

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.: IPR2023-00197*

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

* Porsche Cars North America, Inc., which filed a petition in IPR2023-01231, has been joined as a party to this proceeding.

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<i>DyStar Textilfarben GmbH & Co. Deutschland KG v. C.H. Patrick Co.</i> , 464 F.3d 1356 (Fed. Cir. 2006)	2
<i>McCoy v. Heal Systems, LLC</i> , 850 Fed. Appx. 785 (Fed. Cir. 2021)	5
<i>RayVio Corp. v. Nitride Semiconductors Co., Ltd.</i> , IPR2018-01141, Paper 39 (PTAB Dec. 2, 2019)	6

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. 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

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	<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	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	<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>

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
2026	Condensed 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

I. Introduction

Petitioner's continued refusal to elect a specific combination and consistently apply it across a set of claims frustrates application of the Reply arguments to the Petition. Reply arguments address "Beam-Thominet" or "Karlsson-Harbers" as though Petitioner did not present five separate combinations for the prior and seven for the latter. The explanations zigzag across hardware absent from all/some combinations, as though Petitioner's contentions are Legos.

Meanwhile, Petitioner continues to use out-of-context quotes to modify teachings of the art and apply them to new combinations of art or combinations that include multiple different alternatives. Thus, the only way to reconcile the Reply with Petitioner's arguments, uncoupled from specific combinations, is by applying each argument to each of the relevant 41 combinations— a duty that is neither PO's nor the Board's.

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

To maintain the artifice that Dr. Turk is not even a POSA, Petitioner and Dr. Jiao ignore inconvenient 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). In its preliminary response, 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.

Despite Petitioner's narrow interpretation, 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 and 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 flags

Troublingly, Dr. Jiao uses the POSA as a personal proxy, to backfill missing limitations and attack Dr. Turk's testimony on understandable terminology, in ways that contradict the record.

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.) Dr. Jiao's declaration from related IPR2023-00318 however reveals alignment with Dr. Turk's position: with reference to the "*changed emission includes change to... intensity*" aspect of claims 24/25, Dr. Jiao previously asserted that "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, ¶147.)

Next, Dr. Jiao uses **his** POSA to advance a belated construction: “a POSA would have readily understood that ‘intensity’ refers to luminous intensity measured . . . luminous flux per unit solid angle . . . It is not, contrary to Dr. Turk’s misunderstanding, an illumination brightness level or . . . synonymous with “brightness[.]” (Ex.1051, ¶15.) This new construction is however inconsistent with Dr. Jiao’s original Declaration, which equated “intensity” with “brightness” and described intensity separately from directionality/aiming. (Petition, 2, 12, 13, 36, 37, 45, 46, 49, 61, 65; Ex.1003, ¶¶52-53, 74, 78, 171-172, 173-174, 186, 192, 271, 309.) This new construction is also inconsistent with Dr. Jiao’s latest testimony on claim 42, which establishes that *intensity* is different from *spatial light distribution*, but advances the same construction for *intensity* as the one expressly defined for *spatial light distribution*. (Ex.2026, 89:14-90:22.) A POSA would know that in 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.)

Dr. Jiaos’ 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 the LED/SLM “replacement” teaching (Ex.2026, 75:8-16); and 3). Dr. Jiao 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 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).

Given the disconnect between the record evidence and Dr. Jiao’s testimony, and the misuse of an expert rather than a POSA perspective, Dr. Jiao’s testimony should be given less weight than Dr. Turk’s more balanced approach--it is demonstrably hindsight-driven, inconsistent and often devoid of record and legal foundation. *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. Petitioner has no explanation for the 40+ arguments advanced in the Petition

On Reply, Petitioner asserts that “there are only two sets of grounds in the Petition ... Beam-Thominet, and ... Karlsson-Harbers” (Reply, 5), ignoring “Beam alone” or “Karlsson alone,” as well as the myriad of individual “additional or alternative” combinations incorporated within the base “sets.”

PO did not “create” *any* grounds — the grounds exist because Petitioner presented numerous interconnected hardware and/or software arguments, that as explained in the POR, resulted in at least 41 grounds. Even on Reply, Petitioner flip-flops between incompatible elements and ignores the Board’s DI decision on the “software implementation,” 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).

For a single claim element (“aimed sources” – 20.2), Petitioner advances multiple different positions— Beam’s LEDs+SLM are directional (a new position), Beam+Thominet is directional (citing both software and hardware arguments), Karlsson’s “sources” “and/or” those sources with SLMs are “independently aimed,” or Karlsson+Harbers is directional based on cited software and/or hardware arguments about Harbers. (Reply, 6-8.) Given the interconnected

argument style, Petitioner's lack of particularity creates the risk of inconsistent applications across different limitations.

