

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MOBILEYE GLOBAL, INC.,

Petitioner,

v.

FACET TECHNOLOGY CORP.,

Patent Owner.

Case IPR2024-01110

Patent No. 9,335,255

**PETITIONER'S REPLY TO
PATENT OWNER'S RESPONSE**

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I. INTRODUCTION

The Board's Decision Granting Institution (Paper 16, "DI") preliminarily rejected Patent Owner's improper claim construction of "characterization profile" and argument that Lumia does not disclose determining a luminance value utilizing a characterization profile. DI 21, 27. The Board's Decision Denying Patent Owner's Request on Rehearing of Institution Decision (Paper 20, "DRR") maintained those same preliminary rejections. DRR 5-7. Patent Owner's Response (Paper 25, "POR") repeats the same arguments here. Patent Owner's attempts to improperly redefine the claim language and ignore techniques for determining a luminance value disclosed in Lumia fail to rebut Petitioner's demonstration that claim 15, the sole remaining challenged claim after Patent Owner disclaimed the rest, is rendered obvious by Gallagher in view of Lumia.

Patent Owner reasserts the same proposed construction of "characterization profile" from the pre-institution proceedings that is divorced from the claim language and is pieced together from portions of extrinsic evidence. POR 14-22. Patent Owner's expert concedes that he did not participate in this IPR until after Patent Owner had advanced its claim construction to the Board, making it clear he played no role in formulating that position.

Patent Owner further attempts to disprove any motivation to combine Gallagher and Lumia through arguments previously presented and considered by the

Board. *Compare* Paper 7 (“POPR”), Paper 19 (“PORR”) *with* DI, DRR. Patent Owner’s attacks on the references individually cannot overcome Petitioner’s demonstration of obviousness. The Board should reject Patent Owner’s arguments for the same reason it found them unpersuasive in its DI and its DRR and find claim 15 unpatentable.

II. ARGUMENT

A. Claim Construction

As it did before institution, Patent Owner proposes construing “a characterization profile of the at least one light intensity sensor” as “a compilation, presented in a usable format, of the description of the properties and performance characteristics of a sensor across various conditions.” POR 14-22. The Board should reject Patent Owner’s arguments and maintain its preliminary construction that a “characterization profile” refers to “a conversion factor to convert measured light intensity into luminance.” DI 21.

1. The Board’s Preliminary Construction of “Characterization Profile” is Correct

The Board should maintain its preliminary construction for the “characterization profile” term. Claim 15 recites “determining a luminance value utilizing the plurality of light intensity values and *a characterization profile of the at least one light intensity sensor.*” Ex. 1001, 20:11-14 (emphasis added). The claimed “plurality of light intensity values” and “at least one light intensity sensor”

refer back to claim 12, which recites “determining a plurality of light intensity values with at least one intensity sensor.” *Id.*, 19:48-51. The Board correctly understood the claimed “characterization profile of the at least one light intensity sensor” to refer to “a conversion factor to convert” a light intensity value determined “with at least one light intensity sensor” into a luminance value. DI 21. This understanding is consistent with the claim’s existing recitations of both “the plurality of light intensity values” and “the characterization profile” being utilized when “determining a luminance value.”

The specification of the '255 patent supports this construction, disclosing that intensity values are “determined from the gray value of the corresponding pixels” in the light intensity sensor 280, resulting in an intensity value for each of the pixels in the light intensity sensor 280. Ex. 1001, 11:24-33. The '255 patent further discloses that “[i]ntensity values will vary according to the color of the reflected light, since not all colors of incoming light excite the light intensity sensor 280 pixels in the same way.” *Id.*, 11:41-43. By knowing or sensing the color of the object being measured and “the light intensity sensor’s 280 profile for a particular color, *the intensity value 300 for a particular color can be converted into a luminance value.*” *Id.*, 11:43-48 (emphasis added). Accordingly, the '255 patent discloses converting an intensity value determined with a light intensity sensor to a luminance value using the light intensity sensor’s profile for the color of the object being measured. *Id.*,

11:21-48. This further supports the Board's preliminary understanding that the characterization profile refers to, or at least includes, "a conversion factor to convert measured light intensity into luminance." DI 21.

