UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GIESECKE+DEVRIENT GMBH, GIESECKE+DEVRIENT CURRENCY TECHNOLOGY GMBH, AND PAPIERFABRIK LOUISENTHAL GMBH,

Petitioners,

v.

LUMENCO, LLC,

Patent Owner.

IPR2024-00838
Patent No. 10,901,191 B2

PATENT OWNER'S REQUEST FOR DIRECTOR REVIEW

Filed on behalf of Patent Owner by:

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Paper 32

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Rules

37 C.F.R. § 42.75 1

Patent Owner Lumenco, LLC ("Patent Owner") respectfully requests Director Review and reversal of the Final Written Decision (Paper 31; the "FWD") in this *inter partes* review.[1] *See* 37 C.F.R. § 42.75.

I. INTRODUCTION

The Director should review and reverse the FWD because the Board abused its discretion in crediting the testimony of Petitioner's expert, Dr. Hesselink to the exclusion of the well-informed testimony of Dr. Lindstrand, Patent Owner's expert. The FWD acknowledges that the challenged claims of U.S. Patent No. 10,901,191 (the "'191 patent") require ***ambient*** light environments. FWD at 11. The FWD also acknowledges that ambient light environments include ***both parallel and diffuse light***. *Id*. But Dr. Hesslink has no experience with systems including diffuse light—he only has experience in ***pure parallel light systems***. PO Resp. (Paper 13) 10-11 (citing Ex. 1003 ¶6); Exhibit 2004, ¶¶30-37. Petitioner admits this. *See*, *generally*, Paper 17. Thus, by acknowledging that ambient light environments include diffuse light, the FWD admits that Dr. Hesselink has no experience in the ambient light environments claimed by the '191 patent.

Yet, relying almost exclusively on Dr. Hesselink's interpretations of the prior art, the Board determined that all claims of the '191 patent are obvious based on

[1] Unless otherwise noted, all emphasis has been added and all internal citations are omitted.

Fuhse262 alone and in combination with certain other references. FWD at 25. For example, the Board determined that claims [1b.5] and [6b.5] are *"**suggested**"* by Fuhse262 even though the FWD acknowledges that Fuhse262 does not mention or refer to creation of "voxels." FWD at 18-22. That determination is based entirely on the testimony of Petitioner's expert, Dr. Hesselink, which consists in large part of a single figure on which Dr. Hesselink has added highlighting. Pet. (Paper 1) 32-34; EX1003, ¶178.

II. FACTUAL BACKGROUND

A. PETITIONERS USURP PATENT OWNER'S TECHNOLOGY

Patent Owner is a Colorado-based research and development company founded in 2012. PO Resp. 2. Its business focuses on micro-optic, micro mirror, lighting, and screen technologies. *Id.* In early 2017, Patent Owner introduced its Dycyfer™ and micro mirror technology to Petitioners, who are limited liability companies based in Germany. *Id.* 2, 4. Petitioners requested information and a demonstration. *Id.* 4. Patent Owner's founders (who are also the named inventors of the '191 patent) were invited to meet with Petitioners' in Germany. *Id.* During the meeting that was held in Gmund, Germany in May 2017, Messrs. Raymond and Porras presented Dycyfer™ technology and the patent application that issued as the '191 patent to Petitioners' executives, and, afterwards, they traded several emails with Petitioners' representatives regarding Patent Owner's technology and

inventions. *Id.*

Petitioners eventually informed Patent Owner that they were not interested in pursuing a license or partnership. PO Resp. 4. Approximately one year later, however, Petitioners announced that they would be offering a new line of micro mirror optical security products marketed under the brand name Galaxy®. *Id.* Those products infringed, and continue to infringe, Patent Owner's U.S. patents, including the '191 patent. *Id.*

Patent Owner sent Petitioners a letter on January 21, 2021, notifying Petitioners of their infringement of the '191 patent. *See* Ex. 2001. Petitioners not only failed to cease their infringement, but Patent Owner eventually learned that Petitioners were importing infringing products into and selling those products in the United States. PO Resp. 5. In 2023, Patent Owner initiated a patent infringement litigation against Petitioners, asserting four of its U.S. patents, including the '191 patent. *Id.*

B. PARALLEL VERSUS DIFFUSIVE LIGHT SYSTEMS

A parallel (or collimated) light system is one in which "all the rays coming from the source are parallel to each other." Ex. 1003 at ¶46. The direction and angle of these rays of light are controlled and predictable. Ex. 2004 at ¶27. Thus, "the designer knows exactly where the light is coming from and can manipulate and control variables like intensity, beam size, etc." *Id.* "Such systems are ideal for

well-defined problems in highly controlled environments with small and well-characterized sources of disturbance." *Id.*

