

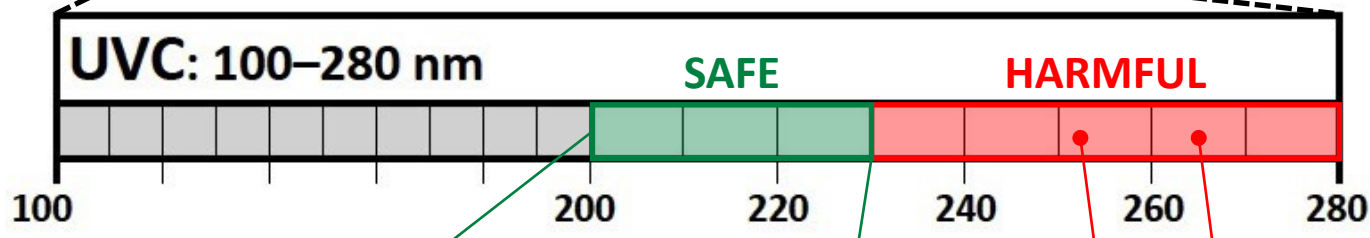
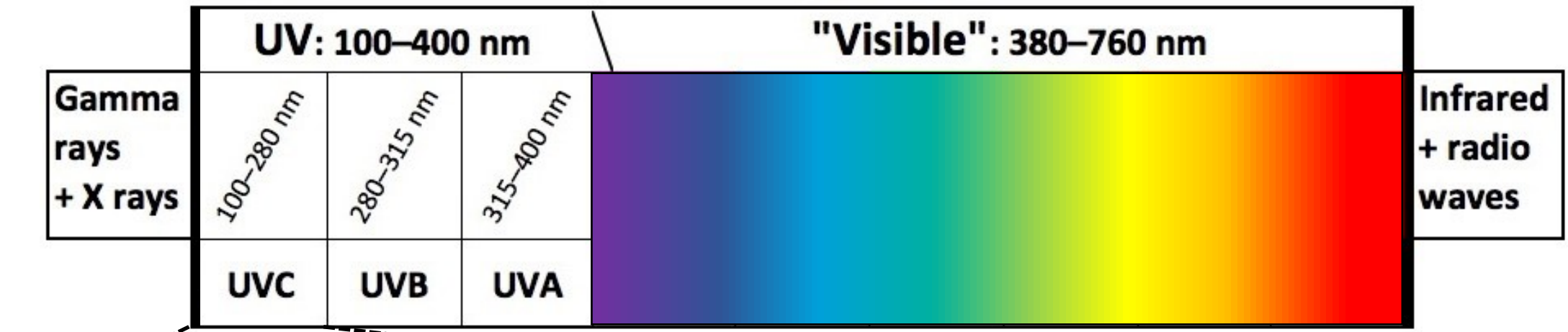


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Far-UVC 222 nm

# What is Far UV-C ?

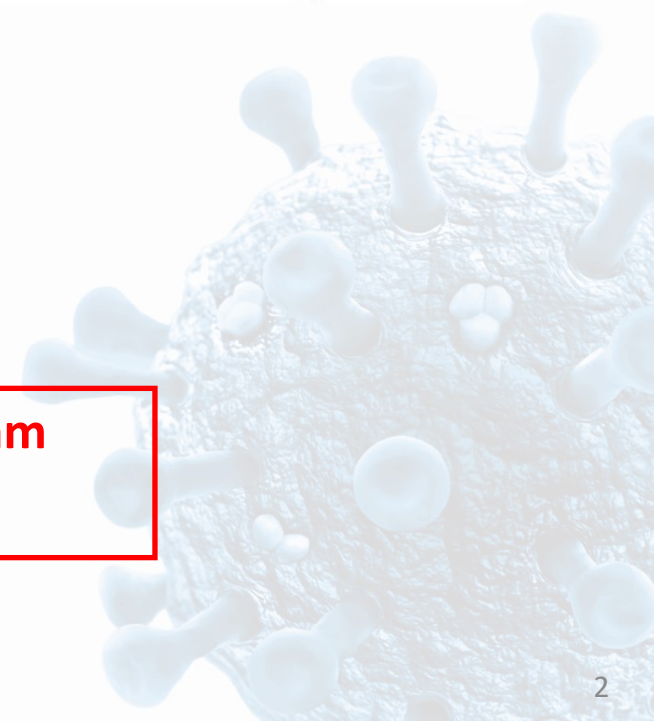
Electromagnetic spectrum



**Far UVC (200–230 nm):**  
this spectral range is safe

**UVC LEDs: 260–270 nm**  
**Mercury lamps: 254 nm**

✓ **UV Medico lamps**  
emit at **222 nm**

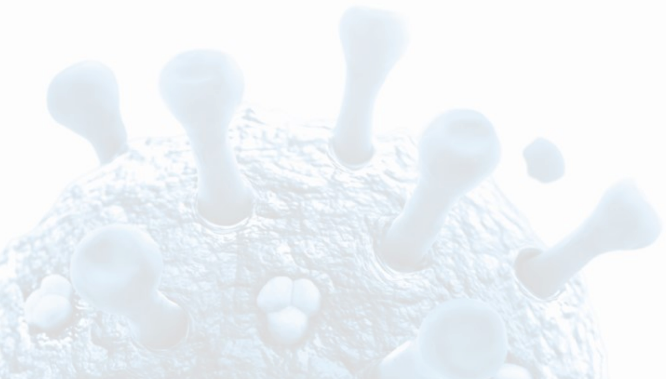
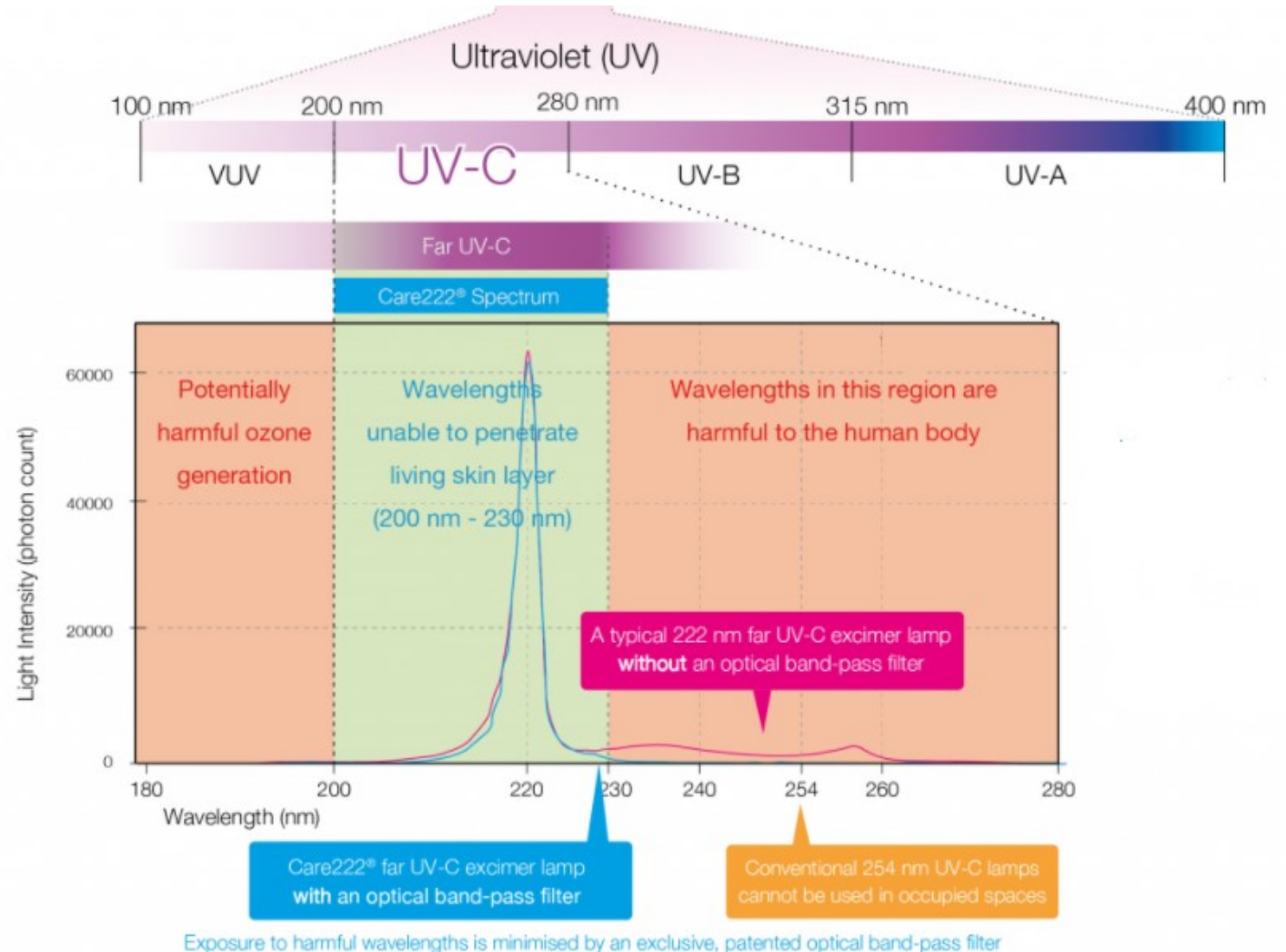


