

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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

v.

S. EDWARD NEISTER,  
Patent Owner.

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IPR2023-00695  
Patent 11,246,951 B2

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Before JEFFREY W. ABRAHAM, ELIZABETH M. ROESEL, and  
JULIA HEANEY, *Administrative Patent Judges*.

HEANEY, *Administrative Patent Judge*.

JUDGMENT  
Final Written Decision  
Determining All Challenged Claims Unpatentable  
35 U.S.C. § 318(a)

## I. INTRODUCTION

Eden Park Illumination, Inc., Larson Electronics LLC, Far UV Technologies, Inc., and Ushio America, Inc. (collectively “Petitioner”) filed a Petition to institute an *inter partes* review of claims 1–5 and 7–18 of U.S. Patent No. 11,246,951 B2 (Ex. 1001, “the ’951 patent”). Paper 5 (“Petition” or “Pet.”). S. Edward Neister (“Patent Owner”) filed a Preliminary Response. Paper 10. With our authorization, Patent Owner also filed a Corrected Preliminary Response. Paper 11. With our authorization, Petitioner filed a Reply. Paper 12. We denied Patent Owner’s Motion for Leave to Submit a Sur-reply Out of Time. Paper 15. We determined the information presented in the Petition established that there was a reasonable likelihood that Petitioner would prevail in challenging at least one of claims 1–5 and 7–18 of the ’951 patent, and we instituted this *inter partes* review as to all challenged claims. Paper 16 (“Dec. on Inst.”).

Patent Owner did not file a Response to the Petition.<sup>1</sup> Petitioner filed a Reply (Paper 20), and Patent Owner did not file a Sur-reply. We did not hold an oral hearing for this proceeding. Ex. 3003.

We have jurisdiction under 35 U.S.C. § 6. We issue this Final Written Decision pursuant to 35 U.S.C. § 318(a). Based on the record before us, we conclude that Petitioner has shown by a preponderance of the evidence that claims 1–5 and 7–18 of the ’951 patent are unpatentable

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<sup>1</sup> Pursuant to the Scheduling Order (Paper 17, 9) and Patent Owner’s election not to file a response to the Petition, we deem Patent Owner’s arguments in the Corrected Preliminary Response waived.

*A. Real Parties-in-Interest*

Petitioner identifies Eden Park Illumination, Inc., Larson Electronics LLC, Far UV Technologies, Inc., and Ushio America, Inc. as the real parties-in-interest. Pet. 64. Patent Owner identifies himself and High Energy Ozone, LLC as the real parties-in-interest. Paper 7.

*B. Related Proceedings*

The parties identify the following litigation involving the '951 patent: *High Energy Ozone LLC v. Larson Electronics LLC*, Case No. 3:21-cv-01166 (N.D. Tex.); *High Energy Ozone LLC v. Eden Park Illumination, Inc.*, Case No. 3:22-cv-00425 (N.D. Tex.); and *High Energy Ozone LLC v. Far UV Technologies*, No. 3:22-cv-00280 (N.D. Tex.). Pet. 64; Paper 7, 1.

The parties also identify the following petitions as related matters: IPR2022-00381 against U.S. Patent No. 9,700,642 and IPR2022-00682 against U.S. Patent No. 8,975,605. Pet. 64–65; Paper 7, 1–2. Patent Owner also identifies *Healthe, Inc. v. High Energy Ozone LLC*, No. 6:20-cv-02233 (M.D. Fla.) as a related matter. Paper 7, 1.

*C. The '951 patent*

The '951 patent, titled “Method and Apparatus for Sterilizing and Disinfecting Air and Surfaces and Protecting a Zone from External Microbial Contamination,” describes using ultraviolet (UV) lamps for the destruction of viruses, bacteria, spores, and pathogens (collectively, microorganisms or VSP). Ex. 1001, code (54), 1:24–31. The '951 patent explains that the broad ultraviolet spectrum has been divided into three regions, depending on its different effects on human skin: UVA as having a band of wavelengths between 320 nm and 400 nm, UVB as having a band of wavelengths between 280 nm and 320 nm, and UVC as having a band of

