

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.: IPR2023-00335*

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

* Porsche Cars North America, Inc., which filed a petition in 2023-01321, has been joined as a party to this proceeding.

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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. Yechezkal Evan Spero</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 in Headlamp Photometric Performance,” SAE Technical Paper

Exhibit No.	Description
	Series 2005-01-0861, (April 2005) (Available at https://www.sae.org/publications/technical-papers/content/2005-01-0861/)
2014	<i>Intentionally left blank.</i>
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	Condensed Transcript of Deposition of Jianzhong Jiao, Ph.D. taken on August 23, 2023, <i>Volkswagen Group of America, Inc. v. Torchlight Technologies LLC</i> , IPR2023-00315, IPR2023-00318.
2019	<i>Intentionally left blank.</i>
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>
2025	Transcript of Deposition of Jianzhong Jiao, Ph.D. taken on

Exhibit No.	Description
	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, confusing prior argument combinations, presented in the Petition and Reply and perpetuated by Petitioner's expert Dr. Jiao, fail to prove all challenged claims are unpatentable.

II. Dr. Turk Qualifies as a POSA under the agreed definition

Dr. Turk is unquestionably a POSA. (Reply, 2-5.) To allege otherwise, Petitioner and Dr. Jiao willfully 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 its POSA qualifications, so the reinterpreted POSA mirrors Dr. Jiao. Through this narrowed interpretation, Petitioner dismisses the impact of Dr. Turk's: 1) Masters/PhD; 2) 20+ years of experience with optics/sensing/imaging; and 3) 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.)

PO contests Petitioner's myopic modification, which ignores the central roles of optics, sensing and imaging in the '503 Patent. Contrastingly, 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,” dictates a POSA with “experience in the field of optical and imaging systems.” (POPR, 9; Ex.2001, ¶32.) *See, 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, ¶32; POR, 41-42; Ex.2006, ¶¶154-155, 26-44.)

The parties agree that: 1) a patent’s purpose 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, *inter alia*, prevent glare in visual tasks (*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); and 4) image processing and knowledge regarding “sensing technology” is relevant for automotive lighting control. (*Id.*, 44:6-45:4.) Dr. Turk’s expertise is indisputably relevant to the technical fields and purpose of the ’503 Patent. He is a POSA.

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

A. Dr. Jiao continually contradicts his own prior positions

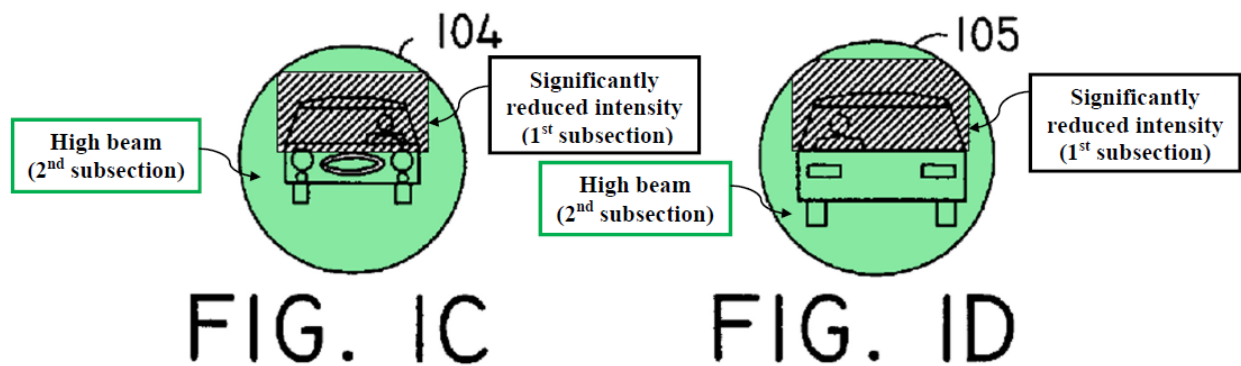
Petitioner/Dr. Jiao use the “understanding” of a POSA to backfill missing teachings and attack Dr. Turk’s balanced explanations of understandable

terminology in ways that contradict Dr. Jiao's prior positions. Dr. Jiao's inconsistent positions under the guise of what "a POSA would have understood" are troubling.