# Patented Filtered Far UV-C

UV222™ uses a narrow-band spectrum UV due to a new unique **patented** wavelength filtration technology.

## UV222™ does not emit:

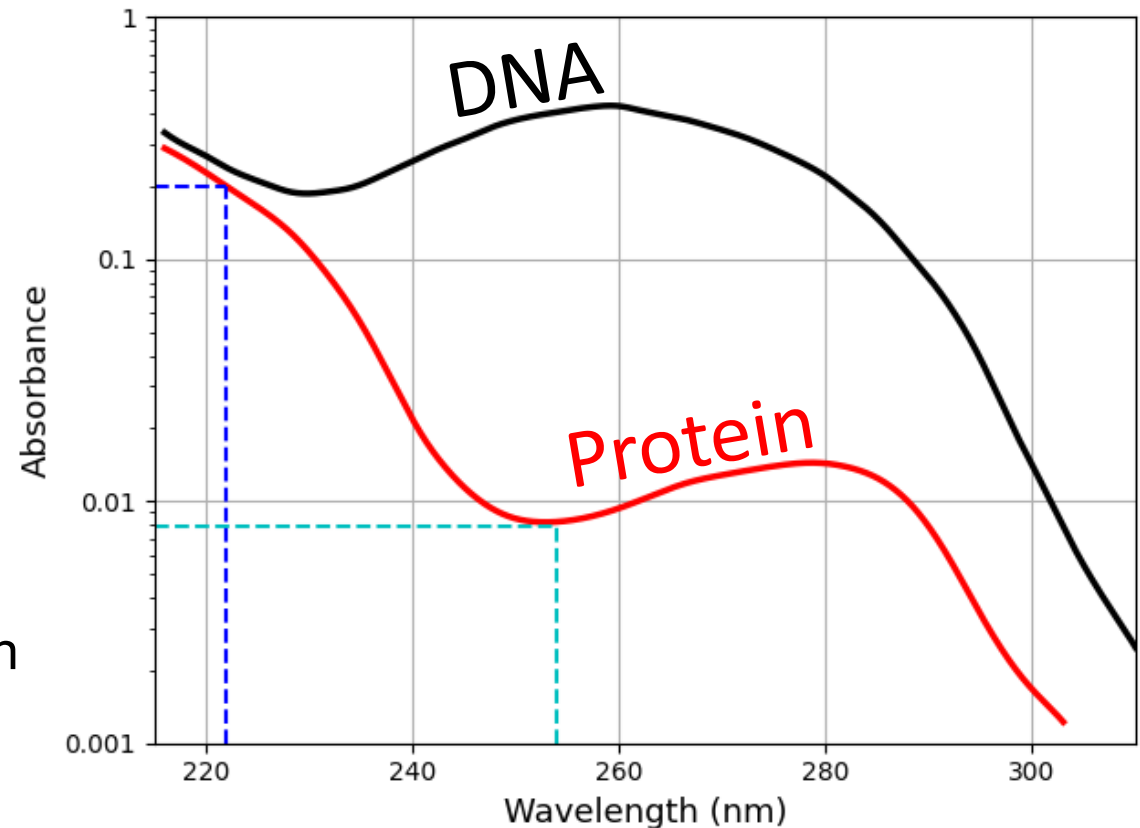
- Harmful wavelengths between 230-280nm which cause skin cancer and cataract
- Ozone generating wavelengths



# Why is far UVC safe?

The top layer of the eye (**cornea**) and the top layer of skin (**stratum corneum**) are dense in **proteins**.

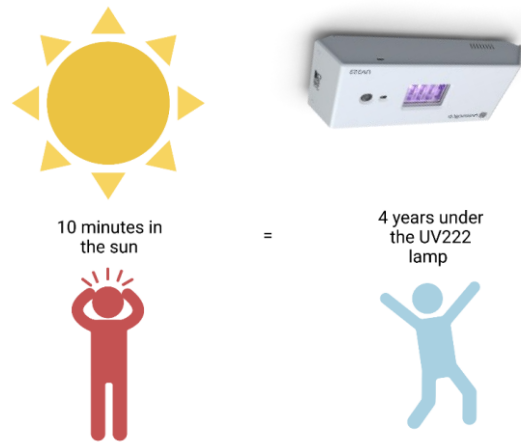
- Proteins at **254 nm**: low absorption  
- penetration through eyes and skin
- Proteins at **222 nm**: high absorption  
- negligible penetration through eyes and skin



