

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

VOLKSWAGEN GROUP OF AMERICA, INC.,
Petitioner,

v.

YECHEZKAL EVAN SPERO
Patent Owner.

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

Case No.: IPR2023-00335

**PATENT OWNER'S RESPONSE TO PETITION
FOR *INTER PARTES* REVIEW UNDER 37 C.F.R. § 42.220**

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List of Exhibits

Exhibit No.	Description
2001	Declaration of Matthew A. Turk, PhD
2002	Curriculum Vitae of Matthew A. Turk, PhD
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, PhD
2007	Transcript of Deposition of Jianzhong Jiao, Ph.D. taken on August 2, 2023, <i>Volkswagen Group of America, Inc. v. Torchlight Technologies LLC</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. Torchlight Technologies LLC</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
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	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	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	Intentionally left blank.
2020	Michael Bass, <i>Handbook of Optics</i> 3 RD Edition Volume V, (McGraw-Hill, 2010) (Available at
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	Intentionally left blank
2024	Intentionally left blank.

Exhibit No.	Description
2025	Transcript of Deposition of Jianzhong Jiao, Ph.D. taken on October 3, 2023, <i>Volkswagen Group of America, Inc. v. Torchlight Technologies</i> , IPR2023-00197, -00328, -00335

Patent Owner submits the following (“Response”) to the Petition (Paper 2) for *Inter Partes Review* of claims 1-19 and 37-58 (“Challenged Claims”) of U.S. Patent No. 10,894,503 (“the ’503 Patent”) filed by Volkswagen Group of America, Inc., (“VW” or “Petitioner”), and the Board’s Decision of Institution (“DI”, Paper 11).

I. Introduction

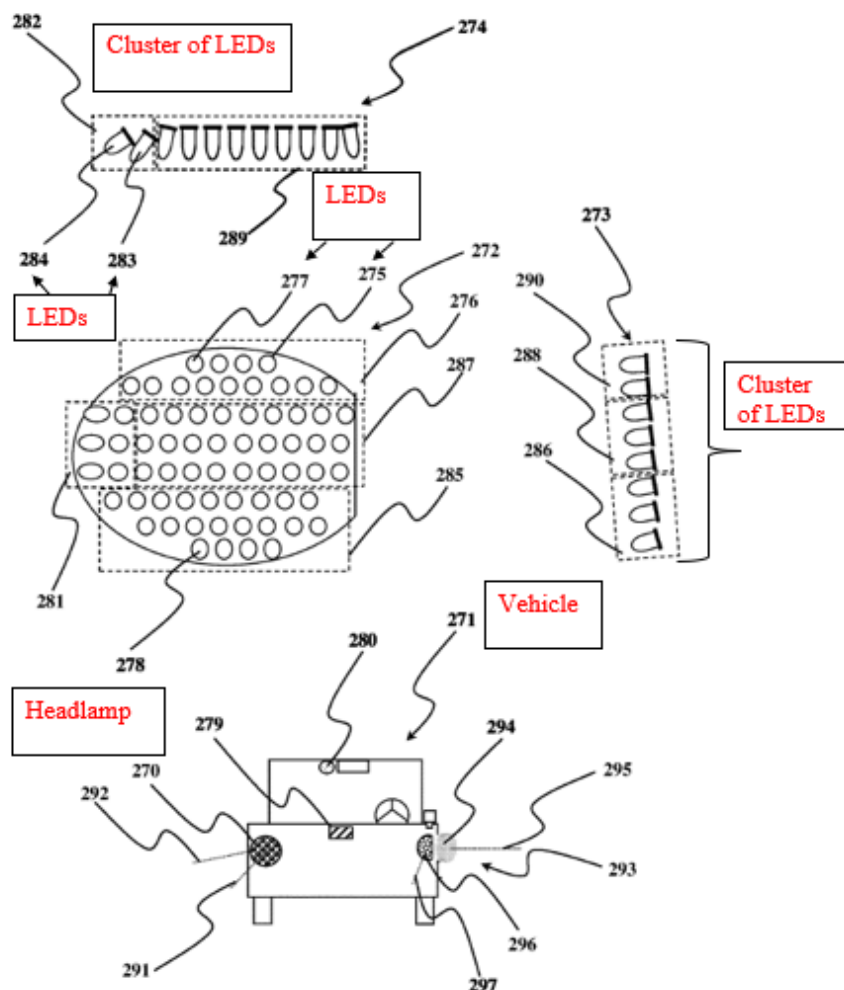
The Petition is devoid of particularity. Through a circuitous web of arguments, the Petition presents at least two different obviousness combinations for each of the Challenged Claims. When unpacked, Grounds 1 and 7 are each at least five distinct sub-grounds: 1) Grounds 1A-1B and 7A-7B—an incomplete argument that disparate embodiments of the primary reference (Beam or Karlsson) anticipate or renders obvious the Challenged Claims. (Petition, 8, 17; 104); 2) Grounds 1C and 7C-7D—the combination of Beam and Thominet’s software, or Karlsson and Harbers’ software (Petition, 11-13, 96-99); and 3) Grounds 1D-1E and 7E-7F—the combination of Beam and Thominet’s hardware, or Karlsson and Harbers’ hardware (Petition, 13-15, 99-100). These sub-grounds cascade through Grounds 2-6 and 8-9 totaling at least 47 distinct grounds.

Despite cramming at least 47 grounds into the Petition (one of three for this patent)—and not justifying the need to do so — Petitioner fails to meet its burden of proof. The disjointed grounds fail to meet the claim limitations, and offer vague

unsupported motivation to combine arguments as to how and why a POSA would have combined the references, while also failing to address all the possible problems the combinations create and how those problems would be solved. Finally, the Petition fails to satisfy the particularity requirements of § 312—the proffered combinations are unclear or inconsistent, the obviousness proofs often map to paraphrasing instead of the actual claim language, and much of the analysis/argument is exported to the expert declaration.

II. Overview of the '503 Patent - The Claimed Invention is Directed to an Adaptive Multi-LED Headlight System for Spatially Differentiated Light Distribution Based on the Detection of a Vehicle in the Field of View

The '503 Patent is directed to “a novel multi-light source approach to the design and construction of solid-state lighting fixtures (vs. solid state lamps), which is termed a ‘Digital Lighting Fixture’, due to the control of individual lighting element ‘digits’ to provide the ‘correct’ lighting solution for the situation at hand.” (Ex.1001, 11:11-16.) The '503 Patent further explains that “[t]he terminology ‘digital’ as used herein refers to the discrete nature of the multiple LED lamps provided in the luminaire, whereby, ‘digital’ control results from the individual control of the discrete, i.e., ‘digital’ lighting elements, the LEDs, in the luminaire.” (*Id.*, 2:67-3:5; Ex.2006, ¶47.)



(Ex.1001, FIG 15, Annotated)

“The added controllability offered by breaking the total light output up into discrete (‘digital’) specifically aimable and dimmable elements which can be addressed by control electronics to effect intensity, spectrum and spatial distribution of intensity and spectrum, yields a lighting fixture (vs. lamp) of unparalleled performance.” (Ex.1001, 11:61-67, emphasis added; Ex.2006, ¶48.) The ’503 Patent describes using a digital light fixture (DLF) to provide multiple

functions, for example “[i]n a DLF it is possible to combine a task light having a very narrow ‘spot’ beam at the correct aiming with a general area lighting ‘flood’ beam into one fixture.” (*Id.*, 22:18-20; Ex.2006, ¶48.)

Specifically, the ‘503 Patent describes methods of using a multi-LED light source to segment a field of view and deliver varied, optimized illumination to the different segments within the field of view based on the presence of a detected object, “covering a wide scope of applications”, including transportation. (Ex.1001, 11:18-21, 4:20-24, 50:40-41; Ex.2006, ¶49.)

In the context of headlights,

[a]dditional features can include an optional very narrow flashlight type of beam. . . Such a beam at the correct narrow aiming can continue to illuminate far ahead (in high beam) without blinding oncoming traffic. Analysis by a detector or an imaging system of the oncoming vehicles position (using its headlights for example) can be used to determine which exact aiming is the maximum allowable for any given traffic situation and road layout.

(Ex.1001, 52:58-53:2; Ex.2006, ¶50.)

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:

Using color and pattern recognition techniques it is possible to determine what is a sign. It is then possible to provide the equivalent of “task lighting” and use the controller and properly aimed SLS to follow and illuminate distant overhead and roadside signs for a longer time, yet not blind oncoming traffic due to the narrow beam.

(Ex.1001, 53:3-8; Ex.2006, ¶51.)

Thus, the ‘503 Patent is directed to multi-LED headlight systems that precisely determine anti-glaring illumination output to optimize illumination for the vehicle operator under a myriad of driving situations, whilst reducing glaring illumination for oncoming vehicles (Ex.2006, ¶52.)

The Challenged Claims include independent claims 1 and 37. Both claims 1 and 37 are reproduced below with emphasis added:

1. A vehicle headlight system comprising:

one or more headlamps and a vehicle structure, arranged for affixing components of the system to the vehicle;

a plurality of light clusters, arranged in each of the one or more of the one or more headlamps, the headlamps capable of projecting light so as to illuminate a plurality of sub-sections of a field-of-view with different illumination characteristics, the subsections determined in response to sensor data, wherein the light clusters operate to create a headlight beam;

Determining
Subsections
Limitation

electronic control circuitry configured to independently operate the light clusters;

one or more sensors configured to obtain and provide the sensor data predefined as pertinent to illumination requirements for the field-of-view; and

a logical controller including a processor, the processor in communication with a memory storing one or more algorithms, with the sensors, and with the control circuitry, wherein the processor is configured to process the one or more algorithms and the sensor data to determine an illumination for at least two of the sub-sections, that reduces illumination to reduce glare in at least a first of the at least two subsections and adapt the light emitted from one or more of the light-clusters so as to create the headlight beam that provides the determined illumination.

Determining
Illumination
for
Subsections
Limitations

37. A vehicle headlight system comprising:

one or more headlamps affixable to a first vehicle;

a plurality of light clusters arranged in each of the one or more of the headlamps and capable of illuminating sub-sections of a field-of-view with different illumination characteristics, wherein at least two of the light clusters operate to create a headlight beam;

Subsections
Limitation

one or more sensors configured to obtain and provide sensor data, at least a portion of the sensor data indicating a second vehicle within the field-of-view; and

at least one processor configured to:

receive the sensor data;

process the sensor data to determine a light distribution pattern for an adaptive headlight beam, such that a headlight beam adapted to the pattern substantially illuminates a first subsection of the field-of-view including at least a portion of the second vehicle with an illuminance below a predefined threshold value, while the beam substantially illuminates at least the one or more second subsections of the field-of-view to either side of the first subsection with an illuminance above the predefined threshold value; and

Determining
Light
Distribution
Pattern
Limitation

instruct operation of at least two of the light clusters to create the adapted headlight beam.

(Ex.1001, claims 1, 37.)

The dependent claims include additional innovative features that specify

illumination strategies for a myriad of driving situations — for example, increasing illumination in a direction of the road curvature or a turn (claims 15-17, 54-56), and, identifying vehicles or determining the position of vehicles (claims 7, 8, 11, 47, 48, 50). (Ex.2006, ¶54.)

III. Level of ordinary skill

Patent Owner does not dispute the Board’s proposed level of ordinary skill. (See DI at 8.)

IV. Claim Construction

Patent Owner agrees that, within the context of the ’503 Patent, the plain meaning of light source is “any system that is capable of receiving an electrical signal and producing light in response to the signal.” (DI at 8; Ex.2006, ¶59.)

V. The Petition Lacks Particularity Under § 312

A Petition must identify “with particularity” the challenged claims, the grounds, and the supporting evidence. 35 U.S.C. § 312(a)(3); *see also Harmonic Inc. v Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016). Under 37 C.F.R. § 42.104(b)(4), “The petition must specify where each element of the claim is found in the prior art patents or printed publications relied upon.”

A. The Petition Presents Alternative Teachings For Each Ground

The Petition presents at least two entirely different obviousness

combinations to challenge the validity of each of the Challenged Claims, along with a massive number of sub-combinations. (Ex.2006, ¶114.)

For example, Ground 1 presents two distinct embodiments for Beam alone, with a statement that “Beam discloses every feature.” (Petition, 8.) Then it proposes to utilize “software **or** hardware” of Thominet. (*Id.*, 10.) Thominet’s software is “implemented with Beam’s controller 108/illuminator 109 (including SLM 203),” resulting in a combination of Beam’s Lamp+SLM and Thominet’s software. (*Id.*, 11-13.) The alternative hardware combinations result in either a “substitution” of Thominet’s array for Beam’s, or a “modification” of “the flat surface of Beam’s LED array with Thominet’s curved surface.” (*Id.*, 14-15.) This results in Thominet’s hardware or curved substrate being combined with Beam’s LED array. (Ex.2006, ¶¶115-118.)