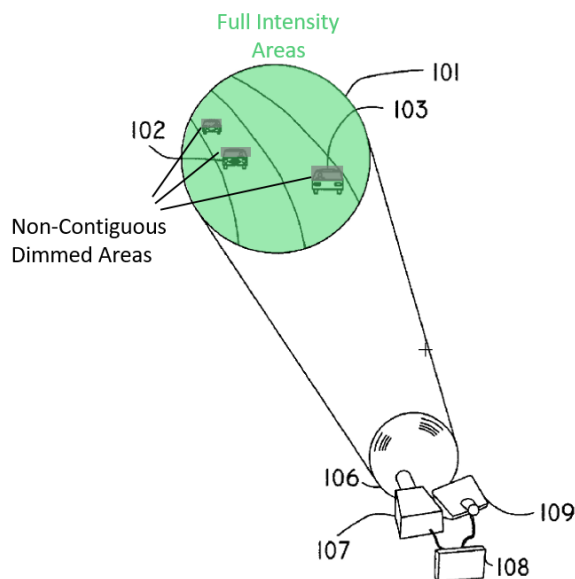
For example, Petitioner/Dr. Jiao use the POSA to inject a belated, self-contradictory construction for intensity, i.e., "Dr. Jiao testified that a POSA would know that 'intensity,' in the context of automotive lighting, includes direction and is not synonymous with 'brightness,' which Dr. Turk does not understand." (Reply, 4; Ex.1051, ¶¶13-16.) This new construction is made in complete disregard of the fact that Petitioner/Dr. Jiao expressly equated the two by using a parenthetical of "(brightness)" to explain "intensity" for both Beam and Karlsson: "**intensity (brightness)** of a lamp/LED changes based on the power (current) applied ..." (Petition, 35, 129; Ex.1003, ¶¶205-206, 666.)

Piggybacking off this manipulation of "intensity" Dr. Jiao now takes the position that "Beam does not ... disclose to a POSA that it is unable to increase light in a direction by virtue of its 'maximum intensity' – which is not 'maximum brightness.'" (Ex.1051, ¶103.) Further, Dr. Jiao now contends "Beam discloses a system that includes *both* low beam and high beam ..." (Ex.1051, ¶79.)

Dr. Jiao's original declaration includes no explanation of high and low beam illumination outside the glare-zone; Dr. Jiao even annotated figures to show the whole scene lit with "high beam" light.



(Ex.1003, ¶173.)



(Ex.2009, 86.)

In complete disregard of his prior positions, Dr. Jiao uses his “POSA would have readily understood” approach to obfuscate. (Ex.1051, ¶113.) As “evidence” of “low beams,” Dr. Jiao cites a teaching about what happens when Beam malfunctions. (*Id.*, ¶113 citing Ex.1005, 3:29-36.) Based on how Beam handles system failure, Dr. Jiao now contends that Beam ordinarily “includes” low beams –

despite the express “maximum intensity” teachings in Beam, and Dr. Jiao’s prior opinion, explaining Beam’s use of “maximum/full intensity” illumination everywhere outside the glare-zone. (Ex.1005, 6:9-12; Ex.1003, ¶255186.)

B. Dr. Jiao misapplied “expert” analysis

Dr. Jiao confirms that he used his own perspective to analyze “what a POSA would know” in July 2002. (Ex.2026, 133:12-134:9.) The law 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 demonstrable disconnect between the record evidence and Dr. Jiao’s testimony, including a myriad of self-contradictions. Dr. Jiao admittedly relied on an expert, not POSA, perspective. His testimony, being demonstrably hindsight-driven, inconsistent, and often devoid of record and legal foundation, should be given less weight than Dr. Turk’s more candid 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 has Merit

The prior art combinations presented in the Petition are far from “clear.” On Reply, Petitioner states: “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 (“Software Implementation”) (Petition, 10-13); Thominet Hardware I & II (“Hardware Implementation[s]”) (*Id.*, 13-14; *See* POR, 20-26).

PO did not “artificially create” *any* grounds — the grounds exist because Petitioner presented numerous alternative software/hardware combinations creating at least 47 grounds. The Board did not opine on the particularity of each alternative ground, and therefore PO addressed all grounds.

V. The Particularity Shortfalls are Exacerbated on Reply

Petitioner’s generalized arguments fail to tie many of its reply arguments to a particular combination. Generic statements referencing “Beam-Thominet” or “Karlsson-Harbers” 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”) and the general combination includes alternative sub-

combinations lacking such elements.

A prime example of this is found in the Reply argument relating to “Beam-Thominet’s” usage of color. (Reply, 13.) Petitioner’s Ground 1 includes the following five sub-grounds:

- 1) Ground 1A – Beam Lamp+SLM (no Thominet/no color)
- 2) Ground 1B – Beam LEDs (no Thominet/no color)
- 3) Ground 1C – Beam’s lamp+SLM+Thominet’s software, (no color, no LEDs)
- 4) Ground 1D – Beam SW +Thominet’s LEDs (possibly color)
- 5) Ground 1E – Beam’s LEDs+Thomient’s curved substrate, (no color) (POR, 22.)