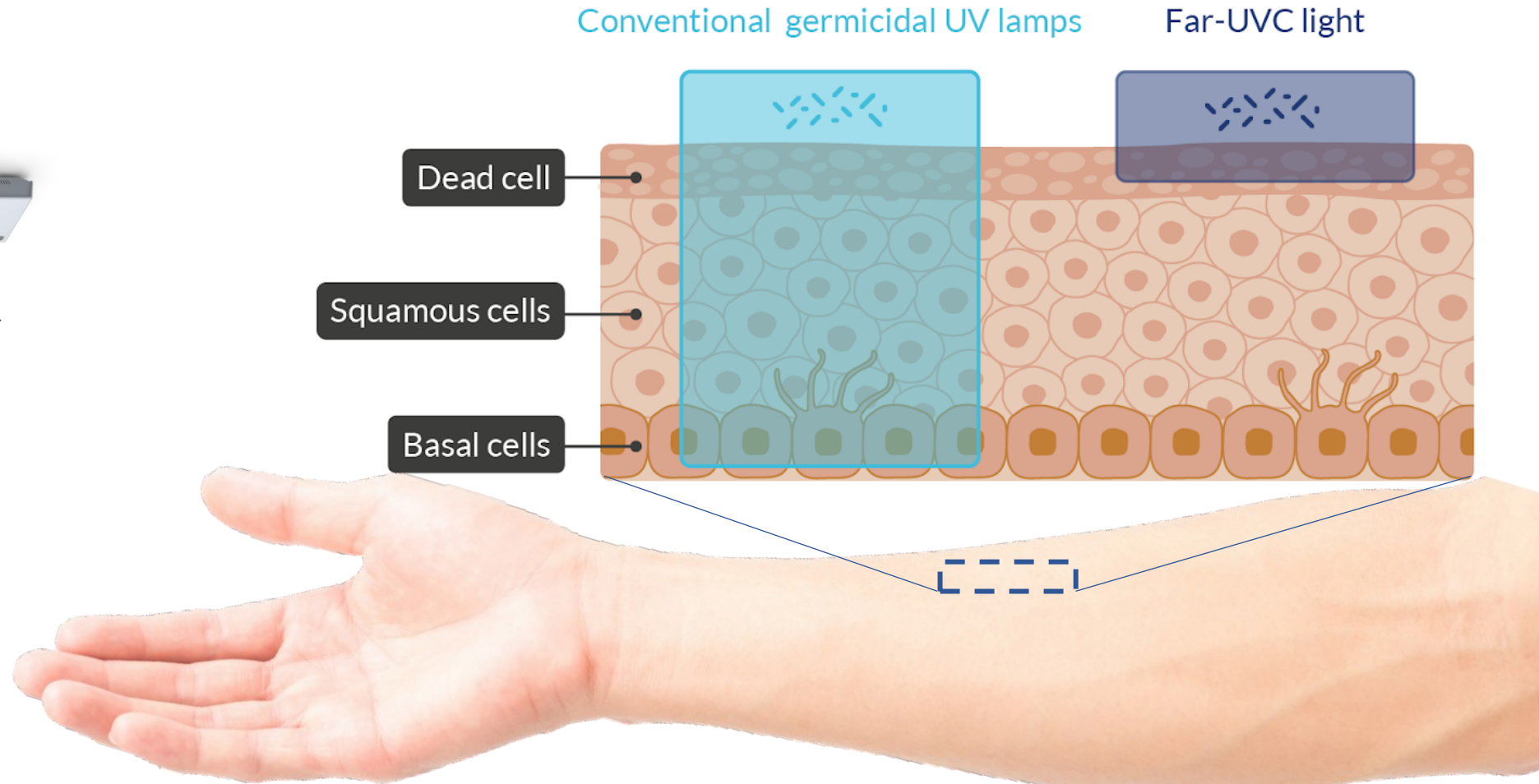
Replotted from: J. Childress, et al. (2020). Disinfection with Far-UV (222 nm Ultraviolet light).

M. Clauss, et al., "Photoreactivation of *Escherichia coli* and *Yersinia enterocolitica* after Irradiation with a 222 nm Excimer Lamp Compared to a 254 nm Low-pressure Mercury Lamp", *Acta hydrochim. Hydrobiol.* **33**, 579–584 (2005).

# Far UVC skin-safety



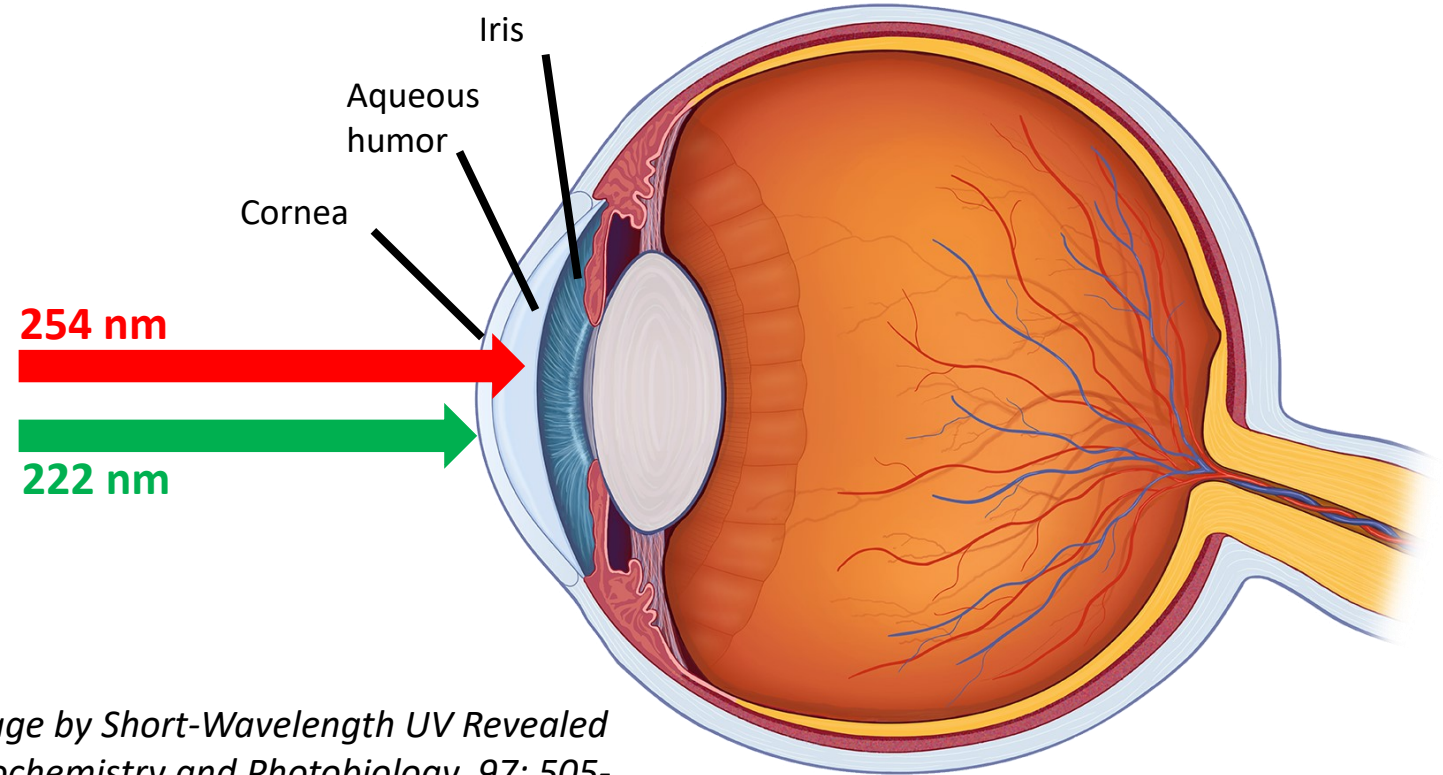
Eadie E. "Computer Modeling Indicates Dramatically Less DNA Damage from Far-UVC Krypton Chloride Lamps (222 nm) than from Sunlight Exposure", 2021, <https://doi.org/10.1111/php.13477>



M. Buonanno, D. Welch, I. Shuryak, and D. J. Brenner, "Far-UVC light (222 nm) efficiently and safely inactivates airborne human coronaviruses", *Sci. Rep.* **10**, 1–8 (2020).

