

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

EDEN PARK ILLUMINATION, INC.,
LARSON ELECTRONICS LLC, and FAR UV TECHNOLOGIES, INC.,
Petitioner,

v.

S. EDWARD NEISTER,
Patent Owner.

IPR2022-00682
Patent 8,975,605 B2

Before, JEFFREY W. ABRAHAM, JULIA HEANEY, and
AVELYN M. ROSS, *Administrative Patent Judges*.

ROSS, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314, 37 C.F.R. § 42.4

I. INTRODUCTION

Eden Park Illumination, Inc., Larson Electronics LLC, and Far UV Technologies, Inc. (collectively, “Petitioner”) filed a Petition (Paper 4, “Pet.”) requesting an *inter partes* review of claims 1, 2, 5, and 6 of U.S. Patent No. 8,975,605 B2 (Ex. 1001, “the ’605 patent”). S. Edward Neister (“Patent Owner”) filed a Preliminary Response to the Petition. Paper 9 (“Prelim. Resp.”).

We have authority to determine whether to institute an *inter partes* review. 35 U.S.C. § 314 (2018); 37 C.F.R. § 42.4(a). The standard for instituting an *inter partes* review is set forth in 35 U.S.C. § 314(a), which provides that an *inter partes* review may not be instituted “unless the Director determines . . . there is a reasonable likelihood that the petitioner would prevail with respect to at least [one] of the claims challenged in the petition.”

For the reasons set forth below, upon considering the Petition, Preliminary Response, and evidence of record, we determine that Petitioner has established a reasonable likelihood of prevailing with respect to at least one challenged claim. Accordingly, we grant the Petition, and institute an *inter partes* review.

A. *Real Parties-in-Interest*

Petitioner identifies itself as the real parties-in-interest. Pet. 44.

Patent Owner identifies “S. Edward Neister, Patent Owner and High Energy Ozone, LLC” as the real parties-in-interest. Paper 7 (Patent Owner’s Mandatory Notices), 1.

B. Related Proceedings

The parties identify the following as related proceedings: (1) *Healthe, Inc. v. High Energy Ozone LLC et al.*, Case No. 6:20-cv-02233 (M.D. Fla.); (2) *High Energy Ozone LLC et al. v. Larson Electronics LLC*, Case No. 3:21-cv-01166 (N.D. Tex.); (3) *High Energy Ozone LLC et al. v. Eden Park Illumination, Inc.*, Case No. 1:21-cv-02753 (N.D. Ill.) (administratively closed); (4) *High Energy Ozone LLC et al. v. Eden Park Illumination, Inc.*, Case No. 3:22-cv-00425 (N.D. Tex.); (5) *High Energy Ozone LLC et al. v. Far UV Technologies*, Case No. 4:21-cv-00345 (W.D. Miss) (administratively closed); and (6) *High Energy Ozone LLC et al. v. Far UV Technologies*, Case No. 3:22-cv-00280 (N.D. Tex.). Pet. 44–45; Paper 7, 1.

The parties also identify as a related matter (because of common parties, inventor, and assignee) IPR2022-00381 (U.S. Patent No. 9,700,642). Pet. 45; Paper 7, 1.

C. The '605 patent

The '605 patent, titled “Method and Apparatus for Producing a High Level of Disinfection in Air and Surfaces,” issued on March 10, 2015. Ex. 1001, codes (45), (54). The '605 patent explains that in the past, a method of “sterilizing and disinfecting air has been based predominately on using commercially available germicidal ultra-violet (GUV) lamps” and that “[t]hese lamps are either pulsed or continuously excited.” *Id.* at 1:24–27. Lamps that are continuously excited are mercury based and emit principally at 254 nm. *Id.* at 1:27–28. According to the '605 patent, though such treatment method “is effective for treating the room air of individual rooms, it is not practical for treating large flowing volumes of air that pass quickly down large ducts.” *Id.* at 1:36–39. This is because of the long treatment

time that is required. *Id.* at 1:39–40. The '605 patent also explains that “[c]laims have been made that germicidal UV-C (GUV) radiation is used to deactivate DNA” because “the mercury lamp emission at 254 nm is close to a good DNA absorption band.” *Id.* at 1:55–58. However, “[n]o claims are made that combine different wavelength UV photons to produce a higher level of deactivation of microorganisms” and “no claims are made that combine FUV [(Far UV)] photons with UV-C photons to produce a higher level of deactivation of microorganisms.” *Id.* at 1:58–62. The '605 patent discloses that recently, new UV emitting lamps based on the excitation of excimers are becoming commercially available in which the emitters produce single line or narrow spectral emission at a wavelength determined by the gas composition of the lamp. *Id.* at 2:4–8. However, “[n]o patent has been found that teaches the use of FUV sources coupled with UV-C sources with supporting equipment that can effectively and efficiently disinfect and sterilize large volumes of air, large and small surfaces, and food stuffs in various stages of preparation.” *Id.* at 2:11–17.

