

# Care222<sup>®</sup> Filtered Far UV-C Excimer Lamp Modules

Filtered Krypton-Chloride 222nm Technology

## FEATURES & BENEFITS

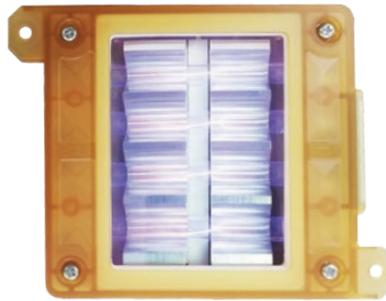
- Proprietary Safety Filter Technology Included to Ensure Narrowband 222nm Emission
- Mercury Free - Environmental Friendly
- Large Production Capacity
- Effective Germicidal Wavelength
- Effective Reduction of Viruses, Bacteria, and Spores
- Wide Operating Temperature
- Instantaneous On/Off at Full Output Power
- No Lifetime Reduction by Frequent On/Off Cycles
- Narrow and Diffused Wide Beam Options Available

## APPLICATIONS

- Surfaces
- Air

## ADVANTAGES OF 222nm LIGHT

Comparison	222nm	254nm	280nm	405nm
<b>Unoccupied Spaces</b> Care222 <sup>®</sup> modules can be safely used in unoccupied spaces.	●●●	●	●	●●●
<b>Occupied Spaces</b> Filtered Care222 modules can be safely used in unoccupied and occupied spaces without posing a health risk to humans when used within the current exposure limits recommended by the American Conference of Governmental Industrial Hygienists (ACGIH <sup>®</sup> ) or the requirements of IEC 62471. Exposure within the current ACGIH recommendations and IEC requirements allow microbial reductions using filtered 222nm far UV-C light sources in occupied spaces. Recent studies indicate that higher doses of filtered far UV-C light emitted from Care222 modules pose a minimal health risk to human skin or eyes.	●●●	X	X	—
<b>Bacteria &amp; Virus Reduction</b> Studies show 222nm is more effective than conventional UV sources reducing certain types of bacteria and viruses. Please ask for our white paper on the comparison.	●●●	●●●	●●●	●
<b>Spore Reduction</b> Studies show that 222nm light is more effective at reducing most spores than 254nm light.	●●●	●●●	●●	—
<b>Prevent Regrowth</b> The regrowth of bacteria is a major factor in maintaining a clean environment. Initial studies of 222nm vs. conventional mercury lamp modules show that 222nm is more effective at reducing microbial regrowth than 254nm.	●●●	●	●	●



B1 Narrow Beam Module



B1.5 Wide Beam Module

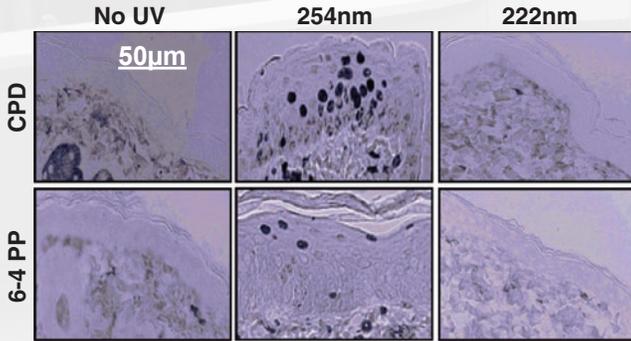


Bringing People Together

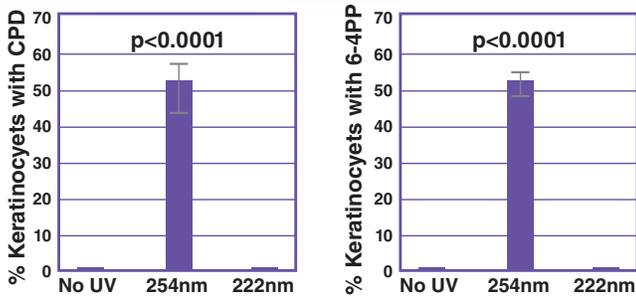
Comparison	222nm	254nm	280nm	405nm
<b>Instant On/Off</b> Features of the Care222 module allows customers to obtain 100% light output in less than a second, whereas 254nm lamps start at 50% output and take several minutes to achieve 100% output. This is ideal for bathrooms, toilets, counter tops, and other occasional use applications.	●●●	●	●●●	●●●
<b>Environmentally Friendly</b> No mercury means no environmental issues with disposal of the lamp module as well as no safety risk if the lamp module breaks. Mercury usage and disposal laws may make conventional UV lamps obsolete in the coming years.	●●●	●	●●●	●●●
<b>Temperature</b> 254nm lamps are sensitive to their environment. Operating temperatures colder than 20°C (68°F) and above 50°C (122°F) will significantly affect the UV output and the microbial reduction capability of 254nm lamps. The Care222 lamps have an operating range of below 0°C (32°F) to over 100°C (212°F) without affecting the output or microbial reduction capability of the lamps.	●●●	●	●	●●
<b>Cost</b> A Care222 solution costs more than conventional mercury lamps, but its mercury-free microbial reduction properties, instant on/off, smaller size, and environmental friendliness more than offset the cost difference for most applications.	●●	●●●	●	●●●