# Far UVC eye-safety

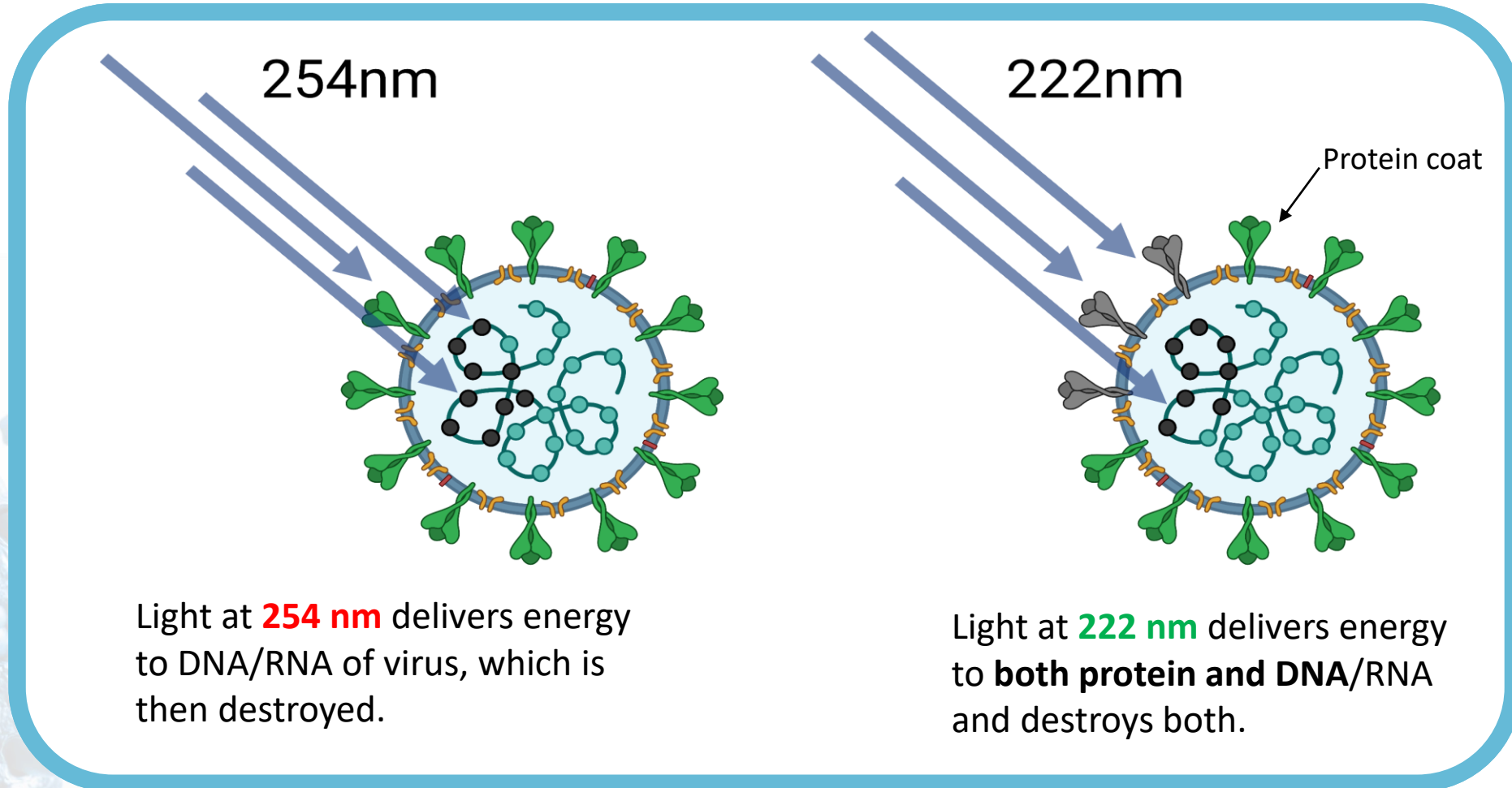
- Transmission of **222 nm** through the cornea: negligible<sup>1,2</sup>
- Tear-layer has a short (~24h) turnover cycle, **restoring** eventual damage.<sup>1</sup>



1: S. Kaidzu, et al., "Re-Evaluation of Rat Corneal Damage by Short-Wavelength UV Revealed Extremely Less Hazardous Property of Far-UV-C". *Photochemistry and Photobiology*, 97: 505-516. (2021)

2: P. Tønning, et al., "Far UV-C absorption in pig cornea" report by **UV Medico** in collaboration with Aarhus University. <https://lnkd.in/e8XvA7nd>

# Efficacy against coronavirus



# 222 nm for disinfection -in occupied rooms.

nature > scientific reports > articles > article

Article | Open Access | Published: 24 June 2020

## Far-UVC light (222 nm) efficiently and safely inactivates airborne human coronaviruses

Manuela Buonanno, David Welch, Igor Shuryak & David J. Brenner 

Scientific Reports 10, Article number: 10285 (2020) | Cite this article

314k Accesses | 129 Citations | 2708 Altmetric | Metrics

An [Author Correction](#) to this article was published on 27 September 2021

This article has been [updated](#)

### Abstract

A direct approach to limit airborne viral transmissions is to inactivate them within a short time of their production. Germicidal ultraviolet light, typically at 254 nm, is effective in this context but, used directly, can be a health hazard to skin and eyes. By contrast, far-UVC light (207–222 nm) efficiently kills pathogens potentially without harm to exposed human tissues. We previously demonstrated that 222-nm far-UVC light efficiently kills airborne influenza virus and we extend those studies to explore far-UVC efficacy against airborne human coronaviruses alpha HCoV-229E and beta HCoV-OC43. Low doses of 1.7 and 1.2 mJ/cm<sup>2</sup> inactivated 99.9% of aerosolized coronavirus 229E and OC43, respectively. As all human coronaviruses have similar genomic sizes, far-UVC light would be expected to show similar inactivation efficiency against other human coronaviruses including SARS-CoV-2. Based on the beta-HCoV-OC43 results, continuous far-UVC exposure in occupied public locations at the current regulatory exposure limit (~3 mJ/cm<sup>2</sup>/hour) would result in ~90% viral inactivation in ~8 minutes, 95% in ~11 minutes, 99% in ~16 minutes and 99.9% inactivation in ~25 minutes. Thus while staying within current regulatory dose limits, low-dose-rate far-UVC exposure can potentially safely provide a major reduction in the ambient level of airborne coronaviruses in occupied public locations.

RESEARCH ARTICLE

## Far-UVC efficiently inactivates an airborne pathogen in a room-sized chamber

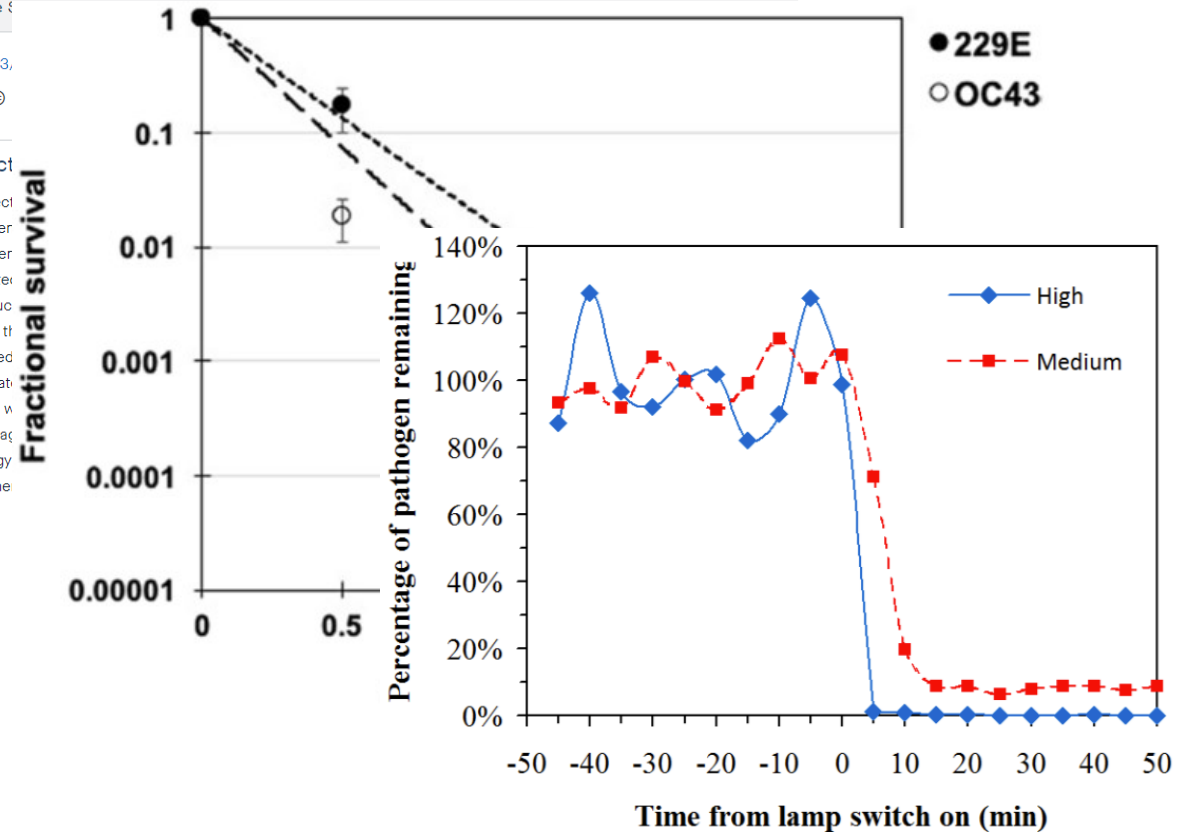
Ewan Eadie, Waseem Hiwar, Louise Fletcher, Emma Tidswell, Paul O'Mahoney, Manuela Buonanno, David Welch, Catherine S. ...