A similar approach was taken with Ground 7, asserting both Karlsson alone and alternative combinations of Karlsson with Harbers’ “software **or** hardware.” (*Id.*, 93, 96.) Petitioner argued that spotlight beams of Karlsson could come from “LEDs” or that they “may also come from light modulator means,” providing two applications of Karlsson, LED alone or LED+modulator. (*Id.*, 93.) Since Petitioner used “may also,” they lack particularity with regards to what elements are ultimately being relied upon, and thus Patent Owner had to consider both. Harbers’ software was “implemented with Karlsson’s control means 14/beams 34,” which

effectively implicates both possibilities from Karlsson alone, with no specificity of a modulator. (*Id.*, 98-99.) Harbers' array was implemented as a "substitution" for "lighting means 2,3" (removing both parts of Karlsson's hardware) or a "modification" to Karlsson's array using only Harbers' "curved substrate." (*Id.*, 100; Ex.2006, ¶119-121.)

Thus, Grounds 1 and 7 total eleven distinct sub-grounds as illustrated below:

Ground	References
1A	Beam Lamp+SLM
1B	Beam LEDs
1C	Beam Lamp+SLM + Thominet Software (SW)
1D	Beam SW + Thominet LEDs (HW)
1E	Beam LEDs + Thominet Curved Substrate
7A	Karlsson LEDs + Mod
7B	Karlsson LEDs
7C	Karlsson LEDs+Mod+ Harbers SW
7D	Karlsson LEDs + Harbers SW
7E	Karlsson SW + Harbers HW
7F	Karlsson Mod+ Harbers Curved Substrate

The derivation of these grounds is explained in detail below for grounds 1 and 7,

and in short synopsis for grounds 2-6 and 8-9.

1. Ground 1A (Beam Lamp+SLM); Ground 1B (BeamLEDs)

Although Ground 1 is presented as an obviousness ground, Petitioner argues Beam alone teaches the limitations: “[i]f Patent Owner argues, incorrectly, [that] Beam does not disclose [1.2], Beam-Thominet renders it obvious.” (Petition, 17.) Petitioner argues two embodiments of Beam: a light source 202 plus spatial light modulator (SLM) 203 embodiment and an LED embodiment where Petitioner contends the LED array 401 “has the same functionality as lamp 202 and SLM 203.” (*Id.*, 9.) Petitioner does not explain how or why a POSA would have combined elements of Beam’s distinct embodiments – indicating that Petitioner argues them as separate grounds (1A, 1B). Beam does not disclose that these embodiments are interchangeable; instead Beam discloses that in its LED array embodiment, the conventional “lamp 202 and spatial light modulator 203 are replaced by an array of light sources 401” (Ex.1005, 5:3-6; Ex.2006, ¶158-162.)

2. Ground 1C: BeamLamp+SLM+ThominetSW

Petitioner also uses disjunctive (at times in concert with conjunctive) terminology to combine each primary reference with one or more teachings of a secondary reference, creating multiple additional grounds. For example, regarding Ground 1, Petitioner proposes combining Beam with Thominet’s “either software

or hardware” teachings. (Petition, 10.) Thominet’s software is described as an “additional control technique” that is “implemented with Beam’s controller 108/illuminator 109 (including SLM 203).” (*Id.*, 11-12; Ex.2006, ¶116.)

3. Ground 1D: BeamSW+ThominetLEDsHW

Petitioner also proposes combining Beam with Thominet’s hardware: “Second, a POSA would have sought to incorporate known components (hardware implementation) of Thominet’s semiconductor light sources 10 on curved surface 12 . . . into Beam (with flat array of light sources 401).” (Petition, 13.) Petitioner describes the combination as “combining” **or** “substitut[ing]”. “This would have been combining prior-art elements **or** a simple substitution of one known element for another (Beam’s LED array on a flat surface and Thominet’s semiconductor sources 10 on a curved surface 12).” (*Id.*, 14; Ex.2006, ¶117.)

4. Ground 1E: BeamLeds+ThominetHW Curved Substrate

Petitioner alternatively proposes modifying Beam’s substrate to provide a curved substrate in view of Thominet: “A POSA would have had a reasonable expectation of success combining Beam and Thominet, for example, by modifying the flat surface of Beam’s LED array with Thominet’s curved surface 12 to provide multiple light clusters/sources (e.g., beam regions 22, 24, 26, 28) for different functions.” (Petition, 14-15; Ex.2006, ¶118.)

**5. Ground 7A: Karlsson LED+Mod; Ground 7B:
Karlsson LED Array**

Similarly, regarding Ground 7, Petitioner argues that “[i]f Patent Owner argues, incorrectly, that Karlsson does not disclose [1.2]/[37.2], Harbers does.” (Petition, 94.) Petitioner argues two discrete embodiments of Karlsson: a lamp + modulator embodiment, and an LED array embodiment. (*Id.*; Ex.2006, ¶119.)

**6. Ground 7C: (Karlsson LED + Harbers Software);
Ground 7D: (Karlsson LED+Mod + Harbers
Software)**

Petitioner proposes combining Karlsson with Harbers’ “software or hardware” teachings. (Petition, 96.) Harbers’ software is described as an “additional control technique.” (Petition, 96-97; Ex.2006, ¶120.) The software is simply combined with “control means 14/spotlight beams 34.” (*Id.*, 98.) Since “spotlight beams” were described in Karlsson in conjunction with “LEDs” as well as possibly also coming from “light modulator means” (use of “may”), both versions of the spotlight beams are separate combinations and need to be addressed. (Petition, 93.)

7. Ground 7E: Karlsson+Harbers Hardware

Petitioner also proposes combining Karlsson with Harbers’ hardware: “Second, a POSA would have sought to incorporate known components (hardware implementation) of Harbers’ opto-electronic elements 11-14 on a ‘curved

substrate’ (with differently aimed opto-electronic elements 11-14 . . .) into Karlsson.” (Petition, 99.) Petitioner describes the combination as “combining” **or** “substitut[ing]” Karlsson: “This would have been combining prior-art elements or a simple substitution of one known element for another (Karlsson’s lighting means 2, 3 on a flat substrate and Harbers’s opto-electronic elements on a curved substrate) according to known methods to yield predictable results.” (Ex.2006, ¶121.)

8. Ground 7F: Karlsson+Harbers’ Curved Substrate

Petitioner alternatively proposes modifying Karlsson’s substrate to provide a curved substrate in view of Harbers: “A POSA would have had a reasonable expectation of success combining Harbers with Karlsson, for example, by simply modifying the Karlsson’s flat substrate as in Harbers’ curved substrate to provide multiple light clusters/sources for different functions.” (Petition, 100; Ex.2006, ¶122.)

9. Ground 2

Presented as “Beam-Beam-Thominet” and **also** “Beam-Thominet combined with Stam,” (Petition, 54-58) this ground implicates all individual sub-grounds of Ground 1 as well as sub-grounds 1C-1E combined with Stam, adding **eight** more sub-grounds, for a total of **fifteen**. (See Ex.2006, ¶¶180-210.)

2A	1A	
2B	1B	
2C	1C	
2D	1D	
2E	1E	
2F	1C	Stam
2G	1D	Stam
2H	1E	Stam

10. Ground 3

Ground 3 modifies “Beam-Thominet” with Kobayashi, implicating sub-grounds 1C-1E. (Petition, 74.) Petitioner also states in combining Kobayashi’s “techniques and system components” that a POSA would have included “road profile calculating means 2 **and/or** advancing prediction direction means 3.” “And/or” sets up 3 alternatives – a, b, a+b. (*See Adaptics Ltd. v. Perfect Co.*, IPR2018-01596, Paper 20 at 18 (PTAB March 6, 2019) (informative).) Each possibility has to be combined with **each** imported sub-ground 1C-1E, for a total of **nine** more grounds, bringing the total grounds to **twenty-four**. (*See Ex.2006*, ¶¶213-228.)

3A	1C	Kobayashi Data	Means 2	
3B	1D	Kobayashi Data	Means 2	
3C	1E	Kobayashi Data	Means 2	
3D	1C	Kobayashi Data		Means 3
3E	1D	Kobayashi Data		Means 3
3F	1E	Kobayashi Data		Means 3
3G	1C	Kobayashi Data	Means 2	Means 3
3H	1D	Kobayashi Data	Means 2	Means 3
3I	1E	Kobayashi Data	Means 2	Means 3

11. Ground 4

Ground 4 is a replication of Ground 3 for motivation to combine, but this time utilizing “Beam-Thominet-Stam.” That combination, without further explanation, includes grounds 2F-2H. The “and/or” language from Ground 3 causes another **nine** grounds to occur, for a total of **thirty-three** grounds. (See Ex.2006, ¶¶229-236.)

4A	2F	Kobayashi Data	Means 2	
4B	2G	Kobayashi Data	Means 2	
4C	2H	Kobayashi Data	Means 2	

4D	2F	Kobayashi Data		Means 3
4E	2G	Kobayashi Data		Means 3
4F	2H	Kobayashi Data		Means 3
4G	2F	Kobayashi Data	Means 2	Means 3
4H	2G	Kobayashi Data	Means 2	Means 3
4I	2H	Kobayashi Data	Means 2	Means 3

12. Ground 5

Ground 5 adds “IR/UV” light from Braun to “Beam-Thominet.” (*Id.*, 87.)
Petitioner shows Thominet’s array at one point (sub-ground 1D) and mentions Beam’s LEDs (sub-grounds 1C, 1E) at another, implicating all of sub-grounds 1C-1E, for **three** more grounds and a total of **thirty-six**. (See Ex.2006, ¶¶237-241.)

5A	1C	Braun Luxels
5B	1D	Braun Luxels
5C	1E	Braun Luxels

13. Ground 6

Ground 6 employs the same logic as Ground 5, using “Beam-Thominet-Stam,” for **three** more grounds and a total of **thirty-nine**. (Petition, 93; See

Ex.2006, ¶242-245.)

6A	2F	Braun Luxels
6B	2G	Braun Luxels
6C	2H	Braun Luxels

14. Ground 8

Ground 8 modifies “Karlsson-Harbers” with Gotou. (Petition, 159.) The modification is contended to involve “Karlsson-Harber’s adaptive, direction controllable headlamps with Gotou’s directional control.” (*Id.*, 162-163.) This implicates all Karlsson-Harbers combined grounds, for **four** more grounds and a total of **forty-three** sub-grounds. (Ex.2006, ¶¶315-325.)

8A	7C	Gotou HW/SW
8B	7D	Gotou HW/SW
8C	7E	Gotou HW/SW
8D	7F	Gotou HW/SW

15. Ground 9

Ground 9 combines “IR/UV luxels” from Braun with Karlsson-Harbers. Again, the Braun combination shows Harbers’ light source 4 and discusses

Karlsson’s LEDs, once again implicating all four combined grounds 7C-7F, for **four** more additional grounds and a total of **forty-seven**. (See Ex.2006, ¶¶326-331.)

9A	7C	Braun Luxels
9B	7D	Braun Luxels
9C	7E	Braun Luxels
9D	7F	Braun Luxels

Petitioner’s alternative arguments within each ground are contrary to USPTO policy: “Do NOT ‘suggest’ other proposed rejections in... ‘disclaimer-type’ language” and “Do NOT lump together multiple proposed rejections based on different grounds.” (Ex.2003.)

Such arguments multiply the challenges and “place[] an undue burden on Patent Owner and undercuts its ability to effectively respond...” *EnergySource Minerals, LLC v. TerraLithium LLC*, IPR2019-01607, Paper 10 at 14 (PTAB May 4, 2020).

This [lack of particularity] require[s]... Patent Owner to scour the Petition to discern Petitioner’s evidence as to each of [the arguments]. [A] Petition that requires... Patent Owner to do so lacks particularity and is tantamount to impermissibly shifting Petitioner’s burden under 35 U.S.C. § 312(a)(3).

InVue Sec. Prods., Inc. v. Mobile Tech., Inc., No. IPR2019-00078, Paper 7 at 15 (PTAB May 1, 2019); *see also* *Adaptics Ltd.*, IPR2018-01596, Paper 20 at 24 (“[T]he lack of particularity results in voluminous and excessive grounds,” and “in the interests of efficient administration... and integrity of the patent system and as a matter of procedural fairness to Patent Owner, the entire petition should [have been] denied under 35 USC § 314(a).”)

This lack of particularity is compounded by Petitioner’s other two petitions challenging the ’503 Patent that suffer the same lack of particularity issues—meaning **Petitioner has asserted at least 149 grounds.** (See Patent Owner’s Responses in IPR2023-00197, IPR2023-00328, IPR2023-00335.)