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" 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 of "Beam-Thominet." (See, Reply 12-13, where the Beam-Thominet conclusion that comes at the end of an argument about Beam alone.)

VI. The Reply is replete with contradictory arguments

Unpacking the statements in the Reply's first substantive paragraph reveals the inconsistencies in Petitioner's arguments.

Statement One: "Beam's headlight includes three directional sources ... with its lamp 202/LEDs 401 (emitter) and spatial-light-modulator (SLM) 203." (Reply, 6.) While this correctly refers to a light source, lamp 202/LEDs 401, as a *source*, it disingenuously inserts the SLM as part of *both* combinations. By contrast, the Petition presented a separate "embodiment with an array ... of light sources 401 (e.g., LEDs), having the same functionality as lamp 202 and SLM 203" (Petition, 14, 24, 30), rendering the inclusion of an SLM with the LEDs

wholly redundant. Not only does Petitioner seek to advance the new combination, it chastises Dr. Turk for pointing out this the redundancy and ignores the Board's finding that the 'angular position' language, is describing Beam's Figure 2 embodiment, not the Figure 4 embodiment. (DI, 13; Ex.1051, ¶54.)

Statement Two: “[M]icrobeam includes emitter ... and spatial light modulator ...” (Reply, 6.) This statement takes the unsupportable position that the “beam” includes the emitter and optical control. Not only is this inconsistent with the first and last sentences in the same paragraph (where sources create the beam) and inconsistent with the Board's construction of light source as “any system that is capable of receiving an electrical signal and producing light in response to the signal” (DI, 8); this position makes no sense when applied. Beam says “the AABH produces a multiplicity of individually directed narrow-angle beams which are herein referred to as microbeams ...” (Ex.1005, 5:61-63.) If “microbeam” includes emitter and SLM, that sentence would read “the AABH produces a multiplicity of individually directed narrow-angle emitters and SLMs”— straining credulity. Similarly, Petitioner stated “Beam uses the term ‘microbeam’ as light emitted from a ‘microbeam source ...’” (Petition, 13.) The Board correctly rejected similar arguments stating: “We do not agree with Petitioners’ analysis because we find that the ‘microbeams’ are the light itself, not the light *source*, as we have construed that term.” (DI, 11.)

Statement Three: “Emitters for ‘directional’ light sources include an optical element, otherwise light emission is omni-directional.” (Reply, 6.) There are multiple references in the Petition to “directional” LED light sources, with no mention of optical elements. (Petition, 2, 3, 8, 23, 24, 25, 35, etc.) This includes calling Beam’s LEDs directional: “each light source of the flat array has its own *independent angular* position (angle/*aiming*) ... so Beam’s array of light sources 401 of Figure 4 form ... three directional light sources having different angles/aimings. (Petition, 24, 30; Ex.2026, 112:22-113:4.)

Petitioner continually advances alternative and often-contradictory meanings for “microbeams,” “source,” and “emitter,” to fit a given argument. As an example, at one point in his deposition, Dr. Jiao stated, in reference to Beam’s LEDs “the light source without optical elements ... is not narrow angle. It’s not directional.” (Ex.2026, 79:19-80:14-16.) Later, when discussing Beam compared to Thominet – Dr. Jiao stated: “Beam using these narrow-angle LED sources, directional sources on a flat substrate ... person of ordinary skill in the arts will understand that both LED, narrow-angle directional light sources.” (*Id.*, 112:22-113:4.) Those statements, given in the same deposition, are directly contradictory.

VII. Petitioner fails to rebut the lack of aimed light sources

- A. All digital mirror SLMs in the art are binary control devices as proven by Petitioner’s own secondary evidence**

In the Petition and Reply, Petitioner cites extrinsic evidence for the proposition that digital mirror device (DMD) SLM's, the SLMs Dr. Jiao equated to Karlsson's SLMs (Ex.1003, ¶51), provide "angular control" of emission. However, consistent with Dr. Turk's explanation and cited extrinsic evidence (Ex.2006, ¶¶35, 65-66), these documents support Dr. Turk's testimony and, actually prove the binary function of a DMD — "[T]he mirrors are rotated . . . to one of two stable positions" (Ex.1056, 19) (on/off) and that the binary states are the result of "angular control" to either block or permit light from exiting the system. (Ex.2006, ¶35; *see also* Ex.1040, 5:12-26.) Intensity may be controlled in some devices by modulating the mirrors to rapidly switch between the two states. (Ex.2006, ¶67.)

