a POSITA would have understood that each of the points on the above graph (disclosing a brightness

percentage output at a time), are pre-programmed into the controller (EX1004, 27), and merely sequentially recalled to simulate fire. That is, 0.9 seconds into the fire simulation, the Astera controller retrieves from memory the appropriate brightness percentage for that time – here, 100%. Conversely, the '257 Patent discloses “calculating” that lighting value. Accordingly, when a device according to the '257 Patent outputs a fire effect, the effects simulator uses an algorithm to *calculate the data point* (0.9s, 100% brightness).

140. The Wood Declaration goes on to say “the Astera Manual describes how the Control Panel and AsteraApp are effect simulator [*sic*] that calculate values representing the effects desired to be generated.” EX1006, ¶58. Mr. Wood does not provide ***any citation*** to the Astera Manual that supports his contention that the Control Panel and the AsteraApp “calculate values.” *Id.*; EX2004 161:14-15, 178:18-179:3, 204:13-205:4.

141. The first part of Mr. Wood’s argument appears to rely on adjustments to the pre-defined effects, which he asserts somehow *create* new data. EX1006, ¶59 (“Based on these selections of the desired lighting effect and the adjusted parameters for that effect, the Control Panel creates data characterizing the adjusted lighting effect, in the form of values and settings for the LEDs”). In support of this contention that the Control Panel “creates data,” Mr. Wood cites to Astera at pages 17 and 20-21. Nothing on these pages teaches or suggests that the

Control Panel “creates data” or indeed is capable of any functionality reasonably involving “calculating ... a time varying lighting value.” *See* EX1003, 17, 20-21.

142. In fact, page 17 of Astera only discusses different modes for controlling the color output of the lighting device. EX1004, 17. Pages 20 and 21 only discuss the functionality of the “predefined patters [*sic*]” and “predefined programs,” for example, how to group multiple lights together to form a “virtual big light” for outputting effects. *Id.*, 20-21. While the “fire effect” is described as having a “random flicker,” this functionality is listed in the “pattern” column of a section labeled “Predefined Programs.” *See* EX1004, 21; *see also id.*, 20 (identifying the table below as showing “predefined patter[n]s”). A POSITA would have understood that Astera is simply disclosing a pre-defined pattern that *looks* random to a user; not a genuinely random pattern for a fire effect that involves a “calculation.” Moreover, the fire effect that has a “random flicker” only allows the background color and the flickering color to be adjusted by a user. EX1004, 21, 27. The independent claims of the ’257 Patent require “calculating... based on at least one simulation parameter” which “is at least one of: a random brightness; a random duration; and a random interval.” EX1001, cls. 1, 15, 20. Astera’s user-selected background and flickering color of the fire effect are not any of these “random” parameters—the colors are neither “random” nor a “brightness,” “duration,” or “interval.”

143. The sections of Astera Mr. Wood cites as teaching the *creation of data* do nothing more than discuss the recalling and replaying of pre-defined patterns, which does not meet the claim language. *See, e.g.,* EX1004, 28; *see also* Section X.B.1, *supra*.

144. In my opinion, Mr. Wood's understanding of Astera's disclosure as it relates to the calculating limitation is fundamentally incorrect. Mr. Wood is reading into the reference disclosure of features that *he admits are not described* in that reference. *See* EX2004, 161:14-15 (admitting the Astera Manual does not describe how speed is adjusted), 178:18-179:3 (admitting neither his declaration nor the Astera Manual describe how Astera generates a fire effect), 204:13-205:4 (admitting Astera does not describe how the light produces effects.) In my opinion, a POSITA would have understood that Astera's effects are pre-defined as that is how the manual repeatedly discusses the lighting effects. *See* EX1004, 10 (the "standalone engine...can display static colors or *replay* a number of *predefined effect patterns*), 24 (same), 20 ("Select one of the *predefined* pattern[s]"), 21 ("The predefined programs may use more than one pixel"), 28 ("effect patterns are *pre-defined and cannot be modified*"). A POSITA would understand these descriptions to disclose simply recalling and replaying pre-defined patterns, *not* "calculating."

145. Mr. Wood ignores this distinction and instead submits conclusory statements about how an anticipatory prior art reference *would have to work* in order to anticipate the '257 Patent. But Astera is not an anticipatory reference, specifically because the Astera effects are *pre-defined*. Mr. Wood fails to cite any part of the Astera Manual suggesting that Astera calculates time varying lighting values as described in the '257 Patent. The '257 Patent describes effects where each next value is actively calculated, without relying on a pre-recorded pattern, and thus distinguishes over Astera.

146. ***Petitioner and Mr. Wood mischaracterize Astera's ability to adjust parameters of pre-recorded effects as "calculating," which it is not.*** Petitioner and Mr. Wood argue that the ability to customize Astera's pre-defined effects patterns constitutes "calculating," stating that "[t]he Astera Manual discloses that selected effects from the AsteraApp can then 'be highly customized', to change certain parameters of the effect." EX1006, ¶60. However, Astera's customization of pre-recorded effects does not involve "calculating" time varying lighting values as described in the '257 Patent. *See* Section IX.

147. As a preliminary matter, I believe that Petitioner's and Mr. Wood's analysis is insufficient to establish anticipation because it: (i) fails to point to explicit disclosures in Astera of "calculating"; and (ii) does not explain why a POSITA would have understood Astera to necessarily disclose "calculating." For

instance, while Mr. Wood states that “based on these user selections, the AsteraApp calculates time varying lighting values,” nothing in the cited pages explains *how* adjusting parameters of the effects requires any *calculation*. EX1006, ¶61 (citing EX1004, 23-29).

148. While Petitioner cites to Astera’s statement that “with the AsteraApp™ these effects can be created and be sent to the light by the built in UHF receiver” (EX1004, 24), Astera makes clear that no “calculation” is performed to create the effects—they are merely parameterized. EX1004, 28 (“[t]he effects’ patterns are pre-defined and cannot be modified by the user. They are pre-programmed inside of each light. Still they can be parameterized.”); *see also id.*, 27 (explaining the adjusted lighting effects are stored).

149. The specification of the ’257 Patent distinguishes its algorithmic generation capabilities from prior art systems that, like Astera, merely allow for customization of pre-recorded patterns. For example, the specification of the ’257 Patent states “[g]enerating the light output with the simulation provides a greater level of user adjustment and control than that produced by simply sampling the intensity of a real flame and replaying it at *different speeds*.” EX1001, 10:13-16. The calculation of time varying lighting values claimed in the ’257 Patent is, in my opinion, both a distinct concept from that described in Astera, and a vast improvement over systems, like Astera, based around pre-recorded effect patterns.

150. Accordingly, in my opinion, customization of pre-recorded values, as disclosed in Astera, does not anticipate “calculating, using an effect simulator, a time varying lighting value.” EX1001, 11:56-58. While a user may adjust the playback speed, color, or overall intensity of a pattern in Astera, the underlying pattern is not actually changed – thus, further demonstrating no calculation is performed. Returning to the mp3 player Jazz analogy, adjusting the volume, or playback speed, of a recorded song does not change the pattern of notes that the mp3 player is repeating. The output is changed, but time varying musical notes are not “calculated.”

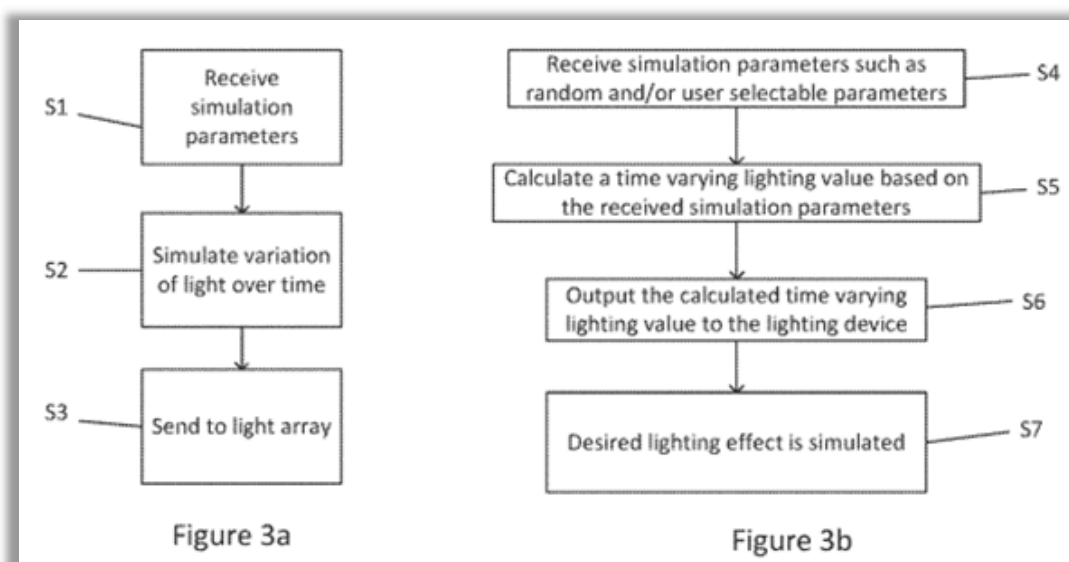
151. As with the mp3 player Jazz analogy, adjusting playback parameters of the lighting effects in Astera is not the same as “calculating, using an effect simulator, a time varying lighting value based on at least one simulation parameter.” EX1001, 11:56-58. Moreover, in my opinion, I understand Petitioner bears the burden to demonstrate invalidity, and I believe it has failed to do so by failing to point to any disclosure in Astera that requires “calculating,” nor articulating how (or why) such a calculation is actually performed in Astera.

152. Accordingly, I believe that the claims 1, 15 and 20 of the '257 Patent distinguish over the Astera Manual.

3. Astera Does Not Anticipate “wherein said at least one simulation parameter is at least one of: a random brightness; a random duration; and a random interval”

153. It is my opinion that Astera at least does not anticipate the “random” limitation of the independent claims.

154. As described in the '257 Patent, a “simulation parameter” is an input received by the “effect simulator” and used to calculate the “time varying lighting value.” This relationship between simulation inputs and outputs is illustrated in FIGS. 3a and 3b, reproduced below:



EX1001, FIGS. 3a and 3b. As illustrated in FIGS. 3a and 3b, a simulation parameter is an *input* into the effect simulator. *See also* EX1001, 7:27-29 (“In a first step S1 simulation parameters are received, such as random parameters and/or user-selectable parameters as shown in step S4”). Conversely, the time varying

lighting value is an **output** of the effect simulator. *See* EX1001, Cls. 1, 15, 20 (reciting calculating the time varying lighting value and “outputting” the time varying lighting value); *see also* EX1001, 7:38-44 (“As shown in S5, the simulation calculates how the lighting changes over time in order to produce the desired lighting effect. Following simulation in a third step S3 the lighting information determined by the simulation is output, for example to a lighting device, as shown in step S6, in order to produce the desired lighting effect as shown in step S7”).

