

UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

**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.

Case IPR2025-00698 · U.S. Patent No. 8,614,539 B2

Petitioners' Demonstratives — Oral Argument, July 16, 2026

Blue-pumped white LEDs were the standard architecture

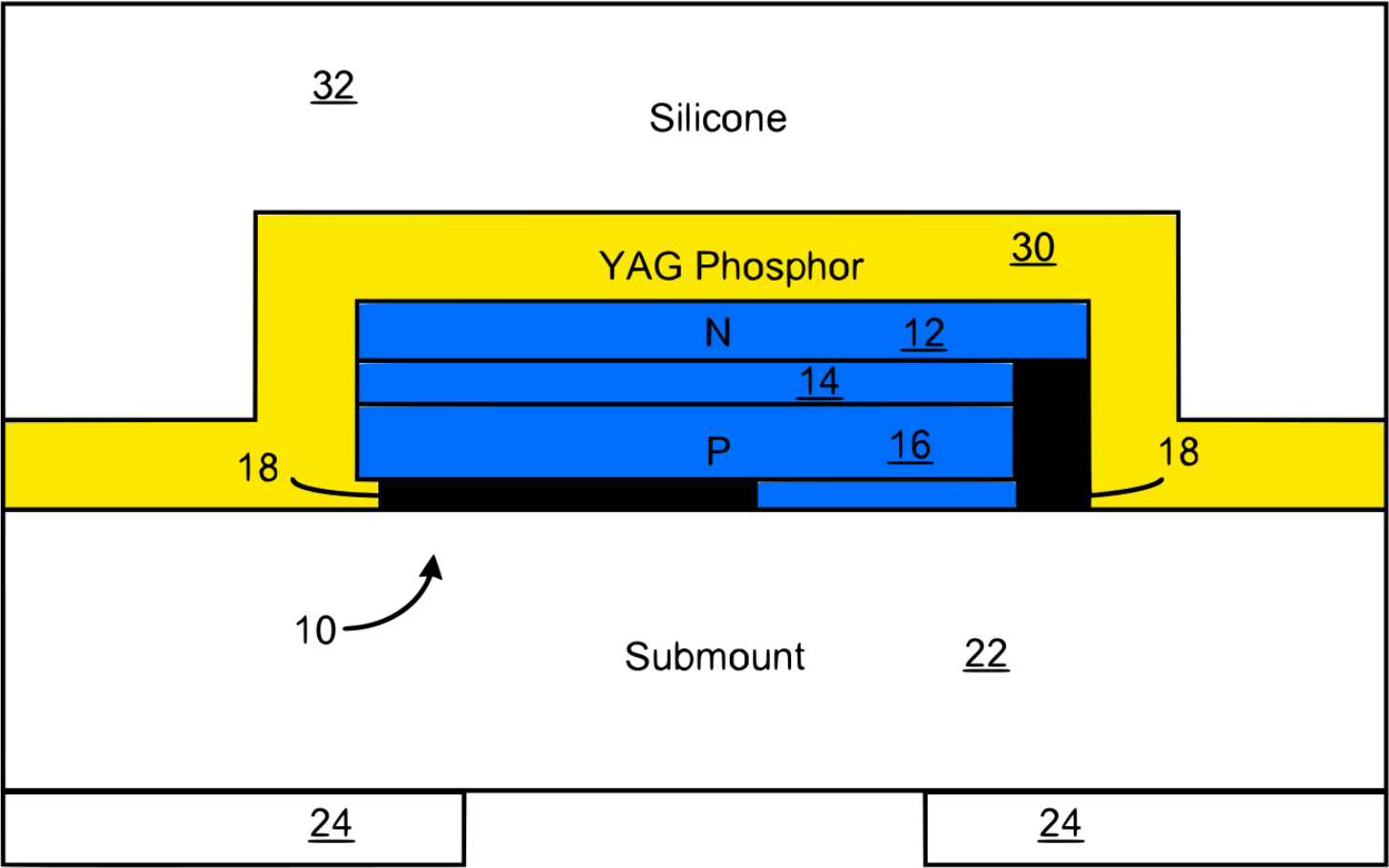


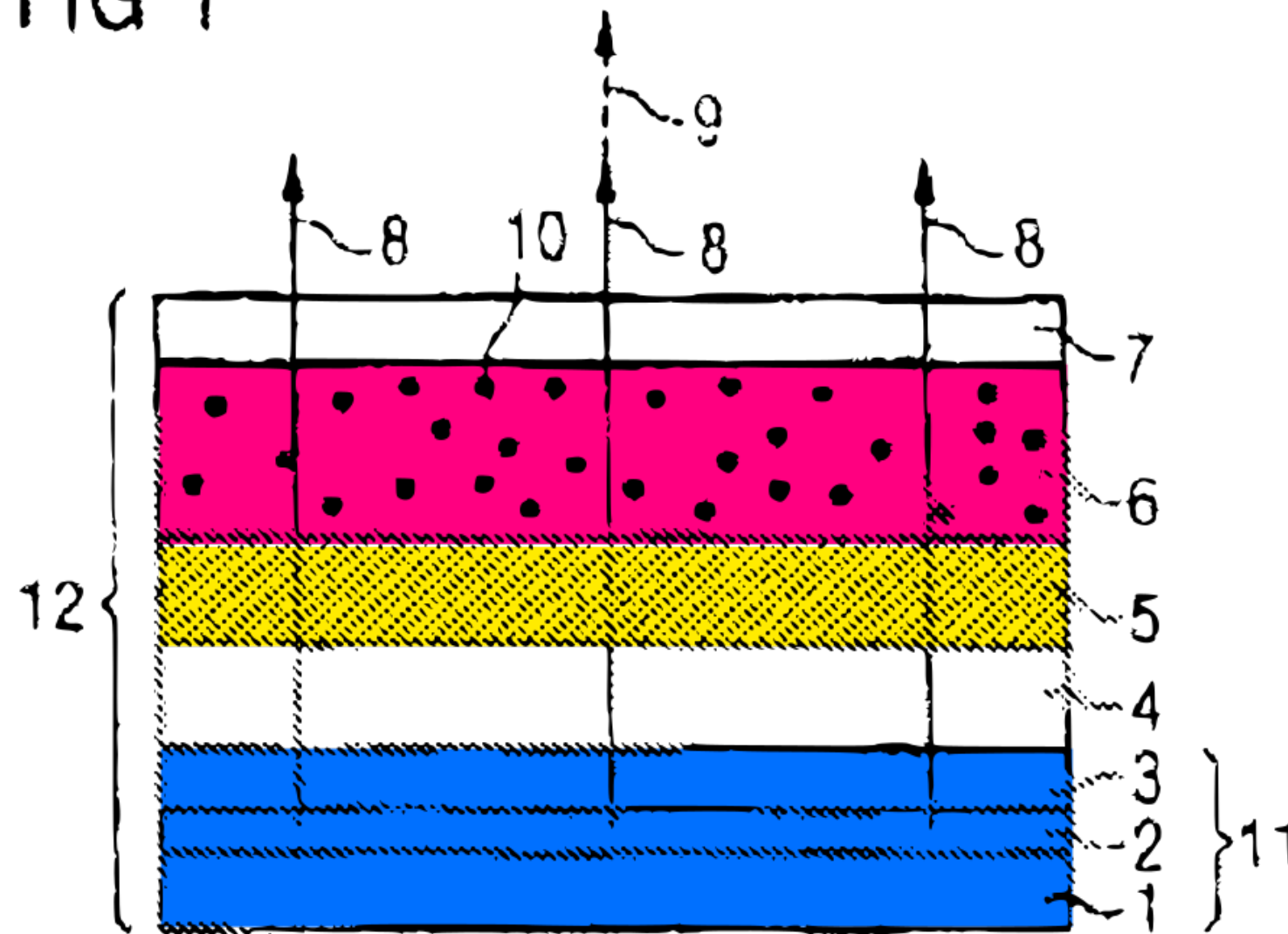
Fig. 1 (prior art)

- **Blue LED + phosphor layer:** the standard white LED architecture
- **White light when on, yellow appearance when off.** The phosphor is visible through the silicone

Pet. at 3, 7-8; EX1105 (Basin-2007), Fig. 1 (annotated); EX1102 ¶¶ 52, 65-69, 71.