The '605 patent discloses that researchers understand that GUV photons produce strong covalent bonds such as those in dimers. *Id.* at 2:33–40. According to the '605 patent, “GUV light is known to produce [t]hymine, cytosine-thymine, and cytosine dimers” and “[a]fter the formation of the dimer, further replication of the DNA stops.” *Id.* at 2:40–43. The '605 patent further discloses that:

It has been fairly well established that the peptide bonds in all proteins are responsible for the peak absorption at two different wavelength regions; namely at 200 nm and at 280 nm. The peak absorption at either 200 nm and/or near 280 nm is also exhibited by all nitrogenous bases in the DNA as well as the proteins that form the outer cellular membrane of bacteria, spores

and viruses. This occurs as well for nucleoproteins, diglycine, triglycine, and bovine albumin Amino acids have a peak absorption band near 260 nm. A UV lamp emitting at 222 nm and/or 282 nm will produce the greatest photon absorption by the nitrogenous bases and proteins. A UV-C lamp emitting at 260 nm will produce the greatest photon absorption by the amino acids in the DNA. Consequently these three wavelengths are primary absorption bands that permit destruction of microorganisms.

Id. at 3:58–4:8.

The '605 patent describes a method that uses “a dual-single lined lamp that emits at least two narrow wavelength bands of ultra-violet photons that match closely to the maximum absorption bands for DNA chromophores of nitrogenous bases, proteins, amino acids and other component bonds of microorganisms” with a preference of “a multi-wavelength narrow line source emitting at least two different wavelengths.” *Id.* at 4:57–64. Three tests were conducted in regard to microorganisms’ exposure to certain wavelengths: (1) with a combination of 222 nm and 254 nm photons or with only 282 nm photons on *Serratia marcescens*; (2) with only 282 nm photons or with a combination of 282 nm and 254 nm photons on *Aspergillus Niger*; and (3) with a combination of 222 nm and 254 nm photons or with a combination of 282 nm and 254 nm photons on *Escherichia coli*. *Id.* at 4:15–31. The '605 patent discloses that the results of these tests “showed significant reduction in living organisms when multi-wavelength narrow line photons were used compared to single wavelength photons” and that “[t]hese tests also demonstrated that the correct combination of dual-single line photons were significant and dependant on each organism.” *Id.* at 4:43–48.

D. Illustrative Claims

Petitioner challenges claims 1, 2, 5, and 6 of the '605 patent. Independent claim 1 is the independent claim challenged and is reproduced below.

1. A process for destroying or deactivating the DNA organic bonds and proteins of microorganisms comprising the steps of:
generating photons of at least two single line wavelengths from a non-coherent light source selected from the group consisting of at least two wavelengths being of 222 nm, 254 nm, and 282 nm;
directing the photons to a substance to be disinfected, whereby the photons destroy or deactivate the DNA organic bonds and proteins of microorganisms;
exposing the surface to be disinfected to the generated photons of at least two wavelengths, wherein the exposing achieves a ninety percent kill of microorganisms in a time period of less than one second.

Ex. 1001, 9:26–10:9.

E. The Asserted Unpatentability Challenges

Petitioner asserts that claims 1, 2, 5, and 6 would have been unpatentable based on the following grounds:

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1, 2	103	Brown-Skrobot ¹ in view of Clauß ^{2, 3}

¹ U.S. Patent Pub. No. 2005/0079096 A1 to Brown-Skrobot et al., published Apr. 14, 2005 (Ex. 1004).

² Clauß, M., Mannesmann, R., & Kolch, A., *Photoreactivation of Escherichia coli and Yersinia enterocolytica after Irradiation with a 222 nm Excimer Lamp Compared to a 254 nm Low-pressure Mercury Lamp*, 33 ACTA HYDROCHIMICA ET HYDROBIOLOGICA 579–84 (2005) (Ex. 1005).

³ Petitioner refers to this reference as “Clauss,” rather than “Clauß.”

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
5, 6	103	Brown-Skrobot, Clauß, Liang ⁴

Pet. 2–3. Petitioner also relies on declaration testimony of Oliver R. Lawal (Ex. 1003).

II. ANALYSIS

A. Principles of Law

“In an IPR [(*inter partes* review)], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (2012) (requiring *inter partes* review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”)). This burden of persuasion never shifts to the patent owner. *See Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (discussing the burden of proof in *inter partes* review). Furthermore, a petitioner cannot satisfy its burden of proving obviousness by employing “mere conclusory statements.” *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016).

Obviousness is a question of law based on underlying determinations of fact. *Graham v. John Deere Co.*, 383 U.S. 1, 17 (1966); *Richardson-Vicks, Inc. v. Upjohn Co.*, 122 F.3d 1476, 1479 (Fed. Cir. 1997). A claim is unpatentable as obvious, under 35 U.S.C. § 103, if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time of the invention to a person

⁴ U.S. Patent Pub. No. 2005/0163648 A1 to Liang, published July 28, 2005 (Ex. 1006).

having ordinary skill in the art. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) objective evidence of nonobviousness.⁵ *Graham*, 383 U.S. at 17–18. Consideration of the *Graham* factors “helps inform the ultimate obviousness determination.” *Apple Inc. v. Samsung Elecs. Co.*, 839 F.3d 1034, 1048 (Fed. Cir. 2016) (en banc), *cert. denied*, 138 S. Ct. 420 (2017). To prevail in an *inter partes* review, Petitioner must explain how the proposed combinations of prior art would have rendered the challenged claims unpatentable. Subsumed within the *Graham* factors are the requirements that all claim limitations be found in the prior art references and that the skilled artisan would have had a reasonable expectation of success in combining the prior art references to achieve the claimed invention. *Pfizer, Inc. v. Apotex, Inc.*, 480 F.3d 1348, 1361 (Fed. Cir. 2007). “Obviousness does not require absolute predictability of success . . . all that is required is a reasonable expectation of success.” *In re O’Farrell*, 853 F.2d 894, 903–04 (Fed. Cir. 1988) (citations omitted).

