

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

**PETITIONERS' OPPOSITION TO
PATENT OWNERS' MOTIONS TO AMEND**

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I. INTRODUCTION

Patent Owner's Motions to Amend should be denied for at least two independent and dispositive reasons. First, the proposed substitute claims are facially indefinite under 35 U.S.C. § 112 and lack the requisite written description and enablement support. Second, the substitute claims are unpatentable as obvious over the instituted prior art, as the amendments merely recite the known purposes and predictable benefits of the prior art structures. For these reasons, and those detailed below, the Motions should be denied.

II. CLAIM CONSTRUCTION

Following institution, the District Court for the Northern District of Texas did not find the claims indefinite and construed "improves an off-state white appearance" functionally to mean "causes an observer to conclude that a wavelength conversion component has more of a white appearance in an off state." EX1044. While Petitioners do not contest this plain meaning construction, the construction itself highlights the term's subjectivity (indefiniteness). By relying on a hypothetical, undefined "observer" and an undefined baseline for comparison, it confirms that, in fact, the term is indefinite (as are several of the newly introduced limitations). No other terms require further construction.

III. ARGUMENT

A. The Proposed Substitute Claims are Unpatentable and Introduce New Matter

The proposed substitute claims are substantively deficient for failing to meet the requirements of 35 USC § 112 and for introducing new matter or broadening the scope of the claims contrary to 35 U.S.C. § 316(d)(3).

1. The substitute claims are indefinite under § 112(b)

Under the standard set forth in *Nautilus, Inc. v. Biosig Instruments, Inc.*, a patent is invalid for indefiniteness if its claims, read in light of the specification and prosecution history, “fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention.” 572 U.S. 898, 901 (2014). The proposed substitute claims introduce, and perpetuate, a host of subjective terms of degree and functional results that lack the objective boundaries required by law.

a. “the light diffusing layer is configured such that a portion of excitation light generated by the light emitting device is directed back at the wavelength conversion layer” (all claims)

This term is indefinite, because there is no meaningful metric for “portion.” Without any such metric, this claim and its “configured such that” language would cover the reflections unavoidable in any white LED package.

That is, as demonstrated by PO’s expert Dr. Schubert, basic principles of optics dictate that scattering is omnidirectional; some light will always be scattered

backward. (EX2026, ¶53). The claim language, however, requires that the layer be “configured such that” this occurs, suggesting an intentional structural configuration aimed at achieving a specific result rather than relying on mere inherency. But the patent provides no standard to define the boundary between an inherent, unavoidable amount of back-scattering and the specifically configured “portion.”

This failure to delineate the scope of the claimed configuration with reasonable certainty renders the claims indefinite. The specification does not link the directed-back “portion” to any specific functional outcome—such as a required increase in efficiency or measurable light recycling—that might otherwise provide context for this claim. A POSITA cannot determine whether “a portion” requires a functionally significant amount of light or merely any detectable, yet trivial, amount of back-scattered light. Without such guidance, a POSITA is forced to guess at the boundaries of the invention. (EX1065, ¶¶4-8).

b. “reduces the wavelength conversion layer material necessary for a given color emission product” (claim 31)

This new limitation in proposed claim 31 is relative, but the claim and specification fail to provide any guidance as to the baseline for comparison, or how to make such a comparison. *See, e.g., Ex parte Anderson*, 21 USPQ2d 1241 (Bd. Pat. App. & Inter. 1991) (the term “comparable” was held indefinite in the context

of a limitation relating the characteristics of the claimed material to other materials). A POSITA reading claim 31 would ask, reduced relative to what? A device without the diffusing layer? A prior art device? A device with a different type of diffusing layer? And how would one compare? The claim provides no answer, leaving a POSITA to speculate about the metes and bounds of the invention. Without a defined baseline and a specified test protocol, the term fails to provide reasonable certainty.

As discussed in more detail below, the only results in the patent supporting a reduction in phosphor relate to an unclaimed embodiment where the phosphors and light scattering material are mixed in a single layer. (*See* EX1001, Fig.13; *see also id.*, Fig.14; 18:47-56, 19:61 *et seq.*). So there is no disclosure that would provide a POSITA with any guideposts for reducing the amount of phosphor in a device with distinct light scattering and phosphor layers as required by the claims. (EX1065, ¶¶9-11; *see also* EX2025, 119:22-121:6; EX2038, 112:17-113:15, 114:8-124:7).

c. “average particle size” (claims 42, 46-49)

Proposed claims 42 and 46-49 are indefinite because they recite an “average particle size” without specifying the method of measurement. In fields where different measurement techniques can yield materially different results, the failure to specify a technique renders a claim indefinite. As the Federal Circuit held in *Honeywell Int’l, Inc. v. Int’l Trade Comm’n*, a claim is indefinite if the patent fails

to identify which of multiple known measurement methods to use for a claimed parameter and the different methods yield different results, so “knowing the proper ... method is necessary to practice the invention” leaving competitors “unable to discern the bounds of the invention.” *Honeywell Int’l, Inc. v. ITC*, 341 F.3d 1332, 1340-42 (Fed. Cir. 2003). Here, there are many ways to potentially measure particle size, including “microscopy, laser diffraction, image analysis, and sieving,” that will lead to different results. (EX2023, ¶¶87-99). Yet the ’678 patent is silent as to any method, leaving the claim scope uncertain.