The prior art already added a TiO₂ scattering layer

FIG 1



Krummacher (EX1107), Fig. 1

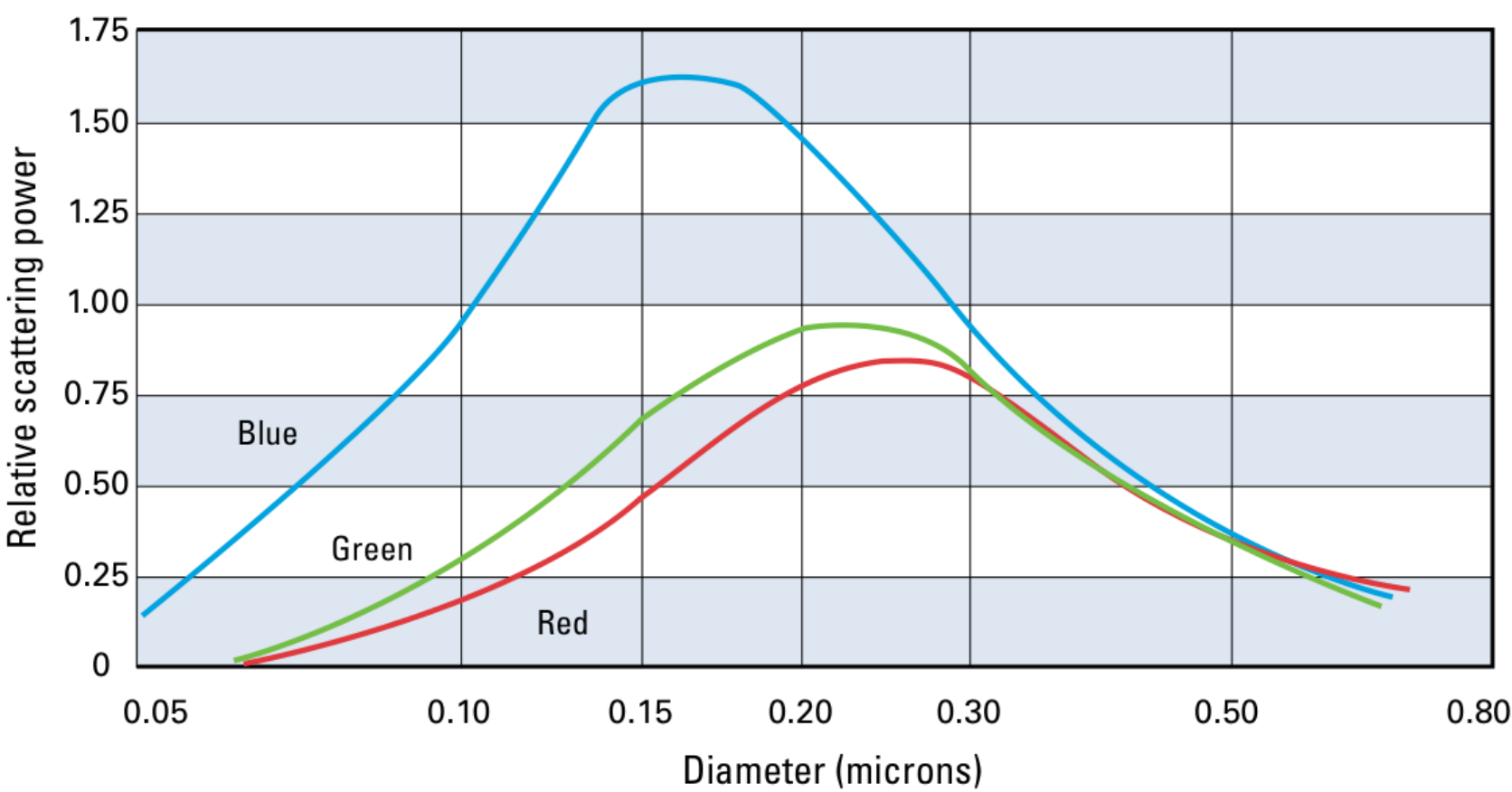
“In a preferred embodiment, the translucent layer contains **light-scattering particles** to bring about the light-scattering effect.”
(EX1107, ¶ 10.)

“Advantageously, the distribution, size and material of the light-scattering particles 10 in light-scattering translucent layer 6 are selected such that the surface of light-scattering translucent layer 6 **appears white**. In this way, the luminescence conversion layer 5 is advantageously **prevented from exhibiting a yellowish hue**, in the off state of the optoelectronic component” (EX1107, ¶ 41.)

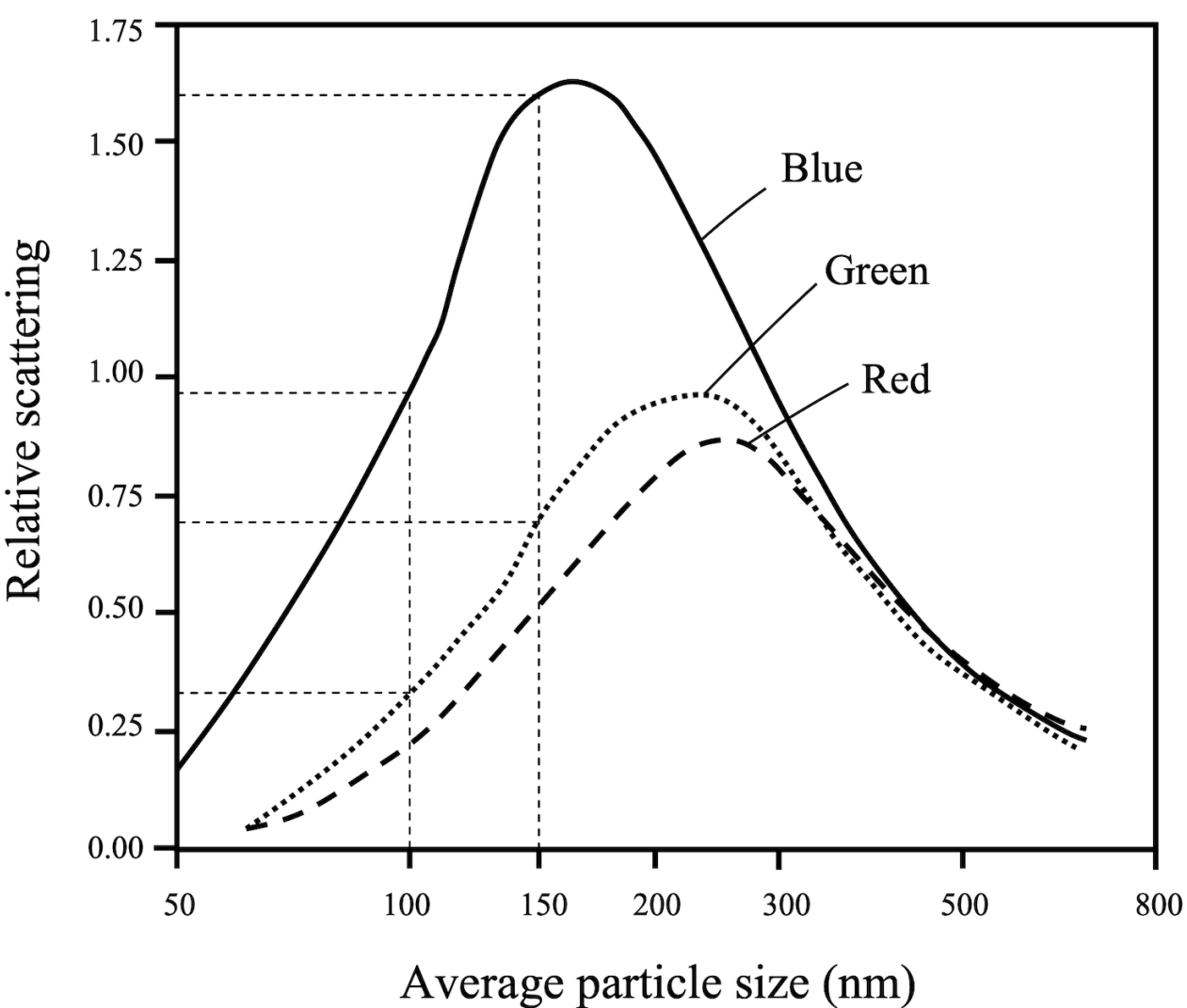
Pet. at 3, 7-8; EX1107 (Krummacher), Fig. 1 (annotated), ¶¶ 10, 41; EX1102 ¶¶ 52, 65-69, 71.

Light scattering depends on particle size

Figure 7. Relative Light Scattering Power versus Rutile Particle Size.



EX1113 (DuPont, “Ti-Pure Titanium Dioxide for Coatings”), p. 8, Fig. 7 (2007)



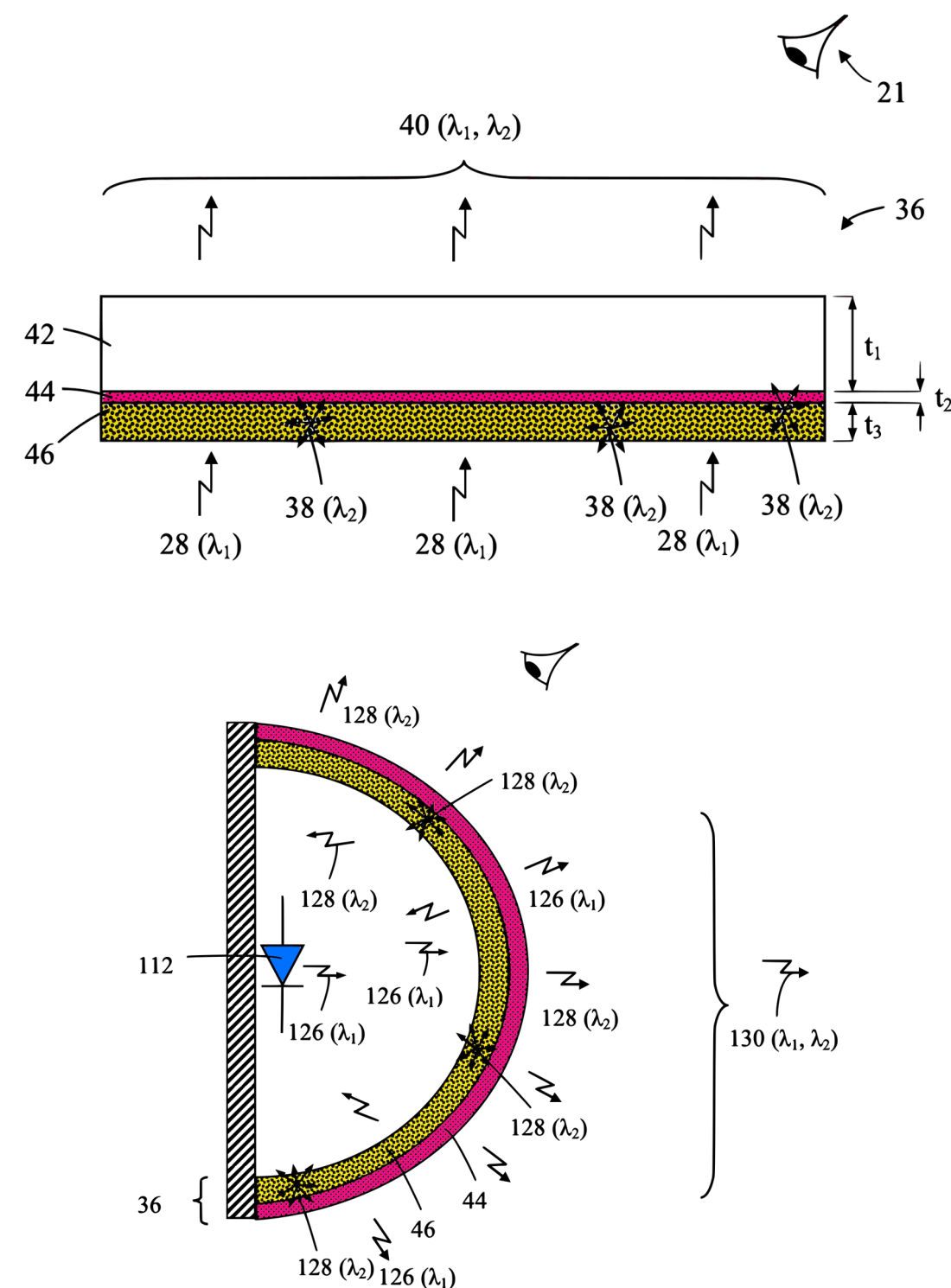
'539 patent, Fig. 10 (2013)

Blue scattering peaks near 0.15 microns — **150 nm**

The '539's own Figure 10 copies DuPont data without attribution

Pet. at 3, 12; EX1113, p. 8, Fig. 7; EX1112, p. 4, Fig. 4; EX1108, 7:9-22; EX1102 ¶ 199.