DOI: 10.21203/

LICENSE: 

### Abstract

Many infect...  
environmen...  
can efficien...  
of its limite...  
effects suc...  
rooms. In th...  
aerosolised...  
steady-stat...  
reduction w...  
effective at...  
technology...  
developme...



# Not just for coronavirus

- Current and future pandemics.
- Light does not discriminate between mutations
- The increasing resistance of bacteria to antibiotics.
- Currently >700.000<sup>1</sup> patients worldwide die every year from an infection with multidrug resistant organisms (MDROs).
- Rising trend

[nature](#) > [scientific reports](#) > [articles](#) > [article](#)

Article | [Open Access](#) | Published: 09 February 2018

## Far-UVC light: A new tool to control the spread of airborne-mediated microbial diseases

[David Welch](#) , [Manuela Buonanno](#), [Veljko Grilj](#), [Igor Shuryak](#), [Connor Crickmore](#), [Alan W. Bigelow](#), [Gerhard Randers-Pehrson](#), [Gary W. Johnson](#) & [David J. Brenner](#)

[Scientific Reports](#) **8**, Article number: 2752 (2018) | [Cite this article](#)

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RESEARCH ARTICLE

## Far-UVC light prevents MRSA infection of superficial wounds *in vivo*

**Brian Ponnaiya\***, [Manuela Buonanno](#), [David Welch](#), [Igor Shuryak](#), [Gerhard Randers-Pehrson](#), [David J. Brenner](#)

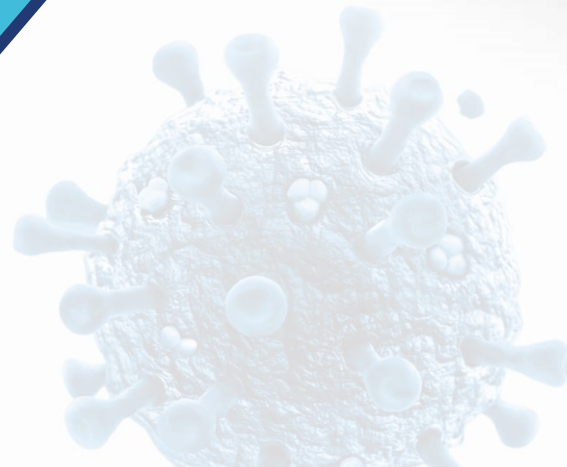
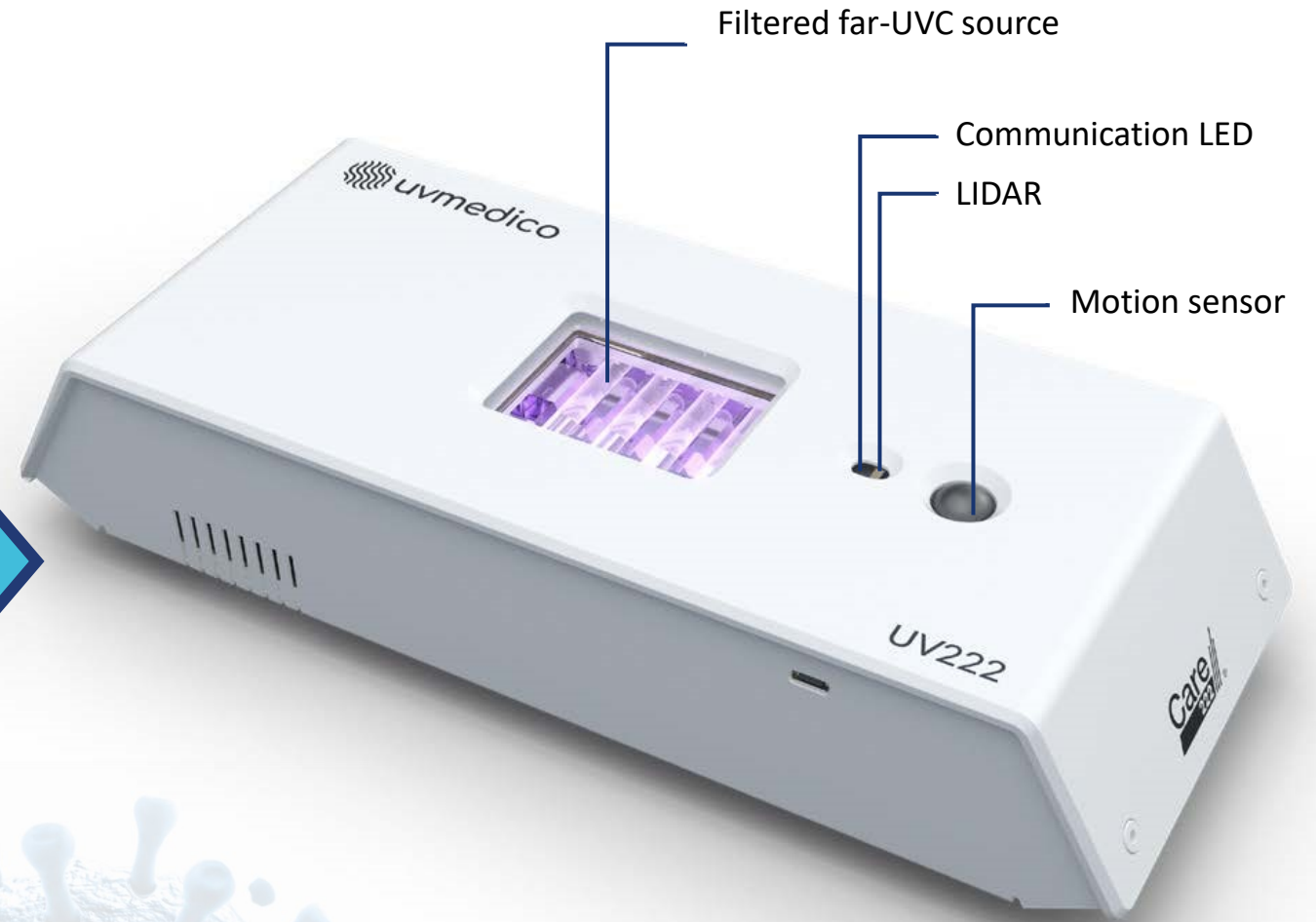
Center for Radiological Research, Department of Radiation Oncology, Columbia University Medical Center, New York, New York, United States of America