d. “scatters excitation light [relatively more / at least twice as much] as light generated by the at least one photoluminescence material” (claims 46-49)

These limitations suffer from the same defect as “average particle size.” The claims fail to specify how this relative scattering is to be measured. (EX1065, ¶¶16-22). The scattering properties of a material depend on numerous factors, including the measurement geometry, the surrounding medium, and the specific wavelengths of light being compared. Without a defined test protocol, a POSITA cannot determine with reasonable certainty whether a given material meets this limitation.

e. “wherein the final visible emission product comprises a luminous flux above 250 lumens” (claims 48, 49)

This limitation renders proposed claims 48 and 49 indefinite because they

are directed to a *component*, yet define its scope by a *system-level* property that the component itself does not control. Luminous flux is a function of the entire lighting system, dependent on external factors like the drive current supplied to the LEDs, the efficiency of the LEDs themselves, the system's optics, and its thermal management.

Patent Owner's expert explains in detail why light output is a system-dependent property, testifying that different applications require "unique combinations of performance, durability, duration of energization, and efficiency" (EX2026, ¶62). For example, "high-power applications, such as... industrial high-bay lighting," require packaging that prioritizes "thermal management to dissipate heat effectively," while LEDs for "decorative purposes emphasize compactness and precise optical control" (EX2026, ¶ 62). The prior art confirms that a POSITA would understand luminous flux as a system-level property, not an intrinsic feature of a single component. Harbers, for instance, makes clear that luminous flux is a system property, defining a key metric as the "photometric output of an illumination module measured in lumens." (EX1056, 10:31-34). Accordingly, the patent evaluates light output not for a standalone part, but for the entire module, which combines an LED array, a submount, and a reflective housing. (*See, e.g., id.* at Figs 5, 6, 11, 12A, 12B). This demonstrates that a POSITA could not evaluate a standalone wavelength conversion component, as required by the claims, for a

specific lumen output of the final visible emission product without knowing the entire system in which it would be placed. The '678 patent itself only has system-level examples for devices emitting a specified level of lumens. (See EX1001, fig.1 & fig.9 (device 10, 1000 or 1100 lumens), fig.20 (downlight 1000, 650-700 lumens), fig.21 (downlight 1100, 650-700 lumens), fig.22 (reflector lamp 1200, 650-700 lumens)). Because luminous flux is not an intrinsic property of the component but a result of its interaction with an undefined and unclaimed system, a POSITA cannot determine with reasonable certainty whether the claimed wavelength conversion component itself meets this limitation.

f. “improves an off-state white appearance” (all claims)

This original claim term, present in all proposed independent claims, remains indefinite. The district court’s construction—“causes an observer to conclude that a wavelength conversion component has more of a white appearance in an off state”—highlights the term’s subjectivity by relying on a hypothetical “observer” and no baseline for comparison. The specification provides no objective boundaries to resolve this ambiguity, so a POSITA would have no way to determine with reasonable certainty whether a given component meets this limitation. The patent itself frames the problem as a subjective marketing issue, worrying that a yellowish appearance might be “off-putting or undesirable” to a “potential consumer” who may be “quite confused” when seeing the device on a

store shelf. (EX1001, 2:6-16). Indeed, Patent Owner’s own expert concedes the purely subjective nature of this limitation, concluding that “‘beauty’ is judged in the eye of the beholder.” (EX2026, ¶69; *see also* EX2023, ¶¶66-75).

g. *Packard*, rather than *Nautilus*, defines the appropriate standard for assessing indefiniteness in IPRs and confirms indefiniteness

Alternatively, “[a] claim is indefinite when it contains words or phrases whose meaning is unclear.” *In re Packard*, 751 F.3d 1307, 1310, 1314 (Fed. Cir. 2014). For the reasons discussed above, the claims have unclear meanings and are indefinite under *Packard*. As the Office has persuasively explained to the Federal Circuit, *Packard* and the Office’s guidance in the MPEP define the appropriate standard when “assess[ing] indefiniteness” in post-grant review proceedings.

EX1061, 1.¹ The Office indeed plays a crucial role “in ensuring that patent claims are clear and unambiguous.” *Packard*, 751 F.3d at 1313. By contrast, the “different approach” that district courts apply “when making invalidity determinations...permits more ambiguity.” EX1061, 7.

Unlike litigation in district court, IPR proceedings concern patentability, not

¹ The previous Administration’s withdrawal of that brief did not address its substance and does not undermine the document’s persuasive force. *See* EX1062, 1-2.

invalidity. IPRs “are essentially agency reconsideration of a prior patent grant,” *Regents of the Univ. of Minn. v. LSI*, 926 F.3d 1327, 1338 (Fed. Cir. 2019)—in short, “a second look.” *Cuozzo Speed Techs., LLC v. Lee*, 579 U.S. 261, 279 (2016). There is no basis for applying one definiteness standard upon initial consideration of patentability and a different standard on reconsideration. Post-grant proceedings under the AIA instead implicate “the same interests as the determination to grant a patent in the first instance.” *Oil States Energy Servs., LLC v. Greene's Energy Grp., LLC*, 584 U.S. 325, 337 (2018).