Independent claim 1



1. A wavelength conversion component for a light emitting device comprising:

at least one photoluminescence material; and

a light scattering material, wherein the light scattering material has an average particle size that is selected such that the light scattering material will scatter excitation light from a radiation source relatively more than the light scattering material will scatter light generated by the at least one photoluminescence material,

wherein the wavelength conversion component is configured such that in operation a portion of the excitation light comprising blue light having a wavelength of greater than or equal to 440 nm is emitted through the wavelength conversion component to contribute to a final visible emission product;

wherein the light scattering material scatters the blue light at least twice as much as light generated by the at least one photoluminescence material.

Two obviousness grounds challenge the '539 patent

GROUND 1

Krummacher + Stokes + Shimizu

Claims 1–11, 18–20, 23–25

GROUND 2

Hussell + Krummacher + Stokes + Van Woudenberg

Claims 18, 28

Person of ordinary skill in the art

A person with an undergraduate degree (B.S. or equivalent) in electrical engineering, materials science, physics, or a similar discipline, plus one to two years of experience in LED packaging design. More education could substitute for experience, and vice versa.

Relationship to pending proceedings

The related proceedings on the '678 patent

IPR2024-01357 and IPR2025-00260 challenge the related '678 patent, which claims the same subject matter.

Post-hearing RPI discovery and briefing closed June 18, 2026. Final Written Decision due September 5, 2026 (non-extendable).

Real party in interest.

Patent Owner has a pending motion to terminate the proceedings regarding the '678 patent based on the RPI requirement.

LEDVANCE LLC is not a Petitioner to this proceeding, so there are no similar allegations of an unnamed RPI here.

Indefiniteness.

Patent Owner asks the Board to dismiss the grounds over Petitioners' cross-forum claim constructions. In the companion '678 proceeding, the Board held it lacks authority to grant such relief — discretionary determinations are the Director's.

IPR2024-01357, Paper 69 (citing *Berkshire Hathaway Energy Co. v. Birchtech Corp.*, IPR2025-00274, Paper 76 (PTAB Mar. 4, 2026) (Board lacked authority to decide discretionary issues)); see also Reply § D.

The '539 patent claims the same subject matter as the '678 patent

'539 patent

What is claimed is:

1. A wavelength conversion component for a light emitting device comprising:
 - at least one photoluminescence material; and
 - a light scattering material, wherein the light scattering material has an average particle size that is selected such that the light scattering material will scatter excitation light from a radiation source relatively more than the light scattering material will scatter light generated by the at least one photoluminescence material,wherein the wavelength conversion component is configured such that in operation a portion of the excitation light comprising blue light having a wavelength of greater than or equal to 440 nm is emitted through the wavelength conversion component to contribute to a final visible emission product;
- wherein the light scattering material scatters the blue light at least twice as much as light generated by the at least one photoluminescence material.

'678 patent

What is claimed is:

1. A wavelength conversion component for a light emitting device comprising:
 - a wavelength conversion layer comprising particles of at least one photoluminescence material; and
 - a light diffusing layer comprising particles of a light scattering material,wherein the light diffusing layer improves an off-state white appearance of the wavelength conversion component;
- wherein the wavelength conversion component is configured such that in operation a portion of excitation light comprising blue light having a wavelength of greater than or equal to 440 nm generated by the light emitting device is emitted through the wavelength conversion component to contribute to a final visible emission product.
11. The component of claim 1, wherein the light scattering material has an average particle size that is selected such that the light scattering material will scatter the excitation light relatively more than the light scattering material will scatter light generated by the at least one photoluminescence material.
12. The component of claim 11, wherein the light scattering material scatters the excitation light at least twice as much as light generated by the at least one photoluminescence material.

EX1101, claim 1; '678 patent (IPR2024-01357, EX1001), claims 1, 11, 12; Reply at 1 n.1.

The '539 patent claims the same subject matter as the '678 patent

'539 patent

What is claimed is:

1. A wavelength conversion component for a light emitting device comprising:

at least one photoluminescence material; and

a light scattering material; and
1. A wavelength conversion component for a light emitting device comprising:

that the light scattering material will scatter excitation light from a radiation source relatively more than the light scattering material will scatter light generated by the at least one photoluminescence material,

wherein the wavelength conversion component is configured such that in operation a portion of the excitation light comprising blue light having a wavelength of greater than or equal to 440 nm is emitted through the wavelength conversion component to contribute to a final visible emission product;

wherein the light scattering material scatters the blue light at least twice as much as light generated by the at least one photoluminescence material.

'678 patent

What is claimed is:

1. A wavelength conversion component for a light emitting device comprising:

a wavelength conversion layer comprising particles of at least one photoluminescence material; and

1. A wavelength conversion component for a light emitting device comprising:

white appearance of the wavelength conversion component;

wherein the wavelength conversion component is configured such that in operation a portion of excitation light comprising blue light having a wavelength of greater than or equal to 440 nm generated by the light emitting device is emitted through the wavelength conversion component to contribute to a final visible emission product.

11. The component of claim 1, wherein the light scattering material has an average particle size that is selected such that the light scattering material will scatter the excitation light relatively more than the light scattering material will scatter light generated by the at least one photoluminescence material.

12. The component of claim 11, wherein the light scattering material scatters the excitation light at least twice as much as light generated by the at least one photoluminescence material.

EX1101, claim 1; '678 patent (IPR2024-01357, EX1001), claims 1, 11, 12; Reply at 1 n.1.

The '539 patent claims the same subject matter as the '678 patent

'539 patent

What is claimed is:

1. A wavelength conversion component for a light emitting device comprising:

at least one photoluminescence material; and

a light scattering material, wherein the light scattering material has an average particle size that is selected such

at least one photoluminescence material; and

light scattering material will scatter light generated by the at least one photoluminescence material,

wherein the wavelength conversion component is configured such that in operation a portion of the excitation light comprising blue light having a wavelength of greater than or equal to 440 nm is emitted through the wavelength conversion component to contribute to a final visible emission product;

wherein the light scattering material scatters the blue light at least twice as much as light generated by the at least one photoluminescence material.

'678 patent

What is claimed is:

1. A wavelength conversion component for a light emitting device comprising:

a wavelength conversion layer comprising particles of at least one photoluminescence material; and

a light diffusing layer comprising particles of a light scattering material,

a wavelength conversion layer comprising particles of at least one photoluminescence material; and

wherein the wavelength conversion component is configured such that in operation a portion of excitation light comprising blue light having a wavelength of greater than or equal to 440 nm generated by the light emitting device is emitted through the wavelength conversion component to contribute to a final visible emission product.

11. The component of claim 1, wherein the light scattering material has an average particle size that is selected such that the light scattering material will scatter the excitation light relatively more than the light scattering material will scatter light generated by the at least one photoluminescence material.

12. The component of claim 11, wherein the light scattering material scatters the excitation light at least twice as much as light generated by the at least one photoluminescence material.

EX1101, claim 1; '678 patent (IPR2024-01357, EX1001), claims 1, 11, 12; Reply at 1 n.1.

The '539 patent claims the same subject matter as the '678 patent

'539 patent

What is claimed is:

1. A wavelength conversion component for a light emitting device comprising:

at least one photoluminescence material; and

a light scattering material, wherein the light scattering material has an average particle size that is selected such that the light scattering material will scatter excitation light from a radiation source relatively more than the light scattering material will scatter light generated by the at least one photoluminescence material,

wherein the wavelength conversion component is config-

a light scattering material, wherein the light scattering material has an average particle size that is selected such that the light scattering material will scatter excitation light from a radiation source relatively more than the light scattering material will scatter light generated by the at least one photoluminescence material,

'678 patent

What is claimed is:

1. A wavelength conversion component for a light emitting device comprising:

a wavelength conversion layer comprising particles of at least one photoluminescence material; and

a light diffusing layer comprising particles of a light scattering material,

wherein the light diffusing layer improves an off-state

a light diffusing layer comprising particles of a light scattering material,

ured such that in operation a portion of excitation light comprising blue light having a wavelength of greater than or equal to 440 nm generated by the light emitting device is emitted through the wavelength conversion component to contribute to a final visible emission product.

11. The component of claim 1, wherein the light scattering

11. The component of claim 1, wherein the light scattering material has an average particle size that is selected such that the light scattering material will scatter the excitation light relatively more than the light scattering material will scatter light generated by the at least one photoluminescence material.

EX1101, claim 1; '678 patent (IPR2024-01357, EX1001), claims 1, 11, 12; Reply at 1 n.1.