Petitioner only combined the LEDs of Thominet in Ground 1D. (*Id.*) Petitioner’s claim 5 explanation did not modify base sub-combinations. (Petition, 43-44). Petitioner merely pointed out that Thominet’s sources can produce colors. (*Id.*) This limits the Reply argument as only applicable to the combination including “Thominet’s sources,” despite Petitioner presenting it as applicable to “Beam-Thominet’s headlight system.” (Petition, 14).

This problem is manifest across arguments throughout the Petition and Reply, where Petitioner treats all elements and teachings of both references as accessible and interchangeable for argument and application to all combinations –

without express combination, modification, or explanation. Had a single combination been advanced, it may have been clear what was being modified in statements such as: “Beam-Thominet’s LEDs each have ... (color) and ... Beam-Thominet’s controller provides different colors.” (Petition, 44.) As it stands, there are a multitude of alternative combinations and references to “X_Art-Y_Art” that have no stated correlation to sub-combinations.

Petitioner’s approach of presenting a mishmash of parts and hoping the Board will divine a suitable combination is improper. “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’s Beam-Thominet Reply arguments are detached from the various alternative combinations

A. Determining “illumination” for at least two subsections is not the function of Beam, per Petitioner’s admissions [1.8]-[1.10]/[37.8]

Petitioner has repeatedly explained that Beam’s microbeams “must be extinguished” and “prevents [a beam] from illuminating,” clearly construing Beam’s control of emission directed at the glare-zone as termination. (Ex.1003, ¶¶193, 252, 374, 407.) This comports with Beam’s control teaching of “blanking.” (Ex.1005, 5:45-53.)

Petitioner’s contention that “Beam’s controller determines illuminating the

two subsections ...significantly less than low beams” is incorrect. (Reply, 6.) First, it inaccurately states that both subsections are illuminated with less than low beams. Second, Petitioner spuriously relies on the glare-zone “still” being illuminated with “reduced illumination,” conflating results with operation. (Reply, 7.)

Claim 1 requires: determining illumination “*for*” the first subsection. Beam provides no illumination from LEDs aimed at the first subsection – any “remaining” illumination is from off-center rays of light aimed elsewhere. (Ex.1005, 2:59-3:3, 6:45-48.) Beam does not determine this spillover illumination.

Petitioner uses this “resulting intensity that the ... oncoming driver would see” (*Id.*, 2:65-3) (i.e., the “illumination in the shaded areas”) to undermine its own prior statements about Beam “extinguishing” light and “preventing” illumination. (*Id.*, 1:5-8, 8:33-34; Reply, 7.) Beam’s control is “extinguishing.” (POR, 51-52.) Beam’s result may include “illumination” in the glare-zone, but that illumination is from LEDs aimed outside that zone – per Petitioner, LEDs aimed at that zone are “extinguished.” (Ex.1003, ¶¶193, 252, 374, 407.)

Statements about Beam’s “lamp/LED+SLM” are decoupled from the original combinations where Petitioner clearly presented Lamp+SLM and LEDs as alternatives: “Beam’s LEDs have the same functionality as lamp 202 and SLM 203.” (Reply, 7; Petition, 43.)

B. Thominet’s segmentation is incompatible with Beam’s goals and control strategy

Reply § IV.C is directed to Thominet’s “multi-function beam segments” combined with “Beam’s adaptive headlights.” (Reply, 8.) This argument is limited to the single sub-ground (1C) having Thominet’s software (necessary for “multi-function beam segments”). (POR, 23-24, 37.)

Despite ground 1C not having LEDs, Petitioner presents rebuttal requiring Beam’s LEDs. (*Id.*, 23-24; Petition, 12.) In ground 1C, Petitioner combined Thominet’s software with “the illuminator 109 (including SLM 203),” but also explained that “Beam’s LED array has the same functionality as lamp 202 and SLM 203,” treating the LED array as a functionally equivalent alternative to the Lamp+SLM embodiment. (*Id.*, 9.)

This is why 37 C.F.R. § 42.22(a)(2) requires “a detailed explanation of the significance of the evidence” and 35 U.S.C. § 312(a)(3) requires “identif[ying]... with particularity ... the grounds ...” to prevent a Petitioner from pivoting at the last minute based on unexplained or seemingly contradictory positions.