Patent Owner incorrectly contends that this construction "conflates the specification's 'look-up-table 475' with the specification's 'light intensity sensor characterization 275.'" POR 20. Look-up-table 475 is "a digital table stored in memory that uses the indexes of intensity ... and sheeting color to determine the luminance." Ex. 1001, 11:53-56. This look-up-table 475 is not a conversion factor. *See* Ex. 1030 ("Thorpe Suppl."), ¶29. Rather, it is a table of luminance values created *using* one or more conversion factors, for example, so that a luminance value can be determined by finding the value in the table that corresponds to a particular intensity and color. Ex. 1001, 10:66-11:3, 11:53-60; Thorpe Suppl., ¶29. As Dr. Thorpe explains, look-up-tables were and are commonly used to reduce processing time by allowing a processor to look up a value in memory, rather than performing a mathematical function. Thorpe Suppl., ¶29. In this embodiment, an automated system could determine a luminance value without knowing the characterization profile, but rather by obtaining the luminance value in the look-up-table 475 that corresponds to the intensity value and the color of the object. Ex. 1001, 11:53-60.

Patent Owner's attempt to import from an embodiment a requirement that the claimed "characterization profile" includes characteristics "across various

conditions” conflicts with the law. POR 17-19, 21-22; *Bayer AG v. Biovail Corp.*, 279 F.3d 1340, 1348 (Fed. Cir. 2002) (“[A] court may not read into a claim a limitation from a preferred embodiment, if that limitation is not present in the claim itself.”). For example, Patent Owner argues that “[b]ecause LUT 475 is designed to handle signs of various colors,... light intensity sensor characterization 275 would have to describe the properties of the sensors under various conditions (e.g. measuring signs of various colors).” POR 18 (citing Ex. 2023 ¶80). But nothing in the claimed method requires assessing reflective surfaces with different colors, using a look-up-table with values for different colors, or factoring in a characterization profile with multiple conditions. *See* Ex. 1001, 19:42-20:4, 20:11-14. Indeed, claim 15’s only sensor is an intensity sensor, so it is not clear how the method would determine color. *Id.*; *see id.*, 11:24-27 (describing the light intensity sensor as “a black and white camera”); Thorpe Suppl., ¶30. Unlike other claims in the ’255 patent, claim 15 is silent on how color is used. *See, e.g., id.*, 20:37-41 (reciting “a color identification subsystem”).

Moreover, even if the claimed “characterization profile” requires consideration of multiple colors (it does not), that still does not mean the Board’s preliminary construction is wrong. It simply means that “determining a luminance value” would “utilize[e]” a conversion factor corresponding to the color of the object

being measured. *Id.*, 20:11-14. That is entirely consistent with the Board's preliminary construction. And as explained in Section II.B.1, Lumia teaches this.

Patent Owner's argument that "it would be impractical to create separate characterization profiles to handle all the various colors that may be received by the light intensity sensors" is meritless. POR 22. The '255 patent makes clear that conversion factors for every possible color are not needed because there are only six "common colors" used for road signs. *See* Ex. 1001, 6:16-26. Under Patent Owner's argument, the '255 patent's look-up-table embodiment would not work because the look-up-table 475 would need to be infinitely large to cover the "huge number of different colors" in the visible spectrum. POR 22; *see id.*, 11:53-60. Patent Owner's argument conflicts with the '255 patent and should be rejected.

2. Patent Owner's Piecemeal Construction Overcomplicates What the Intrinsic Evidence Teaches

In arguing for the construction of "characterization profile," Patent Owner rehashes its argument that "sensor characterization" has a purported ordinary meaning that supports its construction of "characterization profile." POR 15-17. Rather than starting with the intrinsic evidence, as required by law, Patent Owner goes straight to extrinsic sources to assemble this purported "ordinary meaning." *Id.*; *see Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1583 (Fed. Cir. 1996).

Patent Owner errs in relying on these extrinsic sources for several reasons, each of which is sufficient for the Board to reject Patent Owner's proposed construction.

First, the Board should disregard Patent Owner's extrinsic evidence because, as discussed in Section II.A.1, the intrinsic evidence resolves the dispute. In such situation, "it is improper to rely on extrinsic evidence." *Vitronics*, 90 F.3d at 1583. Patent Owner's entire analysis is legally flawed, as it begins with extrinsic evidence and then concludes that its "construction is also consistent with the specification." POR 15-19. The Federal Circuit has soundly rejected this methodology. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1320 (Fed. Cir. 2005) (en banc) (rejecting "a methodology for claim interpretation in which the specification should be consulted only after a determination is made, whether based on a dictionary, treatise, or other source, as to the ordinary meaning or meanings of the claim term in dispute"). Patent Owner cannot use extrinsic evidence to redefine a claim term when its meaning is clear based on the intrinsic record.