2. The substitute claims lack support under § 112(a) and improperly enlarge the scope of the claims contrary to 35 U.S.C. § 316(d)(3)

The indefiniteness of the claims is a symptom of a more fundamental flaw: the proposed substitute claims improperly seek to broaden the claims to cover subject matter that the '678 patent fails to show the inventors possessed at the time of filing.

a. Covered non-remote phosphors

The proposed substitute claims are not limited by device architecture, yet the specification's entire substantive technical disclosure is confined to so-called “remote” phosphor systems. (*See, e.g.*, EX1001, 1:56-63 (contrasting remote phosphor devices with devices where the phosphor mixture is applied directly to the light emitting surface of the LED)). Many of the proposed amendments are, in

fact, directed to attributes or benefits that the specification associates with a remote phosphor architecture. By claiming a combination of the two disparate categories, Patent Owner improperly broadens the claims and introduces new matter.

To satisfy the written description requirement for a claim covering both remote and non-remote phosphor systems, the specification must support both. *See Ariad Pharmaceuticals, Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1350 (Fed. Cir. 2010) (*en banc*). But the '678 discloses only remote phosphor systems and offers no structural features or principles that would allow a POSITA to achieve the claimed functional benefits (e.g., reduced phosphor material, improved uniformity) in the vast genus of remote and non-remote phosphor devices without undue experimentation.

As Petitioners' expert explained, a skilled artisan would understand the patent's disclosure to be directed to remote phosphor architectures. (EX2038, 112:17-113:15, 114:8-124:7). He further testified that achieving the same results in a non-remote device could require "specialized skill, specialized tooling, for example," not taught in the specification. (EX2025, 119:22-121:6). Patent Owner's expert confirms the significant technical challenges that divide these technologies. He admits that a person of skill would face "multiple challenges to overcome in attempting to combine remote phosphor devices with non-remote phosphor devices." (EX2026, ¶120). This testimony underscores that the patent's remote-

phosphor-only disclosure cannot provide adequate written description support for claims that purport to cover technically distinct non-remote phosphor devices.

The specification's silence on this broad class of devices is a failure to describe the invention commensurate with the scope of the proposed claims.

b. Full scope of certain functional limitations

Certain aspirational or functional limitations of the substitute claims are unsupported by the disclosure of the '678 patent and claim new matter.

Substitute claim 31 relates to an unclaimed embodiment where the phosphors and light scattering material are mixed in a single layer, and the '678 patent only provides evidence for a reduction in phosphor in connection with such an embodiment. (*See* EX1001, Fig.13; *see also id.*, Fig.14; 18:47-56, 19:61 *et seq.*). There is no disclosure providing written description support for reducing the amount of phosphor in a device with distinct "light diffusing" and "wavelength conversion" layers as also required by the claims.

Substitute claim 48 requires "a luminous flux above 250 lumens," which is an open-ended range with no upper limit. There is no disclosure enabling the full scope of such a claim.

Moreover, the patent suggests using nano-scale particles for preferential blue light scattering to improve an off-state white appearance, but provides no working examples, no data, and no guidance on actually achieving that result. (EX1001,

11:19-12:12). The specification of the '678 patent describes two distinct and irreconcilable technical paths for the light diffusing layer. On one hand, it discloses a micron-scale particle regime (e.g., 5 μm particles) to achieve certain on-state benefits like improved luminous efficacy and color uniformity and it provides limited data allegedly confirming those benefits. (EX1001, 12:29-36). On the other hand, it suggests a nano-scale particle regime (e.g., less than 150 nm, or 0.15 μm , particles) to achieve an improved off-state white appearance through the principle of preferential blue light scattering. (EX1001, 11:19-12:12, Fig. 10). This nano-scale regime is presented as purely aspirational, lacking any working examples or experimental data to demonstrate its feasibility.

During prosecution, the claims were amended to add an “improves an off-state white appearance” limitation, thereby tying the claims to the unsupported, theoretical nano-particle disclosure (EX1004, p. 145). Now Patent Owner seeks to amend the claims again to require on-state functional benefits that the specification only discloses in connection with the entirely different micro-particle embodiment. The proposed substitute claims thus improperly combine the aspirational benefit of the nano-particle regime with the alleged on-state benefits of the micro-particle regime. By doing so, PO seeks to improperly expand the scope of the claims. Moreover, the disclosure of the '678 patent does not demonstrate that the alleged inventors were in possession of a nano-particle embodiment of the alleged

invention at all, let alone one that would also achieve the alleged on-state benefits of the micro-particle embodiment.

c. 440 nm limitation

The numerical limitation requiring blue light “having a wavelength of greater than or equal to 440 nm” was introduced during prosecution to distinguish prior art references. (EX1004, p.194). This precise numerical boundary does not appear in the original specification, which only refers to blue LED chips generically, with a peak wavelength in the “range 400 nm to 480 nm (typically 450 nm to 470 nm).” (EX1001, 7:14-26). Adding a new numerical range during prosecution constitutes new matter if the original specification does not disclose the specific endpoints of that range. *See Indivior UK Ltd. v. Dr. Reddy’s Labs. S.A.*, 18 F.4th 1323, 1329 (Fed. Cir. 2021) . The introduction of this limitation is therefore impermissible new matter.