The '539 patent claims the same subject matter as the '678 patent

'539 patent

What is claimed is:

1. A wavelength conversion component for a light emitting device comprising:

at least one photoluminescence material; and
a light scattering material, wherein the light scattering material has an average particle size that is selected such that the light scattering material will scatter excitation light from a radiation source relatively more than the light scattering material will scatter light generated by the at least one photoluminescence material,

wherein the wavelength conversion component is configured such that in operation a portion of the excitation

wherein the wavelength conversion component is configured such that in operation a portion of the excitation light comprising blue light having a wavelength of greater than or equal to 440 nm is emitted through the wavelength conversion component to contribute to a final visible emission product;

'678 patent

What is claimed is:

1. A wavelength conversion component for a light emitting device comprising:

a wavelength conversion layer comprising particles of at least one photoluminescence material; and
a light diffusing layer comprising particles of a light scattering material,
wherein the light diffusing layer improves an off-state white appearance of the wavelength conversion component;

wherein the wavelength conversion component is configured such that in operation a portion of excitation light comprising blue light having a wavelength of greater

wherein the wavelength conversion component is configured such that in operation a portion of excitation light comprising blue light having a wavelength of greater than or equal to 440 nm generated by the light emitting device is emitted through the wavelength conversion component to contribute to a final visible emission product.

12. The component of claim 11, wherein the light scattering material scatters the excitation light at least twice as much as light generated by the at least one photoluminescence material.

EX1101, claim 1; '678 patent (IPR2024-01357, EX1001), claims 1, 11, 12; Reply at 1 n.1.

The '539 patent claims the same subject matter as the '678 patent

'539 patent

What is claimed is:

1. A wavelength conversion component for a light emitting device comprising:

at least one photoluminescence material; and

a light scattering material, wherein the light scattering material has an average particle size that is selected such that the light scattering material will scatter excitation light from a radiation source relatively more than the light scattering material will scatter light generated by the at least one photoluminescence material,

wherein the wavelength conversion component is configured such that in operation a portion of the excitation light comprising blue light having a wavelength of greater than or equal to 440 nm is emitted through the wavelength conversion component to contribute to a final visible emission product;

wherein the light scattering material scatters the blue light

wherein the light scattering material scatters the blue light at least twice as much as light generated by the at least one photoluminescence material.

'678 patent

What is claimed is:

1. A wavelength conversion component for a light emitting device comprising:

a wavelength conversion layer comprising particles of at least one photoluminescence material; and

a light diffusing layer comprising particles of a light scattering material,

wherein the light diffusing layer improves an off-state white appearance of the wavelength conversion component;

wherein the wavelength conversion component is configured such that in operation a portion of excitation light comprising blue light having a wavelength of greater than or equal to 440 nm generated by the light emitting device is emitted through the wavelength conversion component to contribute to a final visible emission prod-

12. The component of claim 11, wherein the light scattering material scatters the excitation light at least twice as much as light generated by the at least one photoluminescence material.

rial.

12. The component of claim 11, wherein the light scattering material scatters the excitation light at least twice as much as light generated by the at least one photoluminescence material.

EX1101, claim 1; '678 patent (IPR2024-01357, EX1001), claims 1, 11, 12; Reply at 1 n.1.

The basic claimed structure is undisputed

Krummacher discloses the claimed structure

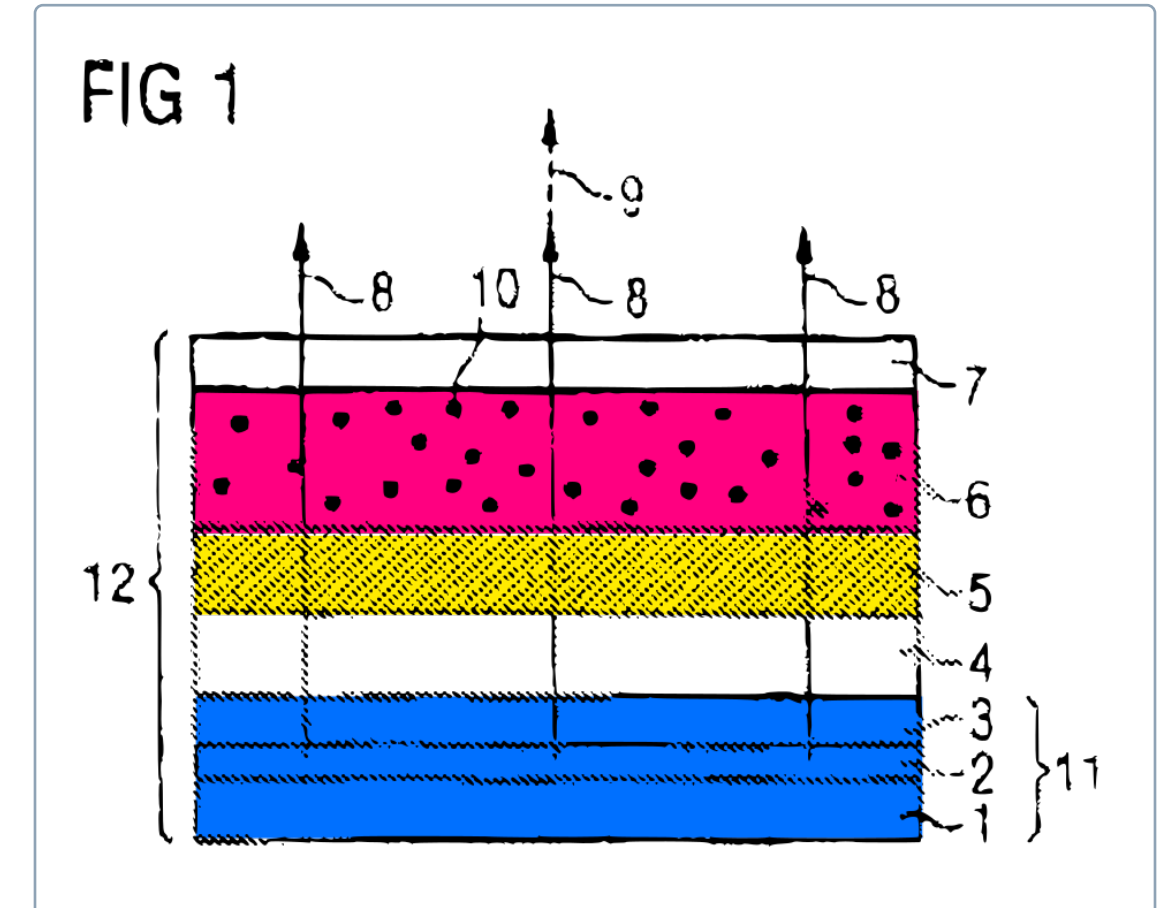
1. A wavelength conversion component for a light emitting device comprising:

at least one photoluminescence material; and

a light scattering material, wherein the light scattering material has an average particle size that is selected such that the light scattering material will scatter excitation light from a radiation source relatively more than the light scattering material will scatter light generated by the at least one photoluminescence material,

wherein the wavelength conversion component is configured such that in operation a portion of the excitation light comprising **blue light having a wavelength of greater than or equal to 440 nm** is emitted through the wavelength conversion component to contribute to a final visible emission product;

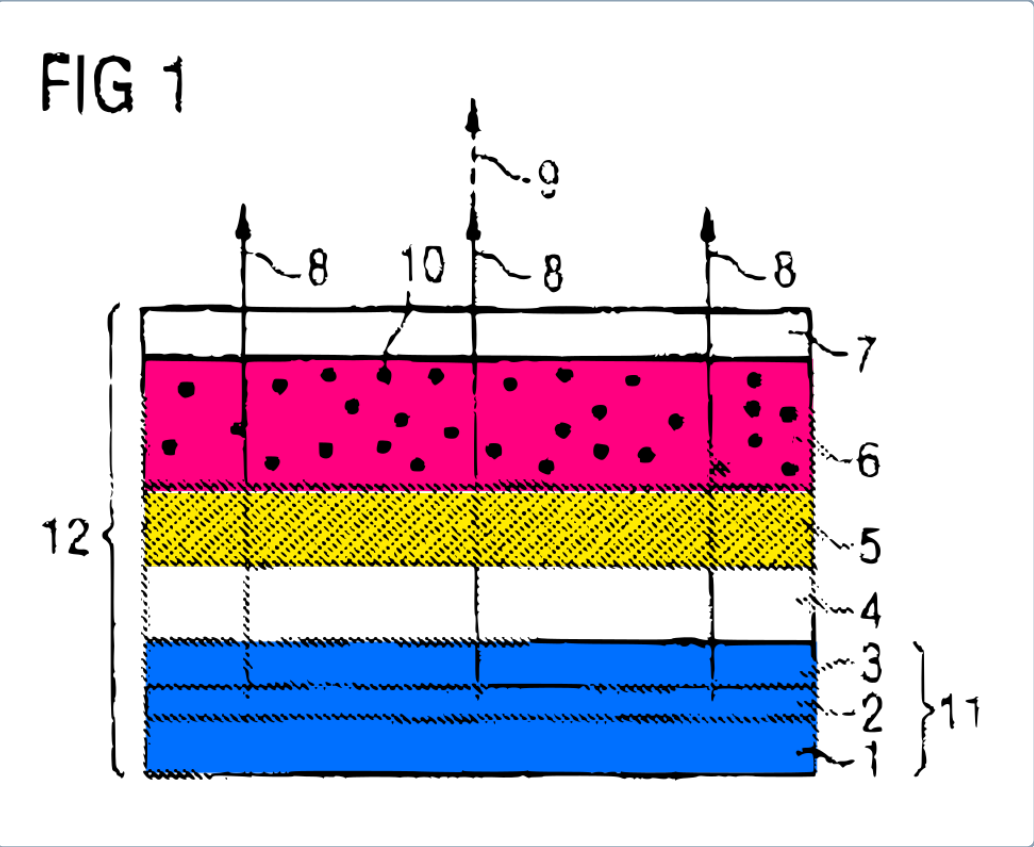
wherein the light scattering material scatters the blue light at least twice as much as light generated by the at least one photoluminescence material.



Krummacher (EX1107), Fig. 1 (annotated) — colors key claim elements to the layers

EX1101, claim 1; EX1107, Fig. 1.