Second, Patent Owner's extrinsic evidence does not even mention a "characterization profile," and instead, addresses words like "sensor characterization" or "profile" in different contexts. *See* Exs. 2011-2014, 2029. Patent Owner does not explain how this evidence relates to determining a luminance value. *See* Ex. 2011 (no mention of "luminance"); Ex. 2012 (same); Ex. 2013 (same); Ex. 2014 (same). For example, Patent Owner elsewhere points to an embodiment

where “[t]he light intensity sensor characterization 275 is empirical information about the light intensity sensor 280 that is used to create the LUT 475,” which identifies the luminance value for a given intensity value and color. POR 17-18. None of the extrinsic evidence Patent Owner cites discusses any sort of characterization profile in that context; Thorpe Suppl., ¶¶26-28.

Third, the Board should afford Exhibits 2011, 2012, 2014, and 2029 no weight because Patent Owner does not provide evidence that they represent a skilled artisan's understanding as of the date of the alleged invention. Exhibits 2011, 2012, 2014, and 2029 are dated after the alleged priority date. Patent Owner's attempt to rely on these exhibits as extrinsic evidence fails because Patent Owner has not shown that they inform what a skilled artisan would understand those terms to mean at the time of the alleged invention. *See Phillips*, 415 F.3d at 1312-13. Because Exhibits 2011, 2012, 2014, and 2029 all have dates that suggest publication after the claimed priority date of the '255 patent, the exhibits are “not credible evidence of how one of ordinary skill would have underst[ood] the terms recited in the issued claims.” *Netflix, Inc. v. GoTV Streaming, LLC*, IPR2023-00759, Paper 33 at 77 (P.T.A.B. Oct. 29, 2024).

Fourth, Dr. Papanikolopoulos's testimony should be given no weight because it largely parallels Patent Owner's analysis, and thus, is wrong for the same reasons as Patent Owner's analysis. Ex. 2023, ¶¶77-86. Moreover, Dr. Papanikolopoulos's

credibility is undermined because he proposes the same construction that Patent Owner proposed before institution and during Patent Owner's Request for Rehearing, even though he did not get involved in this proceeding until *after* those briefs were submitted. *Compare* Ex. 2023, ¶¶77-78, 81 *with* POPR 10-12; PORR 3-8; Ex. 1031 at 8:24-9:11. He also largely cites the same evidence that Patent Owner cited in its prior briefs. *Compare* Ex. 2023, ¶¶77-78, 81 *with* POPR 10-12; PORR 3-8. Expert declarations that recite attorney argument warrant little consideration. *See, e.g., Upjohn Co. v. Mova Pharm. Corp.*, 225 F.3d 1306, 1311 (Fed. Cir. 2000).

The single new exhibit Patent Owner cites in support of its proposed construction, Exhibit 2029, actually reinforces the Board's initial construction. Specifically, Patent Owner attempts to distinguish "calibration" from "characterization." Beyond Patent Owner's narrow wordsmithing, even Exhibit 2029 admits that calibration yields a "luminance *calibration coefficient*"—e.g., a conversion factor—that "gives for each pixel of the CCD array the value that links the A/D converter output with the luminance of the pixel-framed surface." *See* Ex. 2029, 1; POR 17. That is consistent with how characterization profile is used in claim 15. That Exhibit 2029 also suggests obtaining different calibration coefficients for different conditions does not change the fact that it supports a calibration coefficient being a type of characterization profile. Ex. 2029, 1-2; Thorpe Suppl., ¶31. The POR later admits as much by stating that "one could create a scale factor

to convert the light intensity factor from a camera sensor into luminance values.”
POR 29.

3. Patent Owner Mischaracterizes Petitioner's Prior Arguments

Patent Owner argues that Petitioner's pre-institution preliminary reply argued that characterization profile “includes ‘a histogram’ ‘of collected data from sensors.’” POR 19 (quoting Paper 8 at 2). Contrary to Patent Owner's argument, Petitioner did not adopt that construction (or any other construction) before institution. Rather, Petitioner pointed out the inconsistencies between Patent Owner's broad interpretation of “characterization profile” in its district court infringement contentions and Patent Owner's overly narrow construction in this proceeding. Paper 8 at 2-3. Petitioner asked the Board to hold Patent Owner to its construction as documented in the district court proceeding to prevent any perceived gamesmanship. *See Scout Energy Mgmt., LLC v. Pilot Intell. Prop., LLC*, IPR2024-00385, Paper 11 at 15 (P.T.A.B. Aug. 9, 2024).

In any event, for the purposes of this proceeding, Petitioner adopts the Board's preliminary construction. Under this construction—and even under Patent Owner's proposed construction—Gallagher in view of Lumia renders obvious claim 15.