B. The Proposed Substitute Claims are also Unpatentable as Obvious under 35 USC § 103

Should the Board reach the issue, the proposed substitute claims should be found unpatentable as obvious. The newly added functional limitations are predictable qualities of the prior art combinations already found by the Board to present a reasonable likelihood of unpatentability. Claiming a known function of a known structure, or a predictable benefit of a prior art combination, does not render

an otherwise obvious claim patentable. *See In re Kao*, 639 F.3d 1057, 1066 (Fed. Cir. 2011).

Indeed, the '678 patent introduces these concepts not as inventive features, but as the expected “benefits” of its approach, stating that the diffusing layer provides an “improvement... in the white color appearance,” an “improvement to the color uniformity,” and can “substantially reduce the quantity of phosphor material required” by directing light back into the phosphor. (EX1001, 3:15-28). When the patent itself characterizes the claimed functions as the natural benefits of the structure, they cannot be used to overcome obviousness. *Kao*, 639 F.3d at 1067-68.

1. **“the light diffusing layer is configured such that a portion of excitation light generated by the light emitting device is directed back at the wavelength conversion layer”
(claim 30)**

As discussed in the IPR2024-01357 Petition, Ground 1 based on Basin-2007 and Ground 3 based on Krummacher render obvious issued claim 1 by disclosing conventional white LED packages with light diffusing layers. Proposed substitute claim 30 further requires that the light diffusing layer is configured to scatter light back to the wavelength conversion layer.

This limitation simply recites the well-known phenomenon of backscattering, a result flowing from the use of known diffusing materials. For

example, Dr. Schubert recognizes that basic principles of optics dictate that scattering is multidirectional; some light will *always* be scattered backward. (EX2026, ¶53). Because the claim is not specific as the amount or degree of such backward scattering, it encompasses any such scattering.

Indeed, the prior art explicitly teaches this strategy to improve overall efficiency in an LED. Basin-2007 and Krummacher disclose adding TiO₂ scattering particles in a layer over a phosphor, and therefore render obvious this back-scattering effect. (EX1005, ¶13, Fig. 2; EX1007, ¶39; EX2026, ¶53). Basin-2007 expressly discloses that “TiO₂ particles scatter the light from the LED, which helps to mix the light output to create a more uniform brightness and color over the viewing field,” (EX1005, ¶37), and Krummacher discloses that its diffusing layer “contains light-scattering particles to bring about the light-scattering effect,” (EX1007, ¶10). (*See also* EX1005, ¶46 (“If the percentage of [TiO₂] particles keeps increasing, the encapsulant becomes more and more like a diffusing reflector, reflecting most light back into the LED and out the sides.”)).

Other prior art also discloses how use of diffusing materials results in backscattering, reflecting the knowledge of a POSITA. For example, Tong discloses a diffuser that scatters light “back towards the phosphor layer.” (EX1060, 20:58-62; EX1064, ¶154; *see also* EX1060, 18:7-14, 33:35-37; EX1064, ¶¶142, 221)).

Accordingly, this new limitation, and claim 30 as a whole, are rendered obvious in view of Grounds 1 and 3 as presented in the IPR2024-01357 Petition.

2. the back-directed light “reduces the wavelength conversion layer material necessary for a given color emission product” (claim 31)

Claim 31 depends from claim 30 and further requires a reduction in phosphor. This claimed benefit simply restates the consequence of the light-recycling function recited in claim 30.

As discussed above and as noted in, *e.g.*, Tong, recycling excitation light back into the phosphor layer, as required by claim 30, increases the probability that it will be absorbed and converted, thereby increasing the overall downconversion efficiency. That is, “[l]ight scattered back towards the phosphor layer can lead to increased amounts of downconversion and thus a shift in color temperature or color point of the lamp due to the diffuser.” (EX1060, 20:58-62; EX1064, ¶154; *see also* EX1060, 18:7-14; EX1064, ¶142). It was a fundamental principle of engineering understood by a POSITA that increasing the efficiency of a process allows for the use of less input material to achieve the same output. (EX1065, ¶¶11-15). Indeed, the ’678 patent describes this effect as being a natural result of a light diffusing layer, “since the light-diffusing layer increases the probability that a photon will result in the generation of photoluminescence light by directing light back into the wavelength conversion layer.” (EX1001, 3:21-32).

This claim limitation improperly attempts to distinguish the prior art based on function, rather than on structure as required. That is, *prima facie* obviousness is established where there is “technical reasoning to reasonably support the determination that [an] allegedly inherent characteristic *necessarily* flows from the teachings of the applied prior art.” *Ex parte Levy*, 17 USPQ2d 1461, 1464 (BPAI 1990). Thus, a proposed obviousness ground renders obvious a claim limitation when the limitation is “the natural result” of the obviousness ground. *Persion Pharms. LLC v. Alvogen Malta Operations LTD.*, 945 F.3d 1184, 1191, (Fed. Cir. 2019); *see also Hospira, Inc. v. Fresenius Kabi USA, LLC*, 946 F.3d 1322, 1329-32, (Fed. Cir. 2020); *In re Schreiber*, 128 F.3d 1473 (Fed. Cir. 1997). Accordingly, this term is rendered obvious based on the structure rendered obvious by Grounds 1 and 3.