A diffusive light system, on the other hand, "creates multiple areas of difficulty and challenges because the light energy is not transmitted in parallel rays, but instead is diffusive in nature and bounce around." Ex. 2004 at ¶26. "Diffusive light scattering causes unintended light rays in positions and directions not desired." *Id.* at ¶28. "This presents a number of challenges, e.g. positions that should appear deeply black appear instead [to] be grayish." *Id.* "Achieving high intensity and high contrast images in diffusive light systems is much more difficult than in collimated light source systems due to interference, diffraction, and scattering effects from untargeted light rays." *Id.*

III. ARGUMENT

Requests for Director review are directed to "decisions presenting (a) an abuse of discretion,…[or] (c) erroneous findings of material fact."[2] This FWD presents both.

A. THE BOARD MADE MATERIALLY ERRONEOUS FINDINGS OF FACT REGARDING THE DEFINITION OF POSITA

1. A POSITA Must Have Experience With Diffusive Light.

The '191 patent repeatedly states that the invention is for use with "ambient

[2] *See* https://www.uspto.gov/patents/ptab/decisions/director-review-process.

light." *See, e.g.,* '191 patent (Ex. 1001) at 2:54, 5:57-60. As explained by Dr. Lindstrand:

> Considerations such as light conservation are important [when designing an optical security system for use in ambient light] because an image created with ambient light must direct light in the right place. Ambient light also often ends up in the wrong place due to its diffusive nature, and thus may light up an area intended to be dark….[T]hese challenges and considerations must be familiar to a POSITA when designing or considering a security document substrate that works in diffusive or ambient light….

Ex. 2004 at ¶26. "Diffusive light and the behavior of reflected ambient light presents challenges, especially when considering how the human observer perceives light reflected from a security feature." *Id.* For this reason, "[e]xperience in micro-optic security features more broadly, without specific diffusive light experience, would not qualify a person as skilled in the art of the Lumenco Patents." *Id.*

Nonetheless, the Board refused to include experience with diffusive light in the definition of a POSITA, instead only requiring a POSITA to have "experience in micro-optic based security features." FWD at 11. Although the Board recognized that ambient light includes diffusive light and the term "ambient light" is used in the '191 patent, the definition of a POSITA adopted by the Board nonetheless permits someone with only parallel light experience to qualify as a POSITA because the '191 patent "does not discuss any distinctions between parallel light and diffuse light." *Id.*; *see also* Ex. 2004 at ¶32. Such individuals, however, are not POSITAs given the differences between parallel and diffusive light systems and the significant

technical challenges presented by the latter. *See* Ex. 2004 at ¶26 ("Experience in micro-optic security features more broadly, without specific diffusive light experience, would not qualify a person as skilled in the art of the Lumenco Patents."). Moreover, a POSITA would not have expected the '191 patent to contain any discussion comparing parallel and diffuse light since they would already understand the term "ambient light" to inherently mean "a non-collimated light environment, i.e., an environment where light rays are scattered and diffused." Ex. 2004 at ¶36. Any discussion of parallel light in the '191 patent therefore would have been superfluous and unrelated to the disclosed invention.

The '191 patent discloses and claims a "visual display assembly useful as an authentication or anti-counterfeiting element" that "includes a substrate and, on a surface of the substrate, an array of micro mirrors receiving ***ambient*** light. Each mirror includes a reflective surface to reflect the ***ambient*** light…." Ex. 1001 at Abstract. The Board's minimum experience for a POSITA—at least 2 years in micro-optic based security features—is "too generic in the context of the" '191 patent's claimed invention. *Samsung Elecs. Co., Ltd. et al. v. Chien-Min Sung*, IPR2024-00534, Paper 36 (PTAB Sept. 17, 2025) ("*Samsung* IPR") at 22. Instead, the definition of a POSITA should reflect experience with the specific subset of micro-optic based security features claimed by the '191 patent (*i.e.*, micro mirrors that receive and reflect ambient light), just as the definition of a POSITA in the

Samsung IPR reflected the specific subset of integrated circuit processing and fabrication techniques to which that patent was related. *See Samsung* IPR at 19-21; *see also Sigray, Inc. v. Carl Zeiss X-ray Microscopy, Inc.*, IPR2022-00218, Paper 40 (PTAB Dec. 12, 2025) ("*Sigray* IPR") at 9.