wavelengths between 235 nm and 280 nm. *Id.* at 1:57–67. Further, another band called “Far UV” is defined as having a band of wavelengths between 185 nm and 235 nm. *Id.* at 1:67–2:2. According to the ’951 patent, “[c]laims have been made that UV-C radiation is used to alter the DNA” but “[n]one of these claims make reference to any shorter wavelengths and to the absorption band that peaks at 200 nm,” due to the high absorption of molecular water. *Id.* at 2:7–18. The ’951 patent further explains that new ultraviolet (NUV) emitting lamps are becoming commercially available, which have emitters that produce a single line or a narrow spectral emission at a particular wavelength. *Id.* at 2:26–29. Still, “[i]f the treatment lamp’s wavelength is chosen to match closely to the peak of protein absorption of the microorganism’s DNA, then a lethal dosage can be delivered to the VSPs in a shorter time.” *Id.* at 2:30–33.

The ’951 patent discloses that destruction of pathogens is significantly improved by targeting its DNA or RNA with the proper wavelength. Ex. 1001, 2:57–60. This targeting can be accomplished by using a “NUV source at 222 nm” which targets proteins and their peptide bonds. *Id.* at 3:1–2. The ’951 patent discloses that the wavelengths it contemplates do not damage the epidermis “and therefore can quickly and effectively disinfect human or animal skin without skin cell damage.” *Id.* at 8:66–9:2, 9:20–24.

The ’951 patent further discloses that the energy of the emitted photon is determined by its wavelength and different bonds in DNA are affected with photons of different energy. Ex. 1001, 4:24–27. According to the ’951 patent, 540 kJ/mole photon energy from NUV lamps exceeds the bond

energies of many of the peptide bonds and “should cause physical damage to the microorganism.” *Id.* at 4:28–30.

*D. The Challenged Claims*

Petitioner challenges claims 1–5 and 7–18 of the ’951 patent. Pet. 1. Claims 2–5 and 7–18 depend from claim 1. Claim 1, reproduced below with Petitioner’s bracketing and labels, is illustrative of the subject matter of the challenged claims:

[1pre] 1. A process for destroying a DNA or RNA of a microorganism on a substance or on a surface comprising the steps of:

[1A] generating photons of a wavelength corresponding to a peak absorption wavelength of proteins, or DNA, or RNA, the wavelength being 222 nm;

[1B] directing the photons to a substance or surface to be disinfected, whereby the photons are generated to destroy a plurality of chemical bonds within the proteins, DNA, or RNA of the microorganism; and

[1C] wherein the substance or surface to be disinfected is human or animal tissue.

Ex. 1001, 19:52–20:9.

*E. Instituted Ground of Unpatentability*

We instituted trial on the following ground of unpatentability:

| Challenged Claim(s) | 35 U.S.C. § <sup>2</sup> | Reference(s)/Basis                         |
|---------------------|--------------------------|--------------------------------------------|
| 1–5, 7–18           | 103(a)                   | Eckhardt, <sup>3</sup> Sosnin <sup>4</sup> |

Pet. 3.

## II. ANALYSIS

### A. Claim Construction

In an *inter partes* review, 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) (2023). Under *Phillips*, claim terms are afforded “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 its ground for the challenged claims “addresses the interpretation of certain claim terms with reference to the specific prior

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<sup>2</sup> The Leahy-Smith America Invents Act (“AIA”) included revisions to 35 U.S.C. § 103 that became effective on March 16, 2013. Petitioner asserts that “the challenged claims are unpatentable as obvious under 35 U.S.C. § 103(a)” (Pet. 2) but notes that the asserted prior art references are “prior art under pre-AIA § 102(b) and post-AIA § 102(a)” (Pet. 6). Based on Petitioner’s challenge, we apply the pre-AIA versions of the statutory bases for unpatentability, but our decision would not change if the AIA versions apply.

<sup>3</sup> US Patent Pub. No. 2003/0031586 A1 to Eckhardt et al., published Feb. 13, 2003 (Ex. 1004).

<sup>4</sup> Sosnin et al., *New bactericidal UV light sources: excilamps*, Proc. SPIE 5483, Atomic and Molecular Pulsed Lasers V, May 3, 2004 (Ex. 1005).

art references advanced in this Petition” but “[b]eyond these arguments, the challenged claims require no express construction to evaluate their patentability.” Pet. 16–17.