Moreover, a POSITA would have immediately understood that adding a light diffusing layer increases the light extraction efficiency of the device and therefore would allow for less phosphor to achieve the same light output. Basin-2007, for instance, is titled “LED with Particles in Encapsulant for Increased Light Extraction.” (EX1005, Title). It explains that adding TiO₂ particles was found to “increase the brightness (lumens) of a GaN LED greater than 5%.” (*Id.*, ¶5). Having been taught by the prior art that adding a diffuser increases light output, a POSITA would have understood this known efficiency gain would result in a

reduction in the amount of phosphor material needed to generate a given color emission product.

The motivation to achieve this benefit was clear in the prior art and thus known to a POSITA. Vriens teaches placing a dichroic long-wave-pass (LWP) filter on the viewing side that “reflect[s] UV/blue light back to the phosphor” and “transmit[s] visible light emitted by the phosphor,” which “ensures a better absorption of the UV/blue by the phosphor” and “makes it possible to reduce the phosphor grain density somewhat.” (EX1057, 5:6–10). “The overall result is a more efficient use of both the UV and visible light.” *Id.* 5:14-15. This is the claimed function, light recycling to increase conversion efficiency, and it was a well-documented engineering technique.

Oh identified the well-known tradeoff that increasing phosphor concentration to absorb more blue light also increases scattering losses, which hampers conversion efficiency at high loadings. (EX1058, pp.2-3). Oh therefore caps the phosphor-converted LED with a long-wave-pass filter that “functions as a mirror for blue [excitation] light and as a window for the amber phosphor emission,” explicitly “block[ing] and recycl[ing] unabsorbed transmitted blue” back into the phosphor. (*Id.* at pp.1, 3). With that light-recycling setup, Oh shows you can use substantially less phosphor while still getting strong color quality and meaningfully better efficiency—i.e., the art had already solved this with known

optics. (*Id.* at pp.1, 6, 10). Thus, the benefit of reducing phosphor material was a known and intended goal of employing a light-recycling structure.

Accordingly, this new limitation, and claim 31 as a whole, are also rendered obvious in view of Grounds 1 and 3 as presented in the IPR2024-01357 Petition.

**3. “the light diffusing layer has a uniform thickness”
(claim 32)**

Claim 32 also depends from claim 30 and further requires a uniform thickness scattering layer. This feature represents a conventional and explicitly taught design choice for manufacturing optical layers in LEDs.

The prior art discloses this feature and explains why it is advantageous. Basin-2007 discloses a light diffusing layer that comprises a planar shape and teaches that “the encapsulant is formed to have a flat surface” (EX1005, ¶¶11, 32, Fig.2). A layer with a flat surface is, by definition, a layer of uniform thickness. Krummacher similarly discloses planar layers and specifies a “layer thickness,” implying a controlled and uniform dimension. (EX1007, ¶16; *see also id.* ¶¶18, 27-28, 41-42, Fig. 2). Moreover, Patent Owner has conceded that the grounds disclose that the light diffusing layer is a planar shape, by not contesting the issue in its Patent Owner Responses with respect to issued dependent claim 16.

Accordingly, this new limitation, and claim 31 as a whole, are also rendered obvious in view of Grounds 1 and 3 as presented in the IPR2024-01357 Petition.

4. “the light diffusing layer is configured to increase the angular emission color uniformity of the light emitting device” (claim 40)

As discussed in the IPR2024-01357 Petition, Ground 1 based on Basin-2007, Ground 3 based on Krummacher, and Grounds 2 and 4 based on Hussell all render obvious issued claim 19 by disclosing conventional white LED packages with light diffusing layers. Proposed substitute claim 40 further requires that the light diffusing layer is configured to increase angular emission color uniformity. This amendment attempts to claim the primary, well-known, and intended purpose of adding a diffuser to a phosphor-converted LED.

The prior art is replete with teachings that identify angular color non-uniformity as a key problem and the addition of scattering particles as the standard solution. Thus, a POSITA would have understood that it was natural and predictable for a light diffusing layer to increase the angular emission color uniformity of a light emitting device. Basin-2007, for example, expressly states that adding TiO₂ granules “reduces the variation of color temperature over the view angle” and provides quantitative data in Figures 4 and 5 to show it. (EX1005, Abstract, ¶¶ 8-9, 15-16, 37, 40, Figs.4, 5).

The textbook authored by Patent Owner’s own expert confirms that a POSITA would have been well aware of this problem and its conventional solutions. In Light-Emitting Diodes, Dr. Schubert explains:

Spatial uniformity can also be attained by adding *mineral diffusers* to the encapsulant (Reeh *et al.*, 2003 [EX2004]). Such mineral diffusers are optically transparent substances, such as TiO₂, CaF₂, SiO₂, CaCO₃, and BaSO₄, with a refractive index different from the encapsulant. The 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; *see also* pp.198-99). This is a direct teaching from Patent Owner's expert that a POSITA would have been motivated to use a diffuser to solve the exact problem of color non-uniformity.