At this preliminary stage, we determine whether the information presented shows a reasonable likelihood that Petitioner would prevail in establishing that at least one of the challenged claims would have been obvious over the proposed prior art.

We analyze the challenges presented in the Petition in accordance with the above-stated principles.

⁵ At this stage of the proceeding, the parties have not asserted or otherwise directed our attention to any objective evidence of nonobviousness.

B. Level of Ordinary Skill in the Art

We review the grounds of unpatentability in view of the understanding of a person of ordinary skill in the art at the time of the invention. *Graham*, 383 U.S. at 17.

Petitioner contends that a person of ordinary skill in the art “would have had at least a bachelor’s degree in an engineering discipline, such as biological, chemical, environmental, electrical, mechanical, and/or systems engineering, or an equivalent degree such as one in physics or similar subject matter.” Pet. 9 (citing Ex. 1003 ¶ 20). “Such a person would also have had two to three years of work or research experience with UV disinfection technology and/or systems and would be familiar with the fundamentals of UV excimer lamps,” but “less education could be compensated by more experience and vice versa.” *Id.* Patent Owner does not, at this time, dispute Petitioner’s proposed definition. *See* Prelim. Resp. 7.

On this record, we determine that Petitioner’s proposed definition is consistent with the prior art of record, and apply it for this Decision. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (explaining that specific findings on ordinary skill level are not required “where the prior art itself reflects an appropriate level and a need for testimony is not shown” (quoting *Litton Indus. Prods., Inc. v. Solid State Sys. Corp.*, 755 F.2d 158, 163 (Fed. Cir. 1985))). We will make any final determination pertaining to the level of ordinary skill in the art, however, on the full trial record.

C. Claim Construction

We construe claim terms according to the standard set forth in *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–17 (Fed. Cir. 2005) (en banc);

37 C.F.R. § 42.100(b) (2019). Under *Phillips*, we give claim terms “their ordinary and customary meaning.” *Phillips*, 415 F.3d at 1312. “[T]he ordinary and customary meaning of a claim term is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention.” *Id.* at 1313. “Importantly, the person of ordinary skill in the art is deemed to read the claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification.” *Id.*

Petitioner states that “the Challenged Claims require no express construction to evaluate their patentability.” Pet. 10. Patent Owner does not, at this time, seek construction of any terms. *See generally* Prelim. Resp.

For purposes of this Decision, we need not expressly construe any claim terms. *See Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (holding that “only those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy”); *see also Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (citing *Vivid Techs.* in the context of an *inter partes* review).

D. Challenge based on Brown-Skrobot and Clauß, with or without Liang

Petitioner alleges that the combination of Brown-Skrobot in view of Clauß would have rendered obvious claims 1 and 2 of the ’605 patent. Pet. 10–26. Petitioner further asserts that Brown-Skrobot in view of Clauß and Liang would have rendered obvious claims 5 and 6 of the ’605 patent. *Id.* at 26–37. Petitioner also relies on the testimony of Mr. Lawal to support its arguments. *See id.* at 10–37.

1. Overview of the Prior Art

a) Brown-Skrobot (Ex. 1004)

Brown-Skrobot is titled “Method and Apparatus of Sterilization Using Monochromatic UV Radiation Source” and describes an apparatus for delivering UV radiation to a medical device for sterilization. Ex. 1004, code (54), ¶ 22. Brown-Skrobot defines “monochromatic ultraviolet radiation” as “radiation having a wavelength or wavelengths between from 160 to 400 nm, and the majority of the radiation is concentrated within a bandwidth of 3 nm.” *Id.* ¶ 33. Preferably, “the majority of radiation is within a bandwidth of 2 nm, more preferably within 1 nm.” *Id.* Further,

[t]he preferred monochromatic UV radiation has the majority wavelength or wavelengths within about 220 to 320 nm, more preferably within 240 to 280 nm. Preferably the total monochromatic UV radiation is within the range from 220 to 320 nm, more preferably within from 240 to 280 nm. A wavelength or wavelengths within these ranges are the most preferred, because those wavelengths are the most effective at rendering a microorganism sterile. The more preferred wavelength ranges comprise 257 nm, and presently, the most preferred range has the majority of radiation at 257 nm.

Id. Monochromatic UV radiation sources include excimer lasers and excimer lamps; Brown-Skrobot describes examples of gas mixtures used in excimer lamps that produce monochromatic UV radiation, including krypton and chlorine (KrCl), xenon and iodine (XeI), and xenon and bromine (XeBr). *Id.* ¶¶ 34, 38. Multiple monochromatic UV radiation sources can be used together to provide same or different amounts of energy, and different wavelengths “may provide increased levels of sterility.” *Id.* ¶ 42. The monochromatic UV radiation sources may be used in conjunction with other structural and optical elements, such as reflectors, to direct the radiation at the target. *Id.* ¶ 40.