1. Ex.1040 proves DMDs are binary

Dr. Jiao cites Enomoto (Ex.1040) as evidence of a micromirror that "aims light." (Ex.1051, ¶135.) 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**. In one of the two tilt states, spotlight travels from the micromirror 2 to form an image. For example, 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 $+\theta$, a

valid reflection state (ON state) maintains in which **reflection light is utilized for image formation**. While the micromirror 2 takes $-\theta$, an invalid reflection state (OFF state) maintains in which **reflection light is not utilized for image formation ...**

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

Almost incomprehensibly, Dr. Jiao cites the Abstract of Ex.1040 as evidence of selectable angular control over emission, when the Abstract quite plainly describes the two-position “light utilized/not-utilized” operation of the SLM. (Ex.1051, ¶135; Ex.1040, Abstract.) If, as Dr. Jiao contends, the modulators in Karlsson are like those “demonstrated in Enomoto”, the parties agree that Karlsson’s SLMs lack angular control over emission. (Ex.1051, ¶135.)

2. Karlsson uses binary SLMs

Karlsson posits two types of SLMs, both binary. A first fully-transmissive/fully-blocking SLM, which is either full-on or full-off – i.e., all light or none. (Ex.1010, 14:10-15.) A second SLM that transmits light to a “specified degree” so that intensity can be adjusted. (*Id.*)

Despite the Board noting the deceptive nature of Petitioner’s use of ellipses to formulate an “angular control” argument for Karlsson’s SLMs (DI, 14), Petitioner shockingly cites the **same disingenuous combination of partial sentences** to now argue that “[T]he Board overlooked that Karlsson’s modulators

are ‘controlled to transmit light to a specified degree, so that a desired light intensity can be adjusted’...” (Reply, 8 *citing* Ex.1003, ¶333; DI, 14.) Presented in relation to intensity, “degree” of “transmission” plainly refers to an amount and not “angle.” Petitioner once again tries to revise the plain meaning of a term to fundamentally alter a teaching.

3. Beam uses binary SLMs

Petitioner’s evidence in Exs.1040, 1056 supports the conclusion that the few sentences in Beam that describe “angular” control of a “microbeam” refer to a blocking angle or an emitting angle, not the ability to redirect angular emission at some commanded angle. This interpretation is further consistent with Beam’s claim 4 reference to “digital mirror devices,” (DMDs) and the fact that claim 4 uses the claimed SLMs for “selectively controlling intensity”, not angular emission. (Ex.1005, 8:10-12.)

B. Beam or Karlsson alone (Grounds 1A/1B/5A/5B) lack “aimed” sources

1. Beam’s LEDs are not directional

On Reply, Petitioner actually argues that LEDs alone are not directional: “In order to be ‘directional,’ a POSA would have understood that the emitter of the light source is combined with an optical element” e.g., SLM. (Reply, 6; Ex.1051, ¶66.) This is contrary to the Petition: “Beam’s array of light sources 401 form at

least three directional light sources having different angles/aimings.” (Petition, 24.)
In Deposition, Dr. Jiao, at different times, takes both contradictory positions.
(Ex.2026, 80:14-16, 112:22-113:4.)

2. The Petition did not combine Beam’s LEDs and SLM

Any argument based on the Beam LEDs+SLM is an impermissible new argument. Per the Petition, the LED array 401, was the functional equivalent of the “source 202 and SLM 203” and satisfied the “aimings” limitation. (Petition, 24.)

3. Karlsson’s LEDs are not directional

Karlsson’s “sources” are not independently aimed; Petitioner has conceded that sources on a flat substrate cannot be aimed without optics. (Ex.1051, ¶66.)

4. The LED + SLM argument for Karlsson is misplaced

Petitioner’s arguments that Karlsson’s LED+SLM provides angular emission are manufactured. The Petition improperly used sentence fragments to apply the phrase “given directions” (related to light *detection*) to the modulator 3. (Petition, 77, 93.) The Reply further misleads by interpreting the words “transmit light to a specified degree” to mean angular control instead of “amount.” (Reply, 8). As established above, Karlsson discusses two versions of a binary SLM, neither able to provide angular control over emission.