2. A POSITA Can Have An Undergraduate Degree In A "Similar Field"

The Board also erred by rejecting the possibility that an undergraduate degree in "a similar field" may qualify a person as a POSITA when coupled with appropriate experience. FWD at 11. The Board's rationale was that the phrase "introduces vagueness and unnecessary uncertainty into the definition." *Id.* Yet inclusion of such language is common in patent disputes. *See, e.g., Fluidmaster, Inc. v. Danco, Inc.*, IPR2024-00633, Paper 45 (PTAB Dec. 15, 2025) at 11-12 (adopting POSITA definition including "a Bachelor of Science degree in mechanical engineering ***or a related field***").[3]

The Board's exclusion of "a similar field" unnecessarily limits the scope of a

[3] *See also, e.g., Sigray* IPR at 8 (adopting POSITA definition that includes "master's degree in physics, optics, electrical engineering or ***a similar field***"); *Luxottica of Am. Inc. v. E-Vision Optics, LLC*, IPR2024-01071, Paper 35 (PTAB Dec. 11, 2025) at 9 (adopting POSITA definition including "bachelor's degree in mechanical engineering, electrical engineering, or computer engineering, or ***an equivalent degree***"); *Kohler Co. v. Delta Faucet Co.*, IPR2024-00700, Paper 32 (PTAB Oct. 1, 2025) at 7-8 (adopting POSITA definition that includes "a degree in industrial design ***or an equivalent field***").

POSITA to only those persons with an undergraduate degree in electrical engineering, mechanical engineering, or physics. FWD at 9-10. "The danger of defining the scope of the pertinent art too narrowly is that it may exclude experts with relevant technical backgrounds." *Sonos, Inc. v. D&M Holdings*, 297 F.Supp.3d 501, 510 (D. Del. 2017). This is why factfinders generally agree that "[e]xperience and/or technical training may substitute for college education requirements." *Flashmark Techs. LLC v. Gtech Corp.*, No. 2:06CV205, 2007 U.S. Dist. LEXIS 65317, at *4 n.2 (E.D. Tex. Sep. 2, 2007). A factfinder can easily determine from an expert's curriculum vitae, resume, or the like whether course work undertaken is "similar" to what would be expected in the designated subjects. *See, e.g., Sprint Communs. Co. L.P. v. Vonage Holdings Corp.*, 500 F.Supp.2d 1290, 1344 (D. Kan. 2007). The Board's refusal to do so here is unwarranted and legally incorrect.

B. The Board Abused Its Discretion In Weighing The Experts' Testimony

The Board's incorrect definition of a POSITA materially affected the outcome of the IPR by altering the weights afforded to each party's expert.

1. The Board Abused Its Discretion In Crediting Dr. Hesselink's Testimony

While Dr. Hesselink has experience with micro-optics design, he lacks experience with diffusive light systems. *See* Ex. 2004 at ¶30. His high-level summary of experience does not include any specific disclosure of experience with

diffusive or ambient light features, nor does it mention optical security features.[4] *Id.* at ¶31. A disclosure of a general experience in "optics" does not necessarily include experience with diffusive light systems. *Id.* at ¶32. The more specific examples of Dr. Hesselink's experience with optical systems likewise provide no disclosure of experiences with diffusive or ambient light features.[5] *Id.* at ¶33. Moreover, Dr. Hesselink's entire declaration is based on the conclusion that the term "ambient light" as used in the '191 patent "refers to parallel light" (Ex. 1003 at ¶46)—a conclusion the Board expressly rejected. FWD at 11. Because Dr. Hesselink lacks critical experience in the art of the '191 patent and his declaration is based on a fundamentally flawed underlying premise, his declaration either should have been afforded little weight or excluded completely. *Homeland Housewares, LLC v. Whirlpool Corp.*, 865 F.3d 1372, 1378 (Fed. Cir. 2017) ("[W]e must disregard the testimony of an expert that is plainly inconsistent with the record or 'based on an incorrect understanding of the claim[s].'"). Instead, however, the Board relied

[4] "My expertise is in ultra-high density optical data storage, and optical information systems generally, as well as optical communication components, nano photonics, optics and optical systems, and optical interconnects." Ex. 1003 at ¶6.

[5] Dr. Hesselink states that he has experience with "3-D displays, including autostereoscopic holographic displays, 3-D up conversion display, 3-D displays for security applications, grating-based displays, as well as data analysis of complex 3-D flow visualizations using scanning laser systems, tomography, and mathematical topology," as well as "3-D display and storage devices" and the use of "interferometry to determine the 3-shape of objects using optical and X-ray scanners." Ex. 1003 at ¶7.

almost exclusively on Dr. Hesselink's testimony to fill in gaps in Fuhse262 and find certain claim limitations obvious.

2. The Board Abused Its Discretion In Failing To Credit Dr. Lindstrand's Testimony

The Board did not treat Dr. Lindstrand as a POSITA or properly credit his testimony, as evidenced by the paucity of citations to his testimony in the FWD (there are only four) and the repeated instances of resting obviousness rejections entirely on the testimony of Dr. Hesslink without providing any explanation of why Dr. Lindstrand's testimony was discounted. If the Board had properly considered Dr. Lindstrand's extensive experience with diffusive and ambient light systems, security holograms, and optical document security materials used on banknotes, it would have concluded that Dr. Lindstrand is a POSITA and given more weight to his testimony. *See* Ex. 2004 at ¶¶5-17. When Dr. Lindstrand's testimony is properly credited, all claims should have been confirmed patentable.