After considering the arguments and information Petitioner presents, we determine that we do not need to expressly construe any terms for purposes of this Decision. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (citing *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (“[O]nly those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy.”)).

*B. Level of Ordinary Skill in the Art*

Petitioner argues a person of ordinary skill in the art at the time of the invention “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. 16 (citing Ex. 1003 ¶ 21). Petitioner further argues that “[s]uch a person would also have 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.*

In light of the record before us, we adopt Petitioner’s proposal regarding the level of ordinary skill in the art. Based on our review of the ’951 patent and the prior art of record, we determine that the definition offered by Petitioner comports with the qualifications a person would have needed to understand and implement the teachings of the ’951 patent and the

prior art. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (explaining that specific findings regarding 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)).

*C. Principles of Law*

A claim is unpatentable under 35 U.S.C. § 103 if “the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” *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) when available, evidence such as commercial success, long felt but unsolved needs, and failure of others. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966); *see KSR*, 550 U.S. at 407 (“While the sequence of these questions might be reordered in any particular case, the [Graham] factors continue to define the inquiry that controls.”).

The Supreme Court made clear that we apply “an expansive and flexible approach” to the question of obviousness. *KSR*, 550 U.S. at 415. Whether a patent claiming the combination of prior art elements would have been obvious is determined by whether the improvement is more than the predictable use of prior art elements according to their established functions. *Id.* at 417. Reaching this conclusion, however, requires more than merely

showing that the prior art includes separate references covering each separate limitation in a challenged claim. *Unigene Labs., Inc. v. Apotex, Inc.*, 655 F.3d 1352, 1360 (Fed. Cir. 2011). Rather, obviousness additionally requires that a person of ordinary skill at the time of the invention “would have selected and combined those prior art elements in the normal course of research and development to yield the claimed invention.” *Id.*

*D. Effective Filing Date*

In our Decision on Institution, we determined Petitioner demonstrated a reasonable likelihood that it would prevail on its contention that the challenged claims are not entitled to an effective filing date based on the provisional application filed January 31, 2005. Dec. on Inst. 9.

Having further considered the matter, we determine that Petitioner’s challenge of claims 1–5 and 7–18 based on the combination of Eckhardt and Sosnin does not require us to determine the effective filing date of the challenged claims. Eckhardt and Sosnin were published in 2003 and 2004, respectively, which pre-date the January 31, 2005, filing date of the ’626 provisional application. Neither party disputes that both references are pre-AIA § 102(b) prior art, even assuming claim 1’s effective filing date is the filing date of the ’626 provisional application. Accordingly, we need not reach the issue of whether the ’626 provisional application provides sufficient written description support for claims 1–5 and 7–18. *See Bos. Sci. Scimed, Inc. v. Cook Grp. Inc.*, 809 F. App’x 984, 990 (Fed. Cir. 2020) (non-precedential) (recognizing that the “Board need not address issues that are not necessary to the resolution of the proceeding”).

*E. Obviousness Based on Eckhardt and Sosnin*

Petitioner argues claims 1–5 and 7–18 are rendered obvious by Eckhardt in view of Sosnin. Pet. 17–50. As discussed above, Patent Owner did not file a Response to the Petition and accordingly has not disputed Petitioner’s arguments and evidence at trial. Nonetheless, Petitioner bears the burden of persuasion to prove unpatentability of the claims challenged in the Petition by a preponderance of the evidence, and this burden never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015).

*1. Eckhardt (Ex. 1004)*

Eckhardt is titled “Method and Apparatus for Sterilizing or Disinfecting a Region Through a Bandage” and “relates generally to the field of sterilization or disinfection systems and methods.” Ex. 1004, code (54), ¶ 2. Eckhardt discloses that a region of tissue to be sterilized or disinfected may include unbreached or bare skin. *Id.* ¶¶ 29, 69. The sterilization or disinfection may occur via killing microorganisms or via inactivating microorganisms by rendering the microorganisms unable to reproduce. *Id.* ¶¶ 29–30. Sterilizing or disinfecting light is emitted by a light source. *Id.* ¶ 31. Eckhardt discloses that the light source “may be any light source that emits light capable of sterilization or disinfection,” such as a xenon flash lamp. *Id.* ¶¶ 31, 43. For example, a lamp may be used to “emit narrow spectrum light (e.g., a line spectrum) or broad spectrum light,” and the broad spectrum light “may include, e.g., UVA, UVB, and UVC light, or UV light accompanied by light from another portion of the electromagnetic spectrum.” *Id.* ¶ 31. Eckhardt further discloses that the energy from the light source of a single flash of greater than 10 mJ/cm<sup>2</sup> of

UVC may be sufficient to deliver a sterilizing or disinfecting dosage. *Id.*

¶ 32. A material can be used to transmit sterilizing light “from a xenon flash having a wavelength in the range of 220 to 310 nm.” *Id.* ¶ 70.

