

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

VOLKSWAGEN GROUP OF AMERICA, INC., AND
PORSCHE CARS NORTH AMERICA, INC.,*
Petitioner,

v.

YECHEZKAL EVAN SPERO
Patent Owner.

U.S. Patent No. 10,894,503 to Spero

Case No.: IPR2023-00328

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

* Porsche Cars North America, Inc., while filed a petition in IPR2023-01320, has been joined as a party to this proceeding.

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List of Exhibits

Exhibit No.	Description
2001	Declaration of Matthew A. Turk, Ph.D.
2002	Curriculum Vitae of Matthew A. Turk, Ph.D.
2003	Best Practices and FAQs for Filing Requests for Reexamination Compliant with 37 CFR 1.510 and 1.915, PTAB, May 2010
2004	Petition challenging U.S. Patent No. 10,894,503, <i>Volkswagen Group of America, Inc. v. Yechezkal Evan Spero</i> , IPR2023-00197, Paper 1, November 30, 2022
2005	Petition challenging U.S. Patent No. 10,894,503, <i>Volkswagen Group of America, Inc. v. Yechezkal Evan Spero</i> , IPR2023-00328, Paper 2, December 16, 2022
2006	Second Declaration of Matthew A. Turk, Ph.D.
2007	Transcript of Deposition of Jianzhong Jiao, Ph.D. taken on August 2, 2023, <i>Volkswagen Group of America, Inc. v. Yechezkal Evan Spero</i> , IPR2023-01586
2008	Petition challenging U.S. Patent No. 9,995,551, <i>Volkswagen Group of America, Inc. v. Torchlight Technologies LLC</i> IPR2023-00318, Paper 2, December 22, 2022
2009	Declaration of Dr. Jiao, <i>Volkswagen Group of America, Inc. v. Yechezkal Evan Spero</i> , IPR2023-00318, Exhibit 1003.
2010	Jianzhong Jiao and Ben Wang, “Etendue Concern for Automotive Headlamp Using LEDs,” SPIE Proceedings Vol. 5187, (January 2004) (Available at https://www.spiedigitallibrary.org/conference-proceedings-of-spie/5187/0000/Etendue-concerns-for-automotive-headlamps-using-white-LEDs/10.1117/12.504363.short)
2011	Michael Bass, <i>Handbook of Optics</i> 3 RD Edition Volume II, (McGraw-Hill, 2010) (Available at https://www.worldcat.org/title/555545456)
2012	Ben Wang and Jianzhong Jiao “Studies for Headlamp Optical Design Using LEDs,” SAE Technical Paper Series 2004-01-0434, (March 2004) (Available at https://www.sae.org/publications/technical-papers/content/2004-01-0434/)
2013	Ben Wang and Jianzhong Jiao “Optical Transform Limitations

Exhibit No.	Description
	in Headlamp Photometric Performance,” SAE Technical Paper Series 2005-01-0861, (April 2005) (Available at https://www.sae.org/publications/technical-papers/content/2005-01-0861/)
2014	Intentionally left blank
2015	Jianzhong Jiao and Ben Wang “High-Efficiency Reflector Optics for LED Forward Lighting,” SPIE Proceedings Vol. 6670, (September 2007) (Available at https://www.spiedigitallibrary.org/conference-proceedings-of-spie/6670/66700M/High-efficiency-reflector-optics-for-LED-automotive-forward-lighting/10.1117/12.730524.short)
2016	Navigant Consulting “Energy Saving Estimates of Light Emitting Diodes in Niche Lighting Applications” Building Technologies Program Office of Energy Efficiency and Renewable Energy U.S. Department of Energy (September 2008) (Available at Energy Savings Estimates of Light Emitting Diodes in Niche Lighting Applications (Technical Report) OSTI.GOV.)
2017	PCT Publication No. WO 86/05147 to Flaaten
2018	Transcript of Deposition of Jianzhong Jiao, Ph.D. taken on August 23, 2023, <i>Volkswagen Group of America, Inc. v. Yechezkal Evan Spero</i> , IPR2023-00315, IPR2023-00318.
2019	Intentionally left blank
2020	Michael Bass, <i>Handbook of Optics</i> 3 RD Edition Volume V, (McGraw-Hill, 2010) (Available at https://www.worldcat.org/title/557121959.)
2021	Texas Instruments/Digikey “How DLP Technology Works,” (Available at https://www.digikey.com/en/product-highlight/t/texas-instruments/dlp-technology.) (Accessed September 12, 2023.)
2022	Texas Instruments “Introduction to +/- 12 Degree Orthogonal Digital Micromirror Devices (DMDs)” (Available at https://www.ti.com/lit/an/dlpa008b/dlpa008b.pdf?HQS=dis-dk-null-digikeymode-dsf-pf-null-ww&DCM=yes&distId=10) (Accessed September 12, 2023.)
2023	<i>Intentionally left blank.</i>
2024	<i>Intentionally left blank.</i>

Exhibit No.	Description
2025	Transcript of Deposition of Jianzhong Jiao, Ph.D. taken on October 3, 2023, <i>Volkswagen Group of America, Inc. v. Yechezkal Evan Spero</i> , IPR2023-00197, -00328, -00335
2026	Transcript of Deposition of Jianzhong Jiao, Ph.D. taken on January 29, 2024, <i>Volkswagen Group of America, Inc. v. Yechezkal Evan Spero</i> , IPR2023-00197, -00328, -00335

I. Introduction

Petitioner's unclear argument combinations, perpetuated by Petitioner's expert Dr. Jiao, fail to prove all challenged claims are unpatentable. (Reply, 1.)

II. Dr. Turk Qualifies as a POSA

Dr. Turk's declarations (Ex.2001; Ex.2006) should not be excluded and given weight because he is a POSA in every sense. (Reply, 2-5.) To maintain the artifice that Dr. Turk is not even a POSA, Petitioner and Dr. Jiao disregard aspects of their POSA standard, namely the inclusion of a sliding scale for higher levels of education and the relevance of imaging, sensing and optics within automotive lighting and lighting control experience. (Ex.1003, ¶¶42-44; Ex.2007, 14:1-10, 16:1-13, 113:11-114:9, 119:5-13, 119:22-120:5.)