Krummacher discloses every structural element



Krummacher (EX1107), Fig. 1

CLAIM 1 ELEMENT	KRUMMACHER, FIG. 1
Blue light source	✓ blue LED — layer 2 (¶¶ 31-32, 36)
Photoluminescence material	✓ phosphor layer 5 (¶¶ 36-37)
Light scattering material (TiO ₂)	✓ layer 6 (¶ 39)

Patent Owner does not dispute any structural element — its only claim-limitation dispute is the average particle size.

Do blue LEDs in blue-pumped white LEDs emit above 440 nm?

≥440 nm added during prosecution to distinguish McNulty (UV-pumped LED).

440 nm divides two architectures:

- Blue-pumped (≥440 nm) — conventional
- UV-pumped (≤ about 420 nm) — McNulty

EX1104 at 259-60

Every reference says yes.

Conventional blue LEDs peak above 440 nm

Prosecution history, EX1104 at 253-66, 392-97; EX2003 ¶ 4; POR at 6-8.

Blue LEDs above 440 nm are ordinary — and everywhere in the art

The patent’s own spec · EX1101, 7:14-26

“The blue LEDs 24 can comprise 4.8 W Cetus™ C1109 chip on ceramic devices from Intematix Corporation ... Each blue LED 24 is operable to generate blue light ... having a peak wavelength λ_1 in a wavelength range 400 nm to 480 nm (typically 450 nm to 470 nm).”

The prior art · every reference discloses them

Shimizu (EX1110): 450, 460, 470 nm
Basin-2005 (EX1106): 420–490 nm
Stokes (EX1108): 450 or 480 nm
Van Woudenberg (EX1120): 430–480 nm

Every one is above 440 nm — and Dr. Doolittle’s testimony that these are conventional blue LEDs is unrebutted. (EX1102 ¶ 134)

EX1101, 7:14-26; EX1110 (Shimizu); EX1106; EX1108, 6:62-67; EX1120; EX1102 ¶ 134; Reply at 8-9.

Patent Owner's expert could not identify the wavelength of a blue LED

Q. In a typical device, an LED package that emits white light using a blue LED chip and a yellow phosphor, which wavelengths of blue light would typically be emitted by the blue LED?

A. I would not be able to answer that question with certainty because the description of blue depends to some degree on the context.

EX1148, 51:5-52:20 (Schubert Deposition, Sept. 12, 2025); see Reply at 17

Dr. Schubert's own textbook puts blue LEDs at 455-490 nm

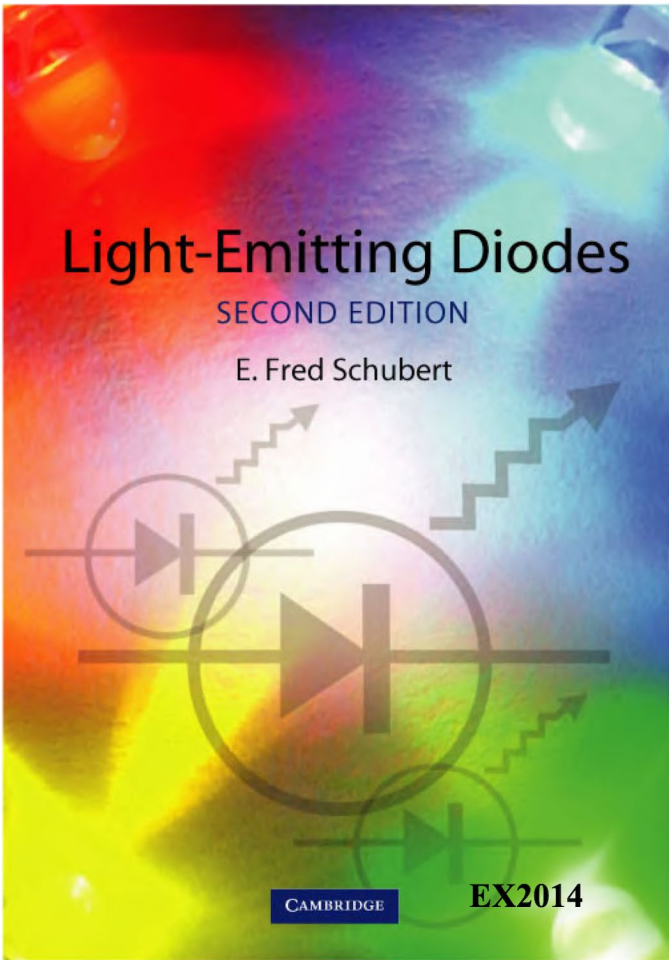


Table 16.5. Colors and associated typical LED peak wavelength ranges

Color	Wavelength	Color	Wavelength
Ultraviolet	< 390 nm	Yellow	570–600 nm
Violet	390–455 nm	Amber	590–600 nm
Blue	455–490 nm	Orange	600–625 nm
Cyan	490–515 nm	Red	625–720 nm
Green	515–570 nm	Infrared	> 720 nm

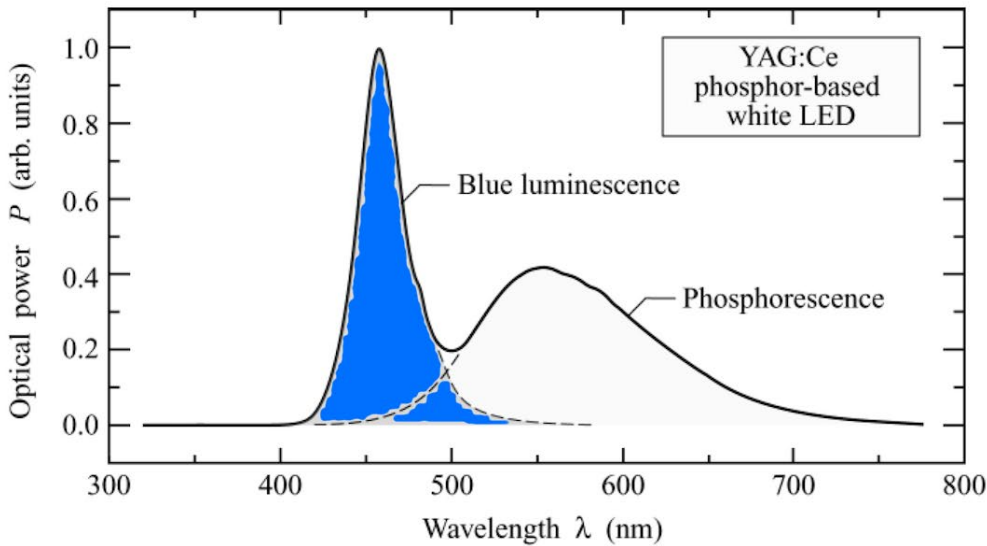


Fig. 21.8. Emission spectrum of a phosphor-based white LED manufactured by Nichia Corporation (Anan, Tokushima, Japan).

IPR2024-01357, Paper 40 at 17-18; EX2014 at 284, Table 16.5 (annotated), 354, Fig. 21.8 (annotated).

Krummacher already discloses the blue LED — nothing is imported

PATENT OWNER’S ARGUMENT	THE FACT
“Petitioners fail to explain why a POSITA would want to import a blue-light LED chip from Stokes or Shimizu into Krummacher.” — POR at 33.	Krummacher already discloses a blue LED (EX1107 ¶¶ 31-32, 36) and a TiO₂ scattering layer (EX1107 ¶ 39). Nothing is “imported” — Stokes and Shimizu supply only the wavelength detail.

No motivation is required to combine elements one reference already shows together. *Gen. Elec. Co. v. Raytheon Techs. Corp.*, 983 F.3d 1334, 1352 (Fed. Cir. 2020); *Guardant Health, Inc. v. Univ. of Washington*, No. 24-1129, slip op. at 9-10 (Fed. Cir. Jan. 23, 2026).

Physical incorporation is not the test. *Allied Erecting & Dismantling Co. v. Genesis Attachments, LLC*, 825 F.3d 1373, 1381 (Fed. Cir. 2016); *In re Keller*, 642 F.2d 413, 425 (CCPA 1981).

POR at 33; EX1107 ¶¶ 31-32, 36, 39; see Reply at 7-8.

The Petition said so expressly

The Petition's motivation showing for the ≥ 440 nm limitation (Ground 1, element 1d):

“A POSA would have been motivated to use a blue-light LED chip like that disclosed by Stokes and Shimizu in a conventional white-light LED light source called for by Krummacher. Shimizu, in particular, is cited by both the '539 patent and the prior art as an example of a conventional white-light LED light source containing a blue-light LED. Thus, ***it would have been obvious to look to Stokes and Shimizu for details of the conventional white-light LED light source used in Krummacher***, and a POSA would have had a reasonable expectation of success in doing so, because they would simply be ***using the conventional white-light LED disclosed in the prior art as directed by Krummacher***. In other words, not only does Krummacher suggest the use of an LED like that disclosed in Stokes and Shimizu, doing so would have been the simple substitution of one known element for another to obtain predictable results and well within the skill of a POSA.”

**Krummacher already calls for a conventional white-LED — which already has a blue LED.
Stokes and Shimizu supply only the wavelength.**

Pet. at 31 (Ground 1, element 1d); EX1102 ¶¶ 134-36.

**Stokes discloses the claimed particle sizes and the
motivation to use them**

Patent Owner does not dispute the obviousness facts

UNDISPUTED — THE FACTS	WHAT PATENT OWNER ARGUES INSTEAD
• Krummacher discloses the blue LED and the TiO₂ scattering layer. (EX1107 ¶¶ 31-32, 39) • The blue-LED examples in the references are above 440 nm — Shimizu 450–470 nm; Stokes 450 and 480 nm. • The scattering physics was known and is unrebutted. • The level of ordinary skill, every dependent claim, and every other limitation, all undisputed.	• Motivation: that the Petition did not sufficiently explain with enough particularity (POR 32-38) • Average particle size: that Stokes does not use the words “average particle size” — not that the physics is wrong. (Sur-Reply § C)

The obviousness facts are undisputed. Patent Owner does not address how the references would be understood by a POSA.