155. Further, Mr. Wood acknowledged at his deposition that the simulation parameter is used in the calculation and is an input to the calculation. EX2004, 72:10-73:4 (“so the simulation parameter *is an input*, whether manual or automatic, into the calculation of a time varying-lighting value. True? A: True.”), 90:22-91:17 (testifying the simulation parameters are **inputs** to the calculation); *see also* EX2004, 67:7-68:20.

156. Astera does not anticipate a device or method “wherein said at least one simulation parameter is at least one of: a random brightness; a random duration; and a random interval” (EX1001, 11:63-65) because the effects in Astera relied upon by Petitioner (and Mr. Wood) are all **outputs** rather than **inputs**. Neither the Petition nor the Wood Declaration identify any random parameters that can be considered **inputs** for a calculation done by the Astera device.

157. Petitioner advances three examples that Petitioner argues disclose various types of random simulation parameters. Each example, however, describes a random light **output**, not a simulation parameter. I discuss each in turn.

158. First, Petitioner discusses Astera's "fire effect," which Astera describes as a "random flicker between two colors." Petition, 25; EX1004, 21, 28. Petitioner states that the "'flicker' characteristic" of the fire effect has a "random brightness levels." Petition, 25. Astera discloses a fire effect characterized by "a random flicker between two colors." EX1004, 21, 28. However, that "random flicker between two colors" describes the **output** of the lighting device, not the **input** into the effects simulator. Claim 1c requires that "at least one simulation parameter is" a random duration, brightness, or interval. The effect simulator calculates the time varying lighting value *based on* the at least one simulation parameter—*i.e.*, it is an **input** into the effect simulator, not an **output** thereof. *See* EX1001, cls. 1, 15, 20. Astera does not disclose that the fire effect is generated "based on" a random brightness. Even the suggestion of allowing a user to input background and flickering colors (*see* EX1004, 27) does not suggest a "random" brightness. A user input color value is not necessarily a brightness value and it is certainly not "random." Accordingly, Astera's disclosure of a fire effect characterized by a random flicker does not demonstrate that any simulation parameter is a random value.

159. Petitioner further argues that the fire effect has a “random duration and a random interval”, because the amount of time each background and flicker color is active is random. Petition, 25. This argument fails for the same reason as the random brightness argument. Even where the fire effect *outputs* a random brightness, duration, and interval, each of those characteristics are *outputs* from the effect simulator, not *inputs* into the effect simulator as required by claim 1c.

160. Petitioner’s second example, the “chaser effect,” fails to disclose a random simulation parameter for the same reasons. The “chaser effect” is characterized by colors that are “randomly chosen.” Petition, 25; EX1004, 28. Here, as with the fire effect, the random characteristic of the chaser effect is an *output, i.e.*, the color. Nothing in the Wood Declaration or the Petition explains how the random color output anticipates calculating, using an effect simulator, a time varying lighting value *based on* a random simulation parameter (*i.e.*, an *input*). Further, the color is directly output in sequential LEDs to create the chaser effect; there is no “calculating, using an effect simulator, a time varying lighting value *based on*” the color (let alone based on a random brightness as actually required by the claim). *See* cls. 1, 15, 20; EX1004, 28.

161. Petitioner’s final example, a strobe effect which includes ““random” settings options” also fails to disclose a random duration, random brightness, or random interval because the parameters defining the effect are “slow,” “medium,”

or “fast;” not *random* durations or intervals. Petition, 26; EX1004, 17, 21, 27.

Petitioner further argues that the option to have a “random strobe” constitutes a random simulation parameter. Petition, 26. But, by selecting a random strobe, the user is simply selecting which pre-recorded effect pattern that the Astera device will replay. See EX1004, 28 (“the effects’ patterns are pre-defined and cannot be modified by the user. They are pre-programmed inside of each light. Still they can be parameterized.”) Accordingly, the selection of a “random strobe” is merely the selection of a pre-programmed effect pattern, not an *input* into an effect simulator. Further, the speed of that random strobe – one of the customizable features – is not a “random” parameter. Accordingly, the strobe effect fails to disclose a random simulation parameter, as required by claim 1c (as well as the same claim limitation appearing in claims 15 and 20).

162. Finally, I also observe that Mr. Wood acknowledged at his deposition that the “random” effects he is relying on from Astera are *outputs* and are what the operator “will see.” EX2004, 218:10-22 (agreeing the fire effect is “what the light *output* is doing” and is “what the operator will see”), 219:16-19 (“Q: And so you believe that the random interval *output* in Astera satisfies Claim Element 1C. True? A: That’s correct.”); see also EX2004, 168:10-15, 174:7-10, 190:5-10.

163. In my opinion, Petitioner has not met its burden of showing that Astera anticipates the at least one simulation parameter being “at least one of: a

random brightness; a random duration; and a random interval” as recited in each of claims 1, 15, and 20.

C. Astera Does Not Anticipate Dependent Claim 10

164. As discussed above, in my opinion, Astera does not anticipate independent claim 1. *See* Sections X.B *supra*. Claim 10 depends from claim 1, and therefore, Astera does not anticipate claim 10 at least for the same reasons set forth above. Further, in my opinion, Astera does not anticipate dependent claim 10, because the functionality of Astera that Mr. Wood describes as “calculating” only occurs once, and then the “calculated” pattern is looped continuously.⁵ As a result, Astera does not disclose “repeated cycles of calculating a time varying lighting value ... and simulating the user customizable lighting effect.

165. Petitioner argues that “at the start of each cycle, the standalone engine in the AX10 would calculate the lighting values for the desired effect, based on any user customizations.” Petition, 45. But this (insufficiently explained) contention is contradicted by the actual disclosure in the Astera Manual. Specifically, even

⁵ I do not agree with Mr. Wood that Astera in any way “calculates” time varying lighting patterns, as discussed above. *See* Section X.B. My discussion of claim 10 should be understood to address how *even if* Astera “calculated” something (which it does not), it still would not anticipate dependent claim 10.

where users opt to customize parameters of the pre-recorded effect using the AsteraApp™, once that effect is customized, it is sent to the light and replayed “autonomously until a new effect is sent.” EX1004, 24. Accordingly, the purported calculation only occurs once, and is followed by the light continuously “simulating the user customizable lighting effect” of claim 10 without any *new* “calculating” step. Thus, Petitioner’s contention that the calculation occurs “at the start of each cycle” is contrary to the disclosure of Astera. Petition, 45.

166. Petitioner contends, without any support, that values are “continuously calculated each cycle to keep the effect ‘random.’” Petition, 45. Nothing in Astera suggests the ability to continuously calculate new effects. Astera states the opposite – effects are customized first, and then replayed on a continuous loop. EX1004, 24. Petitioner relies on the Wood Declaration to explain this contention, but the Wood Declaration does not cite to any support in the Astera Manual. The Wood Declaration contains only the allegation that “where any desired effect includes a ‘random’ color or speed parameter, the values for this effect must be continuously calculated each cycle to keep the effect ‘random’.” EX1006, ¶110. The glaring flaw in this allegation is that Petitioner (and Mr. Wood) have failed to actually point to *where Astera actually discloses* a “random” color or speed parameter. As I have explained above, Astera lacks such a disclosure. *See e.g.*, Section X.B.3.

D. Astera Does Not Anticipate Dependent Claim 19

167. As discussed above, in my opinion, Astera does not anticipate independent claim 15. *See* Sections X.B.1-X.B.2*supra*. Claim 19 depends from claim 18, which depends from claim 15, and therefore, Astera does not anticipate claim 19 for the same reasons set forth above. Further, in my opinion, Astera does not anticipate dependent claim 19 because Astera does not disclose a system “wherein said controller and said lighting device are integrated in a combined unit.”⁶

168. *Petitioner has not met its burden of showing that Astera’s “standalone” mode anticipates independent claim 15.* The Petition and the Wood Declaration rely entirely on Astera’s disclosure of “standalone” mode (*i.e.*, using the local control panel as the input means and the built in engine of the lighting device as the controller) to show anticipation of claim 19. Petition, 54; EX1006, ¶131. But the Petition and the Wood Declaration did not establish that the standalone mode anticipates the claims from which claim 19 depends.

⁶ Notably, Petitioner has not asserted Astera as prior art against U.S. Patent No. 10,197,258 in IPR2021-01497, a family member of the ’257 Patent with the “integrated” limitation in independent claim 1.

169. Throughout the relevant parts of his Declaration, Mr. Wood relies almost exclusively on the AsteraApp functionality to argue that each element of the independent claims are met. *See e.g.* EX1006, ¶¶56-57 (discussing selection and customization of effects using only images from the AsteraApp); *compare* ¶59 (two sentences discussing the Control Panel’s anticipation of the “calculating” limitation with only conclusory statements about its functionality) *with* ¶¶60-62 (three extensive paragraphs discussing the AsteraApp’s similar functionality). Further, Mr. Wood relies on the Astera Manual’s disclosure of “fire,” “chaser,” and “strobe” effects to argue that the random simulation parameter element is met. *See* EX1006, ¶¶68-72. But Mr. Wood fails to show that these effects are accessible in standalone mode. Indeed, the Astera Manual suggests that the same effects available through the AsteraApp are either not available or non-functional in standalone mode. *See* EX1004, 21 (“The predefined programs may use more than one pixel. To display these effects properly with your light, it is first necessary to group them into Flow-Sets and control them by the AsteraApp™.”) Accordingly, the Petition and the Wood Declaration fail to show that the standalone mode anticipates independent claim 15, from which claim 19 depends.

170. Further, the full functionality of the Astera device is not accessible through the standalone mode. *See* EX1004, 23 (“The buttons of the AX10 only allow a basic operation of the light. To gain full control over all features, the

AsteraApp™ should be used.”); *see also* EX1004, 21 (effects accessible through the standalone mode require the AsteraApp to function properly). The AsteraApp is not “integrated in a combined unit” with the lighting device, as required by claim 19, a point on which myself and Mr. Wood apparently agree (Mr. Wood does not argue that the AsteraApp anticipates dependent claim 19.) *See* EX1006, ¶131. Because the full functionality, including functionality Petitioner and Mr. Wood rely upon to show alleged anticipation of the independent claims, is *only available* on the AsteraApp, Astera does not anticipate dependent claim 19.