B. Gallagher and Lumia Render Obvious Claim 15

Patent Owner argues that Lumia does not disclose determining a luminance value utilizing a characterization profile and contends that a POSITA would not have been motivated to combine Gallagher and Lumia. POR 23-44. The Board should reject Patent Owner's arguments.

1. Lumia Teaches the Limitations of Claim 15

Patent Owner argues that Lumia does not disclose determining a luminance value utilizing a characterization profile for two reasons. First, Patent Owner argues that the "system" described in Lumia's "Experimental Results" section converts directly from intensity to retroreflectivity and therefore never determines "a luminance value." POR 24-33. Second, Patent Owner argues that this same "system" only measured signs of one color and computed a scale factor for that color, so it does not disclose utilizing a characterization profile that satisfies Patent Owner's erroneous construction. POR 14. Both of these arguments depend on ignoring (when convenient) what Patent Owner characterizes as Lumia's "Background." *See* POR 31 (arguing that "Lumia's equation (2) is related to the 'Background' concepts, not how Lumia's system actually works"). Consistent with the Board's preliminary construction of the "characterization profile" term, Lumia teaches "determining a luminance value utilizing the plurality of light intensity values and a characterization

profile of the at least one light intensity sensor.” *See* Ex. 1014 (“Lumia”), 15, 24. The Board should reject Patent Owner’s arguments to the contrary.

Lumia discloses a “realistic approach for a mobile system” to “measure[]” the luminance of the reflected light (L) and illuminance on the retroreflector (E_n) and use these quantities to determine retroreflectivity (R'). Lumia, 16. Because Lumia discloses measuring luminance, Lumia discloses “determining a luminance value,” as claimed. In particular, Lumia’s equation (2) discloses that $R'=L/E_n$. *Id.*; Ex. 1003, ¶61. Lumia discloses that illumination (E_n) can be inferred based on the source intensity and the square of the distance. *Id.* And it discloses that its video camera “creat[es] individual luminance meters at each sensing element site ... so that representative legend and background retroreflectances may be calculated.” *Id.* Lumia’s disclosure that an intensity value from the video camera “corresponds to” a luminance value “when properly calibrated” teaches a POSITA to determine a luminance value, for example, using an intensity value and a scale factor based on the color of the sign, as discussed later in Lumia. *Id.*; *see also id.*, 15 (disclosing a technique for calibrating the system); Thorpe Suppl., ¶¶33, 36.

Accordingly, Lumia discloses “determining a luminance value,” as claimed so that the system can then use that luminance value to determine retroreflectivity. Lumia, 15-17, 24. And using a scale factor corresponding to the color of the sign being measured to convert the intensity values from the video camera to a luminance

value teaches utilizing “a characterization profile of the at least one light intensity sensor,” as claimed. *Id.* This is supported by the testimony of Dr. Thorpe. *E.g.*, Ex. 2025, 50:10-17.

Patent Owner's arguments that Lumia does not disclose utilizing a characterization profile to determine a luminance value fall apart as it later admits that Lumia's scale factor could be used “to convert the light intensity factor from a camera sensor into luminance values.” POR 29. Admitting the feasibility of this, Patent Owner then caveats that this would require “specific techniques,” which “Lumia simply does not disclose.” *Id.* But this ignores the “basic algebra” involved in converting between retroreflectivity and luminance measurements using the equations that Lumia explicitly discloses. *See* Ex. 2025, 39:21-40:13. Moreover, the “specific techniques” that are purportedly required are *exactly* what Lumia discloses. *Compare* POR 29 (citing Exhibit 2029's disclosure of creating “a CCD luminance meter, using a ‘camera calibration procedure’”), *with* Lumia, 16 (disclosing that Lumia's camera “creat[es] individual luminance meters at each sensing element site” such that, “when properly calibrated,” an intensity value “corresponds to” a luminance value).

Lumia also teaches utilizing a characterization profile even under Patent Owner's proposed construction. For example, Lumia teaches determining multiple scale factors, each of which corresponds to a particular color, because it discloses

that its design is “able to accommodate signs of different colors.” Lumia, 15. Patent Owner points to the fact that, in the Experimental Results section, Lumia only describes computing a scale factor for measuring a sign with “white sheeting material.” POR 31, 41-43; Lumia, 24. Patent Owner improperly limits Lumia to only the single experimental setup and ignores the rest of Lumia’s teachings, including measuring signs of multiple colors. Indeed, Lumia also discloses measuring a stop sign, which a POSITA would have understood to be red and to have a different scale factor than the one used to experimentally measure ten signs with “a white background color.” Lumia, 16, 24; Thorpe Suppl., ¶¶33-34. Even limiting Lumia to only signs of one color, Lumia still discloses a characterization profile with “various conditions” because it discloses different modes with different measurement distances, warranting a scale factor for each distance. Lumia, 20; Ex. 2023, ¶76 (Patent Owner’s expert testifying that “[d]ifferent scale factors would be required for different distances”); Thorpe Suppl., ¶33. The experimental setup was only configured for one of the modes and, accordingly, was not intended to cover all situations. Lumia, 24.