Accordingly, this new limitation, and claim 31 as a whole, are also rendered obvious in view of Grounds 1-4 as presented in the IPR2024-01357 Petition.

5. “wherein the light scattering material scatters excitation light...relatively more than...light generated by the at least one photoluminescence material. (claim 45)”

As discussed in the IPR2024-01357 Petition, Grounds 2 and 4 based on Hussell (in combination with either Basin-2007 or Krummacher) render obvious issued claim 29 by rendering obvious a white LED package with remote phosphors and a light diffusing layer. Proposed substitute claim 45 further requires preferential scattering of blue light. This limitation is also found in issued claim 11 and is obvious for the same reasons explained in the IPR2025-00260 Petition.

Specifically, the concept of selecting a particle size to maximize scattering

of blue light to aid in conversion was known in the art. Indeed, Stokes explicitly teaches selecting an average particle size “such that the particles preferentially scatter blue ... LED light as compared to yellow ... light from the luminescent material.” (EX1008, 7:1-4). Stokes explains that this is advantageous because it “enhances the scattering of the radiation source radiation while it decreases the amount of scattering of the luminescent material radiation,” improving uniformity and conversion. (*Id.*, 7:17-26). Basin-2007 and Krummacher both disclose TiO₂ nanoparticles. (EX1005, ¶0034; EX1007, ¶0039). According to Figure 10 of the '678 patent and Figure 6 of Stokes, TiO₂ particles of that size scatter blue light more strongly than yellow or red light. (EX1012, 7:1-20, 6:53-65, fig. 4; EX1013, fig. 7). A POSITA would, accordingly, have been motivated to select a particle size that scatters more blue light than converted light.

Therefore, this new limitation, and claim 45 as a whole, are also rendered obvious in view of the Grounds 2 and 4 as presented in the IPR2024-01357 Petition, in further view of Stokes (i.e., essentially the same grounds presented in the IPR2025-00260 Petition for claim 11).

6. “the wavelength conversion component comprises a three-dimensional elongated shape” (claim 46)

As discussed in the IPR2025-00260 Petition, Grounds 1 and 3 of the IPR2024-01357 Petition, in further view of Stokes, render obvious issued claim 11

by disclosing conventional white LED packages with light diffusing layers.

Proposed substitute claim 46 further requires that the light diffusing layer is a three-dimensional shape. This feature represents a conventional and explicitly taught design choice for manufacturing optical layers in LEDs.

As an initial matter, the shape of a claimed device is a matter of choice which a POSITA would have found obvious absent persuasive evidence that the shape was significant. *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966). This limitation is also found in issued claim 17 and so is obvious for the same reasons explained in the IPR2024-01357 Petition, which are undisputed. That is, Basin-2007 discloses that “the silicone encapsulant may be molded into a lens to shape the light emission pattern,” (EX1005, ¶[0011]), and dome-shaped light diffusing layers. (EX1005, Figs. 5-10; *see also id.* ¶[0040]).

Moreover, this limitation is directly taught by Hussell, which is entirely directed to “Elongated Hollow Wavelength Conversion Tubes” for use in replacement bulbs. (EX1011, Title, Abstract). As with claim 29, Hussell itself provides the motivation for this combination, teaching that the inner and/or outer surfaces of its tube can be “textured” because “[t]exturing may enhance scattering of light.” (*Id.*, ¶48; *see also id.*, ¶¶8, 36). The wavelength conversion component having a three-dimensional elongated shape is depicted in at least Figures 6-7, 9A-9B and 17. A POSITA, thus taught by Hussell to enhance scattering, would have

found it obvious to implement the well-known scattering layers of the prior art to achieve this express goal.

Accordingly, this new limitation, and claim 46 as a whole, are rendered obvious by the Grounds in IPR2025-00260 either with or without Hussell.

7. “wherein the final visible emission product comprises a luminous flux above 250 lumens” (claim 48)

Claim 48 depends from claim 46 and further requires a certain level of luminous flux. This limitation recites nothing more than an obvious design choice and routine optimization.

As an initial matter, this wherein clause is nonlimiting because it is directed to an intended result of a structure that is positively recited. However, the court noted that a “whereby clause in a method claim is not given weight when it simply expresses the intended result of a process step positively recited.” *Id.* (quoting *Minton v. Nat’l Ass’n of Sec. Dealers, Inc.*, 336 F.3d 1373, 1381 (Fed. Cir. 2003)).