E. Astera Does Not Anticipate the Other Dependent Claims

171. Claims 2-9, 11-14, 16-18, and 21 ultimately depend from either independent claim 1 or 15 discussed above. I believe that these claims are distinguishable over Astera at least for the reasons discussed above regarding claims 1 and 15, including that Astera is not prior art and that Astera does not disclose certain limitations of claims 1 and 15. Claims 2-9, 11-14, 16-18, and 21 are thus not anticipated by Astera at least due to their dependence from claims 1 and 15.

F. Petitioner Did Not Articulate Any Obviousness Position Beyond Anticipation

172. While Ground 1 based on Astera as described in the Petition cited 35 U.S.C. 102/103 (Petition, 3-4), I do not believe that the Petition, nor the Wood Declaration, sets forth any obviousness analysis beyond anticipation. While I am

not an attorney, my understanding is that obviousness requires analyzing certain factors, which include an assessment of the content of the prior art reference and an identification of the differences between the prior art reference and the claims. *See* Section III.B *supra*. I further understand that in order to establish obviousness, there must be an articulated reason for modifying the underlying reference to arrive at the claimed invention.

173. I have reviewed the analysis set forth in the Petition and in the Wood Declaration regarding independent claims 1, 15, and 20. *See* Petition, 8-31; EX1006, ¶¶40-83. I do not see that there is an analysis presented regarding the scope and content of Astera or identification of any limitation in independent claims 1, 15, and 20 missing from Astera that would purportedly have been obvious to a POSITA based on Astera. Further, I do not see any rationale provided in the Petition or the Wood Declaration articulating a reason to modify Astera in such a manner to arrive at the claimed invention, or any of the other factors for an obviousness analysis I summarize above.

174. Therefore, it is my opinion that the Petition and the Wood Declaration, do not demonstrate that claims 1, 15, and 20 would have been obvious based on Astera for the same reasons as explained above regarding anticipation and because no further obviousness analysis was presented in the Petition.

175. For completeness, and in order to respond to the conclusory obviousness position alleged in the Petition, I have considered the matter and it is further my opinion that a POSITA would not have found claims 1, 15, and 20 obvious in view of Astera. For example, it would not have been obvious to a POSITA to modify Astera to include the functionality of “calculating, using an effect simulator, a time varying lighting value.” Specifically, Astera only discloses a relatively simple system for storing “pre-programmed” effects and recalling and replaying those effects “autonomously until a new effect is sent.” EX1004, 28, 24. The “effect simulator” capable of “calculating ... a time varying lighting value,” is, in comparison, a unique functionality that distinguishes over Astera’s lighting system. Petitioner has not identified any reason to modify Astera to include the “calculating” functionality, nor do I believe a POSITA would have been so motivated. Further, Petitioner, and Mr. Wood, did not offer any opinion that Astera could have been modified to include the “calculating” functionality with a reasonable expectation of success.

XI. CLAIMS 1-21 ARE VALID OVER POHLERT

A. Pohlert Does Not Anticipate Independent Claims 1, 15, and 20

176. As mentioned above, claims 1, 15, and 20 contain several similar limitations, so I will again address these independent claims together. *See* Section X.B.

177. There are two primary reasons I believe that Pohlert does not anticipate the independent claims of the '257 Patent.

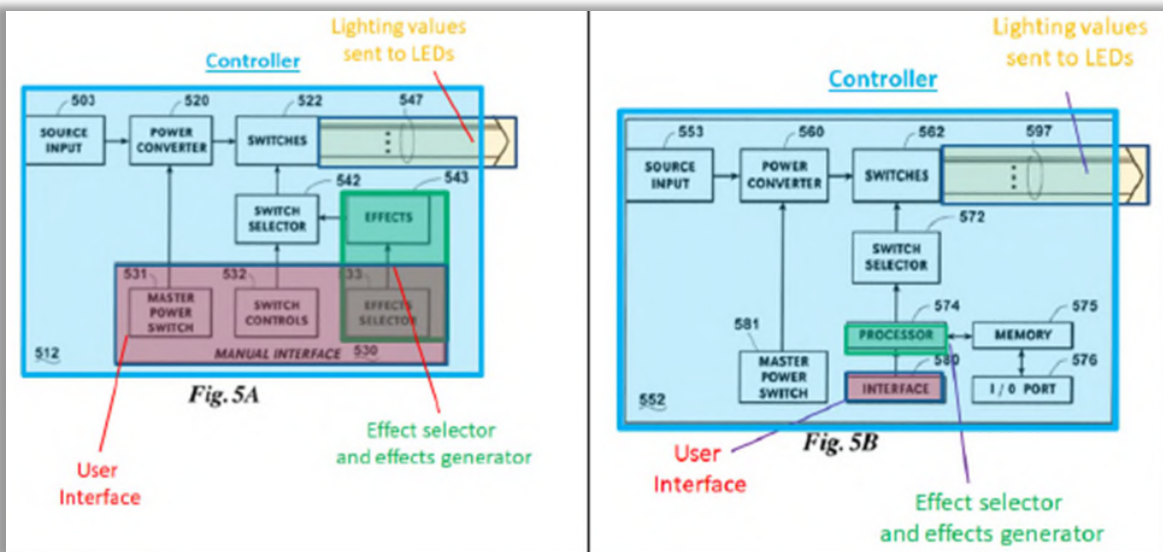
178. First, Pohlert does not “calculate” a time varying lighting value. Instead, Pohlert describes pre-defined light patterns illuminated in pre-defined or pseudo-random “sequences.” EX1003, ¶¶[0063], [0067]. Executing pre-defined light patterns in a pseudo-random sequence does not involve *calculating* a lighting value, and particularly does not involve calculating a “time varying” lighting value. The reliance on manual inputs being converted to power control signals or the generation of special effects such as strobing and pattern generation do not show calculating a time varying lighting value. My explanations regarding the fundamental difference in the “calculating” limitations of the '257 Patent and Astera should be understood as applying here as well. *See* Section IX.

179. Second, Pohlert does not disclose calculating “a time varying lighting value” based on at least one simulation parameter, which is defined to be “at least one of: a random brightness; a random duration; and a random interval.” EX1001, cl. 1; *see also id.*, cls. 15, 20. The Petition and the Wood Declaration improperly rely on the *end result* of Pohlert’s LED lighting system, and thus fail to establish the actual claim language—“calculating, using an effect simulator, a time varying lighting value *based on* at least one simulation parameter” [which is defined to be one of these random parameters]—is met. EX1001, cl. 1; *see also id.*, cls. 15, 20.

1. Pohlert Does Not Anticipate “calculating, using an effect simulator, a time varying lighting value based on at least one simulation parameter”

180. In my opinion, Pohlert does not disclose “calculating, using an effect simulator[,] a time varying lighting value based on at least one simulation parameter” as recited in independent claims 1 and 20. Similarly, I do not think Pohlert discloses “an effect simulator adapted to calculate a time varying lighting value based on at least one simulation parameter” as recited in independent claim 15. As such, it is my opinion that independent claims 1, 15, and 20 are distinguishable over Pohlert.

181. The Petition and Wood Declaration seem to equate two separate components from two embodiments in Pohlert to the claimed “effect simulator”: (i) the effects selector 533 and effects generator 543 (FIG. 5A); and (ii) the processor 574 (FIG. 5B). Petition, 60-61; EX1006, ¶138. Mr. Wood provides marked-up versions of FIGS. 5A and 5B Pohlert that set forth his positions:



EX1006, ¶134.

182. The effects generator 543 (FIG. 5A) and the processor 574 (FIG. 5B) then appear to be relied on in the same way, in that the Petition (and Wood Declaration) focuses on either of these components generating certain “special effects” as allegedly meeting this limitation. Petition, 60-61; EX1006, ¶¶137-141. In particular, it appears that the Petition relies on the generation of “power control signals”, the “strobing”, and “generating [] patterns” collectively or individually to anticipate this claim limitation. *See* Petition, 60-61. Petitioner (and Mr. Wood) further seem to allege the intensity control adjustment of yet another Pohlert embodiment (FIG. 10, a lighting effects system with two different lamp element colors) anticipates this element. Petition, 60-61; EX1006, ¶142.

183. Respectfully, I believe that none of these embodiments involve an effect simulator that calculates anything, let alone “a time varying lighting value.” Therefore, I disagree that Pohlert discloses the “calculating” limitation.

184. ***Power Control Signals.*** The Petition and the Wood Declaration begin their discussion of this element with some references to Pohlert’s disclosure of an effects generator 543 or processor 574 that output “power control signals” to LEDs to produce particular special effects. Petition, 60; EX1006, ¶¶137-39.

185. Indeed, Pohlert discloses an effects generator 543 (FIG. 5A) that provides the ability to create various lighting effects such as “dimming, strobing, pulsation, or pattern generation.” EX1003, ¶[0061]. Pohlert’s processor 574 in Figure 5B executes “programming instructions [that] may also provide for various lighting effects, such as dimming, strobing, pulsation, or pattern generation.” EX1003, ¶[0067].

186. However, the output of power control signals to “generate the desired light output patterns” (EX1006, ¶139) does not mean generating the power control signals themselves involves *calculating* a time varying lighting value as recited in the independent claims. Therefore, in my opinion, the Petitioner’s general allegation that the effects generator 543 or the processor 574 output power control signals to provide a time varying lighting effect does not show that this limitation is met. The critical issue here is whether any of these lighting effects are created

by “calculating...a time varying lighting value” (as Petitioner contends) or whether the effects generator 543 generates the effects without “calculating” time varying lighting values. In my opinion, a POSITA would have known Pohlert discloses the latter—the effects generator 543 is *not* calculating a time varying lighting value.

187. For example, Pohlert explains that dimming may be accomplished using a manual control knob or a multi-position switch on the effects selector 533. EX1003, ¶[0061]. It is my opinion that a POSITA would have readily understood no “calculation” of a time varying signal is required to transfer user input via a manual control knob to effectuate the desired dimming. Converting a manual input to an output power control signal for an LED does not involve “calculating...a time varying lighting value.” Indeed, Pohlert teaches the use of standard electrical components to regulate the LED output. *See* EX1003, ¶¶[0068]-[0071], [0119]-[0125], FIGS. 6, 19A, 19B.

188. The ’257 Patent makes clear that the “calculating” of the time varying signal based on the simulation parameter is distinct from simply converting a manual input signal to a power control signal for an LED. *See* Section IX. Further, the ’257 Patent explicitly discloses a “converter” as a separate component than the effect simulator performing the calculation. *See* EX1001, 8:36-48. A POSITA would have known that it is this type of component—*i.e.*, a converter—that would have been used in a conventional system to convert a manual input

(e.g., a brightness increase or decrease) to a pulse-width-modulation (PWM) output in the form that an LED would understand. *See id.* There is no “calculation” in this type of conversion, and the ’257 Patent thus makes clear from its disclosure at lines 36 to 48 of column eight that the “effect simulator” has a distinct functionality from mere signal conversion.