However, "one petition should be sufficient... [while t]wo or more petitions filed against the same patent . . . may place a substantial and unnecessary burden on the Board and the patent owner and could raise fairness... and efficiency concerns." Consolidated Trial Practice Guide (“CTPG”) at 59. “[T]he Board finds it unlikely that circumstances will arise where three or more petitions by a petitioner with respect to a particular patent will be appropriate.” (*Id.*)

This is especially true here, where in all three Petitions Petitioner challenges the same claims with Beam-Thominet and then again with Karlsson-Harbers. Petitioner asserts that either Beam or Karlsson teaches all limitations at issue and then alternatively relies on Thominet and Harbers respectively to add software or

hardware. Petitioner could have easily consolidated the three petitions into one or two by removing redundant grounds and/or grounds asserting additional art.

Additionally, the Board instituted on Beam alone (Grounds 1A-1B) and Karlsson alone (Grounds 7A-7B), even though Petitioner did not frame these as grounds and without addressing Patent Owner's rationale to combine arguments from the POPR. (DI at 14.) Accordingly, Patent Owner has presented a full accounting of sub-grounds as it can best determine.

VI. The Challenged Claims are Patentable

A. Ground 1 – Beam and Thominet

1. Independent Claims:

- a. Claim 1 – The Beam-Thominet Combination does not teach “*determin[ing] an illumination . . . to reduce glare.*”**

Claim 1 requires a “*processor configured to . . . determine an illumination for at least two of the sub-sections, that reduces illumination to reduce glare.*” The plain meaning of illuminate is “to supply or brighten with light” or “to make luminous or shining.” (www.merriam-webster.com/dictionary/illuminate.) This plain meaning is consistent with the '503 Patent specification which teaches three different operating states for the light emitting elements: 1) operating at full power; 2) operating at a fraction of full power for reduced intensity and 3) not operating. (Ex.1001, 19:30-37; Ex.2006, ¶¶126-128.) Per the '503 Patent, shutting off a light

element is distinct from reducing intensity. (Ex.1001, 65:37-41; Ex.2006, ¶128.)

Petitioner relies on, *inter alia*, Beam’s disclosure at 6:12-19 for satisfying this limitation. (Petition, 32; Ex.2006, ¶129.)

(1) All Sub-Grounds

Beam discloses “AABH headlights [that] will operate at maximum intensity at all times.” (Ex.1005, 6:11-12.) Beam does not teach “*adapt[ing] the light emitted;*” it teaches zeroing or blanking emission so no light is emitted. Beam generates a darkened area of reduced illumination by blanking or inactivating associated LEDs so they are not “active emitters.” (Ex. 1005, 5:9-16.) Beam determines areas not to be illuminated, it does not determine areas to be illuminated nor reducing the intensity of LEDs to “*adapt the light emitted.*” Beam teaches a binary system – “dimmed” emitters that are blanked to become inactive and active emitters that otherwise output “maximum intensity” emission “at all times”: the controller 108 “uses the data to determine the size and position of the light emitters to be dimmed. The output of the active emitters is projected through the optical system.” (*Id.*, 5:13-16.) This comports with Beam’s teaching about blanking light, and the description of “dimming” an area and describing that area as a “blanked” area. (*Id.*, 5:66-6:27; Ex.2006, ¶¶130-131.)

Because Beam teaches a binary system, where the LEDs are either at a maximum output or blanked to no longer provide a determined illumination, Beam

fails to teach “*adapt[ing] the light emitted . . . that provides the determined illumination*” as required by Claim 1. Therefore claim 1 is patentable over the Beam-Thominet combinations. (Ex.2006, ¶¶130-132; *see also* ¶¶60-76.)

2. Dependent Claims:

a. Claim 2 – Beam-Thominet Combinations do not teach “*control of . . . light modifying elements.*”

Claim 2 requires “*one or more light modifying elements provided in the path of light . . . further controlling the light-source characteristics; wherein the structure combined with control of the light sources and light modifying elements . . .*.” Petitioner argues “Beam’s SLM 203 is a ‘light modifying element[.]’ . . . Beam’s optical system 106 (bi-convex lens) and/or Beam-Thominet’s lens 43, 46 of semiconductor source 10 (LED) is a ‘light modifying element[.]’” but without specifying which reference/embodiment is relied on for satisfying the “*light modifying element*” limitation in each sub-ground. (Petition, 36-37; Ex.2006, ¶¶134-135.)

(1) Ground 1B (BeamLEDs)

Beam discloses that in the LED Array embodiment, the conventional “lamp 202 and spatial light modulator 203 are **replaced** by an array of light sources 401.” (Ex.1005, 5:3-6.) Beam discloses that the LED array embodiment includes the optical system 106 (Ex.1005, Fig. 4), which is a non-controllable passive optic.

While the Beam LED Array embodiment discloses control of the light source sources (LEDs), it does not teach “*control of . . . light modifying elements.*” (Ex.2006, ¶136.)

(2) Ground 1D (BeamSW+ThominetHW)

Thominet discloses passive optical element 43 and passive lenses 46. (Ex.1006, [0029]-[0030], Figs. 5, 6.) Thominet does not teach controllable “*light modifying elements*” hardware. (Ex.2006, ¶¶137-139.) Whether Beam has such an element, proposed by Petitioner as an SLM, that element is not included in this sub-ground, which utilizes Thominet’s Array and was not presented to include the SLM. Therefore the BeamSW+ThominetHW combination (1D) has not been shown to teach all claim limitations.

b. Claim 5 – The Beam+Thominet Combinations do not teach “*illuminat[ing] . . . with a different color of light*”

Petitioner relies on Beam’s LEDs, Thominet’s semiconductor light sources and disclosure of mixing color in paragraphs 26-29 for satisfying this limitation, without specifying which reference/embodiment it is relying on for each sub-ground. (Petition, 43-44; Ex.2006, ¶142.)

(1) Grounds 1A-1B (Beam)

Beam does not disclose that its lamp or LEDs provide multi-color light. Accordingly, Beam does not teach “*illuminat[ing] . . . with a different color of*

light.” (Ex.2006, ¶143.)

(2) Ground 1C, 1E (Beam+ThominetSW-Substrate)

Since Beam does not teach different color lamps or LEDs, a POSA would have understood that Thominet’s software would not have been able to control Beam’s single color light source to provide “*different color of light.*” Curving Beam’s substrate would not have changed this. (Ex.2006, ¶144.)

(3) Grounds 1D (BeamSW+ThominetHW)

Since Beam does not teach the control of different color LEDs, Beam’s software (running the claimed “*control circuitry*”) would not be “*configured to alter the overall spectral power distribution characteristic*” using Thominet’s LEDs to provide “*different color of light*” between one sub-section and another. (Ex.2006, ¶145.) Even if colored LEDs were included, Beam would, at most, accidentally control them in some situations, but given that this would be entirely unpredictable, no POSA would make this combination in any event.

The Beam+Thominet Combinations do not teach “*illuminat[ing] . . . with a different color of light,*” and claim 5 is patentable over the combinations. (Ex.2006, ¶146.)

c. Claim 11 – The Beam+Thominet Combinations do not teach “*identify[ing] entities including at least one of beings, vehicles.*”

Petitioner relies on Beam’s disclosure at 4:10-25, 5:33-54, 6:12-27, FIGS. 1C-1D for satisfying this limitation. (Petition, 48; Ex.2006, ¶149.)

(1) All Sub-Grounds

Beam discloses that “[b]y controlling an area determined by analyzing the position of the lights sensed ahead, the area of the beam that would dazzle the driver will be darkened.” (Ex.1005, 2:56-3:3; Ex.2006, ¶150.)

Beam further discloses that “[a]s the positions of both vehicles move, the blanked area tracks the location of the oncoming vehicle, dynamically varying in position and in size.” (*Id.*, 6:24-27.) Beam has no ability to associate detected light with a particular target. Beam simply detects illumination sources within the field-of-view and blanks all microbeams associated with the illumination sources. Each subsequent detection of light is performed anew, with no relationship to a prior detection and thus the Beam+Thominet Combination does not “*identify . . . vehicles*” as claimed. (Ex.2006, ¶¶151-152.)

The Beam and Beam+Thominet Combinations do not teach all claim limitations, and claim 11 is patentable over the combinations.

3. A Person of Ordinary Skill in the Art Would Not Have Been Motivated to Combine Beam and Thominet

Under *KSR*, “there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2006), 82 USPQ2d at 1396 (2007) (quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)).

Because the structure and arguments of this Petition closely resemble the filings in *Sisvel International S.A. v. Sierra Wireless, Inc.*, 2023 WL 6522182, at *3 (Fed. Cir. Oct. 6, 2023) (precedential), that case is particularly instructive. In *Sisvel*, the **Federal Circuit affirmed** the Board’s decision that each of Cross-Appellants’ ten reasons for combining the applied references lacked “a rational underpinning to combine the respective teachings of the references” because the arguments were “expressed at such a non-specific, high level of generality, they never made clear to the Board what portions of the references were being combined and why a skilled artisan would identify those particular elements for a combination.” Faced with this critical lack of clarity, the Federal Circuit held “we cannot fault the Board for being at a loss in trying to decipher Cross-Appellants kitchen-sink of unclear and confusing motivation-to-combine arguments”. (*Id.*, 7.)

As in *Sisvel*, 1) the instant Petition does not explain “what elements are missing from the primary reference, what elements should be added from the secondary reference to reach the claimed invention, or why those particular elements would be obvious to add”; and 2) the Grounds are inconsistent as to how

the primary and secondary references should be combined and the rationale for doing so. (*Supra* V.A., *Infra* VI.A.3a-b.) Like *Sisvel*, this Petition adopts a kitchen-sink approach that is cryptic at best and devoid of rational underpinnings to support the countless motivation to combine permutations presented.

a. Petitioner Fails to Explain Why a POSA Would Have Combined Beam and Thominet Absent Hindsight

Under *KSR*, “if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.” *KSR*, 550 U.S. at 417. This is referred to as the “known-technique” rationale and the Federal Circuit has clarified that “if there’s a known technique to address a known problem using ‘prior art elements according to their established functions,’ then there is a motivation to combine.” *Intel Corp. v. PACT XPP Schwiez AG*, 61 F.4th 1373, 1381 (Fed. Cir. 2023) (quoting *Intel Corp. v. Qualcomm Inc.*, 21 F.4th 784, 799-800 (Fed. Cir. 2021)).

In *Intel v. PACT*, the Federal Circuit expanded this “known technique” rationale when the prior art addressed the same, focused problem of cache coherency, replacing the “improvement” requirement with a “suitable option” requirement, i.e., “[i]t’s not necessary to show that a combination is the *best* option, only that it be a **suitable option**.” *PACT XPP Schwiez AG*, 61 F.4th at

1381. Here, because the applied prior art is directed to different types of systems that function in different ways to address different problems, the *Intel* case is inapposite. Moreover, given the state of the art, suitable versions of the proposed combinations would be beyond the skill of a POSA.

The use of Thominet's clustered regions for predefined functions, when coupled with Beam's array of fungible LEDs, would compromise the ability of the combined system to deliver forward illumination. Because groupings of LEDs would be assigned to predefined functions, e.g., to produce light of different colors (for a signal function and a headlight), a concentric high beam, a horizontally dispersed light beam with wider front illumination or a "one-side oriented light", in operation entire LED clusters would be unavailable to provide forward illumination. Furthermore, Beam's blanking of LEDs associated with detected light to avoid glaring would further reduce the number of active LEDs within the cluster providing forward illumination. Considering the relevant state of the art, and limitations surrounding white LED lumen output, which Petitioner's expert Dr, Jiao repeatedly discussed in articles from the early 2000s, a combined system that relies on only certain segments of LEDs for forward illumination would fail to provide sufficient forward illumination and most likely result in a non-functional system. (Ex.2006, ¶154; Ex.2015.) Given the state of the art at the time, without creating issues with packaging, heat degradation and cost, additional LEDs could

not simply be added to preserve forward illumination and multi-functional LED clusters. (See Ex.2006, ¶¶26-44.)

In the early 2000s, LED headlamp design posed a complex set of challenges and tradeoffs involving optics, heat management, white LED lumen output, and packaging issues, all of which affected cost. (Ex.2006, ¶155.) Per Petitioner's expert, in 2004, the efficiency of available white LEDs was a fraction of a conventional bulb, creating significant technical challenges for their use in headlight applications. For example, as Petitioner's expert points out in 2004, multiple LEDs (e.g., more than 30) were required to generate lumen output similar to a typical tungsten filament halogen bulb because "currently available white LED's lumen output [was] around 30 lm (maximum), which [was] about 3% of the typical tungsten halogen bulb's light flux output (1000 lm for 9006 bulb)." (Ex.2012 at 3; Ex.2006, ¶155.)

Moreover, given the state of the art, suitable versions of the proposed combinations would be beyond the skill of a POSA. (See Ex.2006, ¶¶155, 25-44; Exs. 2011-2013, 2015-2016, 2020-2022.) Petitioner however glosses over the state of the art and provides nothing more than unsupported attorney argument to explain why a POSA would have been motivated to make the proposed modifications.