C. Using curved substrates only (Grounds 1D/1E/5E/5G) does not fall within the stated motivation to combine

Petitioner's "motivation" to add Thominet/Harbers curved substrate included "different spatial distributions for different driving situations." (POR, 41.) Now, Petitioner continues to advance the impossible "Thominet/Harbers hardware" argument that "arranging Beam's/Karlsson's LEDs on a curved surface, as in Thominet/Harbers, would have 'provided different spatial distributions for [] different driving situations.'" (Reply, 9, 14.) The alleged motivation is not achievable with the substrate alone (absent Thominet/Harbers' software). (POR, 41.) Merely moving Beam or Karlsson's LEDs to a curved substrate is not going to change *how* those references operate to *control* their "spatial distributions."

VIII. Thominet's beam segmentation absolutely defeats Beam's maximum illumination goal

First, Petitioner states that Beam controls the "angular position" of its LEDs, which is refuted by its admission that an SLM (never combined with the LEDs) is required "[i]n order to be 'directional' i.e., for angular control. (Reply, 13; Ex.1051, ¶66.) Petitioner next asserts that "dynamically varying in position and size" is evidence of "angular control." (Reply, 13.) This ignores the fact that Beam achieves the "dynamic variance" by simply re-selecting and re-signaling different LEDs as the vehicle moves without any need to ever "aim" a single LED. (Ex.1005, 6:24-28.)

Petitioner ignores the express requirement of Beam for "maximum intensity

at all times.” (Ex.1005, 6:11-12.) This ignores Petitioner’s original position and annotated figures showing (and emphasizing) “maximum intensity” illumination and stating: “this disclosure of ‘having bright high beams’ is to ‘maximize vehicle operator visibility’ in the second subsection and such ‘maximum intensity’ in the second subsection is the ‘optimal use of differently aimed directional light sources.’” (Ex.1003, ¶188.) That statement also contradicts Petitioner’s current new argument about high/low beams. (Reply, 12.)

Segmenting Beam’s output to create lesser-illuminating “functional” beam segments defeats what Petitioner termed the “optimal use” of the light sources, because there is no longer going to be “maximum intensity” everywhere outside the glare-reduction region. (Ex.1003, ¶188.)

Finally, Petitioner contends that Beam will use “segmentation” to deal with snow or fog. (Reply, 14.) Oddly enough, Dr. Jiao admits that Beam does not have sensors to detect snow or fog (Ex.1005, 3:34-36; Ex.2026, 135:3-136), yet Petitioner proposes a system that can “automatically” switch to a fog lamp, in the presence of fog it cannot sense.

In sum, Beam does not adjust the angular position of its microbeams, it uses a binary SLM to control whether those microbeams are emitted, and based on Petitioner’s combinations, it only does this in the single-source 202 embodiment. Using Thominet’s array-control software on the SLM is not only unexplained, it

would produce exactly the same problem as controlling LEDs in this manner – Beam’s goal of maximum intensity light outside glare-reduction regions would be defeated by segmentation of the beam into lesser beams by Thominet’s software.

IX. Harbers’s segmentation is not compatible with Karlsson’s headlights

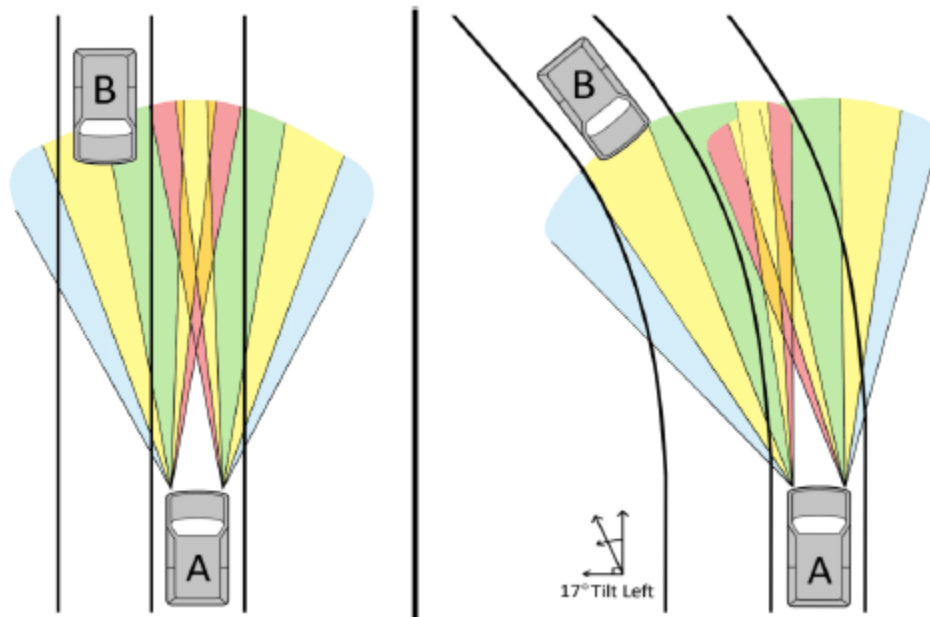
The combination of Karlsson and Harbers raises a multitude of issues unaddressed by the Petition. Petitioner already admitted that Karlsson uses the full array outside of the glare control region “to the greatest extent possible” (although Petitioner tries to newly-contextualize this admission). (Ex.1003, ¶412) And, whether or not the full array were used, segmenting the beam as in Harbers creates issues when areas of the segmented beam are suddenly blanked, responsive to detected light. (POR, 62; Ex.2006 ¶206.) These issues include loss of adequate illumination in a beam segment and/or creation of colored portions of emission. (*Id.*)