189. ***Strobing.*** The Petition and Wood Declaration also seem to allege that the strobing special effect in Pohlert anticipates the “calculating” claim limitation. *See* Petition, 60-61; EX1006, ¶140. The Petition says Pohlert’s “controller generat[es] an oscillating signal (which is a time varying signal)” and thus appears to argue this oscillation signal generation meets the “calculating” limitation. *See* Petition, 60-61; *see also* EX1006, ¶140. To the extent Petitioner asserts Pohlert’s strobing anticipates this limitation, I disagree.

190. Pohlert explains that strobing may be accomplished “by generating an oscillating signal and applying it as a control signal either upstream or downstream from the switch selector 542.” EX1003, ¶[0062]. It does not provide any detail as to how the oscillation signal is “generated.” It does explain that the frequency of oscillation may be selectable via a manual knob as part of the effects selector 533. EX1003, ¶[0062].

191. A POSITA would have known that Pohlert’s effects generator 543 would use conventional electronic components to generate an oscillating signal for

the strobe light effect or a processor executing a predesignated pattern. *See* EX1003, ¶[0062] (explaining generating an oscillating signal), ¶[0067] (describing executing computer instructions “in a conventional manner”); *see also id.*, ¶¶[0068]-[0071], [0119]-[0125], FIGS. 6, 19A, 19B (collectively describing use of conventional electrical circuits to regulate LED output).

192. While there are lots of types and forms of sinusoidal signal generators (sometimes called a signal generator, an oscillator, a waveform generator, etc.), the electrical components used to create an oscillating signal are very well-known and have been around for many years (and thus, Pohlert likely did not include more details in ¶[0062] because someone in the lighting industry would have understood how the oscillating signal is generated). These signal generators use common electrical parts such as amplifiers, capacitors, resistors, and transistors in an integrated circuit to produce an oscillating (*e.g.*, sine wave type) output signal. Pohlert discloses these types of integrated circuits to control LEDs. EX1003, ¶¶[0068]-[0071], [0119]-[0125], FIGS. 6, 19A, 19B. The integrated circuit simply receives a voltage and generates an oscillating signal using the integrated circuit – there is no “calculating” relied upon to generate the signal. Further, to the extent that a processor generates the oscillating signal, Pohlert is quite clear that the processor is merely executing “a predesignated pattern dictated by the programming instructions.” EX1003, ¶[0067]. There is no calculation as claimed.

193. A POSITA would have further understood that the manual knob providing a frequency adjustment for the oscillating signal simply involves adjusting the voltage introduced to the integrated circuit which changes the frequency of the output or the direct adjustment of Pohlert's predesignated pattern dictated by programming instructions. Again, there is no "calculation" performed. It is just a standard electrical circuit at work to produce an oscillating signal or a change in the input frequency to the pre-coded programming instructions.

194. Further, I have reviewed paragraph 140 of the Wood Declaration where it discusses the oscillating signal being a time varying signal. Even if everything stated in paragraph 140 were accurate, I do not see how anything in this paragraph addresses *calculating* a time varying lighting value. Outputting an oscillating signal is not the same as calculating a time varying lighting value.

195. ***Pattern generation.*** The Petition and accompanying Wood Declaration also seem to rely on Pohlert's "pattern generation" special effect to satisfy the "calculating" limitation. *See* Petition, 61; EX1006, ¶141. In particular, the Wood Declaration provides:

Pohlert further discloses generating light effect patterns where light segments are strobed, flashed, or dimmed in sequences, requiring the controller to calculate signals that are time varying, as some lights are on and some off at different times to generate the patterns. (Pohlert, [0063], [0067].)

EX1006, ¶141; *see also* Petition, 61 (setting forth the same argument).

196. I disagree that Pohlert’s lighting sequences, including the pseudo-random sequences, “requir[e] the controller to calculate signals that are time varying.” Rather, Pohlert in these paragraphs is describing executing *pre-defined* lighting effects in particular sequences. EX1003, ¶¶[0063], [0067]. Pohlert explains that pattern generation is done by “e.g., manual selection from a number of predefined patterns or else through an interface allowing different pattern sequencing.” EX1003, ¶[0063]. Patterns may include strobing or flashing different groups of light segments 325, 330, 335, 340, 345, 350, 355, and 360 in a pre-defined sequence or a pseudo-random sequence. EX1003, ¶[0063].

197. But, in my opinion, a POSITA would know executing strobing or flashing in a pseudo-random *sequence* is not the same as “calculating...a time varying lighting value.” The sequence that lighting values are executed does not affect the *lighting value* itself.

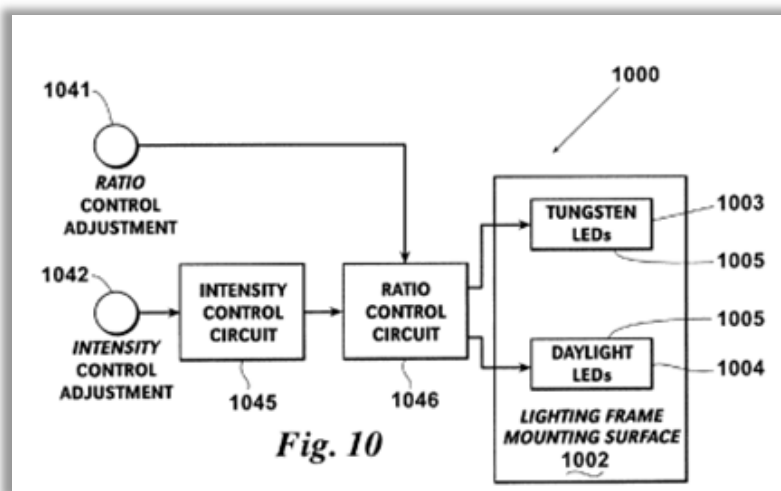
198. Paragraph 67 of Pohlert makes this distinction particularly clear, as it explains that “the processor 574 reads instructions from the memory 575 and executes them in a conventional manner.” EX1003, ¶[0067]. FIG. 5B also clearly shows the arrangement, with the processor 574 connected to the memory 575 via an I/O port. *See id.*, FIG. 5B. A POSITA would have readily interpreted this

figure, in light of paragraph 67, as a clear indication that the processor is receiving information from the memory and is not “calculating” a time varying value. The processor 574 (which Petitioner views as interchangeable for this element with the effects generator 543) is simply executing pre-programmed software instructions to directly control the switches. EX1003, ¶[0067] (“The programming instructions may also provide for various lighting effects, such as dimming, strobing, pulsation, or pattern generation. ... The instructions will generally cause the processor 574 to control the switch selector by, e.g., setting various digital values in registers whose outputs control the switches 562. ... To accomplish dimming, the processor 574 may be *programmed [to] select binary-encoded values* to load into registers of the switch selector 572. ... To accomplish strobing, the processor 574 may be programmed to turn the switches 562 on and off according to a *predesignated pattern* dictated by the programming instructions.”).

199. A processor executing pre-programmed instructions in this manner does not require “calculating...a time varying lighting value.” Pohlert does not disclose that anything is calculated. *See e.g.*, EX1003, ¶[0067]. Further, I do not see any explanation in the Petition or Wood Declaration as to how Pohlert’s pattern generation disclosure anticipates “calculating, using an effect simulator, a time varying lighting value” as recited in claim 1. *See also* EX1001, cls. 15, 20 (using similar language).

200. Finally, I observe that there is no description anywhere in Pohlert of how the pseudo-random sequence is generated, and so it cannot reasonably be “based on at least one simulation parameter” as required by the independent claims of the ’257 Patent. A POSITA would have understood Pohlert as disclosing a pre-defined pseudo-random sequence and not a calculated pseudo-random sequence “based on at least one simulation parameter.”

201. **Intensity and Ratio Control.** Lastly, the Petition and Wood Declaration refer to a different embodiment that includes an intensity control adjustment 1042 and ratio control adjustment 1041. Petition, 61; EX1006, ¶142 (citing to EX1003, ¶¶[0088]-[0092]). This embodiment is shown in FIG. 10:



202. Pohlert explains “FIG. 10 is a block diagram of one embodiment of a lighting effects system 1000 having at least two different lamp colors.” EX1003, ¶[0088]. Pohlert further describes that “lighting effects system 1000 comprises an

intensity control adjustment 1042, an intensity control circuit 1045, a ratio control adjustment 1041, and a ratio control circuit 1046.” EX1003, ¶[0088]. The ratio control adjustment 1041 and intensity control adjustment 1042 are a *manual input means* such as a manual control knob. EX1003, ¶¶[0088], [0090].

203. As a threshold matter, I understand that it is improper to mix and match different embodiments from the same patent to provide an anticipation analysis. That is what Petitioner has done here. As acknowledged by Mr. Wood in his deposition, FIG. 10 is a distinct embodiment from FIGS. 3A-3B and 5A-5B. EX2004, 227:13-230:2, 221:20-224:1, 235:11-236:10 (agreeing that the embodiments of FIGS. 5A-5B and FIG. 10 are “*two separate embodiments* of different things. *But they could be combined* in a single unit.”). For other elements of claim 1 (at least elements 1p, 1c, 1d, and 1e) the Petition and Mr. Wood rely entirely on embodiments distinct from FIG. 10. Petition, 58-59, 64-68; EX1006, ¶¶136, 150-157.

204. Further, there is no discussion in the Petition as to how the ratio control adjustment 1041 and the intensity control adjustment 1042 are part of the embodiments in FIGS. 3A-3B and 5A-5B, nor is there any explanation for why it would have been obvious to modify the embodiments relied on for other elements to include aspects of the embodiment of FIG. 10, which is unique in that it particularly has two differently colored sets of LEDs and includes different

circuitry from the other embodiments to control these two differently colored LED sets.

205. Setting this improper combination of embodiments aside, the FIG. 10 embodiment still does not teach “calculating, using an effect simulator, a time varying lighting value” as recited in claim 1. Using a manual control knob or other manual input to “select” the intensity of the two differently colored LEDs (the “tungsten LEDs” and the “daylight LEDs”) does not involve *calculating* a time varying lighting value. This involves a direct manual input to produce a particular illumination level or relative intensity of the respective LEDs. *See e.g.*, EX1003, ¶[0089] (“setting the intensity control adjustment 1042 *selects* the illumination level for the lamp elements 1005, while setting the ratio control adjustment 1041 *selects* the relative intensities between, in this example, the daylight LEDs 1004 and the tungsten LEDs 1003”).

206. Controlling a light output with a manual knob does not require a calculation. In my opinion, a POSITA would have certainly understood that this is true throughout the various embodiments of Pohlert, regardless of the improper mixing and matching introduced by Petitioner.