There is no explanation of any combination of LEDs+SLM, and clear evidence that Petitioner considered the two as functionally equivalent alternatives. Nonetheless, the Reply argument requires two uncombined elements: Beam’s LEDs and segmentation provided by Thominet’s software – rendering it

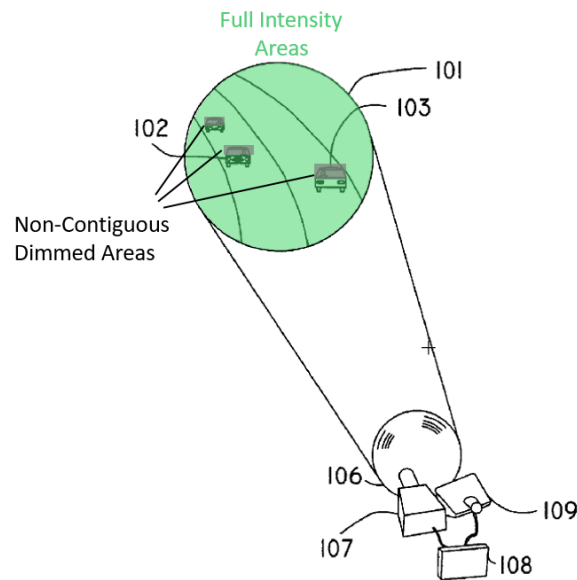
inapplicable to Petitioner's original combinations.

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

Petitioner cannot refute the problems Thominet's software would create, even with a new combination of Beam-Thominet. Petitioner newly argues that Beam includes both low/high beams and that Beam's microbeams "must be able to change direction." (Reply, 9.)

"Changing direction" is an alleged (and incorrect) SLM function, but the SLM is an alternative to the LED array. Petitioner then confusingly argues that Beam "controls the ... angular position of its LEDs," despite Dr. Jiao stating "if a headlamp was only formed from LEDs, it could not control the directionality of its light beam ..." (Reply, 9; Ex.1051, ¶51.)

None of this argument addresses Beam's "maximum illumination" objective or how output segmentation would necessarily defeat this goal. (POR, 49-50.) Petitioner repeatedly relied on Beam using a single level of "maximum intensity" light to illuminate everything outside the glare-zone, but now expressly contradicts its own proffered evidence. (Petition 55, 66, 68, 70; § III, *supra*.)



(Ex.2009, ¶149.)

2. Beam’s glare-reduction unpredictably reduces a beam segmented by Thominet

Petitioner’s rebuttal misses the point. (Reply, 9-10.) PO argued that randomly/intermittently terminating elements of a beam-segment (i.e., less than the full beam) to address glare would be unpredictable and/or detrimental. (POR, 41.) Petitioner’s reply: “Beam-Thominet’s headlight distributes light to where illumination is desired,” does not solve the problem. (Reply, 10.)

However, if Thominet was segmenting the beam, Beam’s glare control would still be active and would impinge on the segmented beam’s ability to perform its intended function. Petitioner never addressed this issue.

3. The SLM does not provide “angular control” and LEDs are not angularly controllable.

Petitioner argues “Beam’s lamp/LED/SLM” without explaining which elements it relies on. (Reply, 10.) There is no ground where Beam has an LED+SLM (§ VI.A, *supra*) and the organization of microbeams into regions as taught by Thominet, making it unclear if Thominet’s software (ground 1C) is necessary for this explanation. (*Id.*)

Beam’s LEDs (grounds 1B/1D/1E) lack angular control per Dr. Jiao – “if a headlamp was only formed from LEDs, it could not control the directionality ...” (Ex.1051, ¶51.)

With regards to 1A/1C, Petitioner’s own extrinsic evidence proves Petitioner is wrong about how an SLM functions. (Reply, 10.)

Dr. Jiao opines that Beam’s SLM (4:26-59) is a digital micromirror device (DMD), providing Enomoto (Ex.1040) as another DMD example and citing Figs. 2A-2C as how DMDs control “angular position.” (Ex.1003, ¶¶148, 51.) 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 + θ , spotlight from the micromirror 2 is guided to an image **forming optical path**. While the micromirror 2 takes - θ , spotlight is not needed so that it is guided to an **eliminating optical path**. While the micromirror 2 takes + θ ... (ON state) ... **reflection light is utilized for image formation**. While the micromirror 2 takes

-θ, ... (OFF state) ... **reflection light is not utilized for image formation ...**

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

By Dr. Jiao's own testimony, the "angular control" achieved by an SLM is binary. A first angle "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 states: "'[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.*)

As explained by Dr. Turk: "Light reflected at the first angle exits the device, while light reflected at the second angle is blocked by the device. (Ex.2022.)" (Ex.2006, ¶35; *see*, Ex.1052, 88:7-10.)

Any proof related to any combination of Beam (or Karlsson) that relies on an SLM to "aim" light fails for relying on a fictional SLM contrived by Petitioner/Dr. Jiao. (Reply, 14, 20.)