On Reply, Petitioner winnows the POSA qualifications, so the reinterpreted POSA mirrors Dr. Jiao. Through the lens of this narrow interpretation, Petitioner dismisses the impact of Dr. Turk's PhD, 20+ years of experience with optics and sensing/imaging, and three years of experience designing an autonomous vehicle system where vehicle lighting and lighting control systems played "an important part." (Ex.1054, 53:4-54:8.) Under Petitioner's full POSA definition, Dr. Turk is, without question, a POSA.

PO contests Petitioner's myopic interpretation, which ignores how central optics, sensing and imaging are to the '503 Patent. PO submits that the POSA

analysis from PO's preliminary response comports with the Federal Circuit's POSA determination factors, supporting why the "patent's purpose/teachings" and "problems/solutions in the art," results in a POSA with "experience in the field of optical and imaging systems." (POPR, 9; Ex.2001, ¶¶28-30.) *See, Daiichi Sankyo Co. v. Apotex, Inc.*, 501 F.3d 1254, 1256 (Fed. Cir. 2007); *DyStar Textilfarben GmbH & Co. Deutschland KG v. C.H. Patrick Co.*, 464 F.3d 1356, 1362–63 (Fed. Cir. 2006); *Best Medical International, Inc. v. Elekta Inc.*, 46 F.4th 1346, 1353 (Fed. Cir. 2022). PO explained that a skilled artisan developing a lighting system utilizing LEDs and corresponding controls would have encountered new challenges with respect to both optics and LED controls. (POPR, 9; Ex.2001, ¶¶31-33; Ex.2006, ¶¶25-44.)

The parties agree that 1) the purpose of a patent is "relevant in determining the [POSA] standard" (Ex.2026, 64:3-7); 2) the '503 Patent's purpose is "utilizing real-time sensor data for the purpose of adaptive illumination" to prevent glare in visual task applications (*Id.*, 11:18-12:1, 43:2-21); 3) all claims obtain/use sensor data to control illumination (*Id.*, 21:2-6, 21:19-22:2, 34:6-15); 4) the field of optics is relevant to the '503 Patent (*Id.*, 44:1-3); and 5) image processing and knowledge regarding "sensing technology" is relevant for automotive lighting experience and pedestrian detection. (*Id.*, 44:6-45:4.) Dr. Turk's expertise is thus indisputably relevant to the technical fields and purpose of the '503 Patent, qualifying him as a

POSA.

III. Dr. Jiao's POSA positions raise credibility flags

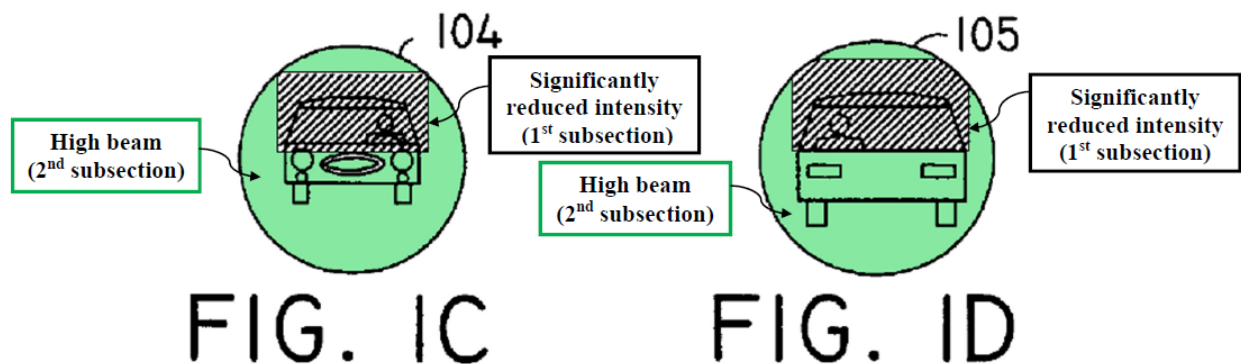
Dr. Jiao invokes the “understanding” of a POSA to backfill missing teachings and attack Dr. Turk’s balanced explanations of understandable terminology in ways that contradict Dr. Jiao’s prior positions and bring into question his credibility.

Dr. Jiao contends “Dr. Turk appears to not understand what the term ‘intensity’ means” when Dr. Turk equates ‘reduce intensity’ to ‘change from one level of illumination to a lower level of illumination’.” (Ex.1051, ¶13.) In Dr. Jiao’s declaration from related IPR2023-00318, however, Dr. Jiao previously opined: 1) “Reducing illumination is ‘changing emission’ as claimed because the reduced illumination lowers the intensity of the LEDs;” and 2) “Beam reduces the illumination of the LEDs in the selected group, which a POSA would have understood as reducing ‘intensity’ of the LEDs as claimed.” (Ex.2009, ¶¶145, 147; Ex.1003, ¶280; Petition, 27, 39.) His original Declaration also regularly uses “intensity” in the context of “brightness” and describes “intensity” separately from directionality/aiming. (Petition, 25, 28, 31, 37, etc.; Ex.1003, ¶¶52, 75, 77, 79, 171, etc.) Indeed, in IPR2023-00335, there can be no clearer an indicator of “intensity” as synonymous with “brightness” than Petitioner and Dr. Jiao’s use of a parenthetical “(brightness)” to explain “intensity” “intensity(brightness) of a

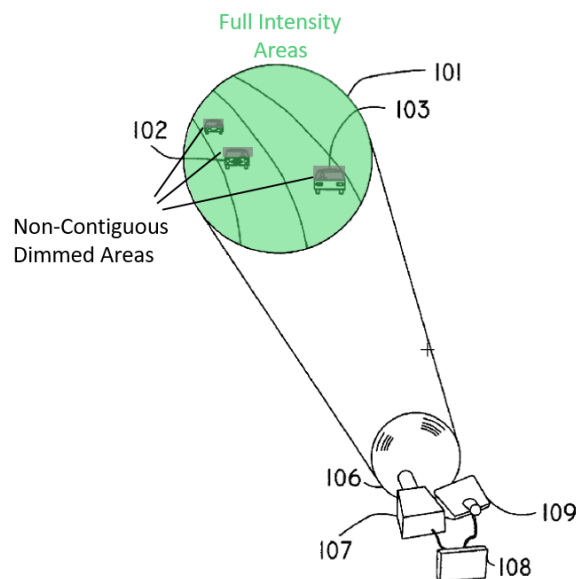
lamp/LED changes based on the power (current) applied.” (Petition, 35, 129; Ex.1003, ¶¶205, 666.)