A. Selective dimming would create colored light issues

In reference to Harbers, Petitioner now contends “a POSA would have understood how to arrange the different-color LEDs to reduce ‘possible color effects [] for an observer looking into the light emitted by the vehicle headlamp.” (Reply, 17.) Petitioner’s Harbers’ “quote” however, omits important context from the reference: “By ordering the LEDs in the manner indicated in Fig. 2 ...”

(Ex.1011, 8:30.) The omitted portion demonstrates that “ordering” of LEDs is important. Once combined with a system that blanks or even dims random LEDs based on detected oncoming light, the disrupted ordering could result in colored output, that will be definitionally disrupted, creating a propensity for the situations described as problematic by Harbers (like mistaking red LEDs for brake lights) to occur. (*Id.*, 8:33-34.)

Citing Harbers (*Id.*, 5:27-29), Petitioner states that the light beams “generated from each colored light source have a more or less ‘white’ appearance.” (Reply, 18.) However, the cited quote is about combinatorial *output* beams and has nothing to do with the “beam generated from each colored source.” *See*, Ex.1011, 8:33-34. While Petitioner would prefer to pretend that its cited teaching is about light from each source, what that teaching actually shows is that additive light results in substantially white emission from the lamp, which relies on the combinations and ordering of light. (Ex. 1011, 8:28-32.) Dr. Turk’s figure (reproduced below), which Petitioner refers to as the rainbow spectrum, is exactly what is “generated” by the array of colored LEDs when certain elements (such as interspersed white elements) are blanked. (Ex.2006, ¶¶238-239.)



(Ex.2006, ¶238.)

X. Neither Beam nor Karlsson “determine” anything about a vehicle in the scene, and certainly not as claimed

A. Neither reference determines that a first section includes a vehicle

Petitioner’s statement that the patent uses the *same* approach as Beam to “determin[e] vehicle presence via detecting headlights” is incorrect. (Reply, 19.) Petitioner ignores all the more complex vision-analysis systems contemplated by the ’503 Patent, any one of which would be usable as a vision-system to identify vehicles based on the numerous characteristics unrelated to simple light detection. For example, the ’503 Patent discloses “[u]sing machine vision technology known in the art such as neural networks training and other pattern recognition techniques the vision system has sensor, algorithmic and computational means for identifying

devices or objects.” (Ex.1001, 52:58-53:8, 64:52-55; Ex.2006, ¶¶47-48.) Additionally, a spatially differentiated illumination pattern can be determined to differently illuminate segments of a field of view based on the detection of an object. (Ex.1001, 53:3-8; Ex.2006, ¶51.)

Petitioner newly argues that “Beam’s controller does distinguish between light sources, filtering weak signals.” (Reply, 19.) Filtering light, as disclosed in Beam, only results in two categories of light — but a bright non-vehicle light source would be indistinguishable to Beam from a vehicle light source, and Beam would treat both as light to which it reacts in the same manner. (POR, 51.)