C. The use of the curved substrate makes no difference in the outcome

Since the combinations including the curved substrates/curved arrays from Harbers/Thominet all expressly lack Harbers/Thominet software to “segment” output, those arrays would still utilize all LEDs for “maximum illumination” (Beam) or “full illumination” to the “greatest extent possible” (Karlsson). (Reply, 11, 26.)

Similarly, adding the curve does not address the general issues with respect to claims 1 and 37.

D. Petitioner’s dependent claim arguments fail

1. Petitioner relies on new combinations of Beam (2-4/42-44)

Contrary to Petitioner’s suggestion, PO did not allege Beam “fails to disclose” the noted embodiment. (Reply, 12.) PO pointed out that Petitioner did not argue any embodiment including LEDs and an SLM. (POR, 35-36.) Petitioner’s explanation of claim 2 bounces between sub-groups including SLMs, Beam-LEDs, Beam-Lamp, and Thominet-LEDs. (Petition, 34-39.) At no point did Petitioner state, let alone explain, that the LEDs are controlled by the SLM. (*Id.*)

On reply, Petitioner points to a Beam citation (Ex.1005, 8:4-12), including recitation of an LED and an SLM, as though it were dispositive. (Reply, 12.) But the same cite includes recitation of an “incandescent lamp” (i.e., source 202) with an SLM. (Ex.1005, 8:4-12.) Per Petitioner: “LED array has the same functionality

as the Lamp 202 and SLM 203.” (Petition, 9.) Thus, absent any explanation to the contrary, the cite to Beam (Ex.1005, 8:4-12) appears to be a string-cite to evidence of an incandescent lamp and SLM. Petitioner never explained a combination using the LEDs and SLM, or a reason for such a combination, but did expressly explain the redundancy of such a combination.

As explained in the POR, Beam’s optical system 106 does not meet the necessary proof, as it is not shown to be an element that would be controlled as required by claims 2, 3, 42, or 43. (POR, 35-36, 54-55.)

2. Petitioner impermissibly tries to include an element from one combination into all combinations (5/45)

Petitioner’s claim that PO is attacking references individually fails to appreciate what elements are in each of its combinations. (Reply, 13.)

PO’s first arguments relate to grounds 1A-1C, wherein the light source comes exclusively from Beam and therefore lacks colored LEDs (1B) or any LEDs at all (1A/1C). (POR, 23-24).

The only combination that includes the LEDs of Thominet is ground 1D. Petitioner does not explain how or why those colored LEDs would be included in a combination that expressly does not have Thominet’s software. (POR, 36.) Thus, Beam’s software would be left with colored LEDs for which it has no control plan and myriad problems would result. (*Id.*)

3. Beam cannot identify vehicles

Petitioner's new "filtering weak signals" theory does not prove that Beam can identify a vehicle. (Reply, 14.) Countless light sources can exist along a road with light strength comparable to a headlamp at various distances. It is unsupportable to suggest that headlights are a "strong" light source and everything else is a weak source, nor does Beam present this as the point of filtering. (*Id.*) For example, a night-construction site or busy city street may have countless non-vehicular "strong" light sources. (*Id.*)

This "identifying" explanation also ignores what Dr. Jiao repeatedly explained as the operation of Beam – "determine[s] the locations of light sources" (Ex.1003, ¶¶126, 157, 192, 251, 300, 330, 351, 373, 406, 424, 443, 463, 484.) Thresholding/filtering was never in the Petition (*see* Petition, 47-48), nor does it render Beam capable of determining anything other than light source strength.

4. Beam does not determine a subsection that has already been "*determined to include at least a portion of the second vehicle.*"

Beam determines an "area" based on detected light, with no knowledge or care of whether that area actually includes a vehicle. (Ex.1005, 6:20-22.) Beam does not determine the area because it detects a vehicle, it determines the area because it detects light. (*Id.*) If a vehicle happens to be the source of the light, that vehicle will be incidentally included in the area. The area is not "determined to

include... the ... vehicle” or anything else.

5. Petitioner again conflates results with claimed steps (39-41)

Claim 39 requires “clusters... illuminating ... with different characteristics based on... processor determining specific, different illumination characteristics.” Claims 40 and 41 require “defining illumination for the first subsection.” These decisions are specifically made with respect to the first subsection. Per Petitioner, Beam’s control over the LEDs/light aimed specifically at that section is to “extinguish” light to “prevent [a beam] from illuminating certain areas.” (Ex.1003, ¶¶193, 252, 374, 407.) Thus, the operation of Beam is to blank or extinguish illumination directed at the region. (POR, 53-54.) The remaining illumination is from off-center rays, the level of that illumination reaching the glare-zone is never determined by Beam “for” the glare-zone. (§ VI.A, *supra*.)