Reply at 3-4, 12; POR at 30, 32-38; Sur-Reply § C; EX1107 ¶¶ 31-32, 39.

The prior art's particle sizes overlap the preferential-scattering range

Preferential scattering is wavelength-dependent Rayleigh/Mie scattering, a known physical property of nano-scale TiO_2 particles.

It was known that particles preferentially scatter at these particle sizes. PO does not dispute the physics.

Krummacher (EX1107)

¶ 39: TiO_2 particles, “a radius of between 50 nm ... and 1000 nm.” — i.e., a diameter of 100–2000 nm, overlapping Stokes’s 100–200 nm at the low end.

Stokes (EX1108)

7:9-22: “100 to 200 nm particles have at least a 50% greater scattering power for blue” than green or red.

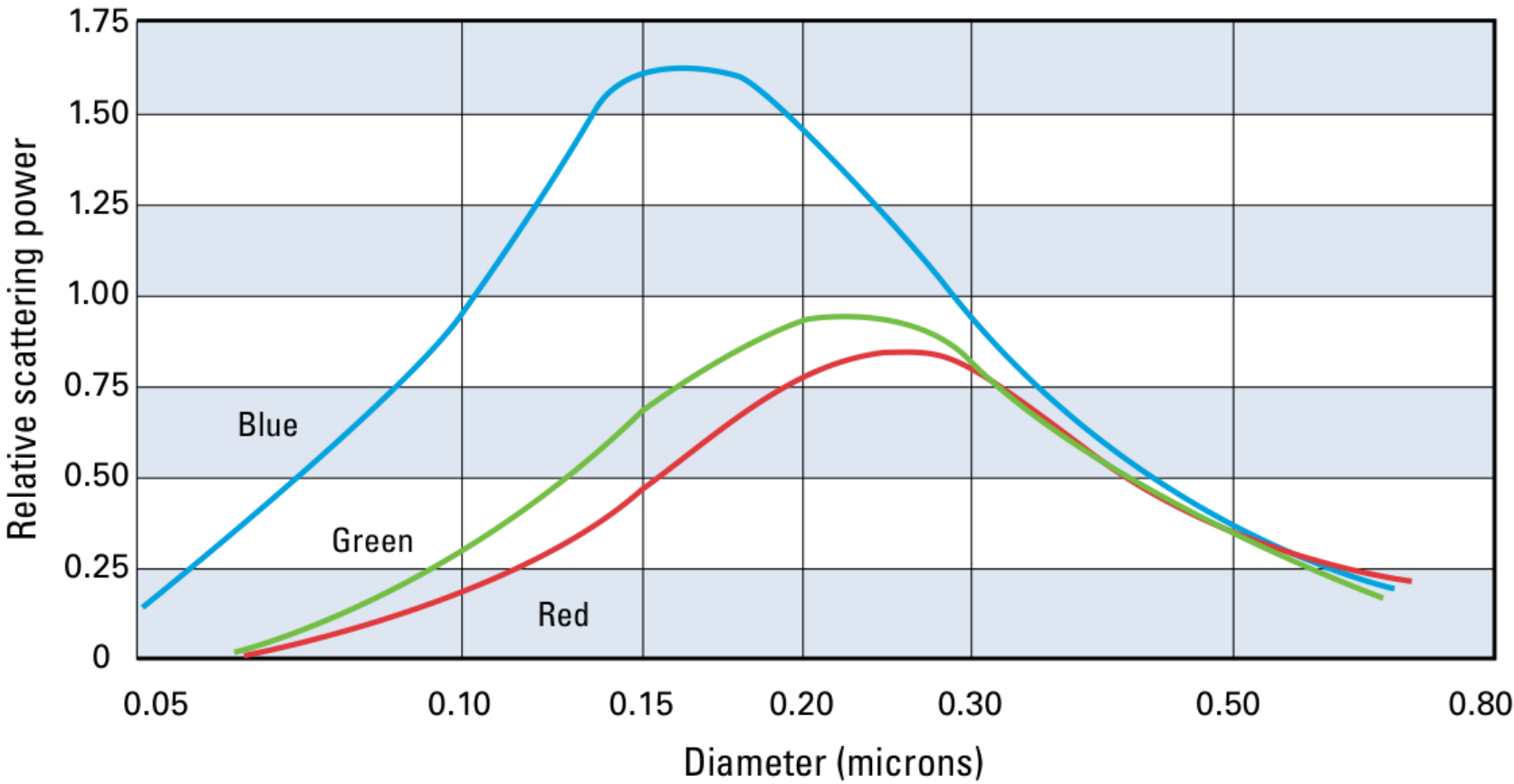
Basin-2007 (EX1105)

¶ 32: sub-micron TiO_2 (≈ 250 nm). Background — same material, overlapping sizes.

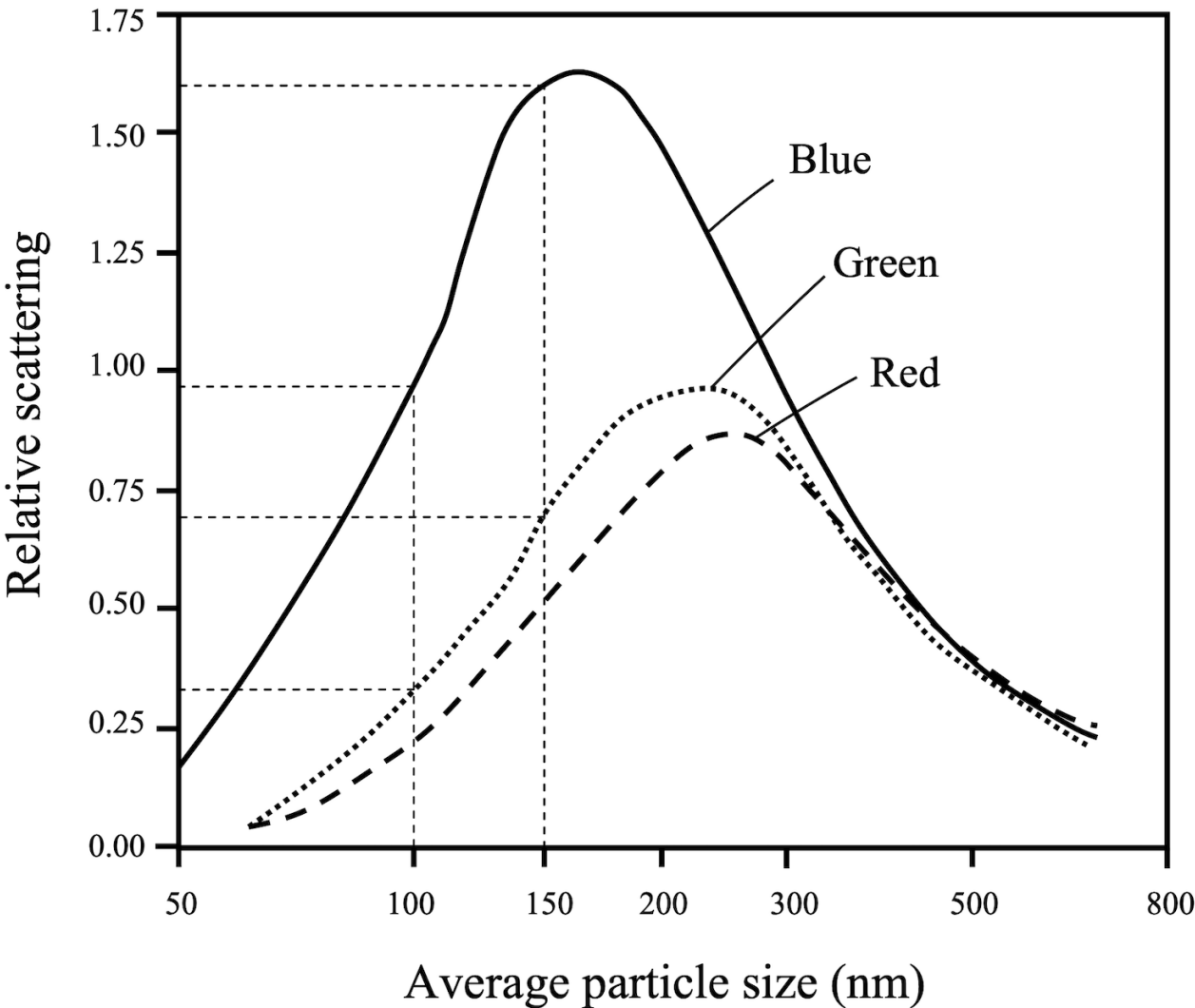
EX1107 ¶ 39; EX1108, 7:9-22; EX1105 ¶ 32; EX1113 (DuPont).

The DuPont scattering curves show the overlap

Figure 7. Relative Light Scattering Power versus Rutile Particle Size.