2. Pohlert Does Not Disclose the Simulation Parameter Is At Least One of: “a random brightness; random duration; and a random interval”

207. Pohlert does not disclose calculating a time varying lighting value based on at least one simulation parameter, which is defined to be “at least one of: a random brightness; a random duration; and a random interval.”

208. I understand the Petition and the Wood Declaration rely on the pseudo-random sequence disclosure in Pohlert as disclosing this claim element. Petition, 64-66; EX1006, ¶¶150-153.

209. A pseudo-random *sequence* (i.e., an order that particular LEDs are illuminated) is plainly not the same as a “random duration” or a “random interval.” The duration a lighting device is illuminated and the interval between lighting different lighting devices are not the same as the *sequence* of illuminating lighting devices.

210. Regarding random brightness, Petitioner relies on the end result of Pohlert’s pseudo-random sequencing, arguing that different groups of LEDs having a different number of LED bulbs may be randomly sequenced such that the output brightness varies because a different number of LEDs are illuminated. Petition, 64-66; EX1006, ¶152.

211. In my opinion, this interpretation does not comport with the claim language. Each of the independent claims recite that the *simulation parameter* is at

least one of a random brightness, etc., and further recites that calculating the time varying lighting value is *based on the simulation parameter*. Therefore, the random brightness is an **input** to the calculation *not* merely an end result in brightness changes due only to a different number of lights sequentially being illuminated. Further, Mr. Wood acknowledged at his deposition that the simulation parameter is used in the calculation and is an input to the calculation. EX2004, 72:10-73:4 (“Q: And so the simulation parameter **is an input**, whether manual or automatic, into the calculation of a time-varying lighting value. True? A: True.”); 90:22-91:17 (testifying the simulation parameters are **inputs** to the calculation).

212. Pohlert discloses “pseudo-random” sequences as an alternative to pre-defined sequences. These pseudo-random sequences are **outputs** applied to special effects generated by the effects generator 543 or processor 574, rather than **inputs** to the effects generator 543 or processor 574. EX1003, ¶¶[0063], [0067] (discussing sequencing the predesignated special effects); *see also* EX2004, 255:4-257:4 (Mr. Wood admitting Pohlert’s pseudo-random sequence is generated as an **output**).

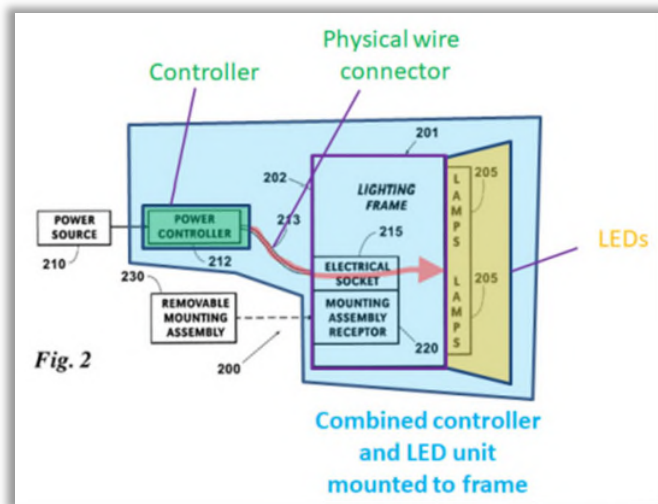
213. There is simply no disclosure in Pohlert of calculating a time varying lighting value “based on” a simulation parameter that “is at least one of: a random brightness; a random duration; and a random interval.”

B. Pohlert Does Not Anticipate Dependent Claim 19

214. As discussed above, in my opinion, Pohlert does not anticipate independent claim 15. *See* Section XI.A. *supra*. Claim 19 indirectly depends from claim 15, and therefore, Pohlert does not anticipate claim 19 for the same reasons set forth above. Further, in my opinion, Pohlert does not disclose a lighting system “wherein said controller and said lighting device are integrated in a combined unit” as recited in claim 19.

215. In addressing this element, the Wood Declaration first makes a conclusory statement that the Pohlert’s power controller and LED lamps are physically connected. EX1006, ¶213 (citing EX1003, ¶¶[0020], [0050]-[0051]). None of paragraphs [0020], [0050], or [0051] actually state the controller and the LED lamps are integrated within a combined unit.

216. The Wood Declaration then argues that Pohlert’s power controller “can be **physically connected by a cable** to the lighting elements on the lighting frame, making them one combined unit” and provides a marked up Figure 2 from Pohlert:



EX1006, ¶213.

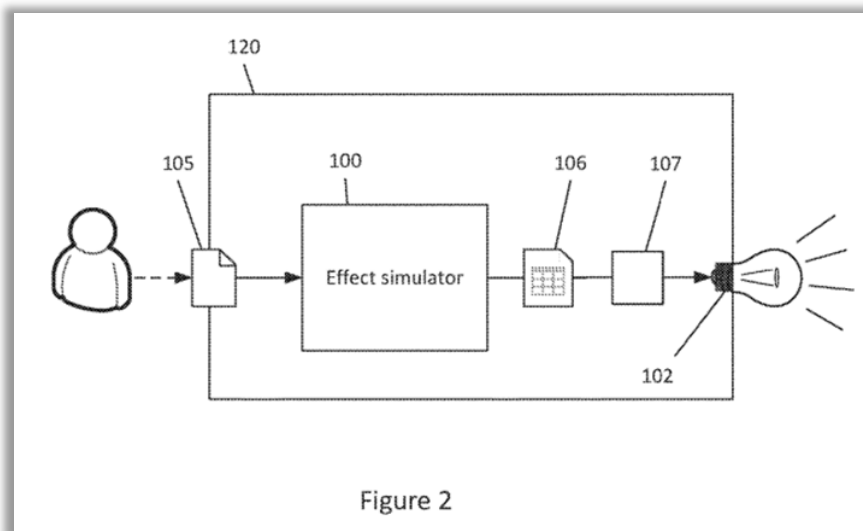
217. First, I note that the blue border, shading, and red arrow in the annotated figure from the Petition and Wood Declaration do not actually appear in Pohlert. EX1003, FIG. 2; Petition, 97-98; EX1006, ¶213; EX2014, 347:5-7 (admitting the same).

218. Second, I disagree that a POSITA, having read the '257 Patent, would believe that a wired cable connection satisfies the claim 19 language of “integrated in a combined unit.” Instead, the '257 Patent includes the following passage:

[I]t should be appreciated that the effect simulator 100 or the computing device 130 *may be separate* from any light 102, and connectable to lights 102, by either a *wired* or wireless connection.

EX1001, 11:39-42.

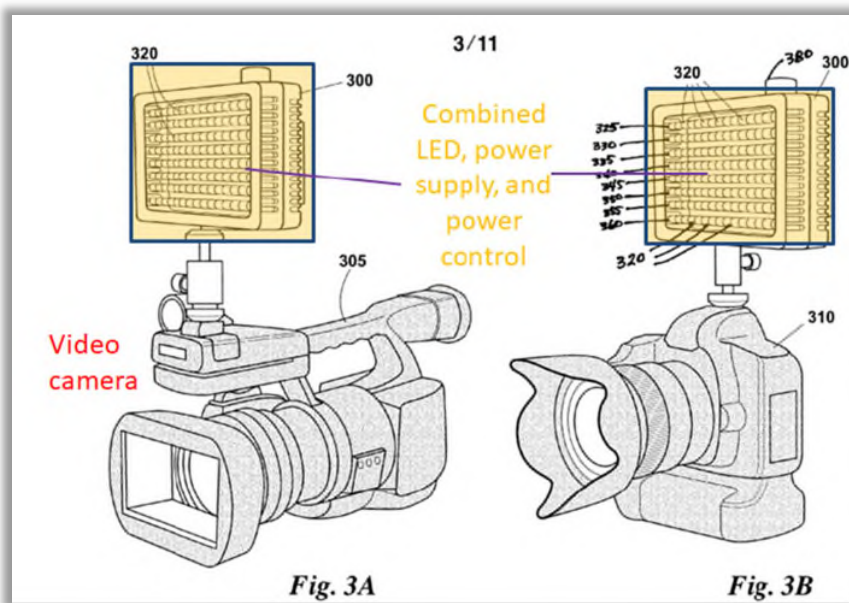
219. In contrast, the '257 Patent explains, in the context of the embodiment of Figure 2, that the “microcontroller or other computing unit is integrated in the lamp device 120 for performing calculations.” EX1001, 5:65-67.



EX1001, FIG. 2 (showing the integrated effect simulator 100 and light 102 within the single studio lamp device 120); *see also id.*, 5:58-60 (describing the single integrated studio lamp device 120).

220. Therefore, in my opinion, the '257 Patent draws a clear distinction between the controller and lighting device being “integrated in a combined unit” and the controller and lighting device being “separate,” which includes *a wired connection*. Accordingly, I do not agree with Petitioner’s positions that a wired connection satisfies claim 19 because they are not reflective of how a POSITA would have understood this claim language.

221. The Wood Declaration then goes on to say that Pohlert's power source 210 "may be either 'a standard electrical outlet' or 'a battery having sufficient current to drive the LEDs,'" and argues that disclosure of a self-contained battery unit satisfies claim 19. *See* EX1006, ¶214. But as can be readily seen even in Mr. Wood's annotated version of Figure 2 above, the power source 210 (*e.g.*, a battery) is a distinct component from the power controller 212. EX1006, ¶213, FIG. 2 (annotated); EX2004, 347:12-16. Even if a *battery* may be self-contained with the lighting device, that does not disclose that the controller is self-contained. The annotations provided in the Wood Declaration regarding FIGS. 3A-3B are misleading in this same respect:



EX1006, ¶214.

222. The Wood Declaration does not point to any disclosure in Pohlert that actually teaches the *controller* is part of what is shown in FIGS. 3A-3B. The reference to a “kit” suffers from the same deficiency as the “kit” mentioned in Pohlert does not include a controller. *See* EX1006, ¶214 (citing EX1003, ¶¶[0024], [0050]). The Wood Declaration’s final citations for this claim involve a general discussion of the transportability of the “lighting and effects generator” and a mention of Pohlert’s Abstract. *See* EX1006, ¶¶215-216 (citing EX1003, ¶[0094], Abstract). The description in Pohlert at paragraph [0094] does not tie the effects generator to being formed in a single integrated unit *with a lighting device*. EX1003, ¶[0094]. Instead, this passage just says the lighting and effects generator is capable of being battery powered and that an LED studio can be set up at a desired location. *See id.* Finally, Pohlert’s Abstract does not disclose an integrated unit with a controller and lighting device because the full language of the portion relied upon (which is cut off in the Wood Declaration in paragraph 216) is: “The lighting apparatus may include an effects generator *in communication therewith...*,” thus indicating the effects generator is “in communication” with the lighting apparatus, but not necessarily integrated in a combined unit. *See e.g.*, EX1003, Abstract; ¶[0107] (discussing wired or wireless communication); FIGS. 2 and 5A-5B (showing embodiments of non-integrated effects generators that are in communication with a lighting device).