Moreover, achieving specific lumen outputs is a matter of standard engineering scaling, and the prior art explicitly discloses outputs far exceeding this arbitrary threshold. Harbers, for example, provides multiple working examples demonstrating that achieving well over 250 lumens was conventional. (EX1056). Crucially, Harbers demonstrates that luminous flux is a system-level property known to scale predictably with the number of LEDs used. Harbers explicitly

discloses illumination modules using varying numbers of LEDs (e.g., 4, 7, or 10 LEDs) to achieve a wide range of flux outputs. (*See, e.g., id.*, 11:26-12:8, Figs. 11, 12A, 12B). The experimental data shows outputs ranging from 478 lumens up to 1413 lumens. (*Id.*). Even Harbers’ configurations using the fewest LEDs (a “4 LED Board”) achieved luminous fluxes between 478 and 555 lumens—roughly double the claimed threshold. (*Id.*). When the prior art explicitly discloses systems achieving lumen outputs significantly above the 250-lumen threshold and teaches the routine scaling necessary to adjust that output, selecting that threshold is an obvious design choice that does not confer patentability.

Accordingly, this new limitation, and claim 46 as a whole, are rendered obvious by the Grounds in IPR2025-00260 either with or without Hussell.

IV. CONCLUSION

For the foregoing reasons, Petitioners respectfully request that the Board deny entry of proposed substitute claims 30-49.

Date: October 3, 2025

Respectfully submitted,

/s/ David C. Radulescu

David C. Radulescu, Lead Counsel

Reg. No. 36,250

APPENDIX A – EXHIBIT LIST

Exhibit No.	Description
EX1001	U.S. Patent No. 8,604,678
EX1002	Declaration of William A. Doolittle, Ph.D.
EX1003	Curriculum Vitae of William A. Doolittle, Ph.D.
EX1004	File History for U.S. Pat. Appl. No. 13/273,212 (excl. references)
EX1005	U.S. Pat. Pub. No. 2009/0057699 (“Basin-2007”)
EX1006	U.S. Pat. Pub. No. 2007/0045761 (“Basin-2005”)
EX1007	U.S. Pat. Pub. No. 2008/0079015 (“Krummacher”)
EX1008	U.S. Patent No. 6,791,259 (“Stokes”)
EX1009	U.S. Patent No. 5,998,925 (“Shimizu-APA”)
EX1010	U.S. Patent No. 6,069,440 (“Shimizu”)
EX1011	U.S. Pat. Pub. No. US2010/0124243 (“Hussell”)
EX1012	DuPont: Polymers, Light and the Science of TiO ₂ (2007)
EX1013	DuPont: Titanium Dioxide for Coatings (2007)
EX1014	Erik S. Thiele and Roger H. French, “ <i>Computation of Light Scattering by Anisotropic Spheres of Rutile Titania</i> ”, Adv. Mater. 1998, 10, No. 15
EX1015	Erik S. Thiele and Roger H. French, “ <i>Light-Scattering Properties of Representative, Morphological Rutile Titania Particles Studied Using a Finite-Element Method</i> ”, J. Am. Ceram. Soc., 81 [3] 469–79 (1998)
EX1016	Robert W. Johnson, Erik S. Thiele, And Roger H. French, “ <i>Light-scattering efficiency of white pigments: an analysis of model core - shell pigments vs. optimized rutile TiO₂</i> ”, TAPPI JOURNAL, November 1997, Vol. 80(11)
EX1017	William D. Ross, “ <i>Theoretical Light-Scattering Power of TiO₂ and Microvoids</i> ”, Ind. Eng. Chem., Prod. Res. Develop., Vol. 13, No. 1, 1974
EX1018	Feit Electric’s Initial Infringement Contentions - Claim Charts (May 28, 2024)
EX1019	U.S. Patent No. 8,547,010 (“Jagt”)
EX1020	Int’l Pat. Pub. No. WO 2008/044171 A2 (“Van Woudenberg”)
EX1021	Declaration of Etai Lahav
EX1022	Declaration of William A. Doolittle, Ph.D. regarding claims 11-14

Exhibit No.	Description
	of the '678 patent
EX1023	Sudhakar Madhusoodhanan and Devdatt S. Nagvekar, "UV Curable High Opacity Ink Jettable White Ink", RadTech e 5 2006 Technical Proceedings (2006)
EX1024	U.S. Pat. Pub. No. 2011/0001151 ("Toquin")
EX1025	<i>Feit Elec. Co. v. Savant Techs. LLC d/b/a GE Lighting</i> , No. 1:24-cv-473 (N.D. Ohio), December 12, 2024 docket entry
EX1026	Kentucky Eastern, U.S. District Court – Judicial Caseload Profile (September 30, 2024), available at https://perma.cc/C3LU-9ET5
EX1027	U.S. District Courts – Median Time from Filings to Trial for Civil Cases (March 31, 2024), available at https://perma.cc/6FA3-3G89
EX1028	Civil Docket for No. 3:20-cv-3126 (N.D. Tex.)
EX1029	<i>Feit v. LEDVANCE</i> , Scheduling Order, No. 5:24-cv-31 (E.D. Ky.), Dkt. 33
EX1030	<i>Feit v. Savant</i> , Joint Motion for Leave to Amend the Case Management Order, National Science Foundation, Semiannual Report to Congress, dated September 2010. (so ordered January 7, 2025 setting claim construction hearing for May 27, 2025).
EX1031	<i>Feit v. Elong</i> , Scheduling Order, No. 3:24-cv-1089 (N.D. Tex.), Dkt. 37.
EX1032	<i>Feit v. Savant</i> , Case Management Order, No. 1:24-cv-473 (N.D. Ohio), Dkt. 19.
EX1033	Stipulations re District Court Litigations.
EX1034	<i>Feit v. LEDVANCE</i> , Plaintiff's Preliminary Claim Constructions, No. 5:24-cv-31 (E.D. Ky.), served Nov. 6, 2024.
EX1035	<i>Feit v. Savant</i> , Plaintiff's Final Claim Constructions, No. 1:24-cv-473 (N.D. Ohio), served Dec. 10, 2024.
EX1036	<i>Feit v. Elong</i> , Joint Claim Construction and Prehearing Statement, No. 3:24-cv-1089 (N.D. Tex.), Dkt. 45.
EX1037	<i>Feit v. LEDVANCE</i> , Plaintiff's Disclosure of Initial Infringement Contentions, No. 5:24-cv-31 (E.d. Ky.), served Aug. 30, 2024.
EX1038	<i>Feit v. Savant</i> , Supplemental Initial Infringement Contentions, No. 1:24-cv-473 (N.D. Ohio), served Oct. 8, 2024.
EX1039	<i>Feit v. Elong</i> , Plaintiff's Disclosure of Asserted Claims and Preliminary Infringement Contentions, No. 3:24-cv-1089 (N.D.