### 2. *Sosnin (Ex. 1005)*

Sosnin is titled “New bactericidal UV light sources – excilamps.” Ex. 1005, 317. Sosnin describes the use of various excilamps, such as a KrCl lamp having radiation emission at 222 nm wavelength. *Id.* at 319, Fig. 2. Sosnin further describes the bactericidal effect of excilamps due to their radiation spectrum “being close to the DNA absorption maximum.” *Id.* According to Sosnin, “KrCl-excimer lamp irradiation leads to inactivation 99.9 % of *E. coli* during 8 seconds of exposure at primary irradiation and during 6 seconds at the secondary irradiation.” *Id.* at 320.

### 3. *Reason to Combine*

Petitioner contends it would have been obvious to a person of ordinary skill in the art to combine Eckhardt’s method of disinfecting skin using any light source that emits light capable of sterilization or disinfection, with Sosnin’s KrCl excimer light source, which generates photons having a wavelength of 222 nm. Pet. 21. Petitioner contends a person of ordinary skill would have been motivated to combine the teachings of Eckhardt and Sosnin for several reasons: (1) Eckhardt’s teaching of using any light source capable of sterilization or disinfection, and specifically “narrow spectrum light (e.g., a line spectrum)” would have suggested to a person of ordinary skill in the art to incorporate other well-known germicidal UV light sources like Sosnin’s, and both references teach that their light sources kill bacteria; (2) a person of ordinary skill would have implemented Eckhardt’s disclosure of using UV-C light to disinfect skin with Sosnin’s 222 nm excimer lamp

because Sosnin's lamp's wavelength is within the range of 220 to 310 nm suggested by Eckhardt; and (3) the effectiveness and relative safety of directing UV-C light of 222 nm onto bare skin for disinfection was already understood by persons of ordinary skill in the art, even though there was general caution against exposing skin to excessive UV radiation. Pet. 21–25 (citing Ex. 1003 ¶¶ 8, 40, 89–109; Ex. 1004 ¶¶ 5, 29–31, 69, 70; Ex. 1005, 318–321; Ex. 1006, 5; Ex. 1007, 8, 11; Ex. 1011 ¶¶ 28, 40; Ex. 1012, 1; Ex. 1013 ¶ 8; Ex. 1014, 3–9; Ex. 1015, 2:22–67; Ex. 1016, 2:23–26; Ex. 1017, 16, 58; Ex. 1001, 3:42–48, 4:7–10).

Having considered the evidence and arguments, we determine that Petitioner demonstrates by a preponderance of the evidence that a person of ordinary skill in the art would have had reasons to combine Eckhardt's teaching of narrow spectrum UV light in the range of 220 to 310 nm to disinfect skin (Ex. 1004 ¶¶ 31, 69–70), with Sosnin's teaching of a KrCl excimer lamp having a narrow band UV emission at 222 nm to kill bacteria (Ex. 1005, 320). In particular, Petitioner shows that a person of ordinary skill in the art would have wanted to obtain the benefits of Eckhardt's teaching of disinfecting skin using any light source capable of sterilization or disinfection and would therefore have considered Eckhardt's suggestion of using narrow spectrum UV light in combination with Sosnin's disclosure of using germicidal excimer lamps within the range of wavelengths taught by Eckhardt. See *KSR*, 550 U.S. at 417 (stating that the “mere application of a known technique to a piece of prior art ready for the improvement” suggests obviousness).