Patent Owner argues that using equation (2) requires “undisclosed modifications to the reference” because, according to Patent Owner, “equation (2) is related to the ‘Background’ concepts, not how Lumia’s system actually works.” POR 31-32. Patent Owner’s attempt to ignore part of a printed publication because

that part is purportedly not part of a later-described experimental “system” has no basis in fact or law. Lumia’s use of equation (2) in the *Background* section instead suggests that equation (2) was well-known to a POSITA and reinforces the disclosure, rather than detracting from it. Patent Owner’s argument also disregards that the Background section discusses the goal of its “system” and a “realistic approach for a mobile system” to implement aspects of equation (2). Lumia, 15-16. Even Patent Owner relies on the Background section when describing how “Lumia’s system” purportedly works. *See* POR 27 (citing Lumia, 16-17 for an explanation of Lumia’s software creating a histogram of light intensity values). Lumia’s disclosures cannot be ignored simply because they appear in a Background section, as a reference is prior art for everything that it discloses. *See In re Applied Materials, Inc.*, 692 F.3d 1289, 1298 (Fed. Cir. 2012).

2. A POSITA Would Have Been Motivated to Combine Gallagher and Lumia

Patent Owner does not dispute that (1) Gallagher discloses a system for identifying and tagging road markers “that do not meet the predetermined minimum acceptable reflectance level” specified by the road authorities, Ex. 1005 (“Gallagher”), [0049], [0077]; (2) Gallagher’s light sensor array outputs light intensity values, Paper 1 (“Pet.”) 31-33; POR 26; and (3) Lumia discloses an equation allowing “a mobile system” to determine retroreflectivity by determining,

inter alia, a luminance value, Lumia, 15-16; Ex. 1031 at 23:18-24:18; 28:13-24. Nonetheless, Patent Owner contends that a POSITA would have lacked a motivation to combine Gallagher and Lumia to determine a luminance value utilizing a characterization profile. Yet this ignores pertinent facts and testimony from the references, Dr. Thorpe, and even Patent Owner's expert.

a. Motivation to Determine a Luminance Value

Patent Owner first argues that the combination purportedly lacks a motivation to determine a luminance value. POR 24. Patent Owner argues that road authorities requiring minimum retroreflectivity values would have motivated "creating a system that results in calculating *retroreflectivity* values," not luminance. POR 24-25. The Board has previously found this argument "unavailing." *See* DI 27. As explained above, Lumia teaches a technique for calculating retroreflectivity by first determining luminance. Lumia, 15-16. Petitioner demonstrated why using this equation in Gallagher's system to calculate retroreflectivity would have been obvious, so Petitioner showed a motivation for determining a luminance value. *See* Pet. 14-19, 44-47.

Patent Owner's attempts to distinguish retroreflectivity from luminance as two foreign concepts ignore how basic and closely-related the two measurements are. POR 25; *see* Pet. 15. Dr. Thorpe testified regarding the ease with which a POSITA would be able to calculate luminance and use that value to calculate

retroreflectivity using Lumia's "very basic equation" and why a POSITA would be motivated to do so. Ex. 2025, 39:21-40:13; *see also id.*, 12:2-14; 24:17-25:15. Dr. Thorpe's testimony shows that combining Gallagher and Lumia to determine a luminance value involves "familiar elements according to known methods"—a simple, known equation—and predictably yields a system for measuring retroreflectivity, as Patent Owner recognizes was desired. *KSR Intern. Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007).

Patent Owner characterizes the use of equation (2) in Petitioner's combination as "a product of hindsight rather than actually identifying a motivation for a POSITA." POR 31. But the proposed Gallagher-Lumia combination is based solely on the teachings of Gallagher and Lumia, not hindsight. The Petition and Dr. Thorpe's declaration, in addition to his deposition testimony, both support that the use of equation (2) accounts for only knowledge which was within the level of ordinary skill at the time. *See* Pet. 23-28, 53-56; Ex. 1003, ¶¶116-117; Ex. 2025, 63:17-65:2.