Brown-Skrobot also discloses that “[n]on-ionizing radiation such as monochromatic ultraviolet (UV) light is known to damage the DNA of exposed cells. The UV radiation causes thymine to dimerize which inhibits replication of DNA during cell reproduction.” *Id.* ¶ 6.

b) Clauß (Ex. 1005)

Clauß is titled “Photoreactivation of *Escherichia coli* and *Yersinia enterocolytica* after Irradiation with a 222 nm Excimer Lamp Compared to a 254 nm Low-pressure Mercury Lamp.” Ex. 1005, 579. Clauß explains that “monochromatic emission of 254 nm almost corresponds with the maximum of DNA absorption at approx. 260 nm” and that “[t]his absorption causes damage to DNA by altering nucleotide base pairing, especially 6–4 photoproducts and thymine dimers formation,” which can lead to cell death. *Id.* at 580. Clauß further explains that UV radiation can also damage proteins’ amino acids and that photoreactivation is a repair mechanism for DNA damage. *Id.* Using KrCl excimer lamps, Clauß investigates irradiation of bacteria at a wavelength of 222 nm (near protein absorption maximum), and using low-pressure mercury lamps, irradiation at a wavelength of 254 nm (near DNA absorption maximum). *Id.* Clauß concludes that “without photoreactivation the inactivation with UV radiation with 254 nm wavelength near the absorption maxima of DNA is most effective.” *Id.* at 583. Clauß also notes its “results indicate the damage of other molecules at 222 nm among the DNA” and “[i]t is assumed that protein damage is most probable.” *Id.*

c) Overview of Liang (Ex. 1006)

Liang is titled “Method and Apparatus for Sterilizing Air in Large Volumes by Radiation of Ultraviolet Rays.” Ex. 1006, code (54). Liang

explains that air transmission of pathogens such as bacteria and viruses can promote infectious diseases. *Id.* ¶ 4. To combat such transmissions, Liang discloses “an air sterilizing method and apparatus to destroy all live microorganisms in the air in large volumes” resulting in “a killing rate higher than 99.999% by adjusting the number of UV lamps and extending the length of the circuitous sterilizing chamber(s).” *Id.* ¶ 12. Liang discloses that “UV radiation at about 253.7 nm is very effective in killing microorganisms.” *Id.* ¶ 13.

2. *Analysis of Claim 1*

Petitioner contends that claim 1 is rendered obvious by the combination of Brown-Skrobot and Clauß, wherein “Brown-Skrobot’s method of sterilizing with ‘[t]wo or more monochromatic uv radiation sources’ ‘having a wavelength or wavelengths between from 160 to 400 nm’ is performed using the 222 nm KrCl excimer lamp and 254 nm low-pressure mercury lamp of Clauss.” Pet. 12 (citing Ex. 1003 ¶ 67; Ex. 1004 ¶¶ 33, 42; Ex. 1005, 580).

Petitioner contends Brown-Skrobot teaches a process for destroying DNA of a microorganism on a substance or surface, as recited in the preamble of claim 1, because it discloses sterilization using monochromatic ultraviolet radiation from one or more monochromatic UV radiation sources, and that “every surface . . . receives a sterilizing dose of radiation.” Pet. 16 (citing Ex. 1004 ¶¶ 2, 6, 34; Ex. 1003 ¶ 89). Petitioner contends Brown-Skrobot also teaches that monochromatic UV light is known to damage DNA because UV radiation causes thymine to dimerize which inhibits replication of DNA during cell reproduction. *Id.* (citing Ex. 1003 ¶ 90; Ex. 1004 ¶ 6).

Petitioner contends Brown-Skrobot teaches “generating photons of at least two single line wavelengths . . . [the] at least two single wavelengths being of 222 nm, 254 nm, and 282 nm,” as recited in claim 1, because it discloses that “[t]wo or more monochromatic [UV] radiation sources can be used together to provide . . . the same or different amount of energy at different wavelengths,” and a preferred embodiment of monochromatic UV radiation having the majority of wavelengths within about 220 to 320 nm and concentrated within a bandwidth of 3 nm, “[preferably] within a bandwidth of 2 nm, more preferably within 1 nm.” Pet. 17–18 (citing Ex. 1004 ¶¶ 33–34, 38, 42, 54; Ex. 1003 ¶¶ 93–98). Petitioner explains that a person of ordinary skill in the art would have recognized that the wavelengths recited in claim 1 fall within Brown-Skrobot’s expressly disclosed monochromatic UV radiation range of 220 to 320 nm, and that monochromatic radiation sources such as the excimer lasers and lamps disclosed in Brown-Skrobot would generate photons of a single line wavelength. *Id.* at 18 (citing Ex. 1003 ¶¶ 95–96; Ex. 1004 ¶¶ 33–34, 38, 54). Petitioner further contends a person of ordinary skill in the art would have understood Brown-Skrobot’s teaching of KrCl, XeI, and XeBr excimer lamps as non-coherent, monochromatic UV radiation sources that would generate photons at about 222 nm, 253 nm, and 282 nm, respectively. *Id.* at 19 (citing Ex. 1003 ¶ 98; Ex. 1004 ¶ 38; Ex. 1011 ¶ 30). Petitioner, through the testimony of Mr. Lawal, explains that a person of ordinary skill in the art would also understand that “a ‘lamp,’ in contrast to a ‘laser,’ is a non-coherent light source.” *Id.* at 18–19 (citing Ex. 1003 ¶ 97). Petitioner also contends Clauß “teaches using a low-pressure mercury lamp generating

photons at 254 nm, in addition to a KrCl excimer lamp emitting 222 nm radiation.” *Id.* at 19 (citing Ex. 1003 ¶ 98; Ex. 1005, 580, 581, Fig. 1).

Petitioner contends Brown-Skrobot teaches directing the photons to the substance or surface to be disinfected, as recited in claim 1 (*see* Pet. 20–21 (citing Ex. 1003 ¶¶ 100–101, 106–107; Ex. 1004 ¶¶ 23, 34, 40)), and that Clauß teaches photon wavelengths selected to destroy a plurality of bonds within the DNA or RNA of the microorganisms. *Id.* at 20 (citing Ex. 1003 ¶¶ 100–101; Ex. 1005, 580).