6. Petitioner doubles down on its fatal flaw in claim 58 analysis

Any proof for claim 58 needs to address controllability of claim 58 elements “as part of the instructed operation.” The explanation for claim 19 is one sentence, without correlation of the argued elements to claim 19, let alone claim 58’s. (Petition, 54.)

This is a clear violation of 37 C.F.R. § 42.22(a)(2) as well as a failure to correctly identify and address the differences between claim 19 and 58. (POR, 53,

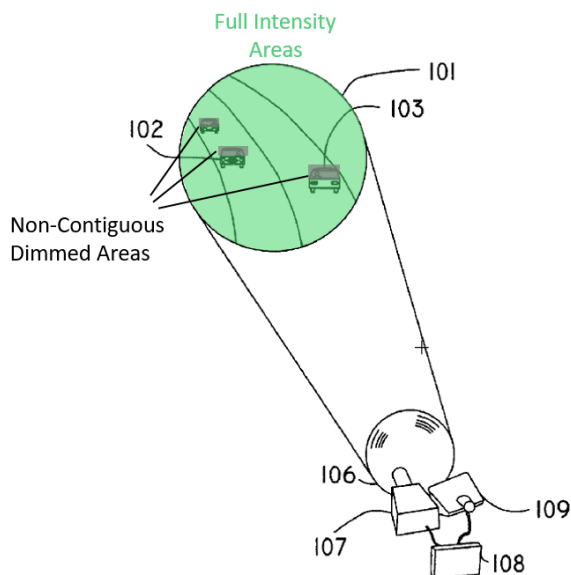
74.) Petitioner’s attempt to incorporate new argument from Dr. Jiao’s reply declaration (Ex.1051) is impermissible.

VII. Petitioner continues to muddle its arguments for claims 9, 15-17, 49, and 54-56

Initially, PO notes that there is no combination of Beam and Kobayashi alone.

The SLM of Beam is a binary control device and effectuates no more control than the LEDs alone. (§ VI.B.3, *supra.*) Petitioner understood this: “the LED array has the same functionality as Lamp 202 and SLM 203.” (Petition, 9.)

Petitioner also understood, and repeatedly relied on, the single “maximum intensity” that Beam provided to Petitioner’s “non-shaded areas” in its annotated figures.



(Ex.2009, ¶149.)

“Dynamic variance in position and size” can be achieved through iteration without any need for “aiming.” (Reply, 16-17.) In a related proceeding, Petitioner stated “Beam discloses ... dynamically varying in position and in size ... Beam would accomplish this step by repeating the determination, selection, and variance” (Ex.2009, ¶187.)

As can be seen above, Petitioner continually attempts to reinterpret the same teachings of the same art to mean different things as it needs them to change.

VIII. The issues with modification based on Braun

PO maintains its refutation of Petitioner’s combination with Braun for the reasons presented in the POR. (Reply, 17; POR, 63.)

IX. Karlsson-Harbers

A. Petitioner’s proof does not demonstrate determining illumination as claimed

Petitioner once again mistakes PO’s burden as proving that Karlsson does not teach “determining illumination for at least two subsections.” (Reply, 18.) PO demonstrated that Petitioner did not prove that Karlsson teaches this. (POR, 65-66.)

Petitioner proffered an annotated Fig. 14 of Karlsson as its “proof” indicating “high” and “no” intensity regions. (Petition, 117.) Karlsson would not have “determined illumination” for “no intensity” regions. (POR, 65-66.) Thus, Petitioner did not meet its burden of proof. (*Id.*, 66.)

Petitioner cannot now supplement the proof with an alternative explanation. Petitioner simply re-presents the same inaccurate figure – but also modifies its explanation to “dimmed LEDs outside of beam 50” (Reply, 20), whereas before it contended “shaded area of no intensity.” (Petition, 116.)

1. Petitioner’s conflicting usages of Fig. 14

Petitioner presents conflicting explanations of Fig. 14, sometimes contending it is emblematic of normal operation, other times contending it demonstrates output under glare reduction. (*See*, Reply 19, 24.) Despite Karlsson not teaching that Fig. 14 is either of these things, Petitioner wants it to be both.

Petitioner’s position in the Petition is that outside the region 50 there are “no

intensity” areas achieved by suppressing illumination. (Petition, 95.) Petitioner now states that “dimmed LEDs outside of beam 50 correspond to subsections with detected vehicle headlights.” (Reply, 20.) Accordingly, prior to “suppression,” those now-suppressed LEDs were in use. This demonstrates that Karlsson does use the full array prior to active “suppress[ion].” (Ex.1010, 2:7-9.)

Then Petitioner pivots to a conflicting explanation of Fig. 14, presenting window 50 as “a subset of the LEDs available” and treating the regions outside this beam as unused LEDs. (Reply, 24.) 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.