Yet, Dr. Jiao now invokes the POSA to belatedly change his stance: “a POSA would have readily understood that ‘intensity’ refers to . . . luminous flux per unit solid angle ... not, contrary to Dr. Turk’s misunderstanding, an illumination brightness level or . . . synonymous with “brightness[.]” (Ex.1051, ¶15.) Dr. Jiao’s belated construction of “intensity” is however inconsistent with the ‘503 Patent – it impermissibly conflates *intensity* and *spatial light distribution*. According to the ‘503 Patent: “spatial light distribution of the light source refers to the luminous flux emanating from the light source 411 at various candle power intensities as a function of the angle” (Ex.1001, 58:29-32) and thus *intensity*, which Dr. Jiao acknowledges is a different light characteristic from *spatial light distribution* per claim 42, cannot also mean “luminous flux per solid angle.” (Ex.2026, 89:14-90:22.)

In another example, Dr. Jiao now contends “Beam discloses a system that includes at least *both* low beam and high beam ...” (Ex.1051, ¶¶79, 103.) Dr. Jiao’s original declaration includes no explanation of high and low beam illumination (outside the glare reduction zone) in Beam. Indeed, Dr. Jiao has even submitted annotated figures of Beam showing the *whole scene* lit with “high beam” light.



(Ex.1003, ¶¶84, 88, 108, 101, 124, 125, 126, 130, 140, 145.)



(Ex.2009, ¶149.)

In complete disregard of his prior positions, Dr. Jiao uses “a POSA would have understood” approach to obfuscate. (Ex.1051, ¶¶79, 103.) The only “evidence” Dr. Jiao cites for “low beams” is a teaching about what Beam defaults to when it malfunctions. (*Id.*, ¶103 citing Ex.1005, 6:40-44.) Then, based on how Beam deals with a system failure, Dr. Jiao contends that Beam “includes” low

beams as part of its normal operations — despite the express “maximum intensity” teachings in Beam and Dr. Jiao’s prior opinion that “maximum/full intensity” illumination is used everywhere outside the glare-reduction region(s). (Ex.1005, 6:9-12; Ex.1003, ¶186.)

Dr. Jiao’s testimony raises several other flags: 1) he uses **his** POSA to further alter the plain meaning of “source,” “microbeam” and “SLM” without requisite evidentiary support *See, Arendi S.A.R.L. v. Apple Inc.*, 832 F.3d 1355, 1361 (Fed. Cir. 2016) (absent a “coherent analysis” regarding why the alleged POSA knowledge would be “common sense,” Petitioner’s attempt fails); 2) he uses claim 4 in Beam to modify Beam’s LED/SLM “replacement” teaching (Ex.2026, 72:21-73:12, 75:8-16); and 3) he confirms that he used his own perspective to analyze “what a POSA would know” in July 2002. (*Id.*, 133:12-134:9.) The law clearly contrasts a POSA with one of “expert skill” and establishes that it is improper to “determine the challenged claims’ patentability from an expert’s perspective rather than the POSA’s perspective.” *McCoy v. Heal Systems, LLC*, 850 Fed. Appx. 785, 788 (Fed. Cir. 2021).

There is a clear disconnect between the record evidence and Dr. Jiao’s testimony, including a myriad of self-contradictions. Dr. Jiao also misapplied an expert (rather than POSA) perspective. As Dr. Jiao’s testimony is demonstrably hindsight-driven, inconsistent, and often devoid of record and legal foundation, it

should be given less weight than Dr. Turk’s more balanced approach. *RayVio Corp. v. Nitride Semiconductors Co., Ltd.*, IPR2018-01141, Paper 39 (PTAB Dec. 2, 2019) (“[W]e determine that Dr. Doolittle’s testimony is entitled to less weight than Dr. Fitzgerald’s because Dr. Doolittle’s testimony contradicts Ozaki’s express disclosure.”).

IV. PO’s “Particularity” Argument is not Meritless / Petitioner has no explanation for the 60+ arguments advanced in the Petition

On Reply, Petitioner asserts that “there are only two sets of grounds here ... Beam-Thominet, and ... Karlsson-Harbers” (Reply, 5) – ignoring “Beam alone,” “Karlsson alone,” and the myriad “additional/alternative” combinations (e.g., Thominet Software – Petition, 10-14; Thominet Hardware I – Petition, 14-15; Thominet Hardware II – Petition, 15-16.)

PO did not “artificially create” *any* grounds — the grounds exist because Petitioner presented numerous alternative software/hardware combinations that resulted in at least 61 grounds. Despite significant prejudice, PO had to address all grounds – lest Petitioner reply by pivoting to an alternative ground, which is exactly what Petitioner did.

V. The Particularity Shortfalls are Exacerbated on Reply

Petitioner’s generalized arguments fail to tie many of its reply arguments to a particular combination of hardware and software. Generic statements referencing

“Beam-Thominet” or “Karlsson-Harbers” thus continue to: 1) materially prejudice PO’s ability to respond effectively; and 2) impose a burden on PO and the Board to “figure out” how the generalized argument applies to each possible combination.