This is not a "new theory," as Patent Owner contends. The Petition pointed to Lumia's teaching of determining a luminance value from the intensity values by calibrating the camera to convert intensity to luminance and Lumia's teaching that "determining the luminance and knowing the illumination allows the retroreflectance to 'be readily obtained'" and argued that it would have been obvious

to incorporate these teachings “to allow Gallagher’s apparatus to calculate the retroreflectivity of road markers.” Pet. 44-47. To the extent Patent Owner argues that Dr. Thorpe elaborated on this theory during his deposition, Patent Owner opened the door by repeatedly questioning Dr. Thorpe on the motivation to combine Gallagher and Lumia. *E.g.*, Ex. 2025, 39:21-40:13, 12:2-14; 24:17-25:15. No new theories have been raised, as Dr. Thorpe defended his previous positions. Further, Petitioner is entitled to rely on new evidence that “is a legitimate reply to evidence introduced by the patent owner.” *Anacor Pharm., Inc. v. Iancu*, 889 F.3d 1372, 1380-81 (Fed. Cir. 2018). Any evidence that Petitioner cites in this reply is in furtherance of the same obviousness theory asserted in the Petition and in reply to the evidence introduced by Patent Owner, as is proper.

The fact that Lumia may disclose *another* technique for determining retroreflectivity does not motivate against combining Gallagher and Lumia. POR 32. “[T]he ‘mere disclosure of more than one alternative’ does not amount to teaching away from one of the alternatives where the reference does not ‘criticize, discredit, or otherwise discourage the solution claimed.’” *SightSound Techs., LLC v. Apple Inc.*, 809 F.3d 1307, 1320 (Fed. Cir. 2015). Lumia does not discourage equation (2) to determine luminance and then determine retroreflectivity. To the contrary, it describes how each of the “quantities” in equation (2) can be “measured” for “a mobile system.” Lumia, 16. Patent Owner’s attempts to characterize Petitioner’s

combination as modifying Lumia or as Lumia motivating against determining luminance improperly disregard Lumia's explicitly disclosed technique for determining retroreflectivity in a mobile system, even if a later-disclosed experimental system combines determining luminance and then determining retroreflectivity into a single step. *Id.*

Patent Owner also argues that "Lumia contains no description of how to actually measure or calculate E_n in its automated system." POR 32-33. This disregards Lumia's disclosure "to use the inverse-square law to infer the illumination from the source intensity, or $E=I/d^2$, where I is the intensity and d is the distance from the source to the detector." Lumia, 16; Ex. 1003, ¶61 (Petitioner's expert explaining this formula). When presented with this question at his deposition, Dr. Thorpe identified such disclosure in Lumia. Ex. 2025, 12:20-13:8. Patent Owner's own expert recognizes this disclosure, as he testified that " E_n is inversely proportional to the square of the distance to the detector." Ex. 2023, ¶76 (citing Lumia, 16).

Patent Owner argues, in passing, that "Gallagher nor Lumia disclose determining luminance values as part of an automated process for calculating retroreflectivity." POR 25. This argument should be rejected because Petitioner demonstrated how Gallagher teaches an automated system and why it would have been obvious to incorporate the teachings of Lumia, into Gallagher's automated

system. *See* Pet. 36-37, 44-47; Ex. 1003, ¶¶80-81. Patent Owner's argument improperly attacks the references individually, rather than as a combination. *See Palo Alto Networks, Inc. v. Centripetal Networks, LLC*, 122 F.4th 1378, 1386 (Fed. Cir. 2024).

b. Gallagher benefits from the proposed combination with Lumia

Patent Owner next argues that there would be no motivation to combine Gallagher and Lumia because Gallagher purportedly “already teaches determining whether road markers meet published standards for minimum retroreflectivity levels.” POR 34-36. But Gallagher instead determines a *different* value—coefficient of *luminous intensity*—not the coefficient of *retroreflectivity*. Gallagher, [0067], FIG. 5; Ex. 1003, ¶¶89, 116-117.

After Gallagher's computer processing system determines what data from its sensor indicates road markers, the system “determin[es] the reflectance level of the road marker in a value of millicandela per Lux (CIL).” Gallagher, [0066]-[0067]. Figure 5, below, represents the reflectance levels in “mcd/lux” for each of the front and rear faces of road markers along a stretch of road, as compared to a “threshold minimum acceptable reflectance level B.” *Id.*, [0078]-[0079], FIG. 5.