(1) Grounds 1A-1B (Beam): Beam's Embodiments Are Unsuitable for Combining

Although “a patent can be obvious in light of a single prior art reference,” the Federal Circuit has held that a single-reference obviousness ground requires that “it would have been obvious to modify that reference to arrive at the patented invention.” *Arendi S.A.R.L. v. Apple Inc.*, 832 F.3d 1355, 1361 (Fed. Cir. 2016).

Although Petitioner did not frame the obviousness ground as based on Beam alone, Petitioner argues that Beam alone teaches the claim 1 limitations: “[i]f Patent Owner argues, incorrectly, [that] Beam does not disclose [1.2], Beam-Thominet renders it obvious.” (Petition, 17.) Additionally, the Board instituted on Beam alone without considering the rationale to combine with Thominet. (DI, 11; Ex.2006, ¶158.)

Beam discloses two discrete lamp embodiments: 1) a conventional light source with a SLM, and 2) an LED array. (Ex.1005, Figs. 2, 5; Figs. 4, 6.) Beam discloses that the conventional “lamp 202 **and** spatial light modulator 203 are **replaced** by an array of light sources 401.” (Ex.1005, 5:3-6; Ex.2006, ¶159.) Claim 4 of Beam claims a system that “*includes an array of individual, independently controllable microbeam sources ... of light-emitting diodes..., and a spatial light modulator for selectively controlling the intensity of individual microbeam sources in said array.*” (Ex.1005, 4-12.) However, this claimed

embodiment is not described in Beam and contradicts Beam's disclosure of replacing the SLM with the LED array. Thus, a POSA would have understood that Beam teaches separate embodiments, not combinable embodiments. (Ex.2006, ¶159.)

Petitioner cites to either or both Beam embodiments throughout the Petition without explaining how or why a POSA would have combined these embodiments. The Petition never even contends that a POSA would have combined these embodiments. For example, for claim 1.5, Petitioner relies solely on Beam's lamp-SLM embodiment for satisfying the '*electronic control circuitry*' configured to '*independently operate the light clusters*' claim limitation. (Petition, 22-23.) 'Beam's controller/processor sends control signals (blanking/non-blanking) to illuminator (SLM 203) to control microbeams.' (Petition, 23.) However, for claim 18, Petitioner relies solely on Beam's LED array embodiment for teaching a "*laser diode*." (Petition, 52-53; Ex.2006, ¶160.) In a related proceeding, the Board correctly rejected Petitioner's attempts to mix Beam's embodiments, stating "[m]ost of the material cited by Petitioner, including the 'angular position' language, is describing the Beam's Figure 2 embodiment, **not** the Figure 4 embodiment." (IPR2023-00197, Paper 13 at 13.)

A POSA would have understood that a light modulator is not needed with an array of LEDs because the LEDs themselves can be controlled or modulated and

therefore a light modulator is redundant, and further unsuitable with an LED array as it decreases optical efficiency and adds expense and packaging challenges. (Ex.2006, ¶¶35-39, 161, 296.) A POSA would thus not have been motivated to combine Beam’s teachings of the LED array and light modulator embodiments. (Ex.2006, ¶296.) *Arendi S.A.R.L.*, 832 F.3d at 1361. Further, such an inefficient and cost-prohibitive combination would be unsuitable, especially in the extremely cost-conscious automotive industry. (Ex.2006, ¶161-162.) In corollary to this point, any argument using Beam alone for a claim that does not entirely rely on one Beam embodiment or the other then necessarily fails.

(2) Ground 1C (Beam+ThominetSW)

Petitioner argues that “including an additional control technique (software implementation) for Beam—Thominet’s known technique of using multiple directional beam regions for different functions—would have added different functions to Beam’s system for different situations.” (Petition, 11.) Petitioner further posits that “Thominet’s express control of having multiple directional beam regions (clusters), implemented with Beam’s controller 108/illuminator 109 (including SLM 203), would have provided Beam’s system with different spatial distributions for different driving situations beyond reducing glare for drivers.” (Petition, 12; Ex.2006, ¶164.)

Thominet discloses minimal “automation” of selecting LEDs for different

functions. (Ex.1006, [0026].) The disclosure is limited to “a control device” that performs “switchover” depending on “speed and/or steering wheel position, or wiper, or recognizing counter traffic.” (*Id.*, [0026].) Thominet thus solves the problem of “improving visibility” by using different beam segments for different situations. Beam solves the same problem by simply illuminating everything, maximally, always. Petitioner never explains how or why a POSA would combine these markedly different approaches for solving the same problem. (Ex.2006, ¶165.)

Any “automatic” segmentation control immediately conflicts with Beam’s goal of maximum illumination. Thominet’s speed-based adjustments switch between high-intensity beams and wide beams (neither using the full array as Beam would) based on corresponding high and low speeds (*Id.*, [0023]-[0024]) Counter-traffic control is never described in detail, but implies automatic switching to lower-intensity narrower beams – i.e., conventional automatic dimming. (Ex.2006, ¶166.)

The two contradictory control systems, both present in Petitioner’s “software” combinations, are unsuitable for combination in virtually every situation, expressly because they solve “improving visibility” differently. Petitioner never addresses these contradictions, and instead simply suggests that Beam’s software would have been modified “to organize Beam’s microbeam array

into multiple beam regions (clusters) for different functions.” (Petition, 13.) What those “functions” are, how or when that organization would occur (what SLM portions would be used, when they would be used) and how all of the noted conflicting Thominet “functions” will comport with Beam’s strategy is never explained. Recognizing these conflicts, a POSA would not have been motivated to combine the two disparate control strategies as Petitioner proposes or have a reasonable likelihood of success in combining them without at least first noting, and then either dispensing with, or solving, all the above problems – none of which Petitioner does at all, let alone with any particularity. (Ex.2006, ¶¶167-168.)

**(3) Grounds 1D-1E
(BeamSW+ThominetHW- Substrate):**

Petitioner states that “a POSA would have sought to incorporate known components (hardware implementation) of Thominet’s semiconductor light sources 10 on curved surface 12 (arranged in different beam regions 22, 24, 26, 28 . . .) into Beam (with flat array of light sources 401)” to provide “different spatial distributions for different situations, improving visibility and thereby safety.” (Petition, 13.) Petitioner thus relies on Thominet’s curved substrate to provide different spatial distributions. (Ex.2006, ¶170.)

However, Thominet describes the curved substrate as an optional feature without any particular advantages or use scenarios. See Ex.1006 ¶18 (“The

semiconductor light sources 10 can be arranged approximately in one plane, **or can be** distributed over a concavely curved surface or a stepped surface”). And Petitioner has further never shown that Thominet’s array alone (without software) segments illumination. Since Thominet’s curved substrate is optional, a POSA would have understood that it is not needed to provide Thominet’s different spatial distributions – therefore a POSA would not have been motivated to combine Beam with Thominet’s unnecessary hardware. Additionally, adding a curved substrate would negatively impact packaging limitations, further discouraging a POSA from making Petitioner’s proposed modification. (Ex.2006, ¶¶171-172.)

b. The Proposed Beam-Thominet Combinations Renders Beam Inoperable and Defeats Beam’s High-Intensity Illumination “At All Times” Purpose

If a proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 902 (Fed. Cir. 1984).

(1) Grounds 1C-1D (Beam+ThominetSW-HW)

Petitioner’s proposed modification of controlling Beam’s Lamp+SLM with Thominet’s software and controlling Thominet’s light sources with Beam’s software would be inoperable because the software would need to be modified to

accommodate different light sources. As explained by Petitioner's expert, software is used to control changes in light direction and intensity:

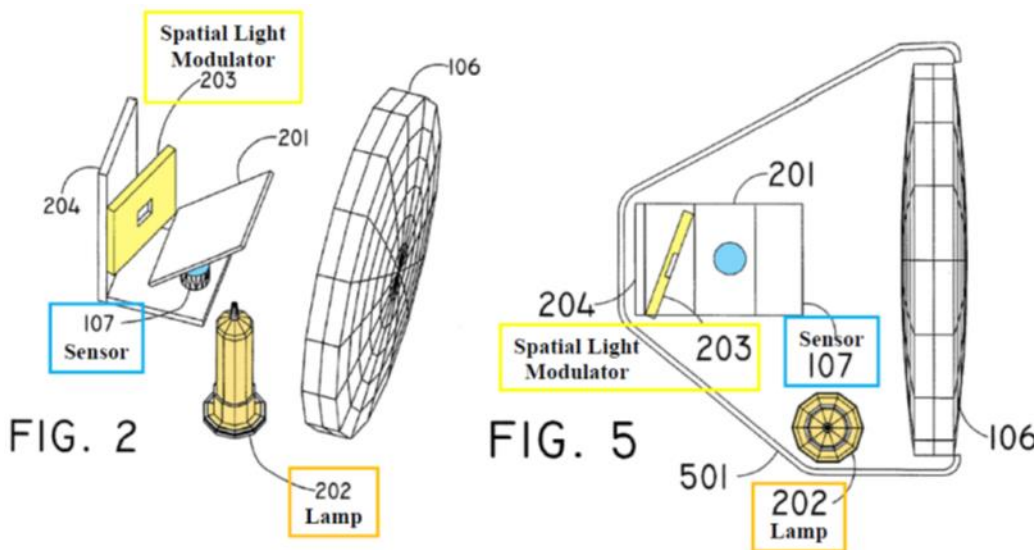
Q. . . . [T]o achieve the control, specifically intensity and direction, in Thominet, that requires software controls?

A It is always software control the light direction and intensity change, both Beam and Thominet.

(Ex.2025, 65:13-19; Ex.2006, ¶174.))

**(2) Ground 1C
(BeamLamp+SLM+ThominetSW):**

The proposed combination of Thominet's software with Beam's lamp 202 and SLM 203 as annotated by petitioner is reproduced below. (Petition, 11; Ex.2006, ¶176.)



(Ex.1005, Figs 2, 5, Annotated)

Beam uses lamp 202 (operating at “maximum intensity at all times”) for all

“active” (non-blanked) microbeams to provide maximum illumination to the field-of-view. (Ex.1005, 6:11-19.) Were Petitioner to attempt to create any beam segment as described by Thominet using less than all illumination (see Ex.2006, ¶¶71-76) via Beam’s lamp/SLM control, Beam’s primary purpose of maximum forward illumination would be defeated. Petitioner never addresses these issues. Since Thominet is intentionally using various segments at different times, it frequently defeats Beam’s maximal illumination objective (Ex.2006, ¶177) and thereby would have rendered Beam inoperable for its intended purpose of providing “maximum intensity at all times”. *In re Gordon*, 733 F.2d at 902.

B. Ground 2 – Beam, Thominet, and Stam

1. Independent Claims:

- a. Claim 37 – The Beam-Thominet-Stam Combination does not teach “*substantially illuminat[ing] a first subsection of the field-of-view including at least a portion of the second vehicle.*”**

Claim 37 requires “*at least one processor configured to: . . . process the sensor data to determine a light distribution pattern for an adaptive headlight beam, such that a headlight beam adapted to the pattern substantially illuminates a first subsection of the field-of-view including at least a portion of the second vehicle with an illuminance below a predefined threshold value.*” The plain meaning of illuminate is “to supply or brighten with light” or “to make luminous or

shining.” (www.merriam-webster.com/dictionary/illuminate.) Therefore, the claimed beam that is adapted to “*substantially illuminate[] . . . a portion of the second vehicle*” is created by controlling the headlight to emit or supply light. (Ex.2006, ¶¶180-181.)

Petitioner relies on Stam for satisfying the “*predefined threshold value*” limitation and Beam for satisfying the remaining limitations. (Petition, 59-61.) The Board stated in the institution decision that “on this record at least, that Beam satisfies the predefined illuminance limitations.” (DI, 12; Ex. 2006, ¶182.)

(1) All Sub-Grounds

As explained for claim 1, Beam teaches a binary system – in which emitters are either blanked to become inactive or otherwise output “maximum intensity” light “at all times”: the controller 108 “uses the data to determine the size and position of the light emitters to be dimmed. The output of the **active** emitters is projected through the optical system.” (Ex.1005, 5:13-16; 4:36-57; 2:60-62; 6:23-27.) The “active” emitters are the emitters that remain after the “dimmed” emitters are deactivated – hence the use of “active.” Further, Beam provides “The present invention generally relates to a method and apparatus for automatically reformatting the pattern of a beam from a light source **to prevent it from illuminating** certain areas...” (*Id.*, 1:5-8; Ex.2006, ¶¶183.)

Because Beam teaches a binary system, where the changed LEDs are

blanked, and not emitting light, Beam fails to teach “*substantially illuminat[ing] a first subsection of the field-of-view including at least a portion of the second vehicle*” as claimed. The Beam+Thominet+Stam Combination does not teach all claim limitations, and claim 37 is patentable over the combination. (Ex2006, ¶184.)