223. Accordingly, Petitioner has not met its burden of showing that Pohlert discloses a lighting system “wherein said controller and said lighting device are integrated in a combined unit” as recited in claim 19.

C. Pohlert Does Not Anticipate the Other Dependent Claims

224. Claims 2-14, 16-18, and 21 ultimately depend from either independent claim 1 or 15 discussed above. I believe that these claims are distinguishable over Pohlert at least for the reasons discussed above regarding claims 1 and 15. Claims 2-14, 16-18, and 21 are thus not anticipated by Pohlert at least due to their dependence from claims 1 and 15.

D. Petitioner Did Not Articulate Any Obviousness Position Beyond Anticipation

225. While Ground 2 based on Pohlert as described in the Petition cited 35 U.S.C. 102/103 (Petition, 3-4), I do not believe that the Petition, nor the Wood Declaration, sets forth any obviousness analysis beyond anticipation. While I am not an attorney, my understanding is that obviousness requires analyzing certain factors, which include an assessment of the content of the prior art reference and an identification of the differences between the prior art reference and the claims. *See* Section I.B *supra*. I further understand that in order to establish obviousness, there must be an articulated reason for modifying the underlying reference to arrive at the claimed invention.

226. I have reviewed the analysis set forth in the Petition and in the Wood Declaration regarding independent claims 1, 15, and 20. *See* Petition, 56-70; EX1006, ¶¶132-162. I do not see that there is an analysis presented regarding the scope and content of Pohlert or identification of any limitation in independent claims 1, 15, and 20 missing from Pohlert that would purportedly have been obvious to a POSITA based on Pohlert. Further, I do not see any rationale provided in the Petition or the Wood Declaration articulating a reason to modify Pohlert in such a manner to arrive at the claimed invention, or any of the other factors for an obviousness analysis I summarize above.

227. Therefore, it is my opinion that the Petition, and the Wood Declaration, do not demonstrate that claims 1, 15, and 20 would have been obvious based on Pohlert for the same reasons as explained above regarding anticipation and because no further obviousness analysis was presented in the Petition.

228. For completeness, and in order to respond to the conclusory obviousness position alleged in the Petition, I have considered the matter and it is further my opinion that a POSITA would not have found claims 1, 15, and 20 obvious in view of Pohlert. For example, in my opinion, it would not have been obvious to a POSITA to modify Pohlert to include the functionality of “calculating, using an effect simulator, a time varying lighting value.” Specifically, Pohlert discloses a manual lighting effects and pre-programmed lighting effects that may

be recalled in a particular pattern or in a pseudo-random sequence. EX1003, ¶¶[0061]-[0067]. Pohlert lacks disclosure of the effects generator 543 (FIG. 5A embodiment) or the processor 574 (FIG. 5B embodiment) *calculating* a time varying lighting value based on at least one simulation parameter (which is at least one of a random brightness, random duration, or random interval) as I have detailed above. *See* Sections IX and XI.A *supra*. A POSITA would not have found it obvious to arbitrarily introduce such functionality as there is no suggestion of any particular benefit for reconfiguring Pohlert's effects generator 543 or processor 574 to calculate time varying lighting values in this manner. Petitioner has not identified any reason to modify Pohlert to include the "calculating" functionality, nor do I believe a POSITA would have been so motivated. Further, Petitioner, and Mr. Wood, did not offer any opinion that Pohlert could have been modified to include the "calculating" functionality with a reasonable expectation of success.

XII. CONCLUSION

229. For at least the reasons set forth above, I am of the opinion the Challenged Claims would not have been obvious to a POSITA at the time of the invention of the '257 Patent based at least on the discussed prior art.

230. I understand that this Declaration is to be filed in an IPR proceeding before the PTAB. I acknowledge that I may be subject to cross-examination in the case and that cross-examination will take place within the United States. If cross-examination is required of me, I will appear for cross-examination within the United States during the time allotted for cross-examination.

231. I hereby declare under penalty of perjury that the foregoing is true and correct, 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 are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001 and may jeopardize the validity of the application or any patent issuing thereon. If called to testify as to the truth of the matters stated herein, I could and would testify competently.

Dated: June 16, 2022


Eric Bretschneider, Ph.D.

Skills Summary

- Successful Management and Team building with personnel at levels ranging from Sr. Scientists and Engineers to Technicians/Operators. Maximum Department size >100; Budget >\$25 million/yr.
- Strong New Product Development background; over 100 new SSL products taken from concept to manufacturing, including regulatory, Energy Star certification and DLC certification.
- Excellent communication skills sales and sale support experience as evidenced by development of new 8+ figure accounts for LED die, packages and applications. Proven ability to match customer demands/needs/desires with existing products.
- Comprehensive technical background in the full range of LED production technologies including MOCVD hardware/process, fabrication, LED chip/package test/reliability, optical design, thermal management, color conversion, SSL fixture/lamp design/integration and reliability.
- Direct Design and Development experience of LEDs (structures, die, packages) and SSL fixtures/components using TracePro and SolidWorks.

Employment**CTO; EB Designs & Technology Colleyville, TX****2014 –**

- Design and development of innovative solid-state lighting technology and designs, with a primary focus on optical design, thermal design and production/assembly technologies.
- Manage technology roadmap and draft IP disclosures/patent filings.
- Provide technical support and conduct research/technology development for clients in the field of solid-state lighting. This work additionally includes serving as an expert witness.
- Developed the first method able to predict chromaticity shift of LED products over time. Method is being used as the basis for a new industry standard: IES TM-35-19 "Projecting Long-Term Chromaticity Coordinate Shift of LED Packages, Arrays and Modules."
- Developed the method for interpolating between drive currents for flux maintenance lifetime for LED based products that is being implemented in IES TM-21-19 "Projecting Long Term Lumen, Photon and Radiant Flux Maintenance of LED Light Sources."

Director of Engineering; HeathCo, LLC Bowling Green, KY**2013 – 2014**

- Managed Engineering Department Staff (11 domestic, 14 international); Responsibilities included preparation and administration of the department budget (\$3.5 million annual). The department was charged with developed advanced technology/products related to: Solid State Lighting, Sensors, Notifications and Control Products and included regulatory/certifications for UL, FCC, Energy Star and DLC.
- Developed technology, IP and product roadmaps for all three business units (Lighting, Sensors, Notifications). Provided solid state lighting technology support for The Chamberlain Group.
- Additional responsibilities included establishing career development paths and training goals for all members of the department.
- Key accomplishments:
 - Led team for product recall issue dating back to 2006. Reduced recall scope (# units) by >80% and financial exposure by >85% through detailed investigation and analysis of production records and analysis of excess and obsolete inventory.
 - Completed review for entire product portfolio to comply with new cUL bi-lingual language requirements. Project required warning requirement changes to physical components (tooling), warning labels, documents and packaging on >400 products.

Elec Tech International Zhuhai, Guangdong Province, P.R. China**Chief Engineer ETi Lighting Research Institute****VP Research & Development ETi Solid State Lighting****2011 – 2013**

- Managed Engineering and R&D staff for newly formed vertically integrated LED company (107 Engineering, Scientists, Designers); responsibilities included preparation and administration of the department budget (>\$25 million annual)
- Worked directly with President and CEO of the company to develop IP and product roadmaps for all LED based lighting products/projects for markets in the US, Europe, Japan and China.
- Key accomplishments:
 - Developed capability for fast turn functional prototypes (<2 weeks from concept to operating units). This was an improvement over the prior process that required 6+ weeks for a working prototype. Prior to this the company lost ~50% of all opportunities that required functional prototypes.
 - Supported product development and production ramps that enabled the company to increase sales from ~\$10 million to >\$40 million in one year.
 - Developed proprietary linear lamp technology capable of >1000 lumens/ft with a wall plug efficacy >100 lm/W, CRI>80 and L70>50,000 hrs (Ta = 25°C). Technology allows the same base units to be installed in fixtures as a replacement tube or used as individual luminaires with transverse spacing criteria ranging from 1.6 – 2.9.

Lighting Science Group Corporation Satellite Beach, FL

2010 - 2011 VP of Research

- Assembled and managed research and development teams for projects related to solid state lighting.
- Direct responsibility for design/development of customized photometric and radiometric characterization equipment.
- Direct responsibility for modeling and determining product and component lifetimes based on optical, thermal, mechanical and electrical analysis with respect to intended operating environments.
- Served as company representative on industry standards committees related to SSL technology (LM79, LM80, TM21, etc.)
- Key accomplishments:
 - Developed advanced LED models for product development and production control; including advanced color control schemes for multi-color applications. Methods capable of predicting average chromaticity to within a combined $\Delta xy \leq 0.02$; production variation < 2 step MacAdam ellipse.
 - Developed and characterized wavelength conversion materials, methods and technology. Work included development of optics and materials for L-Prize entry.

2008 – 2010 Product Development Manager

- Tasked with developing Solid State Lighting products including: optical, mechanical and thermal design, design and process FMEA, oversight of initial production, development of quality system documents and requirements for internal production and out-sourced components. Projects ranged from individual efforts to team of 10+ employees
- Served as the primary technical resource for all OEM customers.
- Managed group responsible for all product certifications and standards requirements including UL, FCC, CE, Energy Star and DLC as well as IES lighting requirements for outdoor products.
- Responsible for development, calibration and maintenance of photometric equipment in development and production areas.
- Key accomplishments:
 - Completed fast track development and launch of OEM SSL acorn retrofit product (<5 months). Product exceeded all customer requirements including: lumen output, efficacy, thermal resistance and size. Developed second generation product with >100% increase in light output with now cost increase.
 - Completed design of Streetlight family (4 products) in 4 month time span. Products achieved >90 lumens/Watt efficacy at thermal stability with projected L70 lifetimes >80,000 hours at Ta=40°C (continuous).
 - Development replacement lamp family line (6 primary lamp types, 100+ variations). Product family included the first replacement LED lamps to achieve Energy Star certification. Product variations developed for LSG brand name and 3 OEM customers. Altogether the family accounted for >50% of the Energy Star certified LED lamps as of December 2011.

