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DID YOU KNOW?

UVC STERILIZATION: THE IMPORTANCE OF WAVELENGTH

While we commonly talk about UVC sterilization without further wavelength specification, the UVC wavelength spectrum is actually quite broad, ranging from 100 nm to 280 nm [1]. The selection of the peak wavelength is crucial to increase the germicidal effectiveness of inactivating microorganisms such as bacteria and viruses.

The ideal wavelength with maximum efficiency would be 265 nm. The current state of the art UV LED from Vishay allows a typical wavelength of 274 nm, which results in about 85 % efficiency from the theoretical maximum. The maximum limit of the peak wavelength, providing the least efficiency, plays a crucial role in ensuring adequate sterilization. The maximum wavelength limit of the UV LED from Vishay is typically at 280 nm, which results in about 71 % efficiency. To design safe sterilization applications, the maximum wavelength limits have to be considered.

Comparing to other market offerings, many parts are limited at 285 nm, which results in only 58 % efficiency.

Let's have a look at how the output power requirement would change with the higher maximum specified wavelength to achieve similar germicidal efficiency. Using the example of our VLMU35CR40 — with a typical radiant power of 37 mW, as well as a maximum wavelength of 280 nm — compared against other UV LEDs on the market with a higher maximum wavelength limit of 285 nm, the required radiant power to achieve similar germicidal efficiency, given the same exposure time and distance, is

$$37\ mW \times \frac{71\ \%}{58\ \%} = 45.3\ mW$$

Therefore, a UV LED with a maximum wavelength of 285 nm would need a typical radiant power of 45.3 mW to have the same germicidal effectiveness as a UV LED with a maximum wavelength of 280 nm and 37 mW.

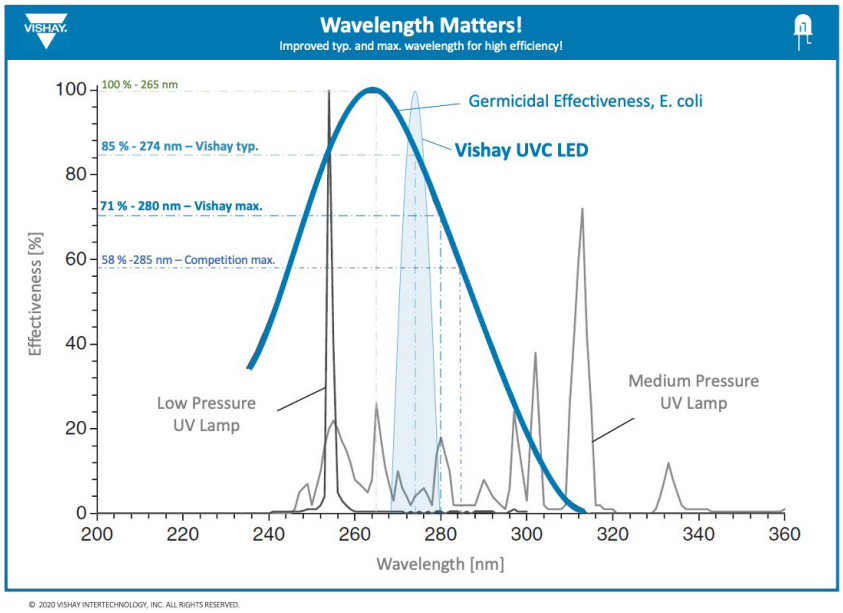

Figure 1. Germicidial Effectivness vs. Wavelength [2]

Notes

[1] "ISO 21348 Definitions of Solar Irradiance Spectral Categories"
[2] Kowalski, Wladyslaw (2009). Ultraviolet Germicidal Irradiation Handbook: UVGI for Air and Surface Disinfection

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