Many reply arguments reference elements only present in a particular sub-combination, though the underlying explanation addresses a general combination (e.g., “Beam-Thominet”). This is problematic when the general combination (e.g., “Beam-Thominet”) also includes alternative combinations lacking such elements. *See*, Reply, 14, where Petitioner is arguing “Beam-Thominet’s lamp/LED/SLM” can “organize Beam’s array of microbeams into multiple directional regions” as taught by Thominet.”

“Lamp/LED/SLM” is confusing because the three terms are not interchangeable and no combination included both an SLM and LED array. Instead, Petitioner argued “Beam’s LED array has the same functionality as lamp 202 and SLM 203.” (Petition, 9, 14.) Further, “organiz[ation] ... into multiple direction regions as taught by Thominet” requires Thominet’s software — which is only combined with the lamp+SLM embodiment and not the LED embodiment. (*Id.*, 11-13, Reply, 14; Ex.1003, ¶124.) This imprecise argument style compounds the underlying lack of particularity, sowing confusion.

As another example, Petitioner argues “Beam’s headlight beams are directional ...” (Reply, 19.) Petitioner then presents arguments about controlling

the direction of Beam's microbeams. (*Id.*, 19-20.) Despite only arguing Beam (although there is no Beam-Kobayashi combination), halfway through the explanation Petitioner purports to “modify Beam-Thominet/Beam-Thominet-Stam” in view of Kobayashi. (*Id.*, 20; Petition, 53, 62.)

In order to rely the combinations that include Thominet/Thominet-Stam, the combinations must include use of Thominet or Thominet-Stam. Petitioner originally relied on a software function of Thominet and then switched to a hardware argument, ignoring that there is not a combination that has both from Thominet. (Petition, 55, 59.) Now, on Reply, Petitioner argues that Beam alone has the necessary elements. (Reply, 20.) If that is true, there is no need for Thominet.

The above exemplifies Petitioner's strategy — presenting a mishmash of parts and hoping the Board will divine a tenable unpatentability combination. (DI, 19 FN9.) But “Judges are not like pigs, hunting for truffles buried in briefs ...” *See, Apple Inc. v. Qualcomm Inc.*, IPR2018-01276, Paper 32, 6 (PTAB Feb. 3, 2020).

VI. Petitioner fails to apply their proofs to the claim language

Instead of proving the claimed steps are present in the art, Petitioner attempts to prove that “comparable” results are present. On at least two occasions, the Reply cites the output of Beam or Karlsson as “proof” of the claimed steps Beam or Karlsson use to achieve glare reduction. (Reply, 6-10.)

A. Petitioner’s proof for how Beam achieves glare reduction demonstrates that Beam does not determine “illumination” for the first subsection

1. Claim 26.4

Petitioner’s new argument that Beam *determines illumination for a first subsection*” is predicated on incorrectly treating Beam’s results as a proxy for Beam’s control. (Reply, 6-7.) In its original “proof,” “Beam determines “which ... rays of light must be extinguished” to “prevent[]” illuminating certain areas.” (Petition, 21, 23.) Determining which light should be “extinguished” is not a determination of illumination for the first section. (POR, 40.)

For its reply “proof,” Petitioner merely points to an end-result — Beam having “less than low-beam” illumination in the shaded section. (Reply, 6-7.) In addition to being a new argument, this result-oriented analysis does not prove that Beam determines illumination for the glare-reduction region (the “remaining” spillover illumination). (*Id.*, 7; POR, 44; Ex.1005, 2:65-3:3, 6:44-47.)

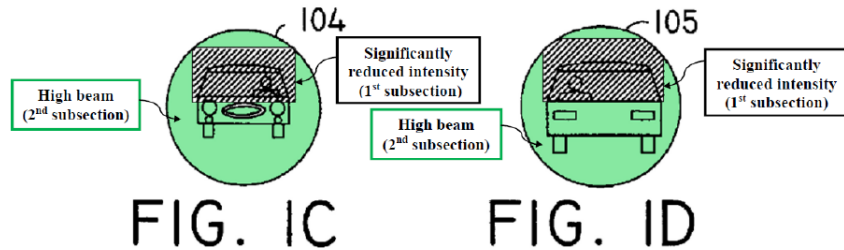
2. Claim 65.3/65.5/65.6

For claim 65, Petitioner presents a similarly specious “result-oriented” argument, contending that “Beam illuminates the first subsection below a predefined illuminance” (Reply, 9.) The limitation is “determining illumination for the first subsection that illuminates the first subsection below the predefined illuminance”. Beam “extinguishes” illumination directed at the subsection. (POR, 43.) This is

done to “prevent [a beam] from illuminating certain areas.” (Petition, 23.) “Preventing illumination” of the areas is not “determining illumination [for those areas] that illuminates” (POR, 43.) That some illumination may spill over from illumination aimed elsewhere does not prove that Beam determines the level of spillover for the first subsection. Petitioner’s analogous proof for claims 26/65 relies on a co-extensive single region outside the glare-reduction zone. (Reply, 6-11.)

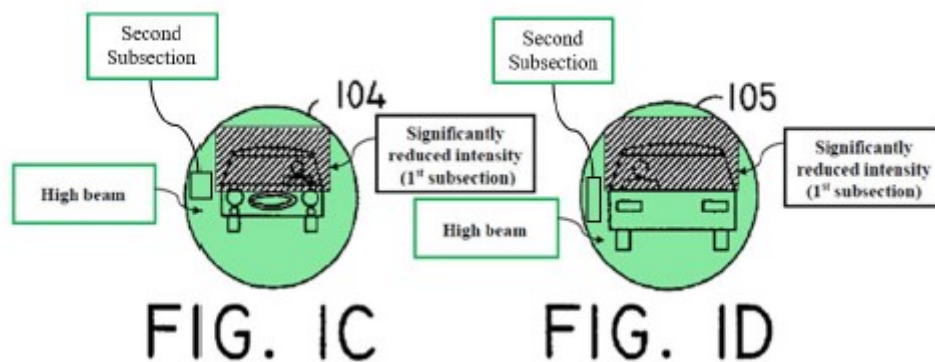
3. Claim 26.5 – Petitioner’s impermissibly proffered “2nd subsection” includes the vehicle

The Petition includes a single paragraph referencing “a second subsection,” accompanied by a figure showing the “2nd subsection” as the entire “high beam” section.