2004 - 2008 Toyota Gosei North America Troy, MI

Sales Manager

- Primary responsibility for developing new and managing existing LED die and package customers for the Eastern region of North America. This required extensive communications with existing and potential customers to determine best fit products for their applications/requirements.
- Additional responsibility for search for and identifying new market opportunities for existing or newly developed products.
- Served as the primary technical resource for all customers in North/South America and Europe; provide engineering support for customers developing LED packages and LED lighting products.
- Key accomplishments:
 - Secured two new 8 figure accounts in a new market niche. These customers designated as the only two priority customers for Toyoda Gosei world-wide. Sales ramped from \$0 to >\$100 million/yr in less than 18 months.
 - Secured sole supplier status for LED backlights in Apple - 9.9" (iPad), 15.4", 17" and 22" displays. This was the culmination of an 18 month campaign with the Apple Display group to find the best fit product for their requirement and to train Apple personnel on potential technical barriers/issues with their application.
 - Addressed Microsoft concerns about blue light hazards related to development of a next generation optical mouse. After three months, I was able to conclusively show to Microsoft that it would be impossible for 14mil die products to present a photo-biological hazard under both IEC 62471 and IEC 60825.
 - Awarded business for all passenger lighting on the B787 Dreamliner. This award was made by Diehl which controls all lighting for Boeing, Airbus and Embraer and was achieved within 4 months of first contact with Diehl. At the time of first contact Diehl had no knowledge of Toyoda Gosei and had been working with 4 LED companies for over 12 months on the project.

2003 – 2004 Beeman Lighting Sarasota, FL

Director of Solid-State Lighting Engineering

- Tasked with leading development of solid-state lighting systems and materials with primary focus on chip on board applications and devices. Product lines included RGB landscape lighting and minimal environmental impact fixtures and novel display/artwork fixtures.
- Managed all IP issues (competitor analysis, IP roadmap, patentability analysis).
- Worked with existing and potential customers to ensure new products meet or exceed requirements and expectations.
- Key accomplishment
 - Developed RGB LED based landscape light with minimal environmental impact. This was accomplished by establishing a research project with FAU and included studies that conclusively showed the products had no impact on the behavior of sea turtle hatchlings.

2003 University of South Florida Tampa, FL

Intellectual Property Manager

- Managed IP portfolio of over 100 active patents and applications for University faculty/staff. Key portfolio items included: anti-cancer bioactive compounds, dendrimer synthesis and application technology, and spectral analysis of biological materials (blood analysis, surface and soluble protein analysis).
- Tasked with enhancing University reputation and revenue through negotiation of licensing agreements for IP
- Key accomplishments:
 - Negotiated license agreement for evaluation of new anti-cancer compounds derived from cold water tunicates.
 - Assembled team that included 3 corporate and 2 academic partners for the DARPA SUVOS program. This task was completed in one month and the resulting proposal was ranked 2nd overall out of a field of 34 entries and was noted by the reviewers as the only proposal to address each and every portion of the RFP.

1998 – 2003 Uniroyal Optoelectronics Tampa, FL

Director of Intellectual Property, University Relations & Government Contracts (2001 – 2003)

- Concurrent assignment as Sr. Epi Scientist.
- Tasked with establishing IP roadmap and track patent landscape related to MOCVD growth, chip/package design and applications for LED technology.

- Reviewed all production and R&D activities to identify potential IP. This included drafting initial disclosures and working with external counsel for patent filings and responses to office actions. Activities with external counsel further included development of opinions of non-infringement.
- Oversight and management of a \$3.4 million multi-campus research program.
- Monitor and track RFP notices for externally funded research related to the company's core technology development roadmap.
- Key accomplishments:
 - Developed opinions of non-infringement with external counsel for 10 LED patents that had been the subject of numerous infringement suits against Tier 1 LED companies.
 - Assembled team that included 3 corporate and 2 academic partners for the DARPA SUVOS program. This task was completed in one month and the resulting proposal was ranked 2nd overall out of a field of 34 entries and was noted by the reviewers as the only proposal to address each and every portion of the RFP.

Team Leader, Epitaxial Materials & Characterization (1999 – 2001)

- Concurrent assignment as Sr. Epi Scientist.
- Oversaw start up and qualification of Epitaxial Growth & Characterization areas; role included training of Sr. Scientists, Engineers and Technicians for both areas in theory, application, process and maintenance procedures.
- Managed Epitaxial Growth & Characterization areas for production of InGaN and AlInGaP LED wafers. This included preparation and administration of the department budget (~\$25 million annual) as well as setting department performance goals (total good wafers, wafer yield, performance improvements and unit production costs).
- Coordinate inventory levels with purchasing department to minimize value of inventory necessary to support production plan. Additionally, negotiated key raw material specifications and prices.
- Served as Sr. member of Quality Team responsible for ISO9001 certification. Certification was achieved within a 12 month time span.
- Key accomplishments:
 - Completed process qualifications for all MOCVD systems within 3 months of CapEx delivery and established initial production yields 15% higher than the benchmark process transferred to UOE.
 - Managed departmental expansion and quality system efforts that allowed >250% increase in production capacity.
- Managed start up and qualification of Epitaxial Growth & Characterization areas; role included training of Engineers and technicians for both areas in theory, application, process and maintenance procedures.

Sr. Epi Scientist (1999 – 2003)

- Primary responsibility for MOCVD hardware and process modifications necessary to support performance improvements, yield enhancements and cost reductions.
- Served as primary technology liaison with customers and investors. Provided support to customers on package and fixture design and integration.
- Tasked with technical oversight of all photometric/radiometric characterization.
- Responsible for LED chip and package optical/thermal design including wavelength conversion materials.
- Key accomplishments:
 - Resolved gold corrosion issue in Fab area. Also eliminated transparent contact failure mechanism. Combined efforts increased fabrication yield by >30%.
 - Modified hardware and epitaxial growth process to increase throughput of Epitaxial Growth & Characterization areas by 80% (9 hour to 5 hour cycle time), while cutting unit cost by >30%. Also reduced surface and interfacial roughness by a factor of >3x while improving thickness uniformity from 4% to <2%, using DOE methods. Additional hardware modification increased throughput by another 20%.
 - Developed new test methods to verify performance of LED structures prior to Fabrication. Methods allowed verification of optical power to within 15% and wavelength within 2 nm prior to beginning of fabrication.

Staff Engineer (1998 – 1999)

- Designed/specified Epitaxial Growth & Characterization areas. This responsibility included specification and selection of all CapEx equipment for the Epitaxial Growth and Characterization areas and managing the construction, CapEx equipment installation and start up.

- Additional responsibilities included determining initial product cost and throughput based on installed CapEx tool base.
- Key accomplishments:
 - Implemented and validated new ammonia delivery system that allowed multiple MOCVD systems to draw from the same cylinder and eliminated downtime for cylinder changes. Implemented new exhaust management process for arsine/phosphine waste stream, extending maintenance interval by >300%.
 - Developed zero assumption cost and throughput models for LED facility. Cost estimate for 18 months post-start up proved accurate to within 10% of actual costs.

1996 – 1998 Emcore Corporation Somerset, NJ

Process Engineer

- Responsible for installation, materials demonstration and production process qualification and transition into manufacturing of MOCVD systems in an ISO9000 manufacturing environment (6 systems in 18 months).
- Tasked with identifying cost reduction and throughput/yield enhancements for epitaxial growth processes.
- Member of internal Quality System audit team.
- Key accomplishments:
 - Developed MOCVD Tool Qualification Procedure for benchmarking and qualifying all MOCVD systems installed for internal corporate use as well as at customer locations world-wide.
 - Completed Manufacturing Readiness Review for AlGaAs/Ge solar cell process in ~25% of standard time. Resulted in 3 year, \$15 million supply contract for company.
 - Scaled up and transferred of InSb magneto resistor process to a higher throughput system (single wafer D-180 to five wafer E-300). Increased wafer yield by from 65% to >95%.
 - Developed industry's first comprehensive cost and throughput model for epitaxial growth processes. The model typically allowed cost reductions of 10-20% and throughput increases of >10%.

1990 AT&T Bell Labs

Holmdel, NJ

Visiting Researcher

- Designed and built custom MOCVD/Mass spec system. System allowed tracking of precursor molecules, reaction intermediates and products over 12+ orders of magnitude of concentration.
- Implemented program to evaluate novel precursors for use in growth and doping of III-V and II-VI compound semiconductors. Data used to determine reaction and decomposition mechanisms for metal-organic sources. Successfully identified grow conditions for novel carbon doping source (norbornadiene) for III-V materials.

1989 Shell Oil Norco, LA

Process Engineer

- Developed and implemented new system for determining optimal time to clean heat exchangers on crude oil distillation column based on global economic metrics of unit and detailed process simulations.
- System exceeded system cost savings target of \$50,000/year by ~3 orders of magnitude. Project resulted in corporate-wide savings of >\$100 million/year. Cumulative corporate savings exceed \$1 billion.

Education

Ph.D. in Chemical Engineering

University of Florida 1997

BSE in Chemical Engineering

Tulane University 1989

- Graduate work focused on development of optoelectronic devices, including novel silicon based visible LEDs and sulfide based TFELD structures.
- Developed the world's first crystalline silicon based visible light LED. Utilized DOE methods to identify process conditions to allow first growth of epitaxial silicon on ZnS epi layers.
- Tested and verified efficacy of novel precursors for p-type doping of ZnSe materials in LED structures.
- Responsible for modification, operation and maintenance of MOCVD system for growth of wide bandgap compound semiconductor materials.
- Trained incoming post docs and graduate students in theory, operation and maintenance of MOCVD systems. Group comprised ~20 students and 6 post docs.

References Available on request

Curricula Vitae

University of Florida, Department of Chemical Engineering Advisory Board

Member 1998 –

Chair 2007 – 2009, 2017 –

University of Florida, Dean's Advisory Board, College of Engineering

Member 2017 -

Professional Societies:

- SPIE
- OSA
- Materials Research Society
- Illuminating Engineering Society (Member of Science Advisory Panel, Member of Executive Board of Test Procedures Committee, Chair of Projection and Reliability Sub-Committee, Member of Light Sources Committee, Secretary of Color Committee)
- American Society of Horticultural Science (ASHS)
- American Society of Agricultural and Biological Engineers (ASABE)

Conference Chair

LED Measurement and Standards, San Diego, CA October 2-3 (2008).

Patents (Granted)

1 US Patent 7,093,956 "Method of Lighting for Protecting Sea Turtles." D. Miller, E. Bretschneider, issued August 22, 2006.

2 US Patent D650,519 "Pole for a Street Light Luminaire." F. Maxik, D. Henderson, E. Bretschneider, A. Widjaja, K. Bowen, J. Sundin, E. Peiniger, issued December 13, 2011.