2. Dependent Claims:

- a. **Claim 38 – The Beam+Thominet+Stam Combinations does not teach determining that “*at least one first subsection of the field-of-view, ... include[s] at least a portion of the second vehicle.*”**

(1) All Sub-Grounds

Petitioner relies on Beam’s disclosure at 5:34-36 and 8:29-38 for satisfying this limitation. (Petition, 64.) Beam discloses sensing light. (Ex.1005, 2:56-3:3; 6:24-27.) However, as explained for claim 11, Beam has no ability to associate sensed light with a particular target. Beam simply detects illumination sources within the field-of-view and blanks all microbeams associated with the illumination sources, but it cannot determine that those sources are or are not associated with a vehicle. Thus the Beam-Thominet-Stam Combinations does not determine that “*at least one first subsection of the field-of-view, ... include[s] at least a portion of the second vehicle*” as claimed. (Ex.2006, ¶¶187-189.)

b. Claims 39, 40, 41 – The Beam-Thominet-Stam Combinations does not teach determining/defining different “illumination” at multiple locations.

Claim 39 requires “determining specific, different illumination characteristics for **each** of the at least two sub-sections.” Similarly, claim 40 requires “wherein the light distribution pattern defines **illumination for at least the first** and the one or more second sub-sections of the field of view.” And claim 41 requires “wherein the light distribution patterns defines illumination for the first subsection designed to result in an illuminance below the predefined threshold value, and defines illumination for the one or more second subsections designed to result in an illuminance above the predefined threshold value.” (Ex.2006, ¶¶191-193.)

(1) All Sub-Grounds

Petitioner relies on Beam’s blanking disclosure for satisfying these limitations. (Petition, 66-71.) As explained for claim 1, Beam teaches a binary system – in which emitters are blanked to become inactive and otherwise output “maximum intensity” emission “at all times.” (Ex.1005, 5:13-16; 4:36-57; 2:60-62; 6:23-27.) Blanked light is the absence of light, *i.e.*, not illumination. Therefore, Beam does not teach determining/defining different “illumination” at multiple locations. The Beam+Thominet+Stam Combinations do not teach all claim

limitations, and claims 39, 40, 41 are patentable over the combination. (Ex.2006, ¶¶194-196.)

c. Petitioner Fatally Fails to Note The Differences between Claim 58 and Claim 19

Claim 58 recites “at least one of reflectors, refractors, or lenses usable to alter emitted light from at least one of the light clusters as part of the instructed operation.” Petitioner relies on its claim 19 analysis, stating “claim 58 is patentably indistinct. (Ex.2006, ¶200-201.) Failure to note the materially different requirement from claim 58, that the recited elements are “usable to alter emitted light... **as part of the instructed operation,**” and failure to at least explain why it is inconsequential, is an incurable fatal flaw. *Microsoft Corp. v. IPA Techs. Inc.*, No. 2021-1412, 2022 WL 989403, at *6 (Fed. Cir. Apr. 1, 2022) (Affirming Board’s post-institution lack of particularity finding and refusal to consider Petitioner’s reply arguments to the contrary.)

d. Claims 42, 58–Beam+Thominet+Stam Combinations do not teach controllable “light modifying elements” or “reflectors, refractors, or lenses usable to alter emitted light . . . as part of the instructed operation.”

Claim 42 is representative of claim 43 and requires “control of the light sources **and** light modifying elements results in a specified emitted light-source light characteristic.” Petitioner references its claim 2 analysis for satisfying these

limitations, respectively. (Petition, 71.)

Similarly, claim 58 requires “*at least one of reflectors, refractors, or lenses usable to alter emitted light from at least one of the light clusters as part of the instructed operation.*” Reflectors, refractors, and lenses that alter emitted light as part of the instructed operation are controllable or active lenses.

Petitioner references its claim 19 analysis in which it relies on Beams LEDs, Thominet’s semiconductor light sources and disclosure of mixing color in paragraphs 26-29 for satisfying this limitation. (Petition, 74, 43-44; Ex. 2006, ¶¶198-201.)

(1) Ground 2B (BeamLEDs+Stam)

Beam’s LED embodiment does not include an SLM or any controllable optics and therefore does not meet this limitation. (Ex.2006, ¶202.)

**(2) Ground 2D
(BeamSW+ThominetHW+Stam)**

Thominet discloses passive optical element 43 and passive lenses 46. (Ex.1006, [0029]-[0030], Figs. 5,6.) Thominet does not teach controllable optics. (Ex.2006, ¶203.)

The BeamSW+ThominetHW+Stam Combinations do not teach all claim limitations and claims 42 and 43 are patentable over the combination.

- e. **Claim 45 – The Beam+Thominet+Stam Combinations do not teach “each light source having a spectral power distribution characteristic alterable . . . resulting in a color change to projected light.”**

Petitioner references its analysis of claim 5 in which it relied on Beam’s LEDs, Thominet’s semiconductor light sources and disclosure of mixing color in paragraphs 26-29 for satisfying the claim limitation. (Petition, 71, 43-44; Ex.2006, ¶207.)

(1) Grounds 2A-2B (Beam+Stam)

Beam does not disclose that its lamp or LEDs provide multi-color light. Accordingly, Beam does not teach “*a color change to projected light.*” (Ex.2006, ¶208.)

(2) Grounds 2C, 2E (Beam+ThominetSW-Substrate)

Since Beam does not teach different color lamps or LEDs, a POSA would have understood that Thominet’s software would not have been able to control Beam’s single color light source to provide “*a color change to projected light.*” (Ex.2006, ¶209.)

(3) Ground 2D (BeamSW+ThominetHW+Stam)

Since Beam does not teach the control of different color LEDs, Beam’s software would not be able to control Thominet’s LEDs to provide “*a color*

change.” (Ex.2006, ¶210.)

The Beam+Thominet+Stam Combinations do not teach “*each light source having a spectral power distribution characteristic alterable . . . resulting in a color change to projected light*” as claimed, and claim 45 is patentable over the combinations. (Ex.2006, ¶211.)

C. Ground 3 – Beam, Thominet, and Kobayashi

1. Dependent Claims:

- a. Claims 15, 17 – The Beam+Thominet+Kobayashi Combinations Do Not Teach “increasing illumination in a direction of the road curvature.”**

(1) All Sub-Grounds

Petitioner relies on, *inter alia*, Beam’s disclosure at 6:14-27 for satisfying this limitation. (Petition, 81.) Beam discloses “AABH headlights [that] will operate at **maximum intensity at all times.**” (Ex.1005, 6:11-12.) Beam further discloses “The controller module uses the sensor spatial data (video) to determine whether there are illumination sources (headlights or tail lights) present in the headlight’s field-of-view, determines their location relative to the Adaptive Anti-Blinding Headlights beam, and uses these data to control the Illuminator.” (*Id.*, 6:14-19.) (Ex. 2006, ¶215.)

Beam further discloses a headlamp that provides “the equivalent of high beam headlights or brighter on **at all times**, greatly enhancing the ability to see at night” except for areas where incoming light is detected. (Ex.1005, 6:53-56.) Beam further discloses that “[t]he resulting beam is at full intensity except in areas that would dazzle a driver ahead.” (*Id.*, 4:57-59.) Petitioner admitted, in a related proceeding, that this disclosure teaches providing a “Full Intensity” beam outside of the anti-glare region. (Ex.2008 at 36; Ex.2009, ¶¶145-146; Ex.2006, ¶95.) Similar to the European approach to adaptive driving beam (ADB) technology, Beam uses the high-beam at all times and includes anti-glare strategies, to avoid blinding oncoming traffic when needed. (Ex.2007 at 69, 71 Ex.2006, ¶216.)

Since Beam discloses providing maximum intensity light everywhere it could be needed, there would be no reason to increase light or provide the ability to change the direction of microbeams in the AABH system. (Ex.2006, ¶¶96, 217.) Accordingly, the Beam-Thominet-Kobayashi Combinations does not teach “*increasing illumination in a direction of the road curvature*” as claimed, and claims 15, 16, and 17 are patentable over the combination.

**2. A POSA Would Not Have Been Motivated to
Combine Beam+Thominet with Kobayashi**

**a. The Proposed Combination Renders Beam
Inoperable and Defeats Beam’s High-Intensity
Illumination “At All Times” Purpose**

Petitioner states that “A POSA would have been further motivated to modify Beam-Thominet to adjust light based on sensed data, such as map data from a GPS sensor (including road curvature/planned upcoming turns), as in Kobayashi, to further control Beam’s system to illuminate curves/turns.” (Petition, 74-75; Ex.2006, ¶220.)

Petitioner’s proposed modification of Beam by adding map data and associated control complexity from Kobayashi would render Beam’s AABH system inoperative or unsatisfactory for its stated purpose. In particular, Petitioner’s proposed combination would: 1) defeat Beam’s stated purpose of providing high-intensity illumination all the time but for selective blanking relative to other vehicles, 2) be inoperative in that Beam’s AABH system is incapable of changing the direction of light from the headlamps, or of increasing light beyond maximum intensity of the light source(s), and 3) as a result, would not accomplish Petitioner’s proffered purpose of “improving driver safety.” (Ex.2006, ¶221.) See *Gen. Plastic Indus., LTD. v. Canon Inc.*, IPR2015-01954, Paper 9, at 25-26 (PTAB Mar. 9, 2016) (denying institution where “it appears that the proposed modification [] would render [the prior art] unsuitable for its intended purposes” (citing *In re Gordon*, 733 F.2d at 902)).

Petitioner's contorted rationale undermines the crux of Beam's illumination strategy. (Further, Petitioner reads Beam in a manner that results in a non-functional device. (Ex.2006, ¶¶222-223.) Accordingly, there is no suggestion or motivation to make Petitioner's proposed modification. *See In re Gordon*, 733 F.2d at 900.

D. Ground 4 – Beam, Thominet, Stam, and Kobayashi

1. Dependent Claims:

- a. Claims 54-56 – The Beam+Thominet+Stam-Kobayashi Combination Does Not Teach “increased illumination in a direction of the road curvature.”**

Petitioner cites its claim 15-17 analysis in which it relies on, *inter alia*, Beam's disclosure at 6:14-27 for satisfying this limitation. (Petition, 81.) As explained regarding claims 15-17, Beam discloses “AABH headlights [that] will operate at maximum intensity at all times.” (Ex.1005, 6:11-12.) Since Beam discloses providing maximum intensity light everywhere it could be needed, there would be no reason to increase light or provide the ability to change the direction of microbeams in the AABH system. Accordingly, the Beam-Thominet+Stam-Kobayashi Combination does not teach “*increased illumination in a direction of the road curvature*” as claimed. (Ex.2006, ¶¶231-233.)

2. A Person of Ordinary Skill in the Art Would Not Have Been Motivated to Combine Beam, Thominet, Stam, and Kobayashi

Petitioner references its rationale to combine the Ground 3 references. (Petition, 87.) Accordingly, a POSA would not have been motivated to combine Beam, Thominet, Stam, and Kobayashi for at least the same reasons given for Ground 3. *Supra* Section VI.C.2.

E. Ground 5 – Beam, Thominet and Braun

1. A Person of Ordinary Skill in the Art Would Not Have Been Motivated to Combine Beam+Thominet and Braun

a. Petitioner Does Not Explain How a POSA Would Have Combined Beam, Thominet and Braun

Claim 6 requires “*wherein the headlight beam further comprises light in at least one of infra-red (IR) or ultra-violet (UV) wavelengths.*” The Petitioner relies on Braun’s luxels for satisfying this limitation. (Petition, 91; Ex.2006, ¶243.)

Petitioner states that the combination “would have been combining prior-art elements or a simple substitution of one known element for another (Beam’s/Braun’s respective arrays) according to known methods to yield predictable results (improved visibility and safety).” “This would have been combining prior-art elements or a simple substitution of one known element for another (Beam’s/Braun’s respective arrays) according to known methods to yield

predictable results (improved visibility and safety).” Or “modifying Beam’s LEDs with Braun’s colored LEDs to provide colored light sources with IR/UV wavelengths for different functions.” (Petition, 90; Ex. 2006, ¶238.)

(1) Grounds 5A (Beam Lamp+SLM+Braun), 5D (Beam+ThominetHW+Braun)

Petitioner does not provide any explanation for how and why a POSA would have combined or substituted Beam’s lamp/SLM or Thominet’s LEDs with Braun’s luxels, instead merely explaining why Beam’s LEDs would have been so modified. (Petition, 90.) (Ex.2006, ¶¶239-240.) This constitutes a failure of proof for combinations that do not include Beam’s LEDs, such as 5A and 5D.

(1) Grounds 5B (Beam LEDs), and 5C (Beam+ThominetSW+Braun)

Petitioner does not explain how Beam’s LED arrays and Braun’s luxels would have been combined, or what additional changes would be needed to combine or substitute the light sources. LED headlamps were in their infancy in the early 2000’s, therefore there were no “predictable solutions,” nor was there a “reasonable expectation of success.” Designing an LED Headlamp for a vehicle application requires consideration and tradeoffs involving complex and interrelated optics, heat management, white LED lumen output, packaging, and cost issues. (Ex.2006, ¶¶29-38, 240.)