Petitioner contends the combination of Brown-Skrobot and Clauß suggests exposing the surface to be disinfected with at least two wavelengths to achieve a ninety percent kill of microorganisms in less than one second, as recited in claim 1. Pet. 21. Specifically, Brown-Skrobot states that “[t]he only requirement is that every surface of the medical device receives a sterilizing dose of radiation” and that the system “exposes the entire medical device simultaneously or scans the medical device.” *Id.* at 21–22 (citing Ex. 1003 ¶ 104; Ex. 1004 ¶¶ 34, 44, 56). Petitioner argues that “[t]he UV dose needed to achieve a ninety percent kill of a population of a particular microorganism is often referred to as a ‘D-value,’” and “[t]he D-value will vary depending on the sensitivity of the microorganism to UV light.” *Id.* (citing Ex. 1003 ¶ 105; Ex. 1004 ¶ 31; Ex. 1005, 581–582; Ex. 1012, 250–252). According to Petitioner, Clauß illustrates the “effect just from the 254 nm light in Clauss’s low-pressure mercury lamp providing a surface irradiance of 20.95 W/m² would result in at least a ninety percent kill of that organism in about 0.95 seconds.” *Id.* at 23–24 (citing Ex. 1003 ¶ 106; Ex. 1005, 581–582). Petitioner also contends a person of ordinary skill in the art would have understood how “to increase the UV intensity to reach the

D-value more quickly for a given microorganism, including in less than one second,” based on “the ‘basic formula’ of ‘UV power multipl[ied by] exposure time’ must be higher than the ‘death value’ of the microorganism,” and that numerous “factors can influence the output of a UV lamp.” *Id.* at 24 (citing Ex. 1003 ¶ 108; Ex. 1006 ¶ 48; Ex. 1012, 250–252; Ex. 1007 ¶ 13; Ex. 1006 ¶ 48). Petitioner reasons that because “UV intensity is inversely proportional to the distance between the lamp and target surface,” it would have been obvious to the person of ordinary skill in the art that “shortening the distance would have an exponential effect . . . [and] an efficient way to shortening kill time.” *Id.* at 25 (citing Ex. 1003 ¶ 108). Other solutions, known to the skilled artisan, for reducing the time required to achieve a ninety percent kill of microorganisms would be to use a more powerful UV lamp. *Id.* at 25–26 (citing Ex. 1003 ¶ 109).

Petitioner contends a person of ordinary skill in the art would have been motivated to combine the teachings of Brown-Skrobot and Clauß for several reasons. Pet. 13–15. Petitioner contends that Brown-Skrobot teaches using two or more monochromatic UV radiation sources of differing wavelengths and preferably wavelengths within the 220 to 320 nm range. *Id.* at 13. Brown-Skrobot teaches using a KrCl excimer lamp and explains that “[t]hese are only examples, other monochromatic UV radiation sources can be used.” *Id.* (citing Ex. 1004 ¶ 38). Clauß describes additional examples of monochromatic UV radiation sources, including a low-pressure mercury lamp, and a person of ordinary skill in the art “would have been motivated to supplement Brown-Skrobot’s high-level disclosure . . . with the implementation details provided by Clauss because doing so would have merely been a combination of prior art elements according to [their] known

methods to yield a predictable result.” *Id.* at 13–14 (citing Ex. 1003 ¶¶ 70–71; Ex. 1005, 580–581). Petitioner further reasons that monochromatic UV radiation of wavelengths of 222 nm and 254 nm was “known to be effective for disinfecting substances and surfaces: light of wavelength 254 nm because it destroys DNA through dimer production and of wavelength 222 nm due to the absorption maxima of protein.” *Id.* at 14 (citing Ex. 1003 ¶ 72; Ex. 1005, 580; Ex. 1009, 2:16–24). According to Petitioner, a person of ordinary skill in the art “would have understood and appreciated that using a UV light source comprising 222 nm and 254 nm wavelengths as taught by Clauss would yield certain predictable advantages” as “Brown-Skrobot teaches using multiple light sources because ‘different wavelengths may provide increased levels of sterility,’ or require less energy to sterilize” and “the synergistic effect of using multiple light sources of different wavelengths for germicidal use, including specifically sources emitting monochromatic 222 nm and 254 nm wavelengths, was known.” *Id.* at 15 (citing Ex. 1003 ¶ 73; Ex. 1004 ¶ 42; Ex. 1008, 1529, 1532; Ex. 1009, 4:28–33, Ex. 1030, 1:23–26.)

a) Whether a person of ordinary skill would have looked to Brown-Skrobot

Patent Owner argues that a person of ordinary skill in the art would not have looked to Brown-Skrobot “without relying on improper hindsight, as Petitioner did here.” Prelim. Resp. 7. First, Patent Owner argues that “Brown-Skrobot focuses almost exclusively on the use of lasers,” and that Brown-Skrobot’s single paragraph discussing light sources other than lasers “would not point a [person of ordinary skill in the art] to the wavelengths of the claims.” *Id.* at 7–8. Second, Patent Owner argues that “claim 1 requires ‘generating photons of at least two single line wavelengths from *a* non-

coherent light source,’ not more than one light source,” as described in Brown-Skrobot. *Id.* at 8. According to Patent Owner, “Petitioners never identify ‘a non-coherent light source’ that ‘generat[es] photons of at least two single line wavelengths’” and instead, only point to two separate light sources. *Id.* at 8–9 (citing Pet. 11–13; Ex. 1004 ¶ 42). Patent Owner reasons that neither Brown-Skrobot nor Clauß “would motivate a [person of ordinary skill in the art] to consider Brown-Skrobot when arriving at a claim.” *Id.* at 9.