The teachings of both Eckhardt and Sosnin support Petitioner's combination. In particular, both references teach using UV lamps with

narrow bands or monochromatic emissions to sterilize surfaces. Eckhardt teaches “light source 7 may be any light source that emits light capable of sterilization or disinfection” and may be a UV light source such as a lamp that “may emit narrow spectrum light (e.g., a line spectrum) or broad spectrum light” including UVA, UVB, and UVC light. Ex. 1004 ¶ 31. Eckhardt also teaches flash light source 7a generates a flash sufficient for sterilization or disinfection and may be a xenon flash lamp having a wavelength in the range of 220 to 310 nm. *Id.* ¶¶ 43, 70. Additionally, Eckhardt teaches “[t]he sterilization/disinfection units previously described are designed to have a beneficial effect when used on bare skin.” *Id.* ¶ 69. Sosnin teaches using excimer lamps for sterilization and specifically discloses a KrCl lamp which generates photons having wavelengths of 222 nm. Ex. 1005, 320.

We find that Eckhardt would have led a person of ordinary skill to consider using a 222 nm excimer lamp because that wavelength falls within the range of UV light (220–310 nm) suggested by Eckhardt, and the range known to provide disinfection. Ex. 1004 ¶ 70; Ex. 1005, 320 (describing “the high rate of bactericidal effect of excilamps”). We find that Eckhardt also supports Petitioner’s contention that it was within the knowledge of a person of ordinary skill in the art to use UV light in the range of 254 nm for disinfection, even though that wavelength presented safety concerns. Ex. 1004 ¶¶ 54, 56; *see* Pet. 25.

We find that Eckhardt’s teaching of improved safety associated with applying low intensity UV light to human skin would have led a person of ordinary skill to consider Sosnin’s excimer lamp. For example, Eckhardt teaches that “the lower intensity of the light generated by instantaneous

sterilization/disinfection unit 16a does not present as much of a safety concern” as higher intensity light. Ex. 1004 ¶¶ 5, 54. Sosnin also supports Petitioner’s rationale by suggesting using excimer lamps to selectively kill bacteria. Ex. 1005, 320, Fig. 3. More particularly, Sosnin provides percent survival curves resulting from irradiation of *E. coli* with XeCl, XeBr, and KrCl excimer lamps (*id.*, Fig. 3). Sosnin teaches that KrCl excimer lamp irradiation “leads to inactivation 99.9% of *E. coli* during 8 seconds of exposure at primary irradiation and during 6 seconds at the secondary irradiation” (*id.* at 320); this provides support for Petitioner’s combination of Eckhardt’s skin sterilization method with Sosnin’s 222 nm excilamp.

We also find support for Petitioner’s contention that, despite the general caution against exposing skin to excessive UV light, a person of ordinary skill would have been motivated by the beneficial effect of disinfecting skin to use light in the UVC spectrum for disinfection. Pet. 23. For example, as noted by Petitioner, the Health Physics Society in July 1998 stated that “UVC, used in germicidal lamps, causes almost no damage because of its low penetration of the skin.” *Id.* (quoting Ex. 1012, 1).

Our findings regarding a reason for combining Eckhardt and Sosnin are also supported by Mr. Lawal’s testimony. Ex. 1003 ¶¶ 88–93. For the foregoing reasons, we find that Petitioner has established that it would have been obvious to combine the teachings of Eckhardt and Sosnin in the manner recited in the challenged claims.

#### 4. Claim 1

[1pre]

Petitioner contends that the Eckhardt-Sosnin combination teaches a process for destroying DNA or RNA of a microorganism on a substance or

surface, as recited in the preamble of claim 1. Pet. 25. Petitioner directs us to Eckhardt's disclosure of using a light source to disinfect human or animal skin. *Id.* at 26 (citing Ex. 1003 ¶ 112; Ex. 1004 ¶¶ 29, 31, 32). Petitioner relies on Eckhardt's disclosure that sterilization or disinfection may occur by "rendering the microorganisms unable to reproduce" (Ex. 1004 ¶ 30) as teaching "destroying" DNA or RNA of the microorganisms. Pet. 25–27 (also citing Ex. 1003 ¶ 113; Ex. 1018, 7:36–50). Based on the evidence before us, we determine that Petitioner has shown by a preponderance of evidence that Eckhardt discloses the preamble of claim 1.