F. Ground 6 – Beam, Thominet, Stam and Braun

1. A Person of Ordinary Skill in the Art Would Not Have Been Motivated to Combine Beam, Thominet, Stam, and Braun

Claim 46 requires “*wherein the light output from at least one headlamp further comprises at least one of infrared or ultraviolet wavelengths.*” The Petitioner relies on Braun’s luxels for satisfying this limitation. (Petition, 91.) Petitioner references its claim 6 analysis for claim 46. (Petition, 93.) A POSA would not have combined Beam-Thominet-Stam and Braun for at least the same reasons given for claim 6 in Ground 5. (*Supra*, Section VI.E.1; Ex.2006, ¶¶242-244.)

G. Ground 7 – Karlsson and Harbers

1. Independent Claims:

- a. Claims 1/37 – The Karlsson-Harbers Combinations do not teach “*determin[ing] an illumination . . . to reduce glare*” or “*substantially illuminat[ing] a first subsection of the field-of-view including at least a portion of the second vehicle.*”**

Claim 1 requires a “*processor configured to . . . determine an illumination for at least two of the sub-sections, that reduces illumination to reduce glare.*”

Claim 37 requires “*at least one processor configured to: . . . process the sensor data to determine a light distribution pattern for an adaptive headlight beam, such*

that a headlight beam adapted to the pattern substantially illuminates a first subsection of the field-of-view including at least a portion of the second vehicle with an illuminance below a predefined threshold value.” (Ex.2006, ¶¶246-247.)

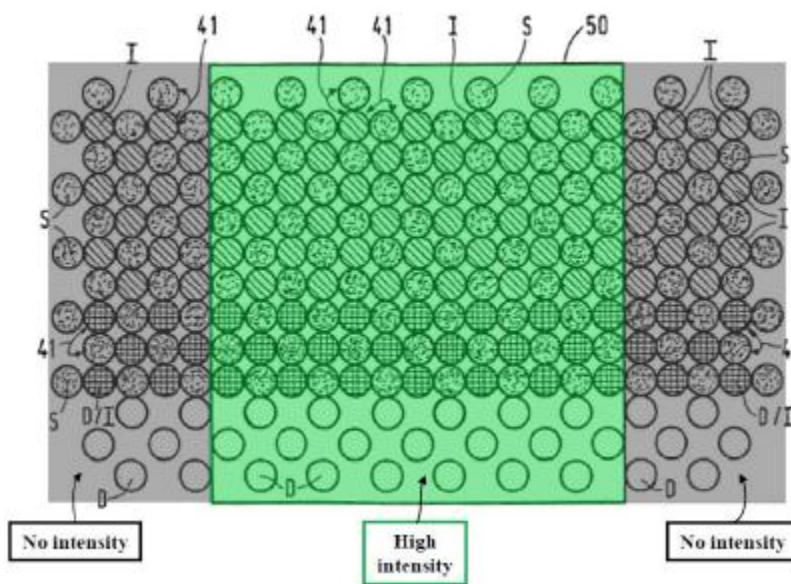
The plain meaning of illuminate is “to supply or brighten with light” or “to make luminous or shining.” (www.merriam-webster.com/dictionary/illuminate.) This plain meaning is consistent with the ’503 Patent specification which teaches three different operating states for the light emitting elements: 1) operating at full power; 2) operating at a fraction of full power for reduced intensity and 3) not operating. (Ex.1001, 19:30-37.) Per the ’503 Patent, shutting off a light element is distinct from reducing intensity. (Ex.1001, 65:37-41; Ex.2006, ¶¶248-249.)

Petitioner relies on, *inter alia*, Karlsson’s disclosure at 9:9-17 for satisfying these limitations. (Petition, 116, 120, 123-124; Ex.2006, ¶250.)

(1) All Sub-Grounds

Karlsson discloses that “the lighting means 2, 3 are intermittently controlled by control means 14 . . . so as to control the lighting means 2, 3 in such a manner that a light beam 7 having a desired pattern and a desired intensity is emitted.” (Ex.1010, 9-17.) Karlsson further discloses that the “light beam 7 ... [is] controlled in such a manner that no light at all or light having a low intensity is emitted in those directions from which light is detected ... [thus] glaring or blinding of oncoming traffic is effectively prevented.” (Ex.1010, 9:18-26; Ex.2006, ¶251.)

Petitioner explains Karlsson's disclosure as teaching a shaded area of "no intensity" and a non-shaded area of "high intensity": "Thus, Karlsson's processor processes the data, and uses memory (with algorithms) to "determine an illumination for at least two of the subsections" (shaded area of no intensity/non-shaded area of high intensity)." (Petition, 116.) Petitioner annotated Karlsson's Figure 14 to identify the areas of "No intensity" and "High intensity" illumination (Ex.2006, ¶252.):



(Petition, 117,119,122,124; Ex.1010, Fig. 14, Annotated by Petitioner)

Karlsson teaches providing illumination depending on the function (dipped beam LEDs (D), combination LEDs (D/I), and high-intensity/driving beam LEDs (I) in the alleged "high intensity" region, other than LEDs where incoming light is detected by an associated sensor (S). To the extent that any "No intensity" regions

(that do not correspond to LEDs associated with light detected by sensors (S)) exist, Karlsson does not teach determining illumination for either of the alleged shaded areas of no intensity. Accordingly, Karlsson does not teach “*adapt[ing] the light emitted . . . that provides the determined illumination*” or “*substantially illuminat[ing] a first subsection of the field-of-view including at least a portion of the second vehicle.*” as claimed. (Ex.2006, ¶¶253, *see also* 87-107.)

Petitioner thus fails to demonstrate with particular evidence how Karlsson or the Karlsson-Harbers Combinations teach all claim limitations, and claims 1 and 37 are patentable over the combinations. (Ex.2006, ¶254.)

b. Claims 1/37 – The Karlsson-Harbers Combinations do not teach “*the subsections determined in response to sensor data.*”

Claim 1 requires “*a plurality of light clusters. . . capable of projecting light so as to illuminate a plurality of sub-sections of a field-of-view with different illumination characteristics, [1.4] the subsections determined in response to sensor data.*” Claim [37.4] requires “*wherein at least two of the light clusters operate to create a headlight beam.*” Petitioner analyzes claims [1.4] and [37.4] together and relies on Karlsson’s disclosure at 2:2-4 for satisfying these limitations. (Petition, 108; Ex.2006, ¶¶257-259.)

(1) All Sub-Grounds

Petitioner improperly merges Karlsson’s description of a prior art sensor at

2:2-4 with Karlsson's disclosure of its control means 14 at 9:9-17 for satisfying this limitation. (Petition, 108.) Petitioner states that:

Karlsson's "light-sensitive sensor...detects the distribution and the intensity of light in the area ahead of a vehicle" and "control means 14...control the lighting means 2, 3...[so] light beam 7 having a desired pattern and a desired intensity is emitted."

(Petition, 108; Ex.2006, ¶260.)

Karlsson is not describing its own light-sensitive sensor at 9:9-1¹, instead it is describing the prior art:

The prior art lighting device comprises a light sensitive sensor, which detects the distribution and the intensity of light in the area ahead of a vehicle.

(Ex.1010, 2:2-4; Ex.2006, ¶261.)

Karlsson also discloses, with reference to its own invention, "light-sensitive sensors 9 and 23 [that] are preferably designed to be capable of precisely determining the direction and the intensity of the detected light 11." (Ex.1010, 12:19-22.) Karlsson discloses light-sensitive sensors 9/23 that determine light direction; Karlsson does not disclose that its light-sensitive sensors determine light

¹ Petitioner does not provide any rationale for combining a prior art light sensor with Karlsson's control means.

distribution or sub-sections. Determining light subsections provides a higher level of specificity than just determining direction. (Ex.2006, ¶262.) The Karlsson-Harbers Combinations do not teach “*the subsections determined in response to sensor data*” as claimed. (Ex.2006, ¶263.) Patent Owner notes that while Karlsson is an improvement to the “prior art” lighting device – the specific point of Karlsson is to improve some of the flaws of the art, which are identified at least as sensor improvements (Ex.1010, 1:8-9; 5:24-32.)

Also, claim 37 requires “the beam substantially illuminates at least the one or more second subsections of the field-of-view **to either side of the first subsection** with an illuminance above the predefined threshold value.” Petitioner’s proffered proof, annotated Fig. 14, does not show this. (Petition, 127.) Petitioner continually states “the second subsections” (plural) but also explains those “sections” as the emitted light beam 50. (*Id.*, 125.) That beam 50 does not encompass plural sections or sections to either side of the first subsections as claimed. No explanation is given as to how this would be true, and Petitioner does not even directly address the “to either side” requirement of the claims in any way, a fatal failure of proof. For this additional reason, the proof is fatally and incurably flawed for claim 37.

2. Dependent Claims:

a. Claims 2, 42, 58 – The Karlsson-Harbers Combination Does Not Teach controllable “light modifying elements”

Petitioner relies on Karlsson’s light modulator means 3 for satisfying these limitations. (Petition, 130, 133-134, 148; Ex.2006, ¶267.)

(1) Grounds 7B (Karlsson LEDs), 7D (Karlsson LEDs + Harbers SW)

Karlsson discloses a passive (not controllable) lens 6 that may be included in the LED embodiments (e.g., Fig. 14) and in the SLM embodiments (e.g., Figs. 1, 3.). Without the SLM, Grounds 7B and 7D do not teach controllable “light modifying elements” or “lenses usable to alter emitted light from at least one of the light clusters as part of the instructed operation.” The Karlsson LED embodiments do not teach all claim limitations. (Ex.2006, ¶¶268-269.)

b. Claims 7, 8, 11, 47, 48, 50 - The Karlsson-Harbers Combination Does Not Teach “determin[ing] a position of the oncoming[preceding] vehicle” or “identifying entities.”

Petitioner relies on Karlsson’s disclosure at 2:2-4, Abstract, 12:19-24, FIGS. 3, 14, 3:17-20, 5:16-32, 3:27-31 for satisfying these limitations. (Petition, 138, 141.)

Karlsson discloses “light-sensitive sensors 9 and 23 [that] are preferably designed to be capable of precisely determining the direction and the intensity of

the detected light 11.” (Ex.1010, 12:19-22.) Karlsson does not disclose determining a position of a vehicle associated with the detected light, identifying the vehicle, or detecting the vehicle. On the contrary, with reference to Figure 14, Karlsson discloses an arrangement in which each sensor (S) of an array of spotlight sensors is electrically connected to an adjacent spotlight source to provide a switch to control the LEDs:

The spotlight sources and the spotlight sensors, ... may also be formed by LEDs and photosensitive transistors, respectively. Arrow 41 schematically indicates an electric connection between the spotlight sensors and spotlight sources D, I and D/I, which, for example, may consist of transistors or the like... Integration of LEDs and phototransistors on one carrier, for example, is also possible.

(Ex.1010, 19:34-20:5; (Ex.2006, ¶278.)

With reference to the Figure 14 embodiment, the proffered evidence of record, Karlsson does not disclose a controller or storage means connected between the sensors (S) and the sources to determine a vehicle position. Instead, if each sensor is functioning as a switch for the adjacent LED(s) to which it is electrically connected, then light detected by the sensor would cause a change to the electrical current to the LED and cause it to change state. (Ex.2006, ¶279.)

Petitioner’s proof for identification of oncoming traffic is also flawed, as Petitioner’s evidence is literally that Karlsson “determine[s] the direction and

intensity of detected light 11.” (Petition, 112.) Since it is not an inherent truth that this equates to determining or identifying a vehicle, more explanation needs to be provided, and none is. The proffered evidence of light detection is insufficient on its face to prove “identification of oncoming traffic” as Petitioner contends, and absent in requisite explanation.

The Karlsson-Harbers Combinations do not teach “*determin[ing] a position of the oncoming [preceding] vehicle*” or “*identify[ing] entities*” as claimed, and claims 7, 8, 11, 47, 48, and 50 are patentable over the combination. (Ex.2006, ¶280.)

c. Claims 14, 53 - The Karlsson-Harbers Combinations Do Not Teach a “camera”

Petitioner relies on Karlsson’s disclosure at 12:19-24 for satisfying this limitation. (Petition, 147; Ex.2006, ¶284.)