EX1113 (DuPont, “Ti-Pure Titanium Dioxide for Coatings”), p. 8, Fig. 7 (2007)



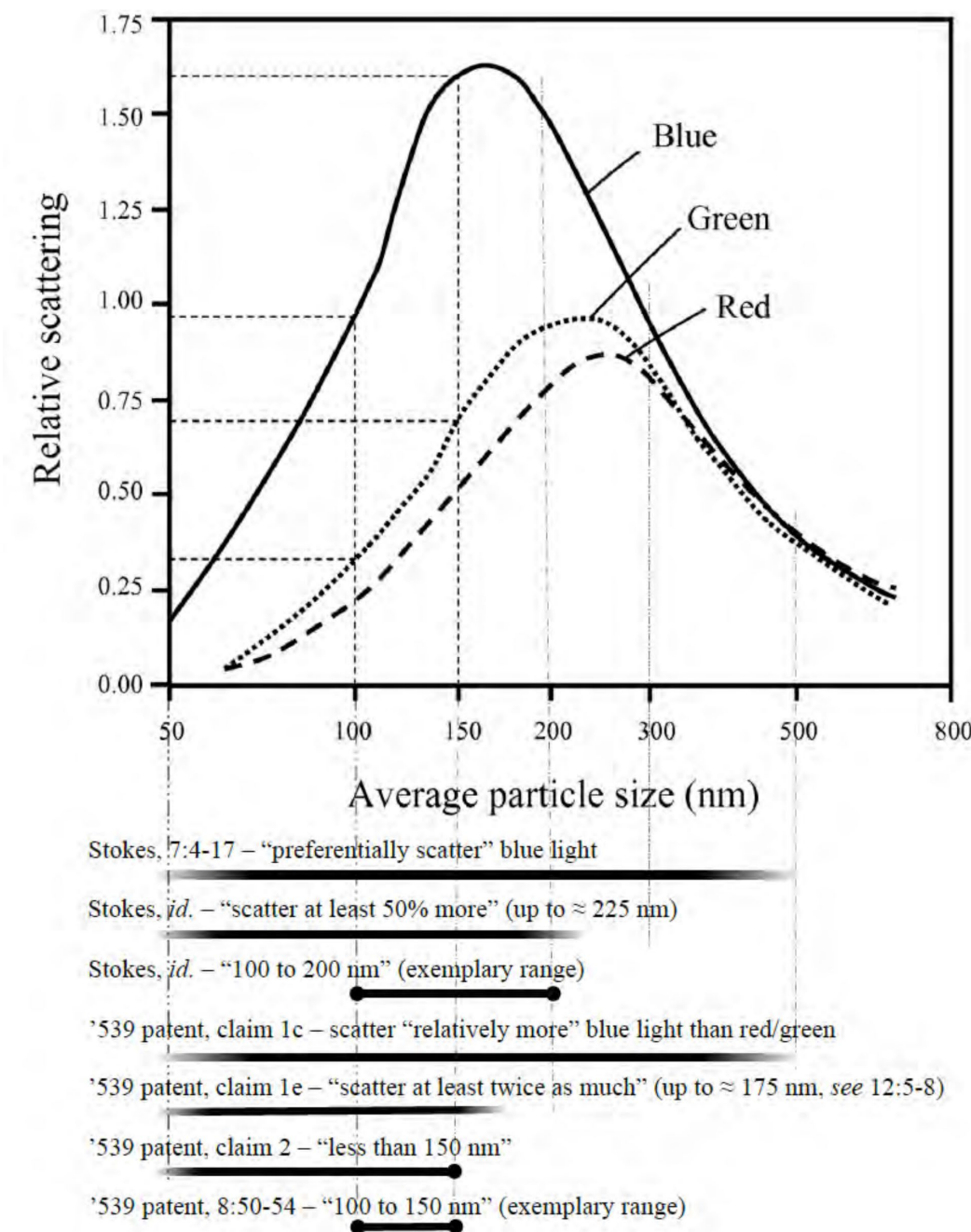
'539 patent, Fig. 10 (2013)

Blue scattering peaks near 0.15 microns — **150 nm**

The '539's own Figure 10 copies DuPont data without attribution

EX1101, Fig. 10; EX1108, 7:9-22; EX1107 ¶ 39; EX1102 ¶ 124.

The claimed ranges overlap the ranges Stokes discloses



Annotated Figure 10

Petition, Annotated Figure 10 (Pet. at 34)

The Petition plots every range on the '539's own scattering curve. Stokes's disclosed sizes and the '539's claimed sizes fall in the same sub-micron band — where TiO_2 scatters blue light the most.

Stokes discloses: 100–200 nm; up to ≈ 225 nm for $\geq 50\%$ more blue scattering.

Petition's mapping: claim 1 maps to ≈ 175 nm; claim 2 to < 150 nm; the spec to 100–150 nm.

“[I]n the absence of evidence ... that there is something special or critical about the claimed range, an overlap suffices ...”

Almirall, LLC v. Amneal Pharms. LLC, 28 F.4th 265, 273 (Fed. Cir. 2022).

Pet. at 34 (Annotated Fig. 10); EX1102 ¶¶ 137-39.

The limitation asks for a result, not a number

Claim 1 requires “an average particle size that is **selected such that**” the light scattering material scatters blue light relatively more than the phosphor’s light. (EX1101, cl. 1.)

That is a **functional** requirement — it demands a result (preferential blue scattering), not a specific number. (Pet. at 26.)

Either way, the prior art produces that result:

Reading 1 — a size that produces the result

Krummacher’s own 50–1000 nm radius TiO₂ range generally scatters blue more than red or green, under the DuPont model. (Pet. at 26; EX1102 ¶ 124.)

Reading 2 — a size chosen for that reason

Stokes selects the size so the particles “preferentially scatter blue.” (EX1108, 7:1-26.)

EX1101, cl. 1; Pet. at 26; EX1102 ¶ 124; EX1108, 7:1-26.

The Petition set out two theories for meeting the average particle size requirement

Petition at 26:

Krummacher discloses a light scattering material with TiO₂ particles “preferably having a radius of between 50 nm inclusive and 1000 nm inclusive.” (EX1107, ¶[0039].) According to the DuPont model, TiO₂ particles of such a size generally scatter more blue light (e.g., excitation light) than red or green light (e.g., light emitted by the phosphor). (EX1102, ¶124.) Accordingly, Krummacher renders obvious this claim element by literally disclosing the selection of average particle sizes that preferentially scatter blue light.

Petition at 26-27:

To the extent that the claim language “an average particle size that is selected such that [it preferentially scatters blue light]” requires an average particle size selected for that reason (rather than an average particle size that leads to that outcome), this claim element is rendered obvious by Stokes. (EX1102, ¶125.) Stokes explicitly discloses the selection of an average particle size “such that the particles preferentially scatter blue ... LED light as compared to yellow ... light from the luminescent material.” (EX1108, 7:1-4.)

Pet. at 26-27; Papers 10, 11 (at 22), 14, 21, 24.

The Preliminary Response alleged the Petition lacks particularity

Patent Owner Preliminary Response at 23:

material.” The Petition fails to point out exactly which theory Petitioners are advancing in support of the “average particle size” limitation. The Petition states both that: (i) “Krummacher renders obvious this claim element” (Pet. at 26) and (ii) “Stokes explicitly discloses the selection of an average particle size.” Pet. at 27. But the Petition fails to pick one or the other. Instead, conflicting with Federal Circuit guidance, the Petition presupposes that readers will figure it out for themselves. *See Netflix, Inc. v. DivX, LLC*, 84 F.4th 1371, 1380 (Fed. Cir. 2023) (“[W]e emphasize that it is the petitioner’s burden to make clear when alternative arguments are being presented and to sufficiently expound on each one. The Board should not have to work [hard] to identify all arguments fairly presented in a petition.”).

Pet. at 26-27; Papers 10, 11 (at 22), 14, 21, 24.

At institution, the Board found the Petition sufficiently particular (Paper 11 at 22)

Institution Decision at 18:

Petitioner then offers two theories for how the combination of Krummacher and Stokes teaches this limitation. Pet. 26–28. First,

Institution Decision at 22:

24. The Petition clearly sets out two theories for how the references teach this limitation, with citations to each reference and supporting explanation. *See* Pet. 26–27. In addition, the Petition provides additional explanation in its discussion of limitation 1[e]. *See id.* at 32–37. Thus, we find that the Petition has sufficient particularity.

Pet. at 26-27; Papers 10, 11 (at 22), 14, 21, 24.

The Response and Sur-Reply repeat the argument the Board rejected at institution

Patent Owner Response at 27-28:

material.” The Petition fails to point out exactly which theory Petitioners are advancing in support of the “average particle size” limitation. The Petition states both that: (i) “Krummacher renders obvious this claim element” (Pet. at 26) and (ii) “Stokes explicitly discloses the selection of an average particle size.” Pet. at 27. But the Petition fails to pick one or the other. Instead, conflicting with Federal Circuit guidance, the Petition presupposes that readers will figure it out for themselves. *See Netflix, Inc. v. DivX, LLC*, 84 F.4th 1371, 1380 (Fed. Cir. 2023) (“[W]e emphasize that it is the petitioner’s burden to make clear when alternative arguments are being presented and to sufficiently expound on each one. The Board should not have to work [hard] to identify all arguments fairly presented in a petition.”).

Patent Owner Sur-Reply at 8-9:

Petitioners have generally chosen not to address Patent Owner’s arguments about average particle size on the merits. Instead, Petitioners simply embrace the Institution Decision as if it is set in stone. For example, Petitioners do not address Patent Owner’s argument that the Petition fails to elucidate its alternative theories on the disclosure of the claimed average particle size. As the Federal Circuit has explained, “it is the petitioner’s burden to make clear when alternative arguments are being presented and to sufficiently expound on each one.” *Netflix, Inc. v. DivX, LLC*, 84 F.4th 1371, 1380 (Fed. Cir. 2023). The disclosures of particle sizes Petitioners cite in Krummacher and Stokes are different, and the Petition fails to explain its alternative theories or how they fit into the alleged combination of prior art teachings.

Pet. at 26-27; Papers 10, 11 (at 22), 14, 21, 24.

Stokes gave the benefits of preferential scattering, and Dr. Doolittle confirmed it

Stokes, 7:17-26:

than green or red (or for that matter yellow) radiation (i.e., such as that emitted by the phosphor or dye). This particle size range is advantageous because it enhances the scattering of the radiation source radiation while it decreases the amount of scattering of the luminescent material radiation. Therefore, the lamp radiation output is rendered more uniform because a greater amount of radiation source radiation is scattered toward the luminescent material, while a lesser amount of the luminescent material radiation that is emitted downward toward the radiation source is scattered back toward the luminescent material.