EX1005, FIGS. 1C-1D (annotated).

(Petition, 25-26; Ex.1005, FIGS. 1C-1D annotated.)



(Reply, 8.)

Petitioner's reply subdivides the section it originally identified as "the" second subsection, impermissibly creating multiple "second subsections" and a new argument. (Reply, 8.)

Petitioner argues that claim 26 does not specify the boundary of the second subsection relative to the first. (Reply, 7.) The claim does, however, specify that the second subsection does *not include the second vehicle*. Beam cannot *determine illumination requirements ... based on the data sensed by the sensors ... including determining illumination ... for at least a second subsection ... not including the vehicle*. Beam determines the location of the sources of light, determines an

“area,” blanks illumination aimed at the area, and leaves the rest of the illumination at high beam. (Ex.1005, 5:35-54, 6:19-24.) If the Board considers the illumination “determined” for the “second subsection,” it is determined for the entire second subsection. That section as originally identified does not meet the limitation of claim 25.5 and Beam cannot break that section up.

That Petitioner/Dr. Jiao subdivide the area outside the glare-reduction zone is immaterial; Beam cannot. Petitioner admits that the function of Beam is to determine “sources of illumination.” (Ex.1003, ¶¶140, 146, 152, 171.) A vehicle extends beyond its headlamps. Beam has no knowledge of the vehicle, let alone where the vehicle is or is not located in the alleged second subsection.

4. Claim 65.4 – a non-coextensive 2nd subsection renders this proof deficient

The new reply argument that the 2nd subsection is not “coextensive” is also unpersuasive. (Reply, 7.) Petitioner uses the same 2nd subsection and explanation for its proof of [65.4], which recites “at least one or more second subsections, to either side of the first vehicle,” simply stating “the features of [65.4] are included in [26.5].” (Petition, 43.) Assuming *arguendo* that the second subsections were not coextensive, Petitioner’s claim 65 proof is *per se* deficient, as it fails to identify separate, second subsections “to either side of the vehicle.” As Petitioner presently interprets the claims on Reply, the different words “not including the second

vehicle” and “to either side of the vehicle” have no meaning. (Reply, 7.)

B. Petitioner cannot maintain a consistent explanation for Karlsson’s Figure 14 disclosure

Petitioner presents conflicting explanations of the Fig. 14 window 50 — contending that it demonstrates both output under normal operation and under glare reduction situations, despite Karlsson not teaching that it is either. (See, Reply, 10, 16.)

Petitioner’s posited that the areas outside region 50 were “no intensity” areas achieved by suppressing illumination. (Petition, 93.) Petitioner restates its position (modifying “no intensity” to “dimmed”) on Reply: “dimmed LEDs outside of beam 50 correspond to subsections where headlights are detected.” (Reply, 11.) This necessarily means that prior to “suppression,” those LEDs were in use. Both parties thus agree that Karlsson uses the full array, except for areas it is actively “suppressing.” (Ex.1010, 2:7-9.) Per Petitioner, the “unsuppressed” LEDs in window 50 are “high intensity,” and “the remaining areas of light beam 7 are left at full intensity ...” (See, IPR2023-00318, Ex.2008, 66.) Thus, the pre-suppression state of all LEDs must be “full intensity.”

Petitioner then pivots to a conflicting explanation, presenting window 50 as “a subset of the LEDs available;” treating the regions outside of window 50 as LEDs Karlsson is simply not using. (Reply, 16.) However, under their latest

interpretation, there would be no active LEDs to “suppress.” Conveniently, Petitioner’s dual, conflicting explanations result in the exact same output pattern of Fig. 14.

Petitioner is thus proposing that Karlsson “normally” only uses the window 50, then, when light is detected, Karlsson turns on all the LEDs outside window 50, only to immediately suppress them for “glare control.” Neither Karlsson nor the state-of-the-art support Petitioner’s strained and conflicting interpretations. (See Ex.2006, ¶26-44; Exs.2011-2013; 2015-2016; 2020-2022.)

Karlsson does not describe Fig. 14 as representative of any specific operational state. (POR, 58; Ex.2006, ¶260.) Though Karlsson is thin on details, the only consistent and rational explanation is that Fig. 14 is an illustrative example of how a shifting window of light can address situational glare related to vehicle movement (described immediately thereafter). (POR, 64; Ex.2006, ¶279.)

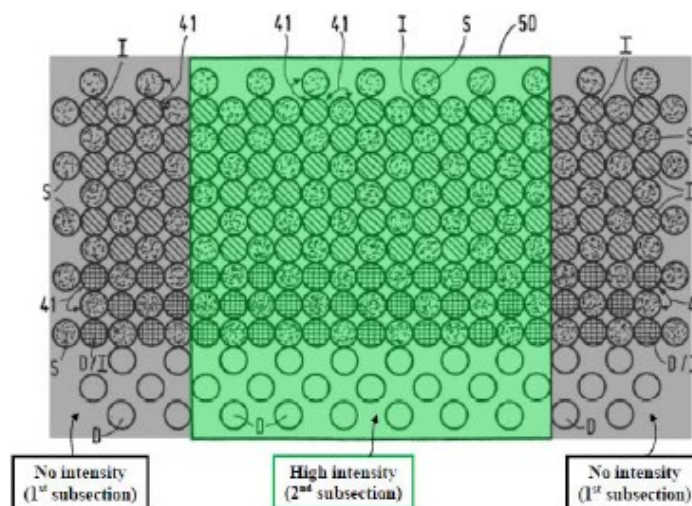
C. Petitioner still has not shown how “unsuppressed” regions “do not include a vehicle” [26.5].

