

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAVANT TECHNOLOGIES LLC d/b/a GE LIGHTING,
and LEDVANCE LLC

Petitioners,

v.

FEIT ELECTRIC COMPANY, INC.,
Patent Owner.

IPR2024-01357

Patent 8,604,678

SAVANT TECHNOLOGIES LLC d/b/a GE LIGHTING,
ELONG INTERNATIONAL USA INC., and
XIAMEN LONGSTAR LIGHTING CO. LTD.

Petitioners,

v.

FEIT ELECTRIC COMPANY, INC.,
Patent Owner.

IPR2025-00260

Patent 8,604,678

**DECLARATION OF WILLIAM A. DOOLITTLE, PH.D.
REGARDING CLAIMS 11-14 OF THE '678 PATENT**

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I, William A. Doolittle, Ph.D., of Atlanta, Georgia, USA, hereby declare as follows.

I. Introduction

1. I am over the age of eighteen and otherwise competent to make this declaration.

2. As discussed in my prior declarations (EX1002, EX1022, EX2023, EX2024), based on my education and experience, I believe I have a detailed understanding of the state of the art relating to the '678 patent during the relevant period, as well as a sound basis for opining how persons of skill in the art at that time would understand the technical issues in this case.

3. I have been asked to provide this second supplemental declaration in the IPR2024-01357 and IPR2025-00260. The purpose of this declaration is to provide information relevant to the patentability of certain proposed substitute claims submitted as part of the Patent Owner's Motions to Amend.

II. "configured such that a portion of excitation light... is directed back"

4. A POSA understands that light scattering from particles, such as those in a diffusing layer or a phosphor layer, is a fundamentally omnidirectional physical process. When excitation light from an LED die strikes a particle, it is scattered in many directions, including backward toward the light source. This is

not a special outcome of a particular “configuration,” but an inherent physical property of scattering media.

5. In his textbook, *Light-Emitting Diodes*, Dr. Schubert further explains that a “diffuser will cause light to reflect, refract, and scatter, thereby randomizing the propagation direction and uniformizing the far-field distribution in terms of chromaticity (i.e. spectral composition).” (EX2014, p.355). This randomization inevitably results in some light being directed backward. Thus, any LED package containing a scattering or phosphor layer will inherently direct at least some fraction of light back toward the source

6. The proposed claim language requires that the light diffusing layer be “configured such that” a “portion” of excitation light is directed back. However, because *some* amount of back-scatter is an unavoidable and inherent consequence of including a scattering layer, the term “portion” fails to provide any meaningful, objective boundary. The ’678 patent specification does not define what quantum of light constitutes a “portion” sufficient to meet this limitation. It does not specify a minimum percentage, a threshold amount, or a functional outcome that would allow a POSA to distinguish between the inherent, unavoidable back-scatter present in *any* such device and a specific, purposefully configured “portion” that falls within the scope of the claim.

7. The specification of the '678 patent provides no guidance to resolve this ambiguity. While it discusses that a diffusing layer can direct light back into the phosphor layer, thereby increasing the probability of photon interaction and potentially reducing the required amount of phosphor material “by up to 40%,” (EX1001, 3:29-32), it never links this *potential result* to a specific, required quantum or percentage of back-scattered light that would define the claimed “portion”. Without such a link, a POSA is left to guess whether “a portion” means any detectable amount—which would render the claim trivial and cover virtually any device with a diffuser—or some functionally significant, yet undefined, amount.

8. A POSA, faced with this claim language, would be unable to determine its scope with reasonable certainty. The claim fails to provide any objective standard to measure the “portion” or to distinguish it from inherent physical phenomena acknowledged by experts on both sides.

III. “reduces the wavelength conversion layer material necessary”

9. A POSA reading this limitation would immediately ask, “reduced relative to what?”. The patent does not specify whether the reduction is relative to a device without a diffusing layer, a prior art device, or a device with a different type of diffusing layer. The claim provides no answer, leaving a POSA to speculate about the metes and bounds of the invention.

10. This term lacks an objective test protocol. A POSA cannot objectively test whether a given device meets this limitation because the patent does not define a baseline or a method for comparison. The amount of phosphor “necessary” for a given color emission is not a fixed value; it depends on numerous other design variables, including the target correlated color temperature (CCT), the quantum efficiency of the specific phosphor batch being used, the luminous flux of the LED die, and the overall device geometry. As I testified in my deposition, determining whether a reduction has been achieved would require a “substantial amount of experimentation” without any guideposts from the patent on how to conduct the experiment or what to compare the results against.