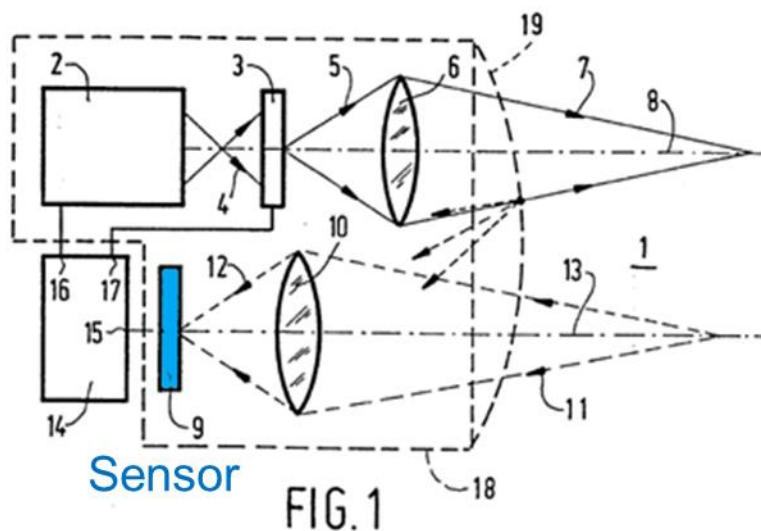
Karlsson discloses light-sensitive sensors 9, 23, that may be comprised of: a matrix of photo-diodes, like the spotlight sensors (S) described with reference to Figure 14, **or, alternatively**, a photo-sensitive plate as used in modern video cameras:

In the preferred embodiment of the invention, the light-sensitive sensors 9 and 23 are preferably designed to be capable of precisely determining the direction and the intensity of the detected light 11. They may for example be comprised of **a matrix of photo diodes or**

in the case of a light-sensitive sensor 23, a photo-sensitive plate as used in modern video cameras.

(Ex.1010, 12:22-24; Ex.2006, ¶¶285.)

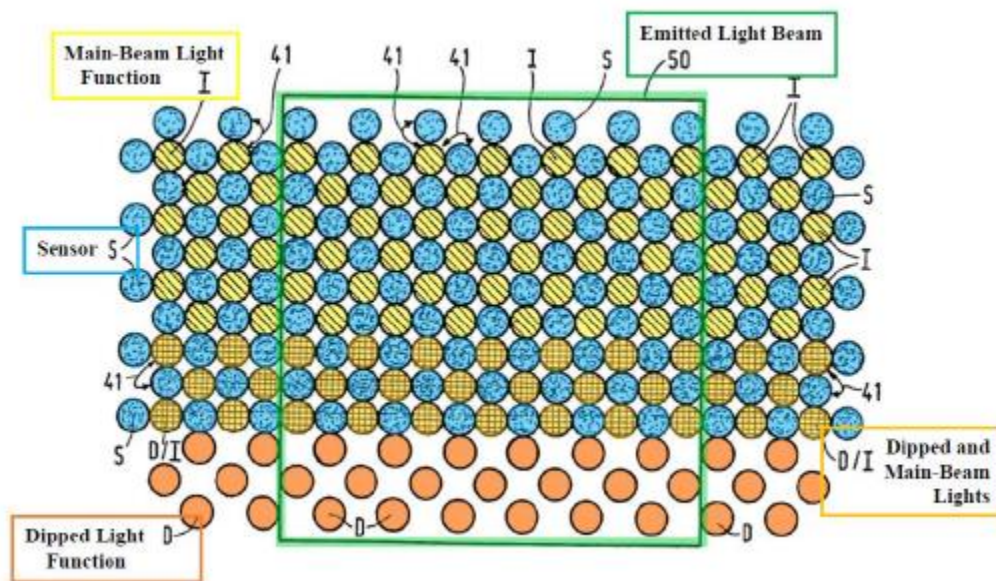
With reference to Figure 1, Karlsson discloses a lighting device 1 with “sensor means consisting of a light-sensitive sensor 9 and a further lens 10 disposed on the side of sensor 9 that is exposed to the incident light, such that incident light 11 on the lens 10 is formed into an incident light beam 12 on light-sensitive sensor 9.” (Ex.1010, 8:19-23; Ex.2006, ¶286.)



(Ex.1010, Fig. 1, Annotated)

With reference to Figure 14, Karlsson discloses spotlight sensors (S) that may be formed by “photosensitive transistors.” (Ex.1010, 19:34-35.) Karlsson further discloses that “a preferred embodiment of the invention comprises spotlight sensors in the form of, for example, photosensitive diodes, photo transistors or

other light- sensitive semiconductor components, which are spatially distributed in a predetermined manner or at random so as to be capable of detecting light from desired directions or from all directions.” (*Id.*, 5:18-23.) Karlsson also discloses that “the term spotlight sensor used herein is understood to indicate a light-sensitive sensor of limited, physically light-sensitive dimensions, which generally detects light from a specific direction.” (*Id.*, 5:25-27; Ex.2006, ¶287.)



(Petition, 107;Ex.1010, Fig. 14 Annotated)

With reference to Figure 3, Karlsson discloses “a light-sensitive sensor 23 and light modulator means 3 are arranged between the light source 2 and the lens 6.” (Ex.1010, 11:10-11.) Notably, Karlsson does not disclose that the light source 2 described with reference to Figure 3 embodiment includes a plurality of LEDs. (Ex.1010, 11:7-36; Ex.2006, ¶288.)

Light Modulator Sensor

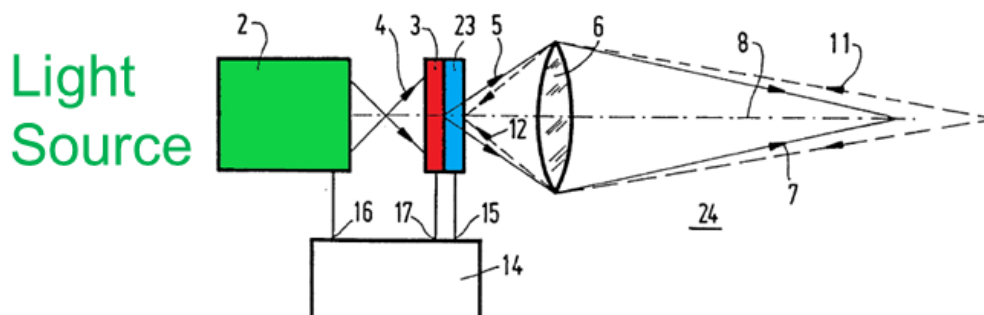
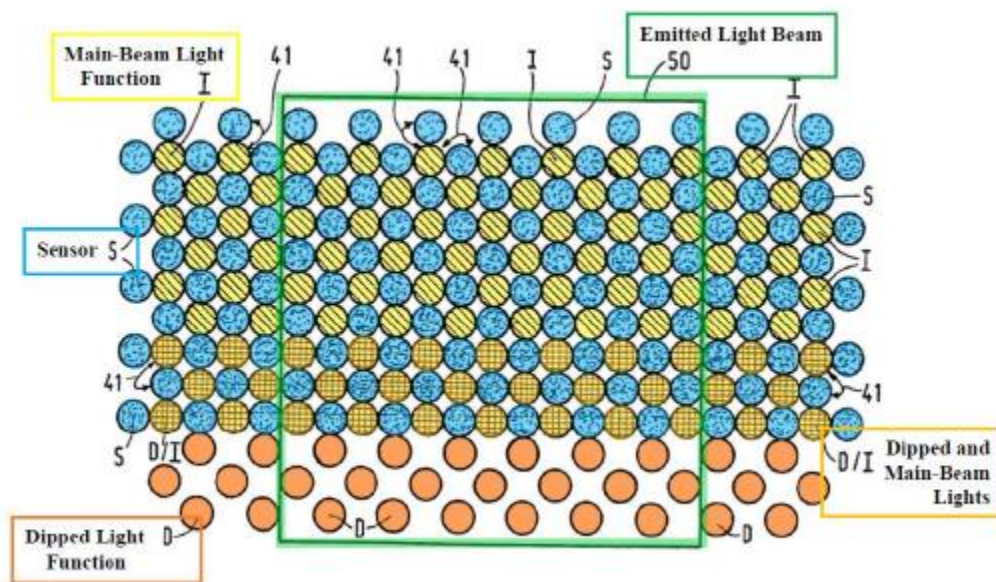


FIG. 3

(Ex.1010, Fig. 3; Petition, 67, Annotated)

Petitioner relies on Karlsson's matrix of photo diodes as illustrated in Figure 14 for satisfying various control limitations. (Petition, 107, 109, 111, 113, 115, 117, 119, 121, 124, 126, 146, 158.) A matrix of photo diodes alone is not a camera. A camera also requires a lens to focus the received light, and to be able to deliver the sensed array for processing and imaging. A POSA would have known that a modern video camera in the early 2000s would have required many thousands of photosensors. Further, a camera would not have included photosensors interspersed with emitters because this would have resulted in low resolution data that could not be formatted into an image. Further, the lack of sensors in the lower region of the array results in no data in this region and Karlsson does not disclose image processing, at all, so it is clear that the spotlight sensors are limited to sensing light. (Ex.2006, ¶¶289-292.)



(Petition, 107, 109, 111, 113, 115, 117, 119, 121, 124, 126, 146, 158; Ex.1010, Fig. 14, Annotated by Petitioner)

The Karlsson-Harbers combinations do not teach “*wherein the one or more sensors further includes at least one of a camera*” as claimed. See generally *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974).

3. A POSA Would Not Have Been Motivated to Combine Karlsson and Harbers

Under *KSR*, “there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *KSR Int'l Co.*, 550 U.S. at 418) (*quoting In re Kahn*, 441 F.3d at 988).

Because the structure and arguments of this Petition closely resemble the filings in *Sisvel International S.A.*, 2023 WL 6522182 at *3 (precedential), that case is particularly instructive. In *Sisvel*, the **Federal Circuit affirmed** the Board’s

decision that each of Cross-Appellants’ ten reasons for combining the applied references lacked “a rational underpinning to combine the respective teachings of the references” because the arguments were “expressed at such a non-specific, high level of generality, they never made clear to the Board what portions of the references were being combined and why a skilled artisan would identify those particular elements for a combination.” Faced with this critical lack of clarity, the Federal Circuit held “we cannot fault the Board for being at a loss in trying to decipher Cross-Appellants kitchen-sink of unclear and confusing motivation-to-combine arguments.” (*Id.*, 7.)

As in *Sisvel*, 1) the instant Petition does not explain “what elements are missing from the primary reference, what elements should be added from the secondary reference to reach the claimed invention, or why those particular elements would be obvious to add”; and 2) the Grounds are inconsistent as to how the primary and secondary references should be combined and the rationale for doing so. (*Supra* V.A., *Infra* VI.G.3a-c.) Like *Sisvel*, this Petition adopts a kitchen-sink approach that is cryptic at best and devoid of rational underpinnings to support the countless motivation to combine permutations presented.

a. Petitioner Fails to Explain Why a POSA Would Have Combined the Ground 7 Embodiments/References Absent Hindsight

(1) Ground 7A-7B (Karlsson): Combining Karlsson’s Embodiments Results in an Unsuitable Headlamp

Although “a patent can be obvious in light of a single prior art reference,” the Federal Circuit has held that a single-reference obviousness ground requires that “it would have been obvious to modify that reference to arrive at the patented invention.” *Arendi S.A.R.L.*, 832 F.3d at 1361.

Although Petitioner did not frame the obviousness ground as based on Karlsson alone, Petitioner argues that Karlsson alone teaches the limitations of claims 1 and 37: “[i]f Patent Owner argues, incorrectly, [that] Karlsson does not disclose [1.2]/[37.2], it would have been obvious in view of Harbers.” (Petition, 104.) Additionally, the Board instituted on Karlsson alone without considering the rationale to combine with Harbers. (DI, 11; Ex.2006, ¶¶294.)

As detailed in (VI)(G)(2)(c) for claims 14, 53, Petitioner’s proposed combination of Karlsson and Harbers combines incompatible features from Karlsson’s alternative embodiments — Karlsson’s LED array with the light-sensitive sensor 23, which may include “a photo-sensitive plate as used in modern video cameras,” from the light modulator embodiment, without explaining why a POSA would do so. (Petition, 147; Ex.2006, ¶295.)

A POSA would not interchange the teachings of the LED array and light modulator embodiments to provide redundant modulation and reduced optical efficiency. (Ex.2006, ¶¶38, 161, 296.) *See Abiomed v. Maquet Cardiovascular*, IPR2017-01204, IPR2017-01205, Paper 9 at 11, PTAB October 23, 2017) (The Board was “unpersuaded that the features of Aboul-Hosn’s various embodiments are interchangeable or that one skilled in the art would have combined those features in the manner proposed by Petitioner.”); *Arendi S.A.R.L.*, 832 F.3d at 1361. Further, such an inefficient and cost-prohibitive combination would be unsuitable, especially in the extremely cost-conscious automotive industry. (Ex.2006, ¶297.)

(2) Ground 7C (Karlsson+HarbersSW)

Petitioner argues that “including an additional control technique (software implementation) for Karlsson—Harbers’s *known technique* of using multiple directional beam segments for different functions—would have added different functions to Karlsson for different situations.” (Petition, 96-97.) Petitioner further states that “Multiple beam segments (clusters) as in Harbers, implemented with Karlsson’s control means 14/spotlight beams 34, would have provided Karlsson with different spatial distributions for different situations beyond reducing glare for drivers.” (Petition, 98; Ex.2006, ¶299.)