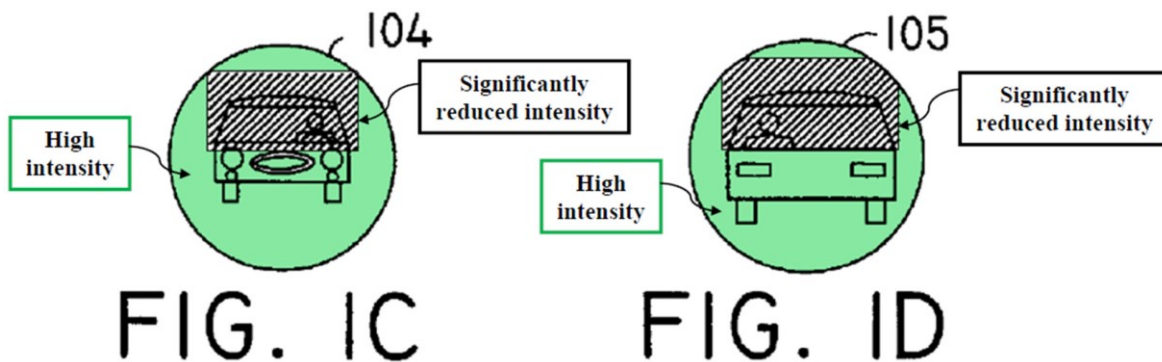
Also, Petitioner miscasts “ambient” light as “dim” detected light. (Reply, 20; Ex.1051, ¶77.) A reflective sign dynamically changes reflected light based on how much light it receives at any moment. It is certainly not distinguished from “vehicle headlights” based on brightness – a nearby sign could appear brighter to a vehicle than far-off headlights.

Karlsson similarly only determines the presence of lights and has no way of knowing if those lights relate to a vehicle or any other light source. (Ex.2006, ¶227.) Petitioner cites Karlsson’s disclosure at 5:16-18 for teaching “distinguishing vehicle lights from ambient lights,” however Karlsson is merely teaching that both ambient light and light from traffic can be sensed, not “distinguishing” between them. (Reply, 25.) Ambient light is not light from a particular source, it is the

combined light in the scene. And, while vehicle lights may be an example of light to which the system reacts, Karlsson could not distinguish a vehicle light from any other comparably bright detected light source in the scene—a person with a flashlight, highly reflective signs, a bright road sight light, etc. (Ex.2006, ¶227.) Indeed, Dr. Jiao admits that a simple photodiode—such as the one disclosed in Karlsson — will “have difficulty to detect” pedestrians wear[ing] dark clothes at night, without any reflection of visible light.” (Ex.2026, 28:8-13.)

B. Petitioner’s new, inconsistent argument about the “second section not including the vehicle” is impermissible and completely ignores how Beam functions

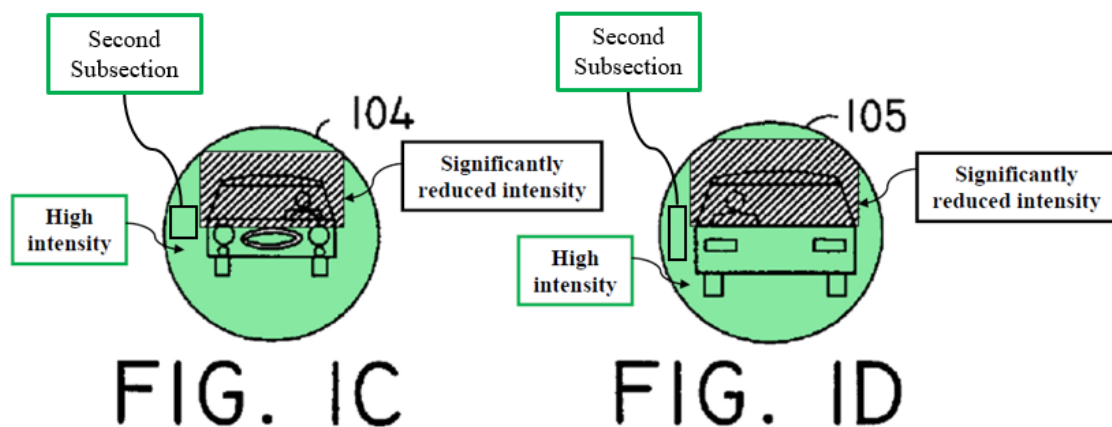
Despite having shown a “second section” that *obviously* includes a portion of the vehicle, Petitioner now advances the fiction that the second section was actually a multitude of smaller sections. (Reply, 20-21.) Petitioner’s original proof was based on the following annotated figures:



(Petition, 58.)

These figures show two sections and are generally a reasonable depiction of

how Beam functions. But, contrary to Petitioner's argument, there is a portion of the vehicle in each section. Now Petitioner argues that this alternative figure is what it meant all along:



(Reply, 21.)

When Petitioner says “any area within the green highlighted section of Beam’s figures 1C-1D that does not include a vehicle corresponds to the second subsection” (Reply, 21) – it is: 1) advancing a new argument that contradicts its prior proof; 2) ignoring the requirements of the claim that the section “be determined”; and 3) ignoring how Beam actually functions.