To backfill missing proofs, Petitioner now contends that because there is glare reduction resulting from its proposed Fig. 14 interpretation, the claims must be met. (Reply, 11; POR, 61-62.) This impermissible, new contention would only “prove” that section 50 “does not include detected headlights.” Since a vehicle is not exclusively comprised of light-emitting elements, other portions of the vehicle

could be inside section 50 — which Karlsson would be unable to discern. (*Id.*) Petitioner had the burden of showing how or why the beam 50 “did not include a vehicle” and even now, it only can argue that beam 50 does not include light sources.

D. Petitioner’s proof for “second subsections to either side of the first subsection” remains deficient

Though the Reply now specifically addresses [65.4], it fails to cure the proof issues. (Reply, 10-11; POR, 63-64.) The sum of Petitioner’s proof is a general statement about how Karlsson generally functions to reduce glare, coupled with the same annotated Figure 14, that shows a no-intensity section to either side of the high intensity section — the converse of [65.4] which requires that Karlsson *determines illumination for at least one or more second subsections to either side of the first subsection.* (*Id.*)



(Petition, 94, 95, 99, 102, 108, 110, 112, 114, 116.)

VII. Explanations about combinations of Thominet/Harbers with Beam/Karlsson are confusing and detached from specific combinations

Petitioner's § V on Reply is directed to “multi-function beam segments” of Thominet/Harbers being combined with “Beam/Karlsson's adaptive headlights.” Petitioner only plead two combinations that incorporated software (necessary for “multi-function beam segments”) from the secondary references:

- 1) Ground 1C (Beam_Lamp+SLM+Thominet_Software); and
- 2) Ground 8C (Karlsson_LEDs+Mod+Harbers_Software)

Because Petitioner's Reply is directed to Beam's LEDs, which are never combined with Thominet's software, the argument is irrelevant. (Reply, 13.)

A. Thominet's segmentation defeats Beam's maximum illumination

Petitioner cannot refute the problems Thominet's software would create with Beam. Creating “beam regions” (i.e., less than the full beam) necessarily defeats Beam's goal of maximum illumination. (POR, 24.) Petitioner's retort thus focuses exclusively on Beam's operations under “conditions like rain/snow/fog”—in the context of an override, when Beam's primary functions are intentionally disabled. (Reply, 14; Ex.1005, 3:32-36.) Thus, any reliance on using less than the full array for some specific purpose requires disabling of the glare-reduction functions of Beam. Were that not the case, the subset of lights used to address weather

conditions, would be blanked in response to detected headlights—which further frustrates the addition of Thominet’s software to Beam. (POR, 26-29.) The addition of Thominet’s control strategy would thus continually conflict with Beam’s maximum illumination goals and create issues with selective blanking; resulting in a conflicted system that would have to disable functionality central to either Beam or Thominet.

B. Beam’s SLM does not produce angular control

Petitioner is simply wrong about how an SLM functions and their own evidence proves it. (Reply, 14.) Dr. Jiao explains that the SLM described in Beam 4:26-59 is a DMD. (Ex.1003, ¶51.) Dr. Jiao provided Enomoto’s Figs. 2A-2C as examples of how “angular position” can be controlled by DMDs. (*Id.*, ¶¶51, 162.)

Cited Figs. 2A-2C are actually evidence of binary control of a blocking/emitting micromirror:

The micromirror 2 has one horizontal state and two tilt states. The **two tilt states are utilized for image formation**. ... while the micromirror 2 takes $+\theta$, spotlight from the micromirror 2 is guided to an image **forming optical path**. While the micromirror 2 takes $-\theta$, spotlight is not needed so that it is guided to an **eliminating optical path**. While the micromirror 2 takes $+\theta$... (ON state) ... **reflection light is utilized for image formation**. While the micromirror 2 takes $-\theta$, ... (OFF state) ... **reflection light is not utilized for image formation** ...

(Ex.1040, 5:12-26.)

By Dr. Jiao's own evidence, the "angular control" achieved by an SLM is binary. A first angle for "forming an optical path" and a second angle for "eliminating an optical path." This is further supported by "angle modulation" as the result of mirrors being rotated "to one of two stable positions." (Ex.1056, 19.)

Even Dr. Jiao's Reply Declaration admits: "these two positions [of the micromirror] determine the direction that light is deflected." (Ex.1051, ¶53 citing to Ex.2022, 2.) Dr. Jiao casts this as "controlling angle[s] [sic]," but Ex.2022 is describing only that one angle is blocking, one angle is emitting, and only two angles exist. (*Id.*, 2.) "[T]he positive (+) state is ... the 'on state' ... the negative (–) state is ... the 'off' state. ... These are the **only** operational states of the micromirror." (*Id.*)

Further, Petitioner even admitted that "the LED array has the same functionality as the Lamp 202 and SLM 203" and further that "a headlamp only formed from LEDs ... could not control the directionality ..." (Petition, 9, 14; Ex.1051, ¶53.) The two statements, taken in concert demonstrate that Petitioner does actually understand that the lamp + SLM also cannot control directionality, else the LED array would, based on the first statement, "have that same functionality." (*Id.*)

Accordingly, any proof related to any combination of Beam or Karlsson that

involves use of an SLM to “aim” light must necessarily fail, as it relies on a completely contrived SLM that Petitioner created for convenience of explanation. (Reply, 14, 19-20.)

C. Harbers’ “beam segments” are unsuitable for use in a system that blanks light

Karlsson suppresses illumination responsive to light detection anywhere in the scene. If, as Petitioner proposes, a Harbers’ segmented beam were used in Karlsson, there are no assurances that some or all of the subset of the beam utilized for a given “driving situation” would not be suppressed if a headlight were detected in that section. (Reply, 15.)