11. The claim recites a predictable and well-known potential result of employing a light-recycling mechanism but fails to quantify the *degree* of that result required to fall within the claim scope. Without a defined baseline and a specified test protocol, a POSA cannot determine the boundaries of the invention with reasonable certainty.

12. This limitation recites nothing more than the known purpose and predictable result of employing a light-recycling mechanism in an LED package. A POSA in 2010 would have immediately recognized this as a straightforward application of well-understood optical engineering principles.

13. The underlying principle of “light-recycling”—that is, directing unabsorbed excitation light back into a phosphor layer to give it a second chance for conversion—was a fundamental concept for improving efficiency in phosphor-converted LEDs. A POSA would have understood that any unabsorbed excitation light that escapes the device represents lost potential output. Therefore, introducing a reflective or scattering element to redirect that light back into the phosphor was a known technique to boost overall luminous output.

14. It was also a well-known engineering trade-off that this increased conversion efficiency could be leveraged in one of two ways: either to increase the total light output for a given amount of phosphor, or to reduce the amount of phosphor material needed to achieve a target light output. Given that phosphor materials, particularly those containing rare-earth elements, were a significant cost driver in LED manufacturing, a POSA would have been motivated to apply light-recycling techniques specifically to reduce the amount of phosphor required.

15. The specification of the '678 patent itself treats this outcome as an expected benefit, not a patentable discovery. It explains that the diffusing layer can “increase the probability that a photon will result in the generation of photoluminescence light by directing light back into the wavelength conversion [phosphor] layer.” It then states the direct consequence: “less phosphor material can be used to generate a selected emission color,” noting this can reduce the

required quantity of phosphor “by up to 40%.” This confirms that the patentees viewed the reduction of phosphor material as a predictable result of their light-recycling configuration. As I confirmed in my deposition, the patent describes this as a known benefit.

IV. “scatters the excitation light relatively more than”

16. This term suffers from the same fundamental flaw I identified in my prior declarations regarding the term “average particle size”. It recites a technical parameter that is dependent on the method of measurement, yet the patent fails to specify any such method.

17. A POSA would know that a material’s scattering properties are not absolute values. The measured scattering efficiency of a particle, and its dependence on the wavelength of light, is critically influenced by a host of variables. To obtain a meaningful and reproducible result for a relative comparison, these variables must be specified and controlled. The ’678 patent fails to specify any of these critical variables, leaving the claim scope uncertain.

18. Based on my expertise and the established science of optics, the critical unspecified variables that would prevent a POSA from determining the scope of this limitation with reasonable certainty include, but are not limited to, the following.

19. Particle Characteristics: The morphology (shape) and size distribution of the scattering particles dramatically affect scattering behavior. As I noted in my prior declaration (EX2023), non-spherical particles, which are common in real-world materials, scatter light differently than the idealized spheres used in theoretical models like Figure 10 of the patent. Furthermore, a broad distribution of particle sizes will yield a different relative scattering curve compared to a monodisperse sample of particles all having the same size.

20. The Surrounding Medium (Binder): Light scattering is fundamentally driven by the difference in refractive index (n) between the particle and its surrounding medium. A titanium dioxide (TiO_2) particle in a silicone binder ($n \approx 1.5$) will scatter light very differently than the same particle measured in air ($n \approx 1.0$). The patent provides no guidance as to whether the “relatively more” scattering property should be measured in situ within the final product or as a property of the raw particles suspended in a different medium.

21. Measurement Geometry and Protocol: The measured scattering result is highly dependent on the instrument and its setup. For example, measuring total integrated scatter using an integrating sphere will yield a different result than measuring scattering intensity at a specific angle with a goniophotometer. The specific wavelengths chosen to represent “excitation light” (e.g., 450 nm) and “photoluminescent light” (e.g., 560 nm) will also change the outcome, as the

scattering efficiency versus particle size relationship is not linear across the visible spectrum.

22. Because of these many unspecified variables, two skilled artisans, using different but equally valid measurement techniques, could test the exact same device and arrive at opposite conclusions as to whether it meets the “relatively more” limitation. One might find that blue light is scattered 1.5 times as much as yellow light, while another, using a different setup, might find the ratio to be 0.9. The patent provides no “metes and bounds” to guide a POSA in making this determination.

V. Conclusion

23. In signing this declaration, I recognize that the declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize 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.

24. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the

knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Date: October 3, 2025



William A. Doolittle, Ph.D.