Beam only determines an area in which to reduce glare, but, for the sake of argument, if the second area, outside that section, is also “determined,” then Beam treats the entire area equally – by fully illuminating it. Beam does not “determine” the little sections now noted by Petitioner, nor is it cognizant of the vehicle. It

simply reduces glare where light is detected and lumps the remainder of the vehicle and scene into a single “determined” (for the sake of argument) section within which Beam does not make distinctions between smaller “sections.” To read the limitation as Petitioner reads it, effectively renders the limitation meaningless, especially considering Beam would have no way of knowing the newly presented smaller box does not include a vehicle.

XI. Full illumination in Beam renders the curve illumination of claims 21-23 and 60-62 impossible

Petitioner has failed to adequately explain how Beam would use less than the expressly taught “maximum intensity” in the full scene, rendering “increases” impossible. (Reply, 25.) All evidence presented is flawed for reasons noted above. To summarize, Petitioner previously repeatedly contended that Beam provides maximum illumination (Section VIII, *supra*), fails to show a compelling reason to “break” Beam by segmenting that illumination (*Id.*), fails to demonstrate that SLMs are not binary devices used to control intensity only (Section VII.A.3, *supra*), fails to use SLMs in combination with LEDs (Section VII.B.2, *supra*), and fails to prove that “dynamic variance” isn’t just a reference to iterations of discrete choices and controls that do not require aiming (Section VIII, *supra*).

XII. Petitioner’s comments on Harbers’s beam segments with Karlsson’s headlights have a multitude of issues

A. Failings for particularity

The Reply fails to isolate what combinations of Karlsson-Harbers-Gotou are being referenced in rebuttal. Petitioner says “because Karlsson’s headlights control beam directionality, the angular position would be adjusted according to Gotou’s techniques ...” (Reply, 27.) As noted in the POR, certain combinations – such as Karlsson’s software + Harbers’s software + Harbers’s LEDs + Gotou’s software (ground 6B) – have a litany of control-related issues. (POR, 72-73.) Other combinations lack all the requisite parts for this statement to even apply – such as Karlsson’s flat array + Harbers’s software (without curved substrate) + Gotou’s software (ground 6A) – this combination does not have “directional light sources.”

B. Petitioner fails to explain how Karlsson is not using full illumination

Petitioner tries to contextualize Karlsson as only using “all of its LEDs” when glare reduction is occurring, which creates several issues. (Reply, 16.) First, that constraint was not originally presented. Petitioner presents Fig. 14 as an example of glare reduction and the noted function of Karlsson is to have “high” illumination everywhere in the figure that glare control is not occurring. (Petition, 109.)

Further, Petitioner’s explanation of how Karlsson functions is thus: “the processor ... determines ... an area *to be suppressed* ...” (Petition, 99). For there to be suppression, there needs to be emission. (*Id.*) That comports with Petitioner’s

annotated Fig. 14. (*Id.*, 100.) Put another way – if the “suppressed” LEDs were not already providing illumination (i.e., the full array being in use), then there would be nothing to “suppress.” (*Id.*)

Moreover, Petitioner states — “Karlsson’s processor determines where light will *not* be suppressed – a second subsection of the field of view (non-shaded area of high intensity).” (*Id.*, 101.) Thus, the “base” state of non-suppressed light is “high intensity” by Petitioner’s own admission. Further, this proves that Petitioner originally contemplated Karlsson as utilizing all LEDs at high intensity for “normal” operation before glare control was applied.

Karlsson can accommodate glare, so it has no reason not to maximally utilize the full array at high intensity (as Petitioner originally demonstrated). (*Id.*) Once it is utilizing the full array, there remains nothing to “increase” in the direction of a curve.

C. Petitioner ignores the color-shift issues by pretending that colored LEDs are not actually colored

Petitioner glosses over the issues of color-shift that occur through their art combination, by maintaining an explanation about the *whole* lamp beam, that overlooks how that beam would be affected by termination of different color elements that make up that beam. Petitioner seems to not understand that Harbers and Thominet did not have a problem using colored LEDs because they never

intended to terminate the emission from certain of those LEDs— the predicate for the color-shift issue. Indeed, Petitioner relies on the “mixing” cited in Thominet, which actually requires all sources to be present, to achieve white light (Ex.1006, [0002]). Combined with selective glare control or even just the “shifting window” of Karlsson, countless unintended color combinations will result because the utilized-LEDs (being of different colors) would constantly change. (POR, 63, 74.) The remaining Reply arguments can’t be correlated to specific combinations, as they fail to explain how the beam is steered, whether via LEDs or using SLMs.