Harbers’ proposed beam segmentation, which uses select LEDs for a specific purpose, doesn’t account for the possibility of random blanking. (POR, 33.) And, Petitioner never explained how Harbers would accommodate the blanking of some or all of those LEDs. (*Id.*) Were Harbers’ segmentation software included with Karlsson, use of either program’s primary function would conflict with the other’s. (*Id.*)

D. Karlsson uses its full array at full intensity

Karlsson’s usage of its full array at “full intensity” “to the greatest extent possible” would conflict with Harbers’ desire to segment beams. (POR, 31; Ex.2008, 66-67.) Petitioner has also already admitted that the “optimum lighting

effect” constitutes “positioning the main beam (full-intensity) LEDs all around the reduced illumination area ... to the greatest extent possible.” (*Id.*, 67.) On reply, Petitioner impermissibly attempts to argue that the “optimum lighting effect” is something completely different. (Reply, 17.) Petitioner’s repurposing of Fig. 14 as needed is completely unsupported and unacceptable. (§ VI.B, *supra.*)

Moreover, Flaaten, the device Karlsson “improves,” specifically teaches “only” “removing” light that inconveniences other cars, and that “curves” are illuminated, supporting both full usage of the lamp and further indicating that such a fully-lit lamp already illuminates curves. (Ex.2006, ¶¶101-102.)

E. Petitioner’s explanation about color ignores the fact that the LEDs are colored

Random blanking of colored light emitted by colored LEDs will create output that is both colored and shifting in color as the blanking changes. (POR, 34-35.) Petitioner’s argument that “the beams generated from each colored light source “have a more or less ‘white’ appearance” is utterly unsupported. Invoking the familiar “a POSA would have understood” refrain doesn’t change that fact. In yet another instance of **rewriting** the art, Petitioner quotes the preceding teaching about photopic and scotopic lamp emission as though it applies to “beams generated from” ... “colored light sources.” (Reply, 18.) This is unacceptable. Petitioner has imported half a sentence in a way that completely revises the art.

Undesirable color shifts can result, Harbers says as much. (Ex.1011, 8:30-34.) And, Harbers makes it clear that the light generated by the colored LEDs is specifically colored, “to ensure that the red LEDs are not mistakenly taken for brake lights.” (*Id.*) The “mixing” is reliant on both the ordering of the LEDs in a specific order and an optical mixing system – which would also require the contributory colors to be present (i.e., unsuppressed) in order to “mix” correctly. (*Id.*) Under no circumstance is the light generated by a colored LED source “more or less white” – and Harbers provides no evidence to back up Petitioner’s rewrite. (Reply, 18.)

VIII. The use of Thominet’s curved substrate is unmotivated and futile

Since there is no software to “segment” the output in the combinations using the curved substrates/curved arrays from Harbers/Thominet, all those arrays would still utilize all LEDs for “maximum illumination” (Beam) or “full illumination” to the “greatest extent possible” (Karlsson). (§§ VII.B/D, *supra*; POR, 24-25, 30, 33, 37.)

Thus, the underlying curve-illumination issues with the combinations are not solved by the addition of Thominet’s curved substrate. (*Id.*, 24-25, 30.) Similarly, adding the curved substrate does not address the general issues with respect to claims 26 and 65. (*Id.*, 33.)

IX. Reply arguments directed to road-curvature claims exacerbate the particularity issues

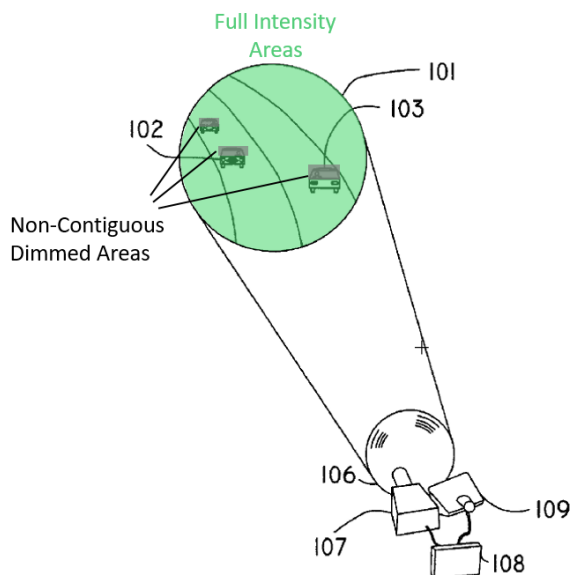
In general, Petitioner attempts to argue that road curvature claims 32-36 and 70 are met based on an SLM, which is absent from most combinations. (Reply, 19-20.)

A. Arguments to Beam-Thominet-Kobayashi (with or without Stam)

With respect to Beam-Thominet-Kobayashi, Petitioner argues that Beam can “set” the angular position of each microbeam. (Reply, 20.) This would require usage of Petitioner’s (incorrect) “beam-steering” SLM, which is only included in grounds 1A and 1C. Because Ground 1A is not combined with Kobayashi, the argument is only applicable to ground 1C, which includes Kobayashi/Kobayashi-Stam.

Beam’s SLM is a binary control device. (§ VII.B, *supra*.) Thus, an SLM effectuates no greater angular control than the LEDs alone. Petitioner’s argument that the “LED array has the same functionality as Lamp 202 and SLM 203,” makes it clear that Petitioner understood this as well. (Petition, 9, 14.)

Petitioner also understood, and repeatedly relied on, the single “maximum intensity” that Beam provided to “non-shaded areas,” such as in the figure reproduced below from a parallel proceeding:



(Ex.2009, ¶149.)

“Dynamic variance in position and size” can be achieved through iterations of Beam’s control successively performed, without any need for “aiming.” (Reply, 20.) Per Petitioner: “Beam discloses ... the blanked area tracks the location of the oncoming vehicle, dynamically varying in position and in size ... Beam would accomplish this step by repeating the determination, selection, and variance steps ...” (Ex.2009, ¶187.)

All Beam combinations will utilize Beam’s “maximum illumination” goal and thus have no reason to *determine a control strategy to control directional light sources* to achieve any of the claimed outcomes in claims 32-36 or 70. (POR, 47; Ex.2006, ¶¶206-211.)