[1A]

Petitioner contends that the Eckhardt-Sosnin combination teaches "generating photons of a wavelength corresponding to a peak absorption wavelength of proteins, or DNA, or RNA, the wavelength being 222 nm," as recited in limitation [1A]. Pet. 27. Petitioner relies on Eckhardt's disclosure that light source 7 may include a lamp emitting narrow or broad spectrum light, including UVA, UVB, and UVC light, and its disclosure of "sterilizing light from a xenon flash having a wavelength in the range of 220 to 310 nm." *Id.* at 27 (citing Ex. 1003 ¶ 115; Ex. 1004 ¶¶ 31, 43, 70). Petitioner contends a person of ordinary skill would have recognized that the range of wavelengths produced by Eckhardt's light source 7 would include generating a wavelength of 222 nm and that 222 nm could correspond to a peak absorption wavelength of proteins, DNA, or RNA. *Id.* at 27–29 (citing Ex. 1003 ¶¶ 116–118; Ex. 1004 ¶¶ 43, 70; Ex. 1038, 580; Ex. 1018, 2:49–52, 3:1–7, 3:38–4:7, 7:38–50; Ex. 1005, 317; Ex. 1001, 2:64–3:2, 3:62–4:5, 6:51–64, Figs. 9, 10). Petitioner further contends that Sosnin expressly discloses sterilizing through irradiation using KrCl excimer lamps, which

generate a wavelength of 222 nm. *Id.* (citing Ex. 1005, 319–321; Ex. 1003 ¶ 116).

Based on the evidence before us, we determine that Petitioner has shown by a preponderance of evidence that the combination of Eckhardt and Sosnin discloses claim limitation [1A]. We find that Eckhardt’s disclosure of a lamp emitting sterilizing light in the range of 220 to 310 nm (Ex. 1004 ¶¶ 31, 43, 70), combined with Sosnin’s disclosure of irradiation of *E. coli* with a KrCl excimer lamp generating a 222 nm wavelength (Ex. 1005, 320, Fig. 3), which correspond to peak absorption wavelengths of DNA or RNA (Ex. 1003 ¶¶ 116–118), discloses limitation [1A].

[1B]

Petitioner contends that the Eckhardt-Sosnin combination teaches “directing the photons to a substance or surface to be disinfected, whereby the photons are generated to destroy a plurality of chemical bonds within the proteins, DNA, or RNA of the microorganism,” as recited in limitation [1B]. Pet. 30. According to Petitioner, Eckhardt discloses directing light towards wound 1 and surrounding skin 3. *Id.* (citing Ex. 1003 ¶ 120; Ex. 1004 ¶¶ 31–32). Petitioner contends Sosnin teaches the photons destroy a plurality of chemical bonds within the DNA or RNA of the microorganism because it discloses using 222 nm radiation, “which intrinsically destroys proteins and the chemical bonds in the proteins associated with the DNA or RNA of the microorganism.” *Id.* (citing Ex. 1003 ¶ 121; Ex. 1005, 319–321).

Based on the evidence before us, we determine that Petitioner has shown by a preponderance of evidence that the combination of Eckhardt and Sosnin discloses claim limitation [1B]. We find that Eckhardt’s disclosure

of directing sterilizing light in the range of 220 to 310 nm toward a surface to be disinfected (Ex. 1004 ¶¶ 31–33, 43, 70), combined with Sosnin’s disclosure of bacterial survival curves resulting from irradiation of *E. coli* with KrCl excimer lamps (Ex. 1005, 320, Fig. 3), discloses claim limitation [1B].

*[1C]*

Petitioner contends that the combination of Eckhardt and Sosnin teaches disinfection of human or animal tissue (e.g., skin) with light source 7, as recited in limitation [1C]. Pet. 30–31 (citing Ex. 1004, Fig. 1, ¶¶ 29–32; Ex. 1003 ¶ 122). Based on the evidence before us, we determine that Petitioner has shown by a preponderance of evidence that Eckhardt discloses limitation [1C]. We find that Eckhardt’s disclosure that “[a] region of tissue to be sterilized or disinfected may include unbreached skin” (Ex. 1004 ¶ 29) and its illustration in Figure 1 of “a method for sterilizing or disinfecting a region of skin or tissue of a patient using sterilizing or disinfecting light” including UVA, UVB, and UVC light (*id.* ¶ 31, Fig. 1), disclose claim limitation [1C].

*Conclusion*

Having considered the evidence and arguments, we determine Petitioner has shown by a preponderance of the evidence that claim 1 is unpatentable under § 103 based on the combination of Eckhardt and Sosnin.