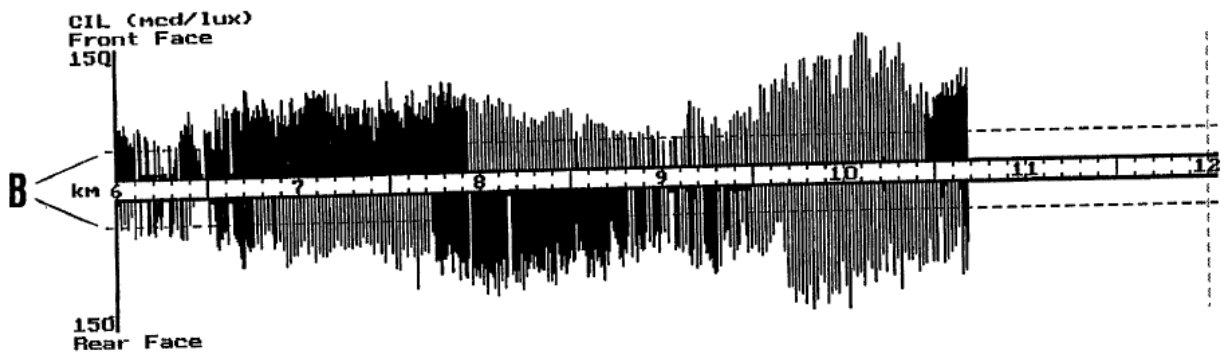


Figure 5

Id., FIG. 5.

Meanwhile, Lumia discloses that retroreflectivity is a different coefficient, expressed in millicandelas per lux *per meter squared*. *See* Lumia, 16; Ex. 2023, ¶¶71 n.2, 89 (explaining that “Lumia discloses that coefficient of retroreflection is measured in candelas per footcandle per square foot,” that “[t]he metric equivalent units would be candelas per lux per square meter,” and that the units could use millicandelas instead of candelas). This shows that Gallagher and Lumia disclose measuring different reflective properties and supports why a POSITA would have found it obvious to combine Gallagher and Lumia “to allow Gallagher’s apparatus to calculate the retroreflectivity of road markers,” as proposed in the Petition. Pet. 44-47. Patent Owner’s argument that Dr. Thorpe’s testimony “provides no apparent benefit obtained from combining Lumia with Gallagher” is without merit. *See* Ex. 2025, 39:21-40:13; *see also id.*, 12:2-14; 24:17-25:15 (responding with several reasons a POSITA would be motivated to combine Gallagher with Lumia).

c. The Compatibility of Gallagher and Lumia

Patent Owner next asserts that the teachings of Lumia are “fundamentally incompatible with Gallagher’s apparatus,” focusing on perceived differences between Gallagher’s and Lumia’s implementations. POR 36-40. Patent Owner’s argument is legally flawed. “The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference[.]” *Allied Erecting & Dismantling Co. v. Genesis Attachments, LLC*, 825 F.3d 1373, 1381 (Fed. Cir. 2016) (quoting *In re Keller*, 642 F.2d 413, 425 (C.C.P.A. 1981)). Instead, the question is whether “a skilled artisan would have been motivated to combine the teachings of the prior art references to achieve the claimed invention[.]” *Id.* Whether a secondary reference can be incorporated into a primary reference is “basically irrelevant” because the test is “whether the claimed inventions are rendered obvious by the teachings of the prior art as a whole,” “not whether the references could be physically combined.” *In re Etter*, 756 F.2d 852, 859 (Fed. Cir. 1985).

Petitioner provided ample reasons why a POSITA would have combined Gallagher and Lumia and why a POSITA would have reasonably expected success in doing so. *See* Pet. 44-47; Ex. 1003, ¶¶114-117. Patent Owner ignores the common objectives and underlying principles of both Gallagher and Lumia, including the use of a light intensity sensor, a computer processing system, calibration techniques, and

a fixed measurement window. *Compare* Gallagher, [0009], [0035]-[0038], [0040], [0055]-[0056],[0066]-[0067] *with* Lumia, 15-17. The Petition accounted for these similarities and demonstrated why it would have been obvious to implement Lumia's teachings in Gallagher's system, resulting in a system that satisfies each limitation of claim 15. *See* Pet. 44-47.