1. IACG (UN-entity) – No time to wait: Securing the future from drug-resistant infections 2019

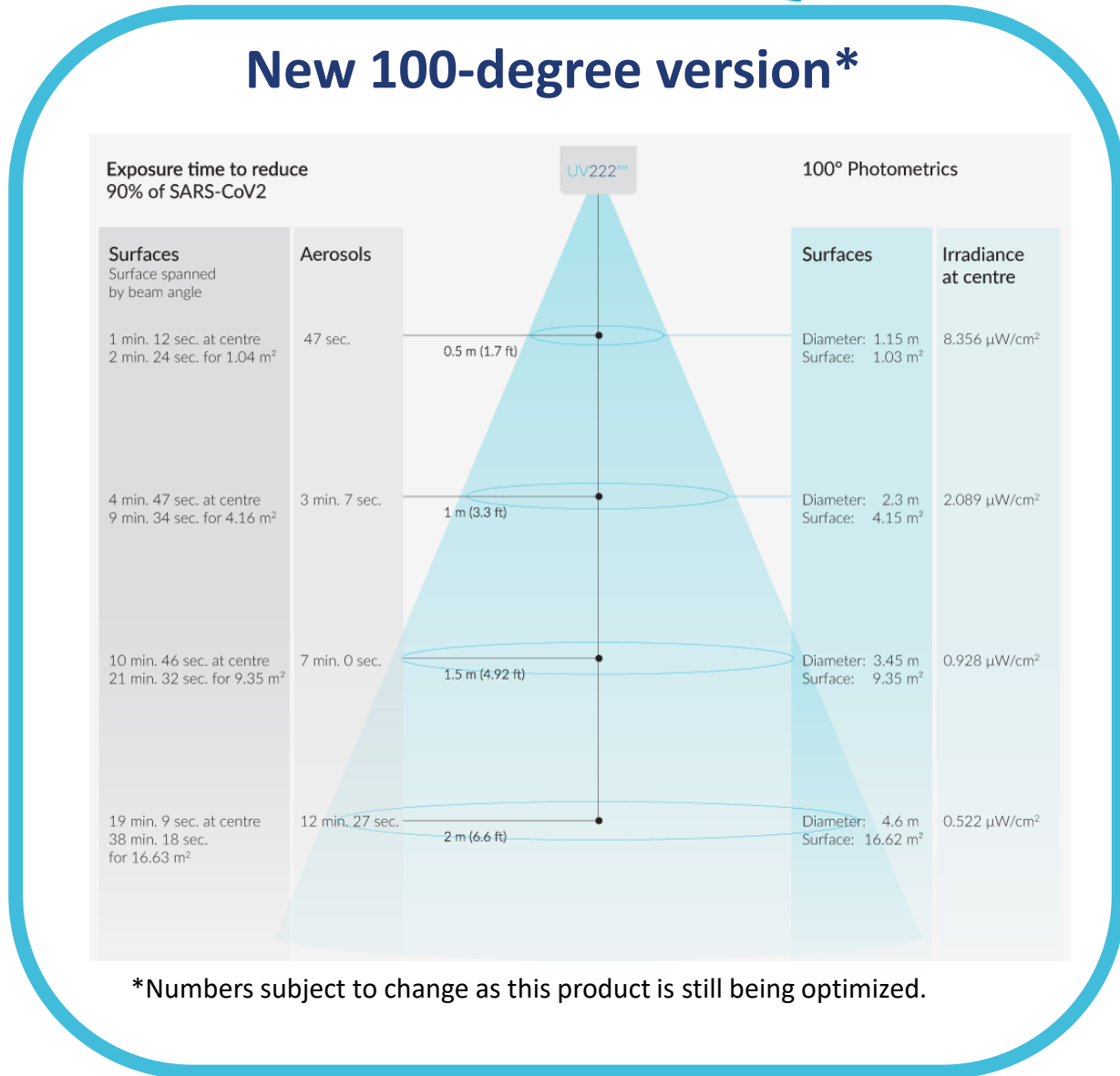
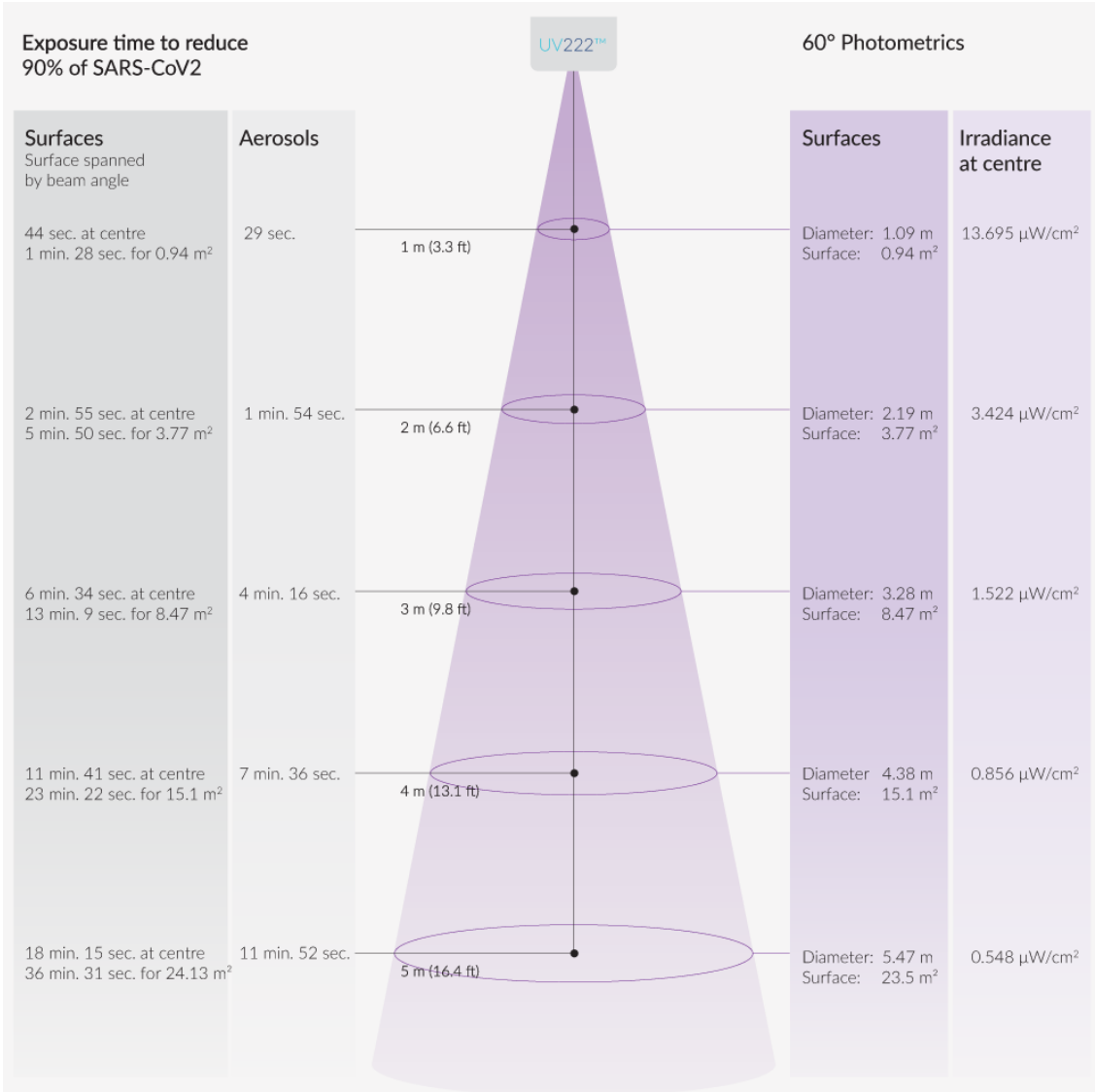
# UV222™

Each product is equipped with the following safety features :

- Far UVC filter – rejection of light >230 nm
- Motion sensor
- Lidar sensor – Distance to nearest object
- Intelligent software to optimize germicidal performance while continuously ensuring safety



# UV222™ photometrics



\*Numbers subject to change as this product is still being optimized.

