

# UV-C LEDS IN THE TIME OF COVID-19

Analysis report on markets & technologies – Update November 2021

The health crisis due to the SARS-CoV-2 virus has generated unprecedented demand for the design and manufacture of disinfection systems using optical UV rays. LED manufacturers have seized this opportunity and we are currently seeing an explosion in the offer of UV-C LEDs.