Strength Level: ●●● Very Strong ●● Strong ● Weak

## UV-C COMPARISON STUDIES

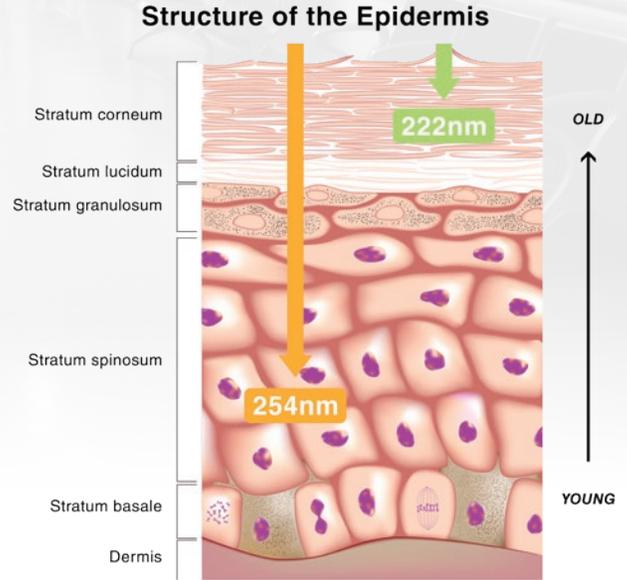


**Fig. 1** Comparison of cross-sectional images of UVC-induced premutagenic skin lesions CPD (cyclobutane pyrimidine dimers) and 6-4PP (photoproducts) in the dorsal epidermis of mice. A UV dose of 157 mJ/cm<sup>2</sup> was used for both 254 and 222 nm<sup>1</sup>.



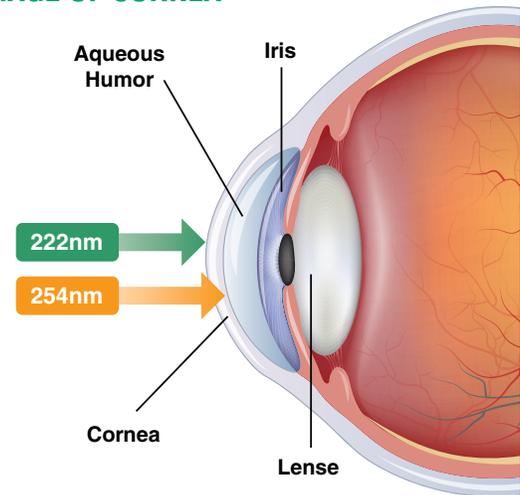
**Fig. 2 & 3** Average percent of keratinocyte cells exhibiting dimers (Fig 2. - right CPD; Fig 3. - left 6-4PP) measured in UVC-induced premutagenic DNA lesions in nine randomly selected fields of view per mouse (n=3)<sup>1</sup>.

## SKIN ABSORPTION SHOWING 222nm VS. 254nm



Light at 222nm far UV-C is absorbed by the Stratum corneum (dead skin cells)

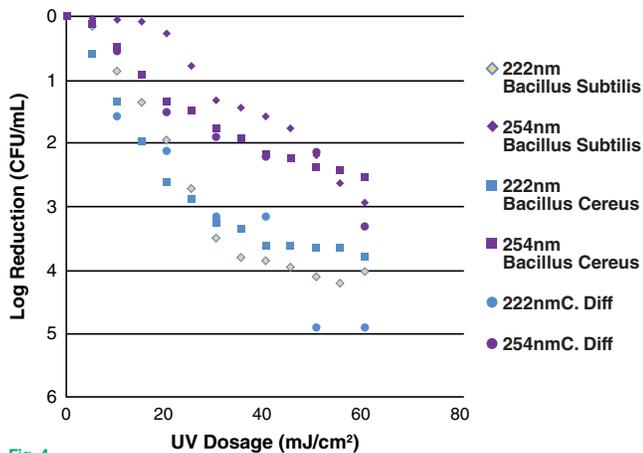
## DAMAGE OF CORNEA



Unlike conventional UV light, 222nm far UV-C is absorbed in the tear layer of the cornea and is much less likely to cause eye damage.<sup>3</sup>

All safety testing was done with Ushio's proprietary filter technology to provide only narrowband 222nm light emission.

## Comparison (254nm VS 222nm) for Spore Inactivation<sup>2</sup>



**Fig. 4**

### References:

<sup>1</sup> Buonanno, Manuela; Ponnaiya, Brian; Welch, David; Stanislaukas, Milda; Randers-Pehrson, Gerhard; Smilenov, Lubomir; Lowy, Franklin D.; Owens, David M.; Brenner, David J.. Germicidal Efficacy and Mammalian Skin Safety of 222nm UV Light. Radiation Research. 2017 April; 187(4): 483-491.

<sup>2</sup> Ushio Inc. Internal Data

<sup>3</sup> Kolozsvári, Lajos; Nógrádi, Antal; Hopp, Béla; Bor, Zsolt. UV Absorbance of the Human Cornea in the 240- to 400-nm Range. Investigative Ophthalmology & Visual Science July 2002, Vol.43, 2165-2168.