B. Curve illumination and turn illumination are different

Turn illumination is distinct from curve illumination. (POR, 49.) As compared to a bend in the road (curve), turns signify sharper directional changes, where lateral and parked cross-traffic may be present; requiring different illumination considerations. (*Id.*) Moreover, the contention that “increasing illumination of an ‘upcoming turn’ would in the same way increase illumination of an ‘upcoming curve’” impermissibly conflates claims 34 and 70 as though they were the same. (Reply, 21; POR, 49.)

C. Karlsson-Harbers-Gotou (with or without Stam)

Here again, Petitioner presents arguments reliant on hardware only present in some combinations but applies it across all combinations.

1. The shifting window is not the normal operation of Karlsson

Normal operation, by Petitioner’s own admission, utilizes all LEDs at “full illumination” “to the greatest extent possible.” Once that is understood, it is equally understood that there are no LEDs remaining to control for curve and turn illumination and curves and turns would already be illuminated “to the greatest extent possible.” (§ VII.D, *supra*; POR, 68-69.) Flaaten, the device which Karlsson “improves,” literally says that curves are illuminated by its operational beam. (Ex.2006, ¶95; Ex.1051, ¶160.)

2. The shifting window creates color issues

The combination of colored LEDs and a shifting window-- created by suppressing certain LEDs— creates color changing issues, that depend on which LEDs would be temporarily encompassed by the window. (§ VII.E, *supra.*) Petitioner again **deceptively** misquotes “more or less ‘white’ appearance” from Harbers and ignores all other color references in Harbers. (*Id.*) Because the LED sources generate colored light, a randomly shifting window, moving across such LEDs, would create arbitrarily colored output—resulting in potential safety risks, as Harbers notes. (Ex.1011, 5:27-30; POR, 35-36.)

3. The explanation about Gotou’s two-bulbs is irrelevant

Contrary to Petitioner’s assertion, Karlsson uses all LEDs for its primary operations. (Reply, 24; § VII.D, *supra.*) The remainder of Petitioner’s reply covers an argument about Gotou’s two bulbs, which is: a) not included in any combination presented in the Petition (*see* Petition, 125-133); and b) never shown to lack express aiming. (Reply, 24; EX1051, ¶¶173-176.)

X. The argument about claims 66-67 fails to address the problems identified by PO

First, as explained repeatedly and evidenced by both Beam’s express disclosure and Petitioner’s own understanding of Karlsson, both Beam and Karlsson operate with full intensity anywhere glare reduction is not occurring, and therefore have no un-used LED sources to deploy in the manner required in claims

66-67 (§§ III, VI.B, VI.D, *supra*; POR, 50-51, 75.)

Even if Braun were combined with Beam or Karlsson, there is a larger issue of control primacy. (*Id.*, 51-52, 75.) Petitioner pretends this is not a problem by limiting its explanation to situations where there is no conflict. (Reply, 26-27.) Because of how vehicles are generally positioned relative to pedestrians and signs, there are numerous examples where the system will detect both a person and a sign/pedestrian in a section accommodated by the same light sources. (POR, 51.) The imported “strategy” from Braun is to identify a sign/person and then spotlight it. (*Id.*) When a person is walking behind an oncoming vehicle, the system will (purportedly) “see” both the person and the vehicle in the same section. (*Id.*) According to the steps combined by Petitioner, Beam would instruct blanking emission, while Braun would instruct at least some of the same LEDs to spotlight the person. (*Id.*) These two instructions cannot co-exist. (*Id.*)

Roads are not static environments. Without a control strategy that accommodates the noted “overlap” scenarios, which was never provided by Petitioner, no POSA is going to build a system that tries to simultaneously perform two diametrically conflicting strategies. (*Id.*, 52.) Petitioner pretends that Braun addresses both things simultaneously, but other than a four-line mention of glare reduction, Braun never explains glare reduction, nor does it explain its use in conjunction with spotlighting. (Reply, 26-27.)

Finally, with no specificity as to how Karlsson would do so, Petitioner simply argues Karlsson can “resolve” the conflict because Karlsson can “optimally adapt the light beam according to road conditions.” (Reply, 27.) To satisfy their burden, more details are required.

XI. Petitioner never showed how any of the art can “sense fog or snow”

There is no proof of sensing fog or snow in Beam/Thominet/Harbers/Karlsson. (POR, 54, 66.) Petitioner argues that claim 29 “merely requires that the method ‘accommodate sensed fog or snow’.” (Reply, 28.) That is incorrect. In combination, claims 26/28 require “*determine illumination requirements for the field of view based on data sensed by the sensors, wherein the illumination requirements accommodate sensed fog or snow by defining a shift ...*”

The cited portions of Harbers discuss what can be accomplished using the segmented beams. (Reply, 28-29.) This includes a capability to switch elements on and off based on external conditions (Ex.1011, 2:15-26), changes to the beam in fog and snow (*Id.*, 4:15-21), and changing of beam color in weather conditions. (*Id.*, 10:6-14.)

Petitioner’s proofs, however, fail to provide any evidence that:

- a) changes are “*based on data sensed by the sensors*;”
- b) Harbers has any sensors for sensing weather; or

c) any of Harbers’ teachings constitute a “*determined*” illumination requirement for the field of view based on sensed data generally, let alone “sensed” fog or snow data.

In short, Harbers tells a POSA that a beam *can be* adjusted in certain manners, it does not teach the claimed determinations or usage of sensed data.

The problem is amplified with respect to claim 69, where the collection of such data is expressly required and Petitioner’s proofs fail to establish collection of such data. (Reply, 28; POR, 56.)

Notably, Petitioner cites Braun for explanation, though Braun was not utilized in this combination. (Reply, 29, *citing* Ex.1009.)

XII. Conclusion

Patent Owner respectfully requests that the Board finds all challenged claims not unpatentable.

Dated: February 16, 2024

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Certificate of Service

The undersigned hereby certifies that on February 16, 2024, a complete and entire copy of **PATENT OWNER'S SUR REPLY TO PETITIONER'S REPLY TO PATENT OWNER RESPONSE AND EXHIBIT**, was served via electronic mail to the attorneys listed below:

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