Dr. Thorpe explains why Patent Owner's arguments are flawed. Thorpe Suppl., ¶¶33-37. For example, Patent Owner largely focuses on "Lumia's histogram method" to "find peaks." POR 37-40. But Petitioner did not propose incorporating Lumia's so-called "histogram method," as Gallagher already has its technique for detecting which intensity values indicate a reflective surface of a road marker. *See* Pet. 44-47; Gallagher, [0060]-[0067]. Lumia determines retroreflectivity from an "average" intensity value. Lumia, 16-17; Gallagher, [0056]-[0057]. Even if Gallagher's light sensor has fewer sensing elements than Lumia's, Lumia's teachings are still compatible because Lumia teaches how to take Gallagher's intensity values and determine luminance and retroreflectivity. Lumia, 16-17. Patent Owner's remaining arguments likewise focus on aspects of Lumia not incorporated into the combination. POR 38-40. These arguments cannot show incompatibility between Gallagher and Lumia. To the extent Patent Owner limits Gallagher to a single embodiment that utilizes ten photodiodes in its light intensity sensor array, this argument improperly limits Gallagher, which discloses that "[a] variety of light

sensors” are “suitable” in its apparatus and suggests increasing the number of sensors to ensure “a relatively small viewing angle” for each sensor. POR 37; Gallagher, [0039]-[0040]. Larger photodiode arrays were well known in the art, and a POSITA would have known how to expand an array to add a desired number of photodiodes. *See, e.g.*, Ex. 1006 (“Schofield”), 4:16-33, 8:38-45, 10:18-29, Fig. 4. Indeed, the state-of-the-art supports a reasonable expectation of success because Schofield discloses using *either* a CCD array (as in Lumia) *or* “photo diodes” (as in Gallagher) to accomplish similar techniques, suggesting that processing techniques compatible with a CCD array are likewise compatible with a photodiode array. Schofield, 8:38-45, 10:66-12:46.

d. The Sufficiency of the Petition's Explanation

Patent Owner concludes by referring back to its prior motivation arguments and arguing that the Petition's theories “are legally insufficient.” POR 40-41. For the reasons explained above, the Board should reject this argument. Petitioner complied with the law's specificity requirements for showing a motivation to combine Gallagher and Lumia.

3. Patent Owner's Arguments Regarding the Gallagher-Lumia Combination Fail

Patent Owner repackages its prior motivation arguments into improper attacks on the references individually. POR 41-44. These arguments should be rejected for

the reasons explained above. For example, Patent Owner argues that Gallagher's automated method does not disclose determining a luminance value, and Lumia's method of determining a luminance value does not disclose an automated method. POR 41-43. Patent Owner also argues that Lumia does not disclose utilizing a characterization profile. POR 43-44. But Petitioner instead relies on a *combination* of Gallagher and Lumia, which satisfies each element of claim 15. The Federal Circuit has emphasized that attacks on the references individually are improper where, as here, the Petition relies on a combination of references. *Palo Alto*, 122 F.4th at 1386.

C. Level of Skill in the Art

Patent Owner argues that Petitioner relies on an “excessive level” of skill in the art. POR 13. Yet Patent Owner and Dr. Papanikolopoulos do not dispute the qualifications of a POSITA, *cf. id.*; Ex. 2023, ¶57; instead, both only contend that Petitioner's requirement for a POSITA to possess at least four years of experience should instead be two years. *Id.* Yet Patent Owner submits no evidence for its conclusion, and submits that the outcomes would not change based on the difference between its unsupported level of skill and the level of skill Petitioner and Dr. Thorpe provided. POR 13-14. And in its Institution Decision, the Board found Petitioner's proposed level of skill reasonable “[b]ased on the arguments presented and the cited references.” DI 18. Thus, Patent Owner fails to demonstrate this “dispute” has any

material impact on its bases challenging the unpatentability of claim 15. Accordingly, the Board should again adopt Petitioner's proposed level of skill in the art.

In any event, Dr. Thorpe testifies that his opinions would not change if the Board adopted a level of skill requiring only two years of experience. Thorpe Suppl., ¶¶ 22-24.

III. CONCLUSION

For the reasons explained above and in the Petition, claim 15 of the '255 patent should be canceled.

Date: September 17, 2025

Respectfully Submitted,

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CERTIFICAION OF WORD COUNT

Pursuant to 37 C.F.R. § 42.24, Petitioner certifies that the word count of Petitioner's Reply (exclusive of any table of contents, table of authorities, mandatory notices under § 42.8, certificates of service and word count, and list of exhibits or claim listing) as measured by Microsoft Word is 5,545.

Dated: September 17, 2025

/Cory C. Bell/
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CERTIFICATE OF SERVICE

The undersigned certifies that a copy of the foregoing **Petitioner's Reply to Patent Owner's Preliminary Response** was served electronically via email on September 17, 2025, in its entirety on the following:

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