Fig. 14 is an illustrative example (as patents are wont to provide) of how a shifting window of light can function, presented to explain the concept. Fig. 14 is not taught as representative of any particular state of Karlsson. In addition to this lack of actual record-support, Petitioner’s “usages” of Fig. 14 conflict.

Petitioner’s presented explanation of Karlsson’s operation was “suppression,” and since the “unsuppressed” LEDs in window 50 are “high intensity,” it is reasonable to assume that, prior to suppression, the now-suppressed LEDs were “high intensity.” (Petition, 95.) This also comports with Petitioner’s understanding of Karlsson in a related proceeding: “the remaining areas of light beam 7 are left at full intensity...” (Ex.2008, 66.) “Left at” indicates that “full

intensity” was the original state of all LEDs.

B. Karlsson cannot determine the presence of a vehicle any more than Beam can

Petitioner attempts to maintain the artifice that Karlsson can “detect traffic,” but explains Karlsson as detecting light – “Karlsson controller uses the ‘light from oncoming traffic ... as a parameter’ to adjust ‘the emitted light beam.’” (Reply, 20.) The lines omitted from Petitioner’s citation further clarify that Karlsson: a) detects light (Ex.1010, 5:16-17); and b) adjusts emission “so as not to emit light in the direction of the detected light.” (*Id.*, 5:31-32.)

At no point is Karlsson aware of what produced the light – “light... adapted in dependence on ... the light being detected.” (*Id.*, 2:5-9.) To the extent that any claim requires affirmative knowledge of a vehicle, Petitioner has not shown how Karlsson can provide this. (POR, 66-68.)

C. Petitioner does not understand the meaning of “to either side”

Claim 37 requires “one or more subsections... to either side.” That is one or more subsections on one side, and one or more subsection on the other side. Petitioner’s proof did not show this. (POR, 68.) Petitioner’s new contention that “a POSA would have understood that beam 50 is adaptable to being on both sides” is a new argument and unsupported by annotated Fig. 14, (Petitioner’s chosen evidence), which is never taught to be separable into two windows. (Reply, 21-22.)

D. Arguments to “multi-function beam segments” of Harbers require Harbers’ software

Any argument directed to the multi-function beam segments of Harbers requires Harbers software, which limits the argument to grounds 7C and 7D. (POR, 25.)

1. Directional beam segments from Harbers would be defeated by selected dimming of Karlsson

Harbers’ segmentation suffers from Karlsson’s strategy just as Thominet’s segmentation suffers from Beam’s. (*Id.*, 78.) Arguing the “system is more ... active” does not address the issues that termination of LEDs would cause when Karlsson’s suppression is applied to a segmented beam. (Reply, 23.) This is doubly true given that Petitioner created a control strategy that, unsupportedly, comprised vertical blanking, which could cause excessive problems with already-segmented beams. (*Id.*)

If “central vertical blanking” (Reply, 21) were combined with Harbers’ usage of beams 6’’/6’’, comprised largely of central elements, those beams could be completely terminated, depriving the driver of all high-beam light and defeating the purpose of including “glare reduction” to preserve high beam light.

A much more reasonable solution would be to fully use Karlsson’s array in the exact manner that Petitioner already admitted it would be used – and such full usage diametrically conflicts with segmentation. (POR, 77-79.)

2. Petitioner pretends as though its admission were PO's position

Petitioner states that “Dr. Turk wrongly conclude[d] that ‘Karlsson provid[es] full or maximum intensity light in the remaining areas outside of the anti-glare region ... to the greatest extent possible.” (Reply, 23.) Petitioner is refuting itself — that quote is Petitioner/Dr. Jiao’s own conclusion, presented by Petitioner to explain how Karlsson functions. (POR, 84-85 quoting Ex.2008, 67.)

The statement that “nothing suggests to a POSA that Karlsson operates with all LEDs active except to implement glare control” (Reply, 24) attempts to irrationally limit “all LED” usage to when glare control is being implemented, essentially proposing that, when another vehicle is detected, Karlsson turns on more LEDs, so that it can suppress them.

This also ignores the general utility of “optimum” illumination achieved by “full illumination” “to the greatest extent possible.” (Ex.2008, 67.) The statement is also technically inaccurate, Petitioner’s own evidence shows no intensity areas during “implementation of glare control.”

3. Harbers’ colored LEDs are incompatible with Karlsson’s selective control and shifting window

Petitioner contends that “a POSA would have understood how to arrange different color LEDs in Karlsson’s headlights” and ‘effectively mix colors.’ (Reply, 25.) Both of these statements reveal the exact problem Petitioner refuses to

address – specific fixed “arrangement” is necessary in order to “mix” consistently. (Ex.1011, 8:28-35.) The moment Karlsson starts suppressing LEDs, the entire system is going to randomly produce different output colors based on what portions of the “arrangement” are removed from the “mix” by suppression. (POR, 80-82.)