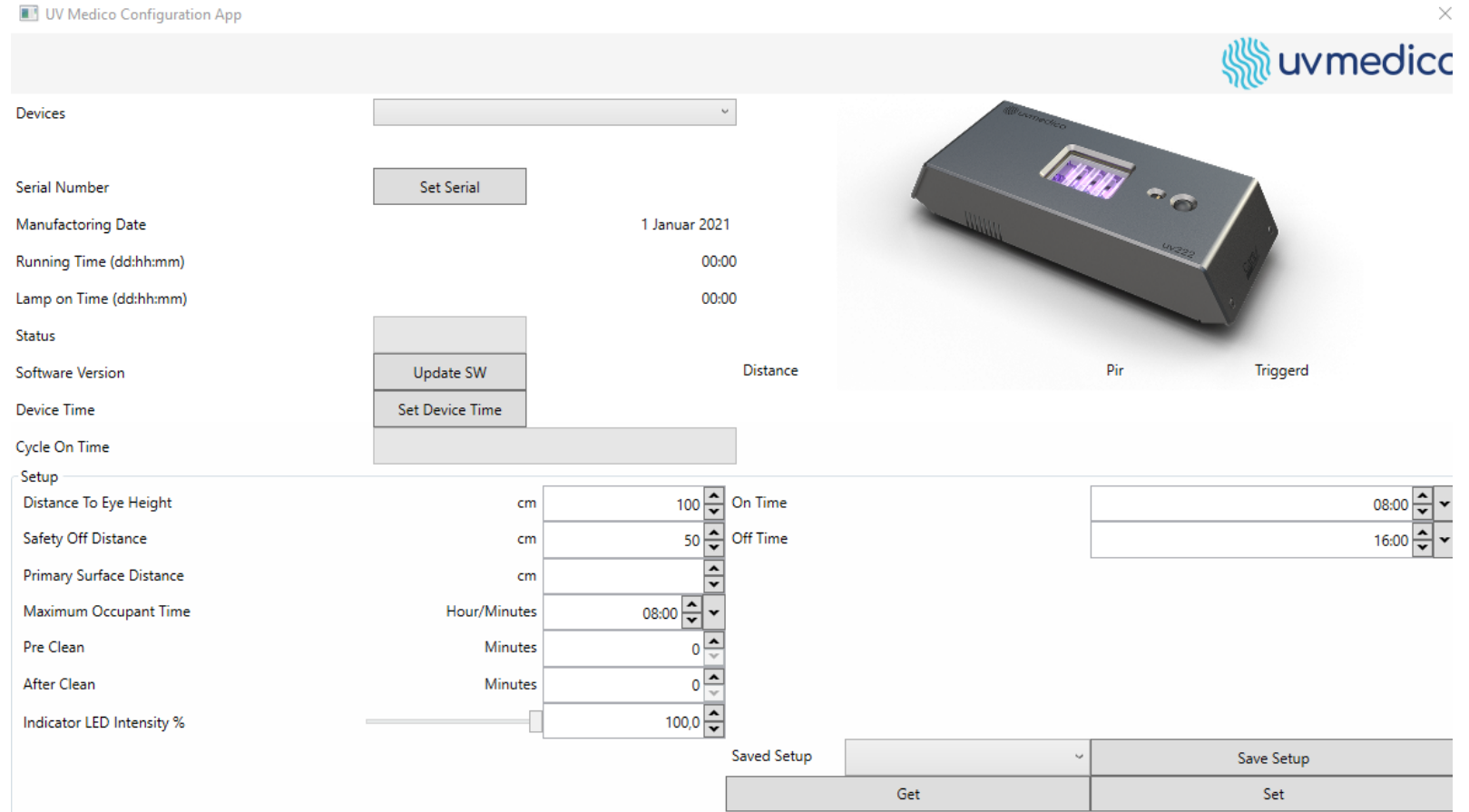
# Lamp configuration



Connects to PC via USB-C

Dose calculations reduced to mounting height and room occupancy.

- The lamp calculates allowed ON-time based automatically and defines a daily duty cycle.



UV Medico Configuration App

uvmedico

Devices

Serial Number

Manufacturing Date 1 Januar 2021

Running Time (dd:hh:mm) 00:00

Lamp on Time (dd:hh:mm) 00:00

Status

Software Version  Distance

Device Time  Pir Triggered

Cycle On Time

Setup

Distance To Eye Height cm 100 On Time 08:00

Safety Off Distance cm 50 Off Time 16:00

Primary Surface Distance cm

Maximum Occupant Time Hour/Minutes 08:00

Pre Clean Minutes 0

After Clean Minutes 0

Indicator LED Intensity % 100,0

Saved Setup

# Real case story

## – Lamp characterization

Spectral goniometer for measuring light distribution



- 360 degrees spatial profiling
- Calibrated spectrometer covering 190-800 nm
- Measurement report traced to each lamp's serial number.

### Light Measurement Report

Print date: 20/11/2021  
 Measurement date and time: 31/05/2021 13.25.13 – Measurement no. VFR-210531-0173-MS  
 Tracking number: VT210531-001891 – Operator:



#### Laboratory and Equipment

Laboratory Owner and Location: UV Medico, Denmark  
 Goniometer System and Type: LabSpion – Type C, horizontal  
 Sensor Name, Calibr. Date and Serial No.: LabSensor Model2 – 15/01/2021 – 3482137104  
 Spectrometer Manufacturer and Model: Ibsen Photonics, Denmark – Freedom VIS (Custom Viso)

#### Measurement Conditions

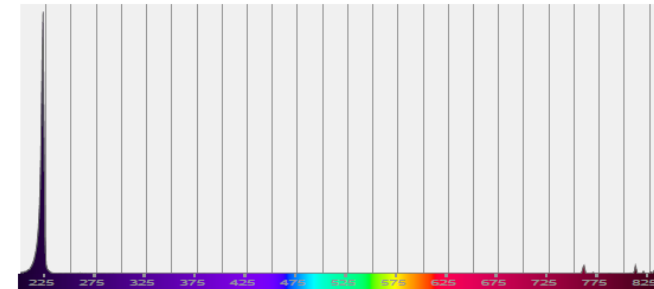
Number of C-planes and Resolution: 16 planes – 22.5°  
 γ (gamma)-Resolution: 2.5°  
 Test Distance: 0.90 m  
 Input Power, Power and Displ. Factors: 12.4 W – PF 0.51 – DPF 0.97  
 Input RMS Voltage and Current: 229 V – 0.106 A  
 Frequency of Input Power: 50 Hz  
 Warm-up Time and Variation: Not completed – 2.0%

#### Tested Light Source

Product Name: UV222 1m med correction  
 Item No. and Manufacturer: – UV Medico  
 Product Description: –

#### Main Light Measurement Results - UV

Output, 200 nm - 850 nm	UVC 200nm - 230nm	110,05 mW
	UVB 230nm - 315nm	102,72 mW
	VIS-IR: 400 nm - 850 nm	5,78 mW
Efficacy (Radiated power/lamp power)		0,89 %
Peak Emission Wavelength (λp)		222 nm
Total Irradiance (distance 1 m)		13,96 μW/cm <sup>2</sup>



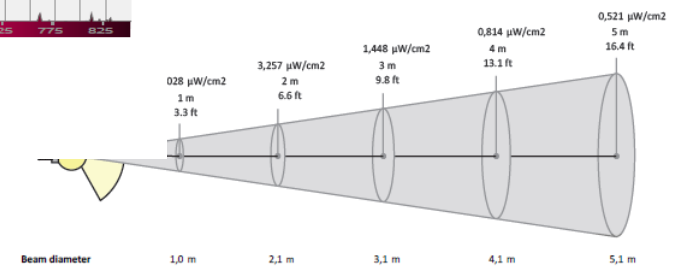
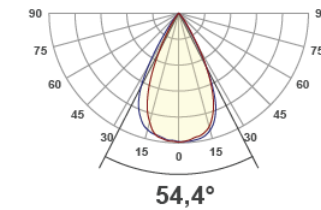
Page 1 of 3