C. The Board Made Materially Erroneous Findings Of Fact And Conclusions Of Law In Concluding The Claims Are Obvious

The Board's errors in defining a POSITA and its abuse of discretion in giving the appropriate weight to the experts' testimony resulted in the Board adopting Dr. Hesselink's testimony wholesale that claim elements [1b.5] and [6b.5] are obvious.

It is undisputed that "Fushe262 does not expressly use the term 'voxel.'" FWD at 18. It is also undisputed that Fushe262 only refers to the intersection of the

light rays as "light spots." *See, e.g.,* Ex. 1006 at [0015]. Nonetheless, the Board held that claim elements [1b.5][6] and [6b.5][7] were taught by Fuhse262 based on Dr. Hesselink's claim that a POSITA would understand that the intersection of the beams of light that reflect off the micro mirrors creates a voxel. FWD at 15-16, 18-19. This may be true in a parallel light system such as those Dr. Hesselink is experienced in, but Dr. Lindstrand explains that this is ***not*** true in a system containing diffuse light, such as an ambient light system. "One cannot simply aim mirrors towards each other and obtain a three-dimensional voxel that assists in creating an image for a security feature." Ex. 2004 at ¶45. This is due to interference from incoming light rays and light rays reflecting from other mirrors in the array. *Id.* at ¶47. "That interference degrades the quality and shape of the light rays as they move toward an intersection point." *Id.* at ¶48. The creation of a voxel requires more information than the creation of a pixel, and the degradation of quality and shape reduces the information available such that only a pixel can form. *Id.* at ¶¶46, 48-49. Thus, contrary to the Board's conclusion, a POSITA would actually have understood that, due to interference, the light reflecting off the entire surface of the

[6] "wherein a voxel is created at each of the point on the plane via intersection of two or more beams of the reflected ambient light"

[7] "wherein the reflected ambient light from the number of the micro mirrors intersects at the point corresponding to the one of the pixels to create a voxel"

mirrors in Fuhse262 would ***not*** converge to form a voxel.[8] *See* FWD at 19-22.

The Board next erred by improperly shifting the burden of persuasion to Patent Owner to prove that claim element [1b.5] was not obvious. *See Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1379 (Fed. Cir. 2015) ("In an *inter partes* review, the burden of persuasion is on the petitioner to prove 'unpatentability by a preponderance of the evidence,' and that burden never shifts to the patentee."). For example, after adopting Dr. Hesselink's opinions, the Board required Patent Owner to "explicitly show" that voxels would not form because the ambient light reflecting from Fuhse262's mirrors would intersect in an irregular manner. FWD at 19. It also rejects Dr. Lindstrand's and Patent Owner's explanations because Patent Owner "does not explain what more is required of Fuhse262 to disclose the creation of voxels." *Id.* at 20. However, Patent Owner is not required to explain how prior art must be modified to practice the claimed invention. As the Federal Circuit has explained:

> Where, as here the only question presented is whether due consideration of the four *Graham* factors renders a claim or claims obvious, ***no burden shifts from the patent challenger to the patentee***. ***This is especially true where the only issues to be considered are what the prior art discloses***, whether there would have been a motivation to combine the prior art, and whether that combination would render the patented claims obvious.

[8] The Board appears to have misunderstood Dr. Lindstrand. It is not a matter of the voxels being "degraded or faint" or "having any particular intensity." FWD at 22. Rather, there is not enough information to create the voxels at all.

In re: Magnum Oil Tools Int'l, Ltd., 829 F.3d 1364, 1376 (Fed. Cir. 2016).

IV. CONCLUSION

In light of the multiple errors and/or abuses of discretion made by the Board as set forth above, Patent Owner respectfully requests that the Director review and vacate the FWD, and terminate these proceedings.

Date: December 19, 2025

Respectfully submitted,

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Counsel for Patent Owner

CERTIFICATION

The undersigned certifies that the foregoing Patent Owner's Request for Director Review, exclusive of the Table of Contents, Table of Authorities, and Mandatory Notices, is less than or equal to 15 pages.

Date: December 19, 2025

By: */s/ C. Matthew Rozier*
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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. §42.6, the undersigned certifies that, on December 19, 2025, the foregoing Patent Owner's Request for Director Review was served on counsel of record for Petitioners by filing this document through the End-to-End System, as well as *via* electronic mail to counsel of record for Petitioners at the following addresses:

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