XIII. The Petition Did Not Show all Dependent Claim Elements were in the Prior Art

A. Claim 25

None of the Beam combinations proffered by Petitioner in the Petition relied on using LEDs with an SLM. (POR, 54; Petition, 14, 24, 30.) Pointing now to a claim of Beam that allegedly combines the two elements does not explain how the SLM was utilized as part of one of the prior LED combinations for independent claim 20. (Reply, 28-29.)

B. Claim 64

In stating that claim 64 was patentably indistinct from claim 25, Petitioner overlooked a limitation; it cannot come back and map to that limitation now. (POR, 27-28.) Moreover, any arguments about the “SLM” of Beam are limited to

the sub-combinations of Beam that originally included the SLM — none of which include LEDs. (Reply, 29; POR, 27-28.)

C. Claims 60-62

To gapfill missing limitations, Petitioner impermissibly draws a new equivalence. (Reply, 30.) On Reply, Petitioner contends that “directing control circuitry to adjust directional light sources. . . in a direction of the . . . curvature” is the same as “determining light output that aims illumination in a direction of the curve”—that the former would require the latter. (Reply, 30.) Petitioner’s gambit fails for two reasons: 1) Petitioner’s new position was never stated or explained in the Petition; and 2) Gotou’s directional control does not require a determination of output, only direction. (POR, 29.)

XIV. Conclusion

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

Dated: February 5, 2024

Respectfully submitted,

/ Sangeeta G. Shah /

Sangeeta G. Shah (Reg. No. 38,614)
David S. Bir (Reg. No. 38,383)
Bernard Tomsa (Reg. No. 60,121)
Andrew B. Turner (Reg. No. 63,121)

Brooks Kushman P.C.
150 W. Second St., Suite 400N

Case No.: IPR2023-00197
Patent No.: 10,894,503

Atty. Dkt. No.: TRCH0111IPR

Royal Oak, MI 48067
(248) 358-4400
Attorneys for Patent Owner

Certificate of Service

The undersigned hereby certifies that on February 5, 2024, a complete and entire copy of **PATENT OWNER'S SUR REPLY TO PETITIONER'S REPLY TO PATENT OWNER RESPONSE**, was served via electronic mail to the attorneys listed below:

LEAD COUNSEL	BACK-UP COUNSEL
Michael D. Specht (Reg. No. 54,463) Sterne, Kessler, Goldstein & Fox P.L.L.C. 1101 K Street, N.W., 10 th Floor Washington D.C., 20005 Telephone: (202) 371-2600 Facsimile: (202) 371-2540 mspecht-PTAB@sternekessler.com	Jason A. Fitzsimmons (Reg. No. 65,367) Daniel E. Yonan (Reg. No. 53,812) Ian B. Soule (Reg. No. 74,290) John D. Higgins (Reg. No. 74,992) Sterne, Kessler, Goldstein & Fox P.L.L.C. 1101 K Street, N.W., 10 th Floor Washington D.C., 20005 Telephone: (202) 371-2600 Facsimile: (202) 371-2540 jfitzsimmons-PTAB@sternekessler.com dyonan-PTAB@sternekessler.com isoule-PTAB@sternekessler.com jhiggins-PTAB@sternekessler.com PTAB@sternekessler.com Edgar H. Haug (Reg. No. 29,309) Robert E. Colletti (Reg. No. 76,417) Haug Partners LLP 745 Fifth Avenue New York, NY 10151 Telephone: (212) 588-0800 Facsimile: (212) 588-0500 ehaug@haugpartners.com ; rcolletti@haugpartners.com PTAB-Porsche@haugpartners.com

Respectfully submitted,

/ Sangeeta G. Shah /

Sangeeta G. Shah (Reg. No. 38,614)
David S. Bir (Reg. No. 38,383)
Bernard Tomsa (Reg. No. 60,121)
Andrew B. Turner (Reg. No. 63,121)

Brooks Kushman P.C.
150 W. Second St., Suite 400N
Royal Oak, MI 48067
(248) 358-4400

Attorneys for Patent Owner

Certificate of Compliance Pursuant to 37 C.F.R. § 42.24

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Respectfully submitted,

Dated: February 5, 2024

/ Sangeeta G. Shah /
Sangeeta G. Shah (Reg. No. 38,614)
Andrew B. Turner (Reg. No. 63,121)
David S. Bir (Reg. No. 38,383)
Bernard P. Tomsa (Reg. No. 60,121)
BROOKS KUSHMAN P.C.
150 W. Second St., Suite 400N
Royal Oak, MI 48067-3846
(248) 358-4400

Attorneys for Patent Owner