Karlsson discloses a headlight having spotlight beams and sensors to . . .

automatically control a lighting pattern to reduce blinding of oncoming traffic” and different illumination patterns/functions “produced by spotlight sources D (dipped light), I (main-beam light), and D/I (dipped and main-beam lights). (Ex.1010, 19:22-30.) Karlsson also discloses “further sensor means, such as inclination sensors, and direction sensors for controlling the light beams . . . dependent on the inclination of a vehicle and/or its change of direction.” (Ex.1010, 15:7-10.) As such, Karlsson already provides “different spatial distributions for different driving situations” such that there would be no increased/improved driver safety or visibility, and therefore no motivation for a POSA to look to Harbers to provide these features as advanced by Petitioner. (Petition, 98; Ex.2006, ¶300.)

Rather than providing articulated reasoning with rational underpinnings for culling building blocks from Harbers and combining them with Karlsson, Petitioner relies on the catch-all goals of “improved visibility” and “increasing safety.” (Petition, 96.) The Petition fails to articulate why the inclusion of the multiple directional beam segments “software or hardware” from Harbers provides “different functions” when combined with Karlsson, resulting in “increase[ed] safety.” (Petition, 96-99.) A POSA would have understood that Karlsson and Harbers disclosed fundamentally different approaches that do not benefit from the combinations Petitioner proffers. (Ex.2006, ¶301.)

(3) Grounds 7E (Karlsson+HarbersHW)

Petitioner also argues that “a POSA would have sought to incorporate *known components (hardware implementation)* of Harbers’s opto-electronic elements 11-14 on a “curved substrate” (with differently aimed opto-electronic elements 11-14 . . .) into Karlsson.” (Petition, 99.) “This, too, would have provided different spatial distributions for different situations.” (*Id.*; Ex.2006, ¶302.)

Petitioner thus relies on Harbers’ curved substrate to provide different spatial distributions. However, Harbers describes the curved substrate as an optional feature. *See* Ex.1011, 7:27–29 (“The array of optoelectronic elements . . . does not have to be provided on a flat substrate, it may alternatively be provided on a curved substrate.”). Since Harbers’ curved substrate is optional, a POSA would have understood that it is not needed to provide Harbers’ different spatial distributions – therefore a POSA would not have been motivated to combine Karlsson with Harbers’ unnecessary hardware. Additionally, adding a curved substrate would negatively impact packaging limitations, further discouraging a POSA from making Petitioner’s proposed modification. (Ex.2006, ¶303.)

a. Petitioner Does Not Explain How a POSA Would Have Combined Karlsson and Harbers

Petitioner fails to recognize a fundamental conflict in the implementation of Karlsson and Harbers strategies. Karlsson modifies high-intensity main-beam

illumination in regions where that illumination might glare, e.g., when it uses such illumination for the full scene to provide “optimum illumination for the driver.” (Ex.1010, 2:2-9.) Harbers, on the other hand, selectively chooses illumination for different situations, such as selectively engaging or disengaging different beam segments based on velocity. (Ex.1011, 9:1-6; Ex.2006, ¶306.)

Petitioner does not explain how Harbers’ selective functions will combine with Karlsson’s illumination strategy. Harbers provides for some form of apparent automatic control, based on velocity and steering (Ex.1011, 3:27-4:14; Ex.2006, ¶309.)

Harbers software would attempt to widen the beam and decrease central forward illumination (use the passing and side beam segments) at the same time as Karlsson would attempt to maintain dimming of the sides that Harbers is attempting to illuminate, as well as maintain intense forward illumination that Harbers is attempting to dim. (Ex.2006, ¶¶310.)

Petitioner also does not explain how any segmentation would occur in the absence of Harbers’ software. Petitioner contends that including Harbers hardware (as an **alternative to software**) into Karlsson’s system would “have provided different spatial distributions for improved visibility in different situations.” (Petition, 96.) Petitioner’s argument that “elements 11-14... provide beam segments,” without having Harbers’ software, is completely unfounded in the

teachings of Harbers. (*Id.* at 99.) All of Harbers’ described control functions are related to software controls (Ex.1011, 3:27-4:14). While the system would have included differently **colored** LEDs, there still would not be a single component of the combination that would have any idea how to segment the beams as Harbers suggests. Thus, no POSA would have made this combination, essentially placing an array with colored LEDs into Karlsson with no actual alleged benefit from segmentation carrying over and Karlsson’s software, the only software present, having no idea how to handle colored LEDs. (Ex.2006, ¶312-313.)

H. Ground 8 – Karlsson, Harbers, and Gotou

1. Dependent Claims:

- a. Claims 15, 17, 54, 56 – The Karlsson-Harbers-Gotou Combinations Do Not Teach “increas[ing] illumination in a direction of the road curvature.”**

Petitioner relies on Gotou’s disclosure of adjusting light based on GPS data including road curvature for satisfying the sensor data limitations, and relies on Karlsson-Harbers for satisfying the hardware and software limitations. (Petition, 159-163, 164, 166; Ex.2006, ¶319.)

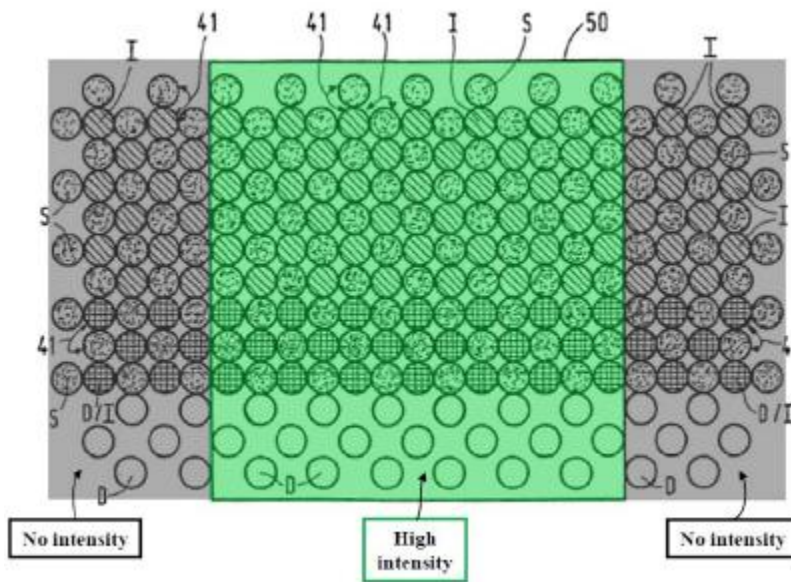
(1) All Sub-Grounds

Karlsson discloses a headlight assembly having a controllable lighting pattern, that provides a high-beam or “main-beam” lighting pattern as a default

setting. (Ex.1010, 1:1-7, 1:18-23.) Karlsson also discloses “retaining an optimum light for the driver of the vehicle” while automatically suppressing “that part of the light beam which might cause inconvenience to oncoming traffic.” (Ex.1010, 2:7-9.) Karlsson also notes that “main-beams are designed and optimized for long-range illumination” (Ex.1010, 1:19-20.) Karlsson seeks the **retention** of “optimum” light anywhere glare is not being accommodated. (Ex.1010, 2:7-10, 9:23-26; Ex.2006, ¶320.)

Karlsson discloses that “the lighting means 2, 3 are intermittently controlled by control means 14 . . . so as to control the lighting means 2, 3 in such a manner that a light beam 7 having a desired pattern and a desired intensity is emitted.” (Ex.1010, 9-17.) Karlsson further discloses that the “light beam 7 ... [is] controlled in such a manner that no light at all or light having a low intensity is emitted in those directions from which light is detected ... [thus] glaring or blinding of oncoming traffic is effectively prevented.” (Ex.1010, 9:18-26.; Ex.2006, ¶321.)

Petitioner explains Karlsson as teaching a shaded area of “no intensity” and a non-shaded area of “high intensity”: “Thus, Karlsson’s processor processes the data, and uses memory (with algorithms) to “determine an illumination for at least two of the subsections” (shaded area of **no intensity**/non-shaded area of **high intensity**).” (Petition, 116.) Petitioner annotated Karlsson’s Figure 14 to identify the areas of “No intensity” and “High intensity” illumination (Ex.2006, ¶320):



(Petition at 117,119,122,124; Ex.1010, Fig. 14, Annotated by Petitioner)

Petitioner admitted, in IPR2023-00318, that Karlsson’s disclosure teaches that the “remaining areas of light beam 7 are left at full intensity (‘main-beam’ or ‘high beam’ in Karlsson’s terms), ‘permitting a light intensity which is generally *higher than that of conventional dipped headlights.*’) (Ex.2008 at 66, emphasis in original, citing Ex.2009, ¶280; Ex.2006, ¶323.) Petitioner continues the explanation and interpretation of Karlsson by admitting that:

A POSA would also have understood that positioning the main beam **(full-intensity)** LEDs all around the **reduced illumination area** provides the “**optimum lighting effect**” for the driver because doing so maximizes the area that is fully illuminated. EX1003, ¶281; EX1010, 2:7-9. In the alternative, it would have been obvious to a POSA to configure Karlsson’s system to **surround** the reduced

illumination area with **full illumination to the greatest extent possible** for the same reason. EX1003, ¶¶281-282.

(Ex.2008 at 67; Ex.2006, ¶323.)

“The greatest extent possible” that “surrounds” a reduced illumination area, is, of course, use of the full LED array, to provide the driving beam 7. As Petitioner explains, this would also “maximizes the area that is fully illuminated” to achieve “optimum lighting effect for the driver.” (Ex.2008 at 67.) Per Karlsson and Petitioner’s admissions, the only reasoned and consistent interpretation is that Karlsson uses full illumination “to the **greatest extent possible**” to achieve an “optimum lighting effect” by “maximizing the area that is fully illuminated”— i.e., use the **entire array** just as Beam does, except for portions dimmed to avoid glare under Karlsson’s specified circumstances. (Ex.2006, ¶324.)

As both parties agree, Karlsson discloses providing full or maximum intensity light in the remaining areas outside of the anti-glare region corresponding to detected incoming light to the greatest extent possible, *i.e.*, everywhere it could be needed. Under such circumstances, there would be no reason to increase light in the direction of the curve, nor would there be remaining unlit LEDs with which to achieve the increase. Accordingly, the Karlsson-Harbers-Gotou combinations does not teach “*increas[ing] illumination in a direction of the road curvature*” as

claimed, and claims 15, 17, 54, 56 are patentable over the combination. (Ex.2006, ¶325.)

I. Ground 9 – Karlsson, Harbers, and Braun (claims 6, 46)

1. A POSA Would Not Have Been Motivated to Combine Karlsson, Harbers, and Braun

a. Petitioner Does Not Explain How a POSA Would Have Combined Karlsson, Harbers, and Braun

Claim 6 is representative of claim 46 and requires “*wherein the headlight beam further comprises light in at least one of infra-red (IR) or ultra-violet (UV) wavelengths.*” The Petitioner relies on Braun’s luxels for satisfying this limitation. (Petition, 172 ; Ex.2006, ¶¶326-327.)

Petitioner states that the combination “would have been combining prior-art elements or a simple substitution of one known element for another (Karlsson’s-Braun’s respective arrays) according to known methods to yield predictable results (improved visibility and safety).” This would include “modifying Karlsson’s LEDs with Braun’s colored LEDs to provide colored light sources with IR/UV wavelengths for different functions.” (Petition, 170; Ex.2006, ¶328.)

(1) Grounds 9A (Beam Lamp + SLM+Stam-Braun) 9D (Beam+ThominetHW+Stam-Braun)

Petitioner does not provide any explanation for how and why a POSA would

have combined or substituted Karlsson's lamp-SLM or Harbers's LEDs with Braun's luxels. (Petition, 170.) Nor does Petitioner explain how either Karlsson or Harbers' software would have any idea how or when to control such luxels, or what LEDs would be replaced, or what effect this would have on the overall system. (Ex.2006, ¶¶329-330.)

(2) Grounds 9B (Karlsson LEDs), and 9C-9D (Karlson + HarbersSW)

Petitioner does not explain how Karlsson's LED arrays and Braun's luxels would have been combined, or what additional changes would be needed to combine or substitute the light sources. LED headlamps were in their infancy in the early 2000's, therefore there were no "predictable solutions," nor was there a "reasonable expectation of success." Designing an LED Headlamp for a vehicle application requires consideration and tradeoffs involving complex and interrelated optics, heat management, white LED lumen output, packaging and cost issues. (Ex.2006, ¶¶330, 29-38.)

VII. Conclusion

In light of the remarks herein, Patent Owner respectfully requests that the Board finds all challenged claims not unpatentable.

Dated: October 12, 2023

Respectfully submitted,

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Certificate of Service

The undersigned hereby certifies that on October 12, 2023, a complete and entire copy of **PATENT OWNER'S RESPONSE and all exhibits**, was served via electronic mail to the attorneys listed below:

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