### Beam Report

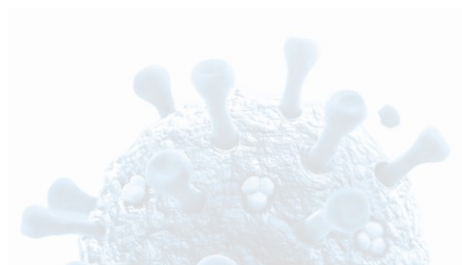
/05/2021 13.25.13 – Measurement no. VFR-210531-0173-MS  
 891 – Operator:



#### Beam Diameter

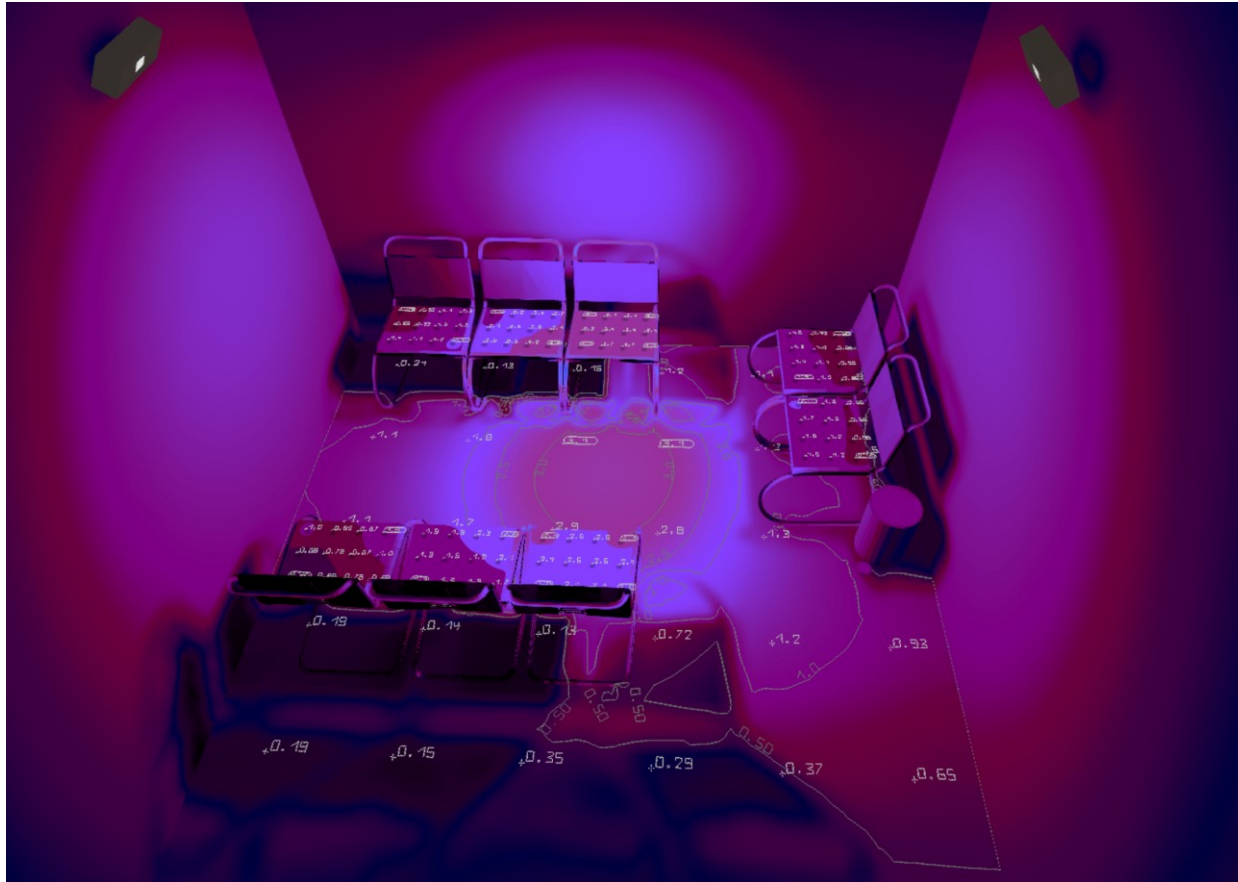


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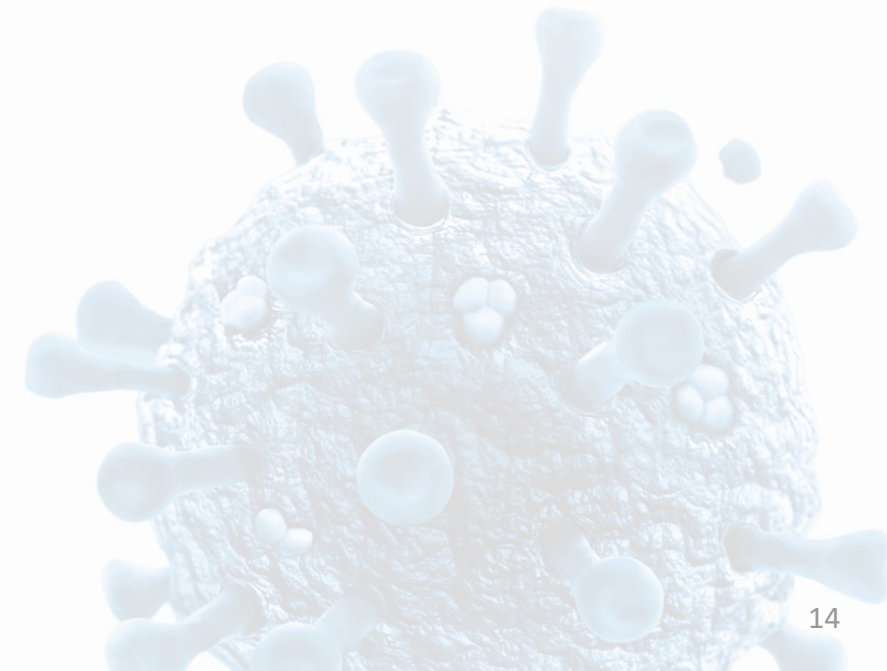
# Real case story

– Light simulations to optimize lamp placement and dose



Waiting area of Department of Lung disease and Allergy  
Aarhus University Hospital, Aarhus, Denmark

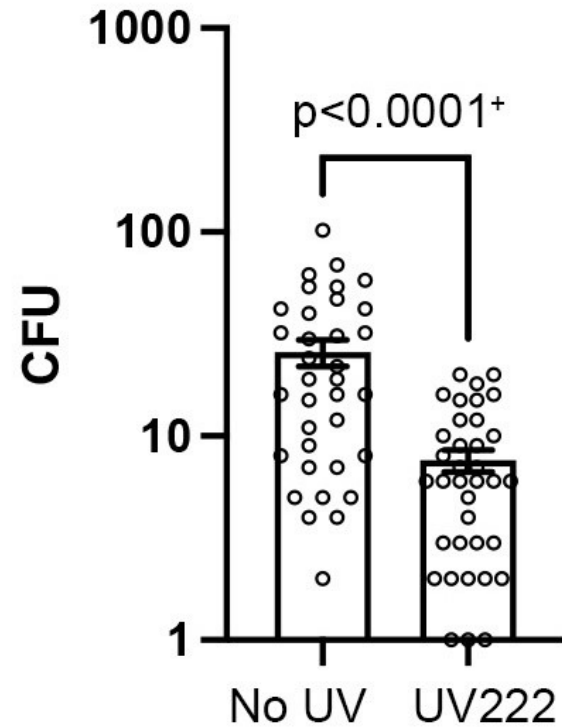
- Stay within Threshold Limit Value (TLV)
  - 222 nm: 23 mJ/cm<sup>2</sup>
- Optimize light distribution



# Real case story

– Validation, UV222™ effortlessly reduces risks of infection

Reduction in bacteria by 90%



Holm, C. K., *et al.* (2021). Anti-microbial effect of filtered 222nm excimer lamps in a hospital waiting area. *medRxiv*.