3 US Patent 8,157,413 "Light Fixture and Associated LED Board and Monolithic Optic." F. Maxik, Z. Gibling, E. Bretschneider, D. Henderson, A. Widjaja, issued April 17, 2012.

4 US Patent D673,323 "Light Fixture." F. Maxik, D. Henderson, E. Bretschneider, A. Widjaja, K. Bowen, J. Sundin, E. Peiniger, issued December 25, 2012.

5 US Patent 8,360,607 "Lighting Unit with Heat Dissipating Chimney." E. Bretschneider, Z. Berkowitz, R. Sosnick, L. Pattison, P. Pattison, issued January 29, 2013.

6 US Patent 8,408,725 "Remote Wavelength Conversion Device and Associated Methods." F. Maxik, E. Bretschneider, R. Soler, D. Bartine, issued April 2, 2013.

7 US Patent D681,874 "Light Fixture." F. Maxik, D. Henderson, E. Bretschneider, A. Widjaja, K. Bowen, J. Sundin, E. Peiniger, issued May 7, 2013.

8 US Patent 8,439,515 "Remote Lighting Device and Associated Methods." F. Maxik, R. Soler, D. Bartine, E. Bretschneider, issued May 14, 2013.

9 US Patent 8,465,167 "Color Conversion Occlusion and Associated Methods." F. Maxik, E. Bretschneider, R. Soler, D. Bartine, issued June 18, 2013.

10 US Patent 8,491,165 "Lighting Unit Having Lighting Strips with Light Emitting Elements and a Remote Luminescent Material." E. Bretschneider, Z. Berkowitz, R. Sosnick, L. Pattison, P. Pattison, issued July 23, 2013.

11 US Patent 8,492,995 "Wavelength Sensing Lighting System and Associated Methods." F. Maxik, E. Bretschneider, P. Medelius, D. Bartine, R. Soler, G. Flickinger, issued July 23, 2013.

- 12 US Patent 8,506,118 "Light Fixture and Associated LED Board and Monolithic Optic." F. Maxik, Z. Gibler, E. Bretschneider, D. Henderson, A. Widjaja, issued August 13, 2013.
- 13 US Patent 8,515,289 "Wavelength Sensing Lighting System and Associated Methods for National Security Application." F. Maxik, D. Bartine, P. Medelius, E. Bretschneider, issued August 20, 2013.
- 14 US Patent 8,547,391 "High Efficacy Lighting Signal Converter and Associated Methods." F. Maxik, R. Soler, D. Bartine, R. Zhou, V. Bastien, M. Regan, E. Grove, E. Bretschneider, issued October 1, 2013.
- 15 US Patent 8,616,715 "Remote Light Wavelength Conversion Device and Associated Methods." F. Maxik, E. Bretschneider, P. Medelius, D. Bartine, R. Soler, G. Flickinger, issued December 31, 2013.
- 16 US Patent 8,680,457 "Motion Detection System and Associated Methods Having at Least One LED of a Second Set of LEDs to Vary Its Voltage." F. Maxik, issued March 25, 2014.
- 17 US Patent 8,686,641 "Tunable LED Lamp for Producing Biologically Adjusted Light." F. Maxik, D. Bartine, R. Soler, E. Grove, E. Bretschneider, issued April 1, 2014.
- 18 US Patent 8,684,566 "Light Emitting Unit With Indirect Light Source." E. Bretschneider, Z. Berkowitz, R. Sosnick, L. Pattison, M. Pattison, issued April 1, 2014.
- 19 US Patent 8,702,259 "Color Conversion Occlusion and Associated Methods." F. Maxik, E. Bretschneider, R. Soler, D. Bartine, issued April 22, 2014.
- 20 US Patent 8,818,202 "Wavelength Sensing Lighting System and Associated Methods for National Security Applications." F. Maxik, D. Bartine, P. Medelius, E. Bretschneider, issued August 26, 2014.
- 21 US D715467 "LED Linear Replacement Lamp Design." E. Bretschneider, Z. Berkowitz, R. Sosnick, issued October 14, 2014.
- 22 US 8,866,839 "High Efficacy Lighting Signal Converter and Associated Methods." F. Maxik, R. Soler, D. Bartine, M. Regan, E. Grove, E. Bretschneider, issued October 21, 2014.
- 23 US 8,941,329 "Tunable LED Lamp for Producing Biologically-Adjusted Light." F. Maxik, D. Bartine, R. Soler, E. Grove, E. Bretschneider, issued January 27, 2015.
- 24 US 9,024,536 "Tunable LED Lamp for Producing Biologically-Adjusted Light and Associated Methods." F. Maxik, D. Bartine, R. Soler, E. Grove, E. Bretschneider, issued May 5, 2015.
- 25 US 9,125,275 "Wavelength Sensing Lighting System and Associated Methods." F. Maxik, E. Bretschneider, P. Medelius, D. Bartine, R. Soler, G. Flickinger, issued September 1, 2015.
- 26 US 9,172,199 "Electrical Fixture Connection." T. Birdwell, E. Bretschneider, J. Fitzgibbon, B. Moore, S. Tylicki, issued October 27, 2015.
- 27 US 9,289,574 "Three-channel Tuned LED Lamp for Producing Biologically-Adjusted Light." F. Maxik, D. Bartine, R. Soler, E. Grove, E. Bretschneider, issued March 22, 2016.
- 28 US 9,307,608 "Wavelength Sensing Lighting System and Associated Methods." F. Maxik, E. Bretschneider, P. Medelius, D. Bartine, R. Soler, G. Flickinger, issued April 5, 2016.
- 29 US 9,578,710 "Wavelength Sensing Lighting System and Associated Methods." F. Maxik, E. Bretschneider, P. Medelius, D. Bartine, R. Soler, G. Flickinger, issued February 21, 2017.

30 US 9,693,414 "LED Lamp for Producing Biologically-Adjusted Light." F. Maxik, D. Bartine, E. Bretschneider, issued June 27, 2017.

31 CA2845210 "Connexion de Luminaire Electrique." T. Birdwell, E. Bretschneider, J. Fitzgibbon, B. Moore, S. Tylicki, issued October 24, 2017

32 EP2783549 "Wavelength Sensing Lighting System and Associated Methods." F. Maxik, D. Bartine, P. Medelius, E. Bretschneider, issued November 21, 2017.

33 US 9,839,092 "Wavelength Sensing Lighting System and Associated Methods." F. Maxik, E. Bretschneider, P. Medelius, D. Bartine, R. Soler, G. Flickinger, issued December 5, 2017.

34 DK2783549 "Wave Detection Lighting System and Related Procedures." F. Maxik, D. Bartine, P. Medelius, E. Bretschneider, issued December 11, 2017.

35 US9,905,976 "Mounting Step Having a Connector to Connect an Electric Fixture to a Junction Box." T. Birdwell, E. Bretschneider, J. Fitzgibbon, B. Moore, S. Tylicki, issued February 27, 2018.

36 US 9,913,341 "LED Lamp for Producing Biologically-Adjusted Light Including a Cyan LED." F. Maxik, D. Bartine, E. Bretschneider, issued March 6, 2018.

37 US 10,054,290 "Movable Barrier Operator Light Distribution." T. Birdwell, E. Bretschneider, J. Fitzgibbon, issued August 21, 2018.

38 US 10,177,287 "Gamut Broadened Displays with Narrow Band Green Phosphors." J. Melman, R. Nordsell, K. Baroudi, Y. Bok Go, E. Bretschneider, A. Thomas, E. Thomas, issued January 8, 2019.

39 US 10,212,781 "Wavelength Sensing Lighting System and Associated Methods." F. Maxik, E. Bretschneider, P. Medelius, D. Bartine, R. Soler, G. Flickinger, issued February 19, 2019.

40 US 10,297,584 "Chip on Board LED Device and Method." S. Mekanoeich, N. Caldani. E. Bretschneider, issued May 21, 2019.

41 US 10,417,882 "Direction Sensitive Motion Detector Camera." E. Bretschneider, J. Fitzgibbon issued September 17, 2019.

42 US 10,462,874 "Wavelength Sensing Lighting System and Associated Methods." F. Maxik, E. Bretschneider, P. Medelius, D. Bartine, R. Soler, G. Flickinger, issued October 29, 2019.

43 US 10,679,476 "Method of Using a Camera to Detect Direction of Motion." E. Bretschneider, J. Fitzgibbon issued June 9, 2020.

Patents (Pending)

>40 US and International Patents pending

Publications

1. "Evaluation of $\text{Zn}\{\text{N}[\text{Si}(\text{CH}_3)_3]_2\}_2$ as a p-Type Dopant in OMVPE Growth of ZnSe" W. S. Rees, D. M. Green, T. J. Anderson, E. Bretschneider, B. Pathangey, C. Park and J. Kim, J. Elec. Mat., vol. 21, pp. 361-366 (1992).
2. "OMVPE Growth of ZnSe Utilizing Zinc Amides as Source Compounds: Relevance to the Production of p-type Material" W. S. Rees, D. M. Green, T. J. Anderson and E. Bretschneider, Wide Bandgap Semiconductors, eds. T. D. Moustakas, J. I. Pankove and Y. Hamakawa, MRS Pub., vol. 242 (1992).

3. "Characterization of ZnS Layers Grown by MOCVD for Thin Film Electroluminescence (TFEL) Devices" J. E. Yu, K. S. Jones, B. Pathangey, E. Bretschneider, T. J. Anderson, J. Fang, P. H. Holloway, Wide Bandgap Semiconductors, eds. T. D. Moustakas, J. I. Pankove and Y. Hamakawa, MRS Pub., vol. 243 (1992).
4. "A Study of Nucleation of ZnS Thin Layers Grown by Low-Pressure MOCVD for Thin Film Electroluminescence (TFEL) Devices" J. E. Yu, E. Bretschneider, B. Pathangey, T. J. Anderson, J. Fang, P. H. Holloway and K. S. Jones, Mechanisms of Heteroepitaxial Growth, eds. M. F. Chisholm, B. J. Garrison, R. Hull and L. J. Schowalter, MRS Pub., vol. 263 (1992).
5. "MOCVD Growth of Non-Epitaxial and Epitaxial ZnS Thin Films" J. Fang, P. H. Holloway, J. E. Yu, K. S. Jones, B. Pathangey, E. Bretschneider and T. J. Anderson, Appl. Surf. Sci., vols. 70-71, pp. 701-706 (1993).
6. "Temperature and Flow Modulation Doping of Manganese in ZnS Electroluminescent Films by Low Pressure Metalorganic Chemical Vapor Deposition" J. E. Yu, K. S. Jones, P. H. Holloway, B. Pathangey, E. Bretschneider and T. J. Anderson, J. Elec. Mat., vol. 23, pp. 299-305 (1994).
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