PO objects to Petitioner’s decision to once again modify a teaching of art by using a partial sentence out of context. “More or less ‘white’ appearance” is about the difference between scotopic and photopic light beams and has nothing to do with the “beams generated from each colored light source.” (Reply, 26.)

The LED sources are colored and “generate” beams of color. (Ex.1011, 8:28-34.) Harbers requires a specific placement in order to achieve “a substantial reduction of possible color effects.” (*Id.*, 30-32.) Petitioner wrongly applies the quoted teaching as a description of what the colored LED sources of Harbers “generated.” (Reply, 25-26.)

Petitioner also simply references “Karlsson-Harbers” without specifying applicable sub-grounds. Only ground 7E includes Harbers LEDs. (POR, 22.) This ground does not include Harbers software, rendering the inclusion of colored LEDs arbitrary. The system would further suffer from a multitude of problems as described in the POR. (POR, 80-82.)

E. Dependent claims

1. Petitioner misframes PO's argument for lack of light modifying elements (2/42)

PO's point about "controllable" light modifying elements was related to grounds 7B/7D, combinations which lacked an SLM. (*Id.*, 69). Petitioner's reply about light modulators misses that point and is inapplicable to grounds 7B/7D. (Reply, 26-27.)

2. Petitioner does not understand the difference between a phototransistor and a camera (7/8, 47/48, 14/53)

Fig. 14 specifically includes "phototransistor" sensors. (POR, 70.) A phototransistor controls current based on a light change. (*Id.*) In the example relied upon by Petitioner as proof, the "sensor" is an array of light-controllable phototransistors. (Reply, 27.) There is no purpose for any other "sensor" as: 1) Karlsson presents "photodiodes" (similar to phototransistors) as an alternative to a "photosensitive plate" (POR, 70-72); and 2) phototransistors (or photodiodes) arranged as shown, are capable of controlling adjacent LEDs through current switching. (*Id.*)

For these reasons, the embodiments proffered for proof lack both a camera/camera-equivalent and a reason to use a camera/camera-equivalent, given the express presence of suitable, alternative sensors.

3. Petitioner cannot refute that Karlsson does not "identify" an entity (11/50)

Petitioner is incorrect that “Karlsson distinguishes between ‘ambient light and light from oncoming traffic.’” (Reply, 28.) Karlsson senses both types of light. (Ex.1010, 2:7-9, 4:17-21, 9:23-26, Fig. 1.) At no point does Karlsson ever understand the source of the light as any particular entity or distinguish between an ambient source and a vehicle, nor does Karlsson show capability to “identify” an entity.

Petitioner’s proof relies on an embodiment that does not even utilize a photosensitive plate (which would still not solve the complete lack of teaching about “identification” of an entity.)

X. Karlsson uses “full illumination” “to the greatest extent possible,” as admitted by Petitioner, and therefore there is nothing left to “increase” based on combination with Gotou

Petitioner continues its unsupported attempts to recast Fig. 14 as varying, conflicting examples of Karlsson’s output. (Reply, 29-30.) Petitioner cannot escape the following:

- 1) it already admitted how Karlsson functions;
- 2) the admission comports with PO’s understanding; and
- 3) the admission makes logical sense given Karlsson’s alleged glare reduction capability and Karlsson’s function of “suppression” of light.

(POR, 84-85.)

There is no reason Karlsson would not use all its LEDs to “optimally”

illuminate the scene; Petitioner’s admission of “optimal” illumination confirms as much. (*Id.*) This also comports with Flaaten’s goal of only suppressing light for other vehicles and providing optimal illumination that already expressly “illuminates curves.” (Ex.2006, ¶¶101-102; Ex.1051, ¶166.)

XI. Petitioner’s inclusion of Braun conflicts with its inclusion of Harbers

Decoupled from any particular combination, Petitioner merely proposes to add more, different light sources to one or more alternative arrays from its base combinations. (Reply, 30.)

Concluding, based on no record-evidence, that this would yield different colored spatial distributions, Petitioner never bothers to explain why this would not conflict with Harbers’ colored LEDs. The LEDs from Braun are not “colored” in the sense of Harbers, they are UV/IR LEDs. Petitioner thinks it acceptable to unexplainedly replace either base LEDs of Karlsson and/or colored LEDs of Harbers – costing visible illumination and/or creating new color issues (POR, 86-87.) Petitioner simply states that a POSA “would have understood” how to do this and completely ignores all the possible issues with the combination. (*Id.*, 86.)

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 correspondence listed below:

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