Exhibit No.	Description
	Tex.), served Oct. 23, 2024.
EX1040	<i>Feit v. Elong</i> , Memorandum and Opinion Order, dated May 5, 2025, No. 3:24-cv-1089 (N.D. Tex.), Dkt. 60.
EX1041	National Science Foundation, Closeout Memorandum, Case Number: I-09080045.
EX1042	National Science Foundation, Semiannual Report to Congress, dated September 2010.
EX1043	National Science Foundation, 2011 FOIA Logs.
EX1044	<i>Feit v. Elong</i> , Memorandum and Opinion Order, dated July 2, 2025, No. 3:24-cv-1089 (N.D. Tex.), Dkt. 81.
EX1045	S. Ye, et al., <i>Phosphors in phosphor-converted white light-emitting diodes: Recent advances in materials, techniques and properties</i> , Materials Science and Engineering R 71 (2010) 1–34
EX1046	U.S. Department of Energy, <i>Life-Cycle Assessment of Energy and Environmental Impacts of LED Lighting Products</i> , Part 2: LED Manufacturing and Performance, dated May 2012.
EX1047	Philippe F. Smet, et al., <i>Selecting Conversion Phosphors for White Light-Emitting Diodes</i> , 2011 J. Electrochem. Soc. 158 R37
EX1048	Deposition Transcript of E. Fred Schubert, Ph.D. M.S., dated September 12, 2025.
EX1049	U.S. Patent No. 3,175,117 (“Kardos”).
EX1050	Intematix Introduces ChromaLit XT Remote Phosphor for High-Intensity LED Lighting, dated April 16, 2012.
EX1051	Intematix, ChromaLit XT 2012 Datasheet, dated November 5, 2012.
EX1052	Home Depot, Feit Electric 60-Watt Equivalent A15 Dimmable White Filament CEC Clear Glass E26 LED Ceiling Fan Light Bulb, True White 3500K (2-Pack).
EX1053	<i>Intentionally Omitted</i>
EX1054	Comparison of POPR-1357 and POR-1357
EX1055	Comparison of Schubert POPR-1357 and POR-1357 declarations
EX1056	U.S. Patent No. 8,104,908 (“Harbers”).
EX1057	U.S. Patent No. 5,813,753 (“Vriens”).

Exhibit No.	Description
EX1058	Jeong Rok Oh, et al., <i>Full down-conversion of amber-emitting phosphor-converted light-emitting diodes with powder phosphors and a long-wave pass filter</i> , Optics Express Vol. 18, Issue 11, pp. 11063-11072 (2010)
EX1059	U.S. Pat. Pub. No. 2007/0139949 (“Tanda”)
EX1060	U.S. Patent No. 9,310,030 (“Tong”).
EX1061	<i>Tinnus Enterprises, LLC v. Telebrands Corp.</i> , Brief for Intervenor, dated August 29, 2017, No. 17-1726 (Fed. Cir. 2017), Dkt. 39.
EX1062	<i>Tinnus Enterprises, LLC v. Telebrands Corp.</i> , Motion of Intervenor to Withdraw from Appeal, dated March 29, 2018, No. 17-1726 (Fed. Cir. 2017), Dkt. 72.
EX1063	Memorandum to Patent Trial and Appeal Board, dated January 6, 2021.
EX1064	US Provisional Patent Application Ser. No. 61/386,437 (“Tong”)
EX1065	Declaration of William A. Doolittle, Ph.D. Regarding Claims 11-14 Of The ’678 Patent, dated October 3, 2025.

CERTIFICATE OF SERVICE

The undersigned certifies that on October 3, 2025 the foregoing was served on counsel at the following electronic service addresses:

Charles M. McMahon, cmcmahon@beneschlaw.com

Thomas DaMario, tdamario@beneschlaw.com

feitelectricipr@beneschlaw.com

Date: October 3, 2025

/s/ David C. Radulescu

David C. Radulescu, Lead Counsel

Reg. No. 36,250