Dr. Doolittle, EX1102 ¶ 128 — never rebutted:

128. Thus, a POSA would have been motivated to apply this principle to Krummacher, because it would increase the conversion of blue light to yellow light and improve the uniformity of the light source. Conversion of blue light to yellow light is improved by maximizing the scattering of blue light. Uniformity is improved by preferentially scattering the concentrated light from the blue-light LED chip instead of the disperse light emitted by the phosphor.

EX1108, 7:17-26; EX1102 ¶ 128; Reply at 10.

Stokes specifies particle sizes

Petition at 27:

Stokes explicitly discloses the selection of an average particle size “such that the particles preferentially scatter blue ... LED light as compared to yellow ... light from the luminescent material.” (EX1108, 7:1-4.)

Patent Owner Preliminary Response at 27:

Petitioners incorrectly claim that “Stokes *explicitly* discloses the selection of an average particle size.” Pet. at 27 (emphasis added). Yet the passage Petitioners cite identifies **no particle sizes at all**. Therefore, like Krummacher, Stokes also does not address *average* particle sizes. Accordingly, the Petition fails to show that either Krummacher or Stokes discloses the claimed “average particle size.”

Stokes, 7:1-26:

In one preferred embodiment, the radiation scattering particles have a size such that the particles preferentially scatter blue or UV LED light as compared to yellow, green, red or white light from the luminescent material. Preferably, the particle size is selected such that the particles scatter at least 50% more radiation source radiation than luminescent material radiation. FIG. 6 illustrates the relationship between the particle diameter and the wavelength of the scattered light for Ti-Pure® rutile TiO₂ particles made by DuPont. As illustrated in FIG. 6, the relative scattering power of 100 to 200 nm TiO₂ particles is above 1 for blue incident radiation, while it is below 1 for green and red incident radiation. Therefore, as illustrated in FIG. 6, 100 to 200 nm particles have at least a 50% greater scattering power for blue radiation (i.e., such as that emitted by a blue emitting LED) than green or red (or for that matter yellow) radiation (i.e., such as that emitted by the phosphor or dye). This particle size range is advantageous because it enhances the scattering of the radiation source radiation while it decreases the amount of scattering of the luminescent material radiation. Therefore, the lamp radiation output is rendered more uniform because a greater amount of radiation source radiation is scattered toward the luminescent material, while a lesser amount of the luminescent material radiation that is emitted downward toward the radiation source is scattered back toward the luminescent material.

POPR at 27; PO Sur-Reply at 10; EX1108, 6:60-7:8, 7:9-22; Reply at 5.

The Board read Stokes the same way at institution

Institution Decision at 22:

We do not agree with Patent Owner’s contention that Petitioner “identifies **no particle sizes at all.**” Prelim. Resp. 27. The cited portions of Stokes state that “the radiation scattering particles have a size such that the particles preferentially scatter blue or UV LED light as compared to yellow, green, red or white light from the luminescent material.” Ex. 1108, 7:1–4. Thus, we find that Stokes sufficiently discloses selecting a particle size. *See* Ex. 1102 ¶¶ 124–128.

We also find that Petitioner has shown sufficiently that Stokes discloses selecting an “average” particle size. As the Petition explains in the context of limitation 1[e], Stokes teaches selecting an exact particle size, and that “the average particle size of a set of exact theoretical particles is the same as the exact particle size.” *See* Pet. 35 n.4 (citing Ex. 1102 ¶ 140 n.6).

Patent Owner Response at 31 (nearly verbatim from the POPR):

Petitioners incorrectly claim that “Stokes *explicitly* discloses the selection of an average particle size.” Pet. at 27 (emphasis added). Yet the passage Petitioners cite identifies no specific particle sizes. Therefore, like Krummacher, Stokes also does not address *average* particle sizes. Accordingly, the Petition fails to show that either Krummacher or Stokes discloses the claimed “average particle size.”

POR at 31; PO Sur-Reply at 10; EX1108, 6:60-7:8, 7:9-22; Reply at 5.

Mean particle diameter is average particle size

PATENT OWNER SAYS · Sur-Reply at 10; POR at 31

- **“Nowhere in Stokes ... is there any discussion of average particle size.”**
(Sur-Reply at 10)
- The cited passages **“identif[y] no specific particle sizes.”** (POR at 31)

THE RECORD SHOWS

- **Stokes states it outright.** The particles “may have a **mean diameter (d₅₀)**” — 100 to 300 nm, and 150 to 225 nm for 450 nm blue LEDs. A mean / d₅₀ is an average. (EX1108, 6:53-67)
- **The Board already agreed.** Stokes “sufficiently discloses selecting a particle size” (Paper 11 at 22), and the Board noted the specific “100 to 200 nm” ranges (Paper 11 at 14).
- Patent Owner **“does not address the Board’s reasoning.”** (Reply at 5)

Stokes uses the words “mean particle diameter” — Patent Owner’s “no average” argument contradicts the reference itself, and the Board already rejected it.

POR at 31; PO Sur-Reply at 10; Paper 11 at 14, 22; EX1108, 6:53-7:8, 7:1-4; Reply at 5.

Mean particle diameter is average particle size

Petitioner Reply at 5:

(quoting EX1108, 7:1-4). Stokes also discloses specific particle size ranges, as the Board noted. *See* ID at 14 (quoting EX1108, 7:9-22 (disclosing that “100 to 200 nm TiO₂ particles” have “at least a 50% greater scattering power for blue radiation” than for green or red)); *see also* EX1108, 6:60-7:8 (preferred mean particle diameters of 100-300 nm and 140-240 nm, and for blue LEDs at 450 nm, 150-225 nm). As to the distinction between “particle size” and “average particle

Patent Owner Sur-Reply at 10:

Nor can they; Petitioners are plainly wrong on this point. Nowhere in Stokes, much less the two paragraphs Petitioners cite, is there any discussion of *average* particle size. But even if Petitioners are right that Stokes teaches the claimed “average particle size” *without* addressing the average and *without* actually identifying any particular particle sizes, Petitioners still have failed to show how or

Stokes, 6:53-67:

The light scattering particles may have a mean diameter (d_{50}) of 50 to 500 nm. Preferably, the mean particle diameter is between $\lambda/3$ and $\lambda/2$, where λ is the peak emission wavelength of the radiation source **43**, such as an LED. The light scattering particles scatter light most efficiently when their diameter is between $\lambda/3$ and $\lambda/2$. Thus, the preferred mean particle diameter is 100 to 300 nm, most preferably, between 140 and 240 nm, for typical blue or UV peak emission wavelengths. For example, for blue emitting LEDs having a peak emission wavelength of $\lambda=450$ nm, the particle size is preferably 150 to 225 nm, while for a peak emission wavelength of $\lambda=480$ nm, the particle size is preferably 160 to 240 nm. For UV emitting LEDs having a peak emission wavelength of $\lambda=390$ nm, the particle size is preferably 130 to 190 nm.

POR at 31; PO Sur-Reply at 10; EX1108, 6:60-7:8, 7:9-22; Reply at 5.

Ground 2: the bulb embodiment is obvious

Ground 2 adds one thing to Hussell: Krummacher’s off-state fix

HUSSELL (EX1111) — the base	KRUMMACHER (EX1107) — the one addition	STOKES + VAN WOUDENBERG — the detail
A hollow tube — a “filament for a drop-in replacement for an incandescent bulb.” Says nothing about off-state appearance or the wavelength of blue light. ¶¶ 32, 52; Pet. at 54.	Its TiO₂ scattering layer is selected so the off-state surface “appears white.” That is the reason to apply it to Hussell’s bulb. ¶¶ 3-4, 39-41; EX1102 ¶¶ 219-230.	Stokes: the particle size — 100–200 nm. (EX1108, 7:9-22) Van Woudenberg: the blue-LED wavelength for this bulb type. (EX1120, 5:15-19) The same conventional detail as Ground 1.

Not four references stitched together — Krummacher’s off-state fix in Hussell’s bulb, plus the same detail as Ground 1.
The motivation: improved off-state white appearance.

Pet. at 52-56; Reply at 10-11; Paper 11 at 24-25; KSR, 550 U.S. at 417-18.

The reason to add Krummacher’s layer is express

PATENT OWNER SAYS · POR at 38-40

- The four references are “**different applications of LEDs**” — incandescent replacement, large-area lighting, automotive/display, mobile-phone lighting. No reason to combine across them.
- Petitioners “**cherry-picked ... only two references at a time**” — no motivation tying all four together. (KSR)

THE RECORD SHOWS

- **The reason is express and known.** Krummacher’s TiO₂ layer is why the off-state “**appears white**” and avoids the “**yellowish hue**” (¶¶ 39-41) — a well-known goal, using diffusing / frosting bulb coatings long known in the art. (Kardos, EX1149)
- **Nothing is imported across applications.** Krummacher already has the blue LED and the scattering layer; requiring a motivation to combine elements already together is error. (GE, 983 F.3d at 1352; Guardant)
- **The Board has rejected the “different applications” argument three times.** (IPR2024-01357, Paper 17 at 26-31 and Paper 42 at 30; Paper 11 at 23-24)

Patent Owner disputes only the reason to combine — and the reason is Krummacher’s own express off-state benefit, a known fix the Board has upheld three times.

POR at 38-40; Reply at 10-11; Paper 11 at 23-25; EX1107 ¶¶ 3-4, 39-41; EX1149, 1:5-15; GE, 983 F.3d at 1352; KSR, 550 U.S. at 417-18.

No credible evidence of nonobviousness

No credible evidence of nonobviousness

No evidence commercial products practice claims

Chromalit XT (2012)

Named inventors' own commercial embodiment (EX1150, EX1151).

No evidence of commercial success.

Twelve-year gap

Filed 2010. Feit bulbs ~2022.

Any success is attributable to subsequent advancements in technology, not the claimed invention.

Anecdotal evidence

Instagram, Reddit, Home Depot Innovation Award from retail partner (EX2031).

Not commensurate with the scope of the claimed invention.

***Fox Factory v. SRAM*, 944 F.3d 1366, 1373, 1378 (Fed. Cir. 2019): Objective indicia must be commensurate with the scope of claimed invention.**