*5. Claims 2 and 12–18*

Claims 2 and 12–18 each depend from claim 1 and specify the type of human or animal tissue to be disinfected. Claim 2 recites “the human or animal tissue is one of blood, an organ, or a wound.” Ex. 1001, 20:9–10. Claims 12–14 recite that “the human or animal tissue” is “skin” (claim 12),

“human tissue” (claim 13), or “human skin” (claim 14). *Id.* at 20:39–44. Claims 15–18 each recite that the human or animal tissue is tissue or skin of a living human or animal. *Id.* at 20:45–53. Petitioner shows that the combination of Eckhardt and Sosnin teaches these limitations. Petitioner asserts that Eckhardt discloses disinfecting a human or animal’s wound by directing light emitted by light source 7. Pet. 34 (citing Ex. 1003 ¶ 130; Ex. 1004 ¶¶ 29–32, 34, Fig. 1); *id.* at 49–50 (citing Ex. 1003 ¶¶ 122–128, 168–169; Ex. 1004 ¶¶ 29–32, Fig. 1).

As discussed above with regard to claim 1, Petitioner shows that Eckhardt teaches disinfecting human or animal tissue, including a human skin wound. Ex. 1004 ¶¶ 29–32, 34. Accordingly, we find that Petitioner has shown by a preponderance of the evidence that claims 2 and 12–18 would have been obvious over Eckhardt and Sosnin.

#### 6. Claim 3

Claim 3 depends from claim 1 and additionally recites “the microorganism is at least one of a bacteria, a virus, a fungus, an amoeba, and a protozoa.” Ex. 1001, 20:11–13. Petitioner shows that the combination of Eckhardt and Sosnin discloses this limitation. Petitioner asserts that Eckhardt teaches sterilization to address the problem of bacteria and “refers to ‘microorganisms’ as including ‘bacteria and viruses.’” Pet. 35 (citing Ex. 1004 ¶¶ 3, 91; Ex. 1003 ¶ 132). Petitioner directs us to Sosnin’s description of the inactivation of the bacteria, *E. coli* and *S. aureus*. *Id.* (citing Ex. 1005, 320–321; Ex. 1003 ¶ 133)).

We find that Petitioner has shown by a preponderance of the evidence that claim 3 would have been obvious over Eckhardt and Sosnin.

#### 7. Claim 4

Claim 4 depends from claim 1 and additionally recites “the step of directing is performed for approximately two seconds.” Ex. 1001, 20:14–15. Petitioner shows that the combination of Eckhardt and Sosnin discloses this limitation. Petitioner asserts that Eckhardt teaches using sterilizing light for “less than a few minutes or seconds.” Pet. 36 (citing Ex. 1004 ¶ 32; Ex. 1003 ¶ 135). We find that this time range overlaps with claim 4’s range. *In re Peterson*, 315 F.3d 1325, 1329 (Fed. Cir. 2003) (an overlap between ranges establishes a *prima facie* case of obviousness).

We find that Petitioner has shown by a preponderance of the evidence that claim 4 would have been obvious over Eckhardt and Sosnin.

#### 8. Claim 5

Claim 5 depends from claim 1 and additionally recites “a lamp within a wand” in connection with the steps of generating photons and directing the photons. Ex. 1001, 20:17–19. Petitioner shows that the combination of Eckhardt and Sosnin discloses this limitation. Petitioner asserts that Eckhardt teaches the use of a hand-held lamp as a source for generating photons. Pet. 40–41 (citing Ex. 1004 ¶¶ 45, 51; Ex. 1003 ¶ 145). Petitioner further asserts that “Eckhardt also teaches that the hand-held UV source includes a ‘light directing component,’ which can be ‘movable’ so as ‘to reflect light from light source 7 to partially shadowed area[s]’ and allows hand-held operation without the need for an attachment mechanism.” *Id.* at 41 (citing Ex. 1004 ¶¶ 51, 64–66; Ex. 1003 ¶ 147) (alteration in original).

We find that Petitioner has shown by a preponderance of the evidence that claim 5 would have been obvious over Eckhardt and Sosnin.