A “[d]etermination of obviousness can not be based on the hindsight combination of components selectively culled from the prior art to fit the parameters of the patented invention.” *ATD Corp. v. Lydall, Inc.*, 159 F.3d 534, 546 (Fed. Cir. 1998). Instead, “[t]here must be a teaching or suggestion within the prior art, or within the general knowledge of a person of ordinary skill in the field of the invention, to look to particular sources of information, to select particular elements, and to combine them in the way they were combined by the inventor.” *Id.*

Here Petitioner directs our attention to Brown-Skrobot’s teaching of sterilizing surfaces using monochromatic ultraviolet radiation, preferably having wavelengths from 220 to 320 nm, from two or more sources, including from excimer lamps. Pet. 18 (Ex. 1004 ¶¶ 33–34, 38, 54; Ex. 1003 ¶ 95). Specifically, Brown-Skrobot states that “[e]xamples of monochromatic UV radiation sources that produce monochromatic UV radiation include lasers and excimer lasers and excimer lamps.” Ex. 1004 ¶ 34 (emphasis added); *see also id.* at 54 (describing additional monochromatic UV radiation sources as including “lasers or excimer lasers or lamps, with or without reflectors, lightguides, lightpipes, fiber optics,

dioptric or catadioptric optical systems.”). Further, Brown-Skrobot’s description of using excimer lamps is not as isolated as Patent Owner suggests. Prelim. Resp. 7–8. Rather, multiple paragraphs describe using excimer lamps as a monochromatic UV radiation source. Ex. 1004 ¶¶ 22 (“In an alternate embodiment the apparatus comprises the use of excimer lamps and suitable optical devices to concentrate the output of the lamps at the medical device.”), 34 (stating that “[a]n expanded laser or excimer lamp which can treat the entire medical device in a single exposure is preferred”), 36, 38, 39 (providing examples of “commercially available excimer lamps”), 40 (stating excimer lamps are “preferably used in conjunction with a reflector or reflectors”), claims 10–12. Accordingly, we determine Petitioner has shown a reasonable likelihood that Brown-Skrobot describes an excimer lamp having the claimed wavelengths.

We agree with Patent Owner that Petitioner has shown two single line wavelengths from two separate sources. Prelim. Resp. 8–9. But, we do not view Petitioner’s showing as fatal to Petitioner’s contentions nor do we understand claim 1 to require a single “‘non-coherent light source’ that ‘generat[es] photons of at least two single line wavelengths.’” *Id.* at 9. Rather, on this record, the plain language of the claim simply requires “generating photons of at least two single wavelengths from a non-coherent light source,” which suggests only that the photons generated are from a non-coherent light source, not whether one or more radiation sources may be utilized. In this case, neither party proposes an express construction of this term for our consideration. *See generally* Prelim. Resp.; Pet. 10. And, Patent Owner does not direct us to any teaching in the ’605 patent that requires the two or more single line wavelengths to be generated by a single

light source. Prelim. Resp. 8–9. Thus, we determine that it is not necessary, at this stage of the proceeding, to provide an express construction for this term. *Vivid Techs.*, 200 F.3d at 803. We encourage the parties to address this issue in subsequent briefing and we will revisit the issue based on the full record developed over the course of trial, if needed.

b) *Whether Petitioner has shown a reason to combine Brown-Skrobot and Clauß*

Patent Owner asserts that “[w]hat Petitioner calls a motivation to combine, the fact that ‘the low-pressure mercury lamp at 254 nm taught by Clauss [sic] falls within the ‘preferred’ wavelength range of monochromatic UV light expressly suggested by Brown-Skrobot’ is a reason the [person of ordinary skill in the art] would *not* have combined them.” Prelim. Resp. 9–10. Specifically, Patent Owner posits “[w]hy would a [person of ordinary skill in the art] look to the low-pressure mercury lamp of Clauß when it is taught as the preferred UV wavelength in Brown-Skrobot?” *Id.* at 10.

Patent Owner further argues that a person of ordinary skill in the art would not have had a reasonable expectation that the combination would be successful “because Clauß itself discloses that photoreactivation rendered the deactivation of DNA to be only temporary: ‘When the photoreactivation after irradiation is excluded, the mercury lamp with 254 nm clearly shows better results regarding inactivation. Whereas, when [photoreactivation is] included, the excimer lamp with 222 nm wavelength obviously shows better results.’” *Id.*

We determine that Petitioner’s evidence is sufficient, at this stage of the proceeding, to show that the combined references would have suggested, to the ordinarily skilled artisan, a reason to include the low-pressure mercury lamp of Clauß in combination with Brown-Skrobot’s 222 nm KrCl excimer

lamp. We disagree with Patent Owner that Petitioner's motivation to combine is limited to the fact that Brown-Skrobot's preferred wavelength of 254 nm is taught by Clauß. *See* Prelim. Resp. 9–10. Rather, Petitioner persuasively explains that Brown-Skrobot describes using two or more monochromatic UV radiation sources with different wavelengths in order to increase the levels of sterility and to use less energy to sterilize. Pet. 15 (citing Ex. 1003 ¶ 73; Ex. 1004 ¶ 42). Brown-Skrobot describes multiple different monochromatic UV light sources having the preferred wavelength range of 220 to 320 nm and also suggests “other monochromatic UV radiation sources can be used.” Ex. 1004 ¶¶ 33, 34, 38. Petitioner explains that the skilled artisan “would have been motivated to supplement Brown-Skrobot's high-level disclosure . . . with the implementation details provided by Clauss.” Pet. 14. On this record, we determine that Petitioner has sufficiently shown that the ordinarily skilled artisan would have had reason to include the 254 nm low-pressure mercury lamp of Clauß in combination with the 222 nm KrCl excimer lamp of Brown-Skrobot, as Brown-Skrobot describes the advantages of using two or more sources having different wavelengths. Further, we determine that the person of ordinary skill in the art would have had a reasonable expectation of success in the combination, as a mere substitution of one known element for another, according to its known function. *KSR*, 550 U.S. at 416 (“The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.”).

c) Whether Brown-Skrobot discourages the use of a KrCl excimer lamp at 222 nm

Patent Owner argues Brown-Skrobot does not teach using a KrCl excimer lamp at 222 nm, and instead discourages using such a lamp. Prelim.

Resp. 10. Specifically, Patent Owner argues Brown-Skrobot's preferred embodiment is a contact lens manufacturing process where monochromatic UV radiation preferably between 240 and 280 nm is applied to the sealed contact lens containers; Brown-Skrobot recognizes the drawbacks of using radiation below 240 nm because such wavelengths are known to damage the polymers used in contact lenses. *Id.* at 11–12 (citing Ex. 1004 ¶¶ 47, 54). Therefore, Patent Owner reasons Brown-Skrobot “teaches away from using a radiation source below 240nm.” *Id.* at 12 (emphasis omitted). Patent Owner also argues Brown-Skrobot's reference to a KrCl lamp is “a sole, passing reference . . . set within numerous other examples of monochromatic UV radiation” and that “Brown-Skrobot never discloses that such a source can or should be used with the described invention.” *Id.*

We disagree that Brown-Skrobot “teaches away” or otherwise “discourages” the use of a KrCl excimer lamp at 222 nm, as Patent Owner contends. To teach away, a reference must discourage one of ordinary skill in the art from following the path set out in the reference, or lead that person in a direction divergent from the path taken by the applicant. *In re Gurley*, 27 F.3d 551, 553 (Fed. Cir. 1994). “A reference does not teach away . . . if it merely expresses a general preference for an alternative invention but does not ‘criticize, discredit, or otherwise discourage’ investigation into the invention claimed.” *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 567 F.3d 1314, 1327 (Fed. Cir. 2009) (quoting *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004)). “A statement that a particular combination is not a preferred embodiment does not teach away absent clear discouragement of that combination.” *Syntex (U.S.A.) LLC v. Apotex, Inc.*, 407 F.3d 1371, 1380 (Fed. Cir. 2005).

Here, Brown-Skrobot broadly describes its “preferred monochromatic UV radiation ha[ving] the majority . . . wavelengths within about 220 to 320 nm.” Ex. 1004 ¶ 33; *see also id.* claim 13 (same). Patent Owner’s argument that Brown-Skrobot teaches away from radiation below 240 nm is based on one embodiment, contact lens manufacturing, without considering the reference as a whole. Patent Owner’s argument that Brown-Skrobot “nowhere” discloses a 222 nm lamp for use with any embodiment (Prelim. Resp. 12) does not credit its disclosure of a KrCl lamp and other examples of monochromatic UV radiation sources; regardless of whether those examples are tied to a particular embodiment in Brown-Skrobot. Patent Owner offers no reason why a person of ordinary skill in the art would have been dissuaded from or unable to use the broader teachings Brown-Skrobot in combination as Petitioner proposes. Furthermore, in combination with the preferred wavelengths, Brown-Skrobot’s reference to using a KrCl lamp, even a “sole, passing reference,” is sufficient (without more) to suggest, to the ordinarily skilled artisan, using a KrCl lamp to generate photons at about 222 nm. Ex. 1004 ¶¶ 33, 38; Ex. 1003 ¶ 98; Ex. 1005, 580; Ex. 1011, 30).

d) Whether the combination of Brown-Skrobot and Clauß to achieve a 90% kill rate is based on hindsight

Patent Owner argues that, as Petitioner admits, “the prior art does not expressly teach or disclose the use of any excimer to achieve a 90% kill rate in less than one second,” but instead, Petitioner must rely on impermissible hindsight “to suggest that it would have been obvious to the [person of ordinary skill in the art] to ‘move the lamp closer’ to achieve a presumably greater or faster kill rate.” Prelim. Resp. 13.

Petitioner, at this stage of the proceeding, has persuasively shown a reasonable likelihood that the combination of Brown-Skrobot and Clauß

suggests a 90% kill rate in less than one second as claimed. Petitioner directs our attention to Clauß and its disclosure that at 254 nm Clauß's low pressure mercury lamp "result[s] in at least a ninety percent kill of that organism in about 0.95 seconds." Pet. 24 (citing Ex. 1003 ¶ 106); *see also* Ex. 1005, 581 (plotting the UV dosage required to reduce the population of *Yersinia enterocolytica*). Petitioner also explains that "[t]he UV dose needed to achieve a ninety percent kill of a population of a particular microorganism is often referred to as a 'D-value'" and that the "D-value will vary depending on the sensitivity of the microorganism to UV light, which varies from microorganism to microorganism." *Id.* at 22 (citing Ex. 1003 ¶ 105; Ex. 1004 ¶ 31; Ex. 1005, 582, Ex. 1012, 250–252). According to Petitioner, the ordinarily skilled artisan would have found it obvious to increase the UV intensity to reach the D-value more quickly for a given microorganism. *Id.* at 24 (citing Ex. 1003 ¶ 108; Ex. 1006 ¶ 108). Further, Petitioner asserts that the person of ordinary skill in the art would know that many factors influence the output and intensity of UV lamps, including moving the lamp closer to the target or selecting a more powerful source. *Id.* at 24–26 (citing Ex. 1003 ¶ 108 (explaining that UV intensity is inversely proportional to the distance between the lamp and the target surface); Ex. 1012, 250–252; Ex. 1007 ¶ 13; Ex. 1006 ¶ 48). Accordingly, because Petitioner relies on the express teachings of Clauß, informed by the knowledge of one skilled in the art, we ascertain no improper hindsight.

e) *Whether Brown-Skrobot teaches an XeBr lamp that emits radiation at 282 nm*

Patent Owner further argues Brown-Skrobot does not teach using a XeBr excimer lamp at 282 nm, nor that any wavelength other than 257 nm is preferred for its manufacturing process. Prelim. Resp. 14. Patent Owner

argues that even though Brown-Skrobot broadly discloses a more preferred wavelength range of 240 to 280 nm and using a XeBr lamp, “Brown-Skrobot does not teach that such an XeBr lamp (or any other device) emits radiation at 282 nm.” *Id.* And, Patent Owner contends that “[w]hile 282 nm is arguably ‘within a bandwidth of 3nm’ from 280 nm (the highest bound of the ‘more preferably’ range), there is no suggestion or teaching that a POSITA would affirmatively choose this wavelength in connection with the described invention.” *Id.*

We find Patent Owner’s argument unavailing. Petitioner sufficiently shows that Brown-Skrobot prefers “monochromatic UV radiation ha[ving] the majority wavelength or wavelengths within about 220 to 320 nm.” Pet. 18; Ex. 1004 ¶ 33. Brown-Skrobot further describes exemplary monochromatic radiation sources “that produce monochromatic UV radiation at the desired wavelength(s),” including, *inter alia*, “krypton and chlorine (KrCl), krypton and fluorine (KrF), xenon and iodine (XeI), chlorine (Cl₂), xenon and bromine (XeBr).” Ex. 1004 ¶ 38. According to Petitioner, a person of ordinary skill in the art would have understood XeBr to produce a wavelength of 282 nm. Pet. 19; Ex. 1011, 30; Ex. 1003 ¶¶ 40, 98; Ex. 1004 ¶ 38. Accordingly, and for purposes of institution, Petitioner’s arguments and evidence establish a reasonable likelihood that Brown-Skrobot would have suggested using a XeBr excimer lamp at 282 nm.

Furthermore, we observe that the claims require selection of “at least two wavelengths being of 222 nm, 254 nm, and 282 nm.” Petitioner’s combination using “the 222 nm KrCl excimer lamp [of Brown-Skrobot] and 254 nm low-pressure mercury lamp of Clauss” (Pet. 12), satisfies that limitation without the need of a XeBr excimer lamp at 282 nm.

Therefore, on the present record, we are persuaded that Petitioner has shown sufficiently at this stage of the proceeding that a person of ordinary skill in the art would have been able to perform the method of claim 1 based on the teachings of Brown-Skrobot in view of Clauß.

3. *Remaining Claims (claims 2, 5, and 6)*

Petitioner also asserts that the combination of Brown-Skrobot in view of Clauß would have rendered claim 2 obvious and that the combination of Brown-Skrobot, Clauß, and Liang would have rendered obvious claims 5 and 6 of the '605 patent. Pet. 26–37.

Having determined that Petitioner satisfies the threshold showing under 35 U.S.C. § 314(a) for institution of trial with respect to at least one challenged claim of the '605 patent, we order that trial shall proceed on all claims and all challenged grounds. *SAS Institute, Inc. v. Iancu*, 2018 WL 1914661, at *10 (PTAB April 24, 2018); *see Adidas AG v. Nike, Inc.*, 894 F.3d 1256, 1258 (Fed. Cir. 2018) (remanding for consideration of all challenged claims and asserted grounds set forth in the petition); *see also* USPTO, Guidance on the impact of SAS on AIA trial proceedings (Apr. 26, 2018), <https://www.uspto.gov/patents/ptab/trials/guidance-impact-sas-aia-trial> (“the PTAB will institute as to all claims or none [and] [i]f the PTAB institutes a trial, the PTAB will institute on all challenges raised in the petition.”).

E. *Discretionary Denial Under 35 U.S.C. § 314(a)*

Petitioner preemptively argues that the Board should not exercise its discretion to deny institution under 35 U.S.C. § 314(a). Pet. 37– 43. Patent Owner does not raise any discretionary arguments in its Preliminary

Response. *See generally* Prelim. Resp. We, therefore, need not address Petitioner's arguments in light of our determination to institute.

III. CONCLUSION

For the foregoing reasons, we determine that Petitioner has demonstrated a reasonable likelihood that it would prevail with respect to at least one of the claims challenged in the Petition. Accordingly, we institute an *inter partes* review of the '605 patent.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, pursuant to 35 U.S.C. § 314(a), an *inter partes* review of claims 1, 2, 5, and 6 of U.S. Patent No. 8,975,605 B2 is instituted with respect to all grounds set forth in the Petition; and

FURTHER ORDERED that, pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial, which will commence on the entry date of this Decision.

IPR2022-00682
Patent 8,975,605 B2

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