9. *Claims 7 and 8*

Claims 7 and 8 depend from claim 1 and recite that the step of generating photons comprises “activating a lamp” (claim 7) wherein the lamp comprises a cover transparent to 222 nm (claim 8). Petitioner shows that Eckhardt and Sosnin disclose these limitations. Pet. 42–43.

Petitioner asserts that Eckhardt describes a UV light source that is “‘optically protected by a UV transmissive window or screen,’ which ‘may be made from quartz, fused silica, a UV transmissive glass or screen, or a perforated sheet of metal or other material.’” Pet. 42 (citing Ex. 1004 ¶ 38; Ex. 1003 ¶ 152). Petitioner further asserts that Eckhardt teaches that its window or screen “is a ‘cover’ because it protects the light source” and that a person of ordinary skill “would understand that the cover described in Eckhardt could be used with Sosnin’s 222 nm excimer lamp to permit 222 nm light to disinfect skin.” *Id.* (citing Ex. 1001,<sup>5</sup> 14:51–53; Ex. 1005, 319–321; Ex. 1003 ¶ 152). Based on Petitioner’s evidence and explanation, we find that the combination of Eckhardt and Sosnin teaches or suggests a lamp cover transparent to 222 nm because a person of ordinary skill would have been able to apply ordinary creativity to adapt Eckhardt’s window as a cover for Sosnin’s 222 nm excimer lamp to permit transmission of 222 nm light. *See KSR*, 550 U.S. at 421 (“A person of ordinary skill is also a person of ordinary creativity, not an automaton.”).

We find that Petitioner has shown by a preponderance of the evidence that claims 7 and 8 would have been obvious over Eckhardt and Sosnin.

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<sup>5</sup> The Petition cites Ex. 1011, which appears to be a typographical error.

*10. Claims 9–11*

These claims each depend from claim 1 and additionally require providing a certain dose of energy, i.e., 540 kJ/mole (claim 9), 40 mJ/cm<sup>2</sup> (claim 10), and 60 mJ/cm<sup>2</sup> (claim 11), in the claimed step of directing photons to the substance or surface to be disinfected. Ex. 1001, 20:28–38. Petitioner shows that the combination of Eckhardt and Sosnin discloses these limitations. Petitioner asserts that Eckhardt “discloses ‘deliver[ing] a sterilizing or disinfecting dosage, e.g., greater than 10 mJ/cm<sup>2</sup> of UVC, to all surfaces to be sterilized or disinfected.’” Pet. 43–44 (citing Ex. 1004 ¶ 32; Ex. 1003 ¶ 156) (alteration in original). Petitioner further asserts that “Sosnin discloses using a range of radiant dose energies of photons of wavelength 222 nm between ~25 mJ/cm<sup>2</sup> and ~260 mJ/cm<sup>2</sup> to disinfect a surface by killing *E. coli*.” *Id.* at 44 (citing Ex. 1005, 320–321; Ex. 1003 ¶ 156); *see also id.* at 47 (citing Ex. 1003 ¶¶ 155–167). Petitioner further asserts that a person of ordinary skill in the art would have known that 222 nm wavelength photons necessarily correspond to approximately 540 kJ/mole of photon energy. *Id.* at 43 (citing Ex. 1001, 4:24–25; Ex. 1003 ¶¶ 29, 154; Ex. 1021, 651).

We find that Petitioner has shown by a preponderance of the evidence that claims 9–11 would have been obvious over Eckhardt and Sosnin.

III. CONCLUSION

Petitioner has shown by a preponderance of the evidence that claims 1–5 and 7–18 are unpatentable as summarized below:

| <b>Claims</b>              | <b>35 U.S.C.<br/>§</b> | <b>Reference(s)/<br/>Basis</b> | <b>Claims<br/>Shown<br/>Unpatentable</b> | <b>Claims Not<br/>Shown<br/>Unpatentable</b> |
|----------------------------|------------------------|--------------------------------|------------------------------------------|----------------------------------------------|
| 1–5, 7–18                  | 103(a)                 | Eckhardt, Sosnin               | 1–5, 7–18                                |                                              |
| <b>Overall<br/>Outcome</b> |                        |                                | 1–5, 7–18                                |                                              |

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner has shown that claims 1–5 and 7–18 of the '951 patent are unpatentable; and

FURTHER ORDERED that because this is a Final Written Decision, parties to this proceeding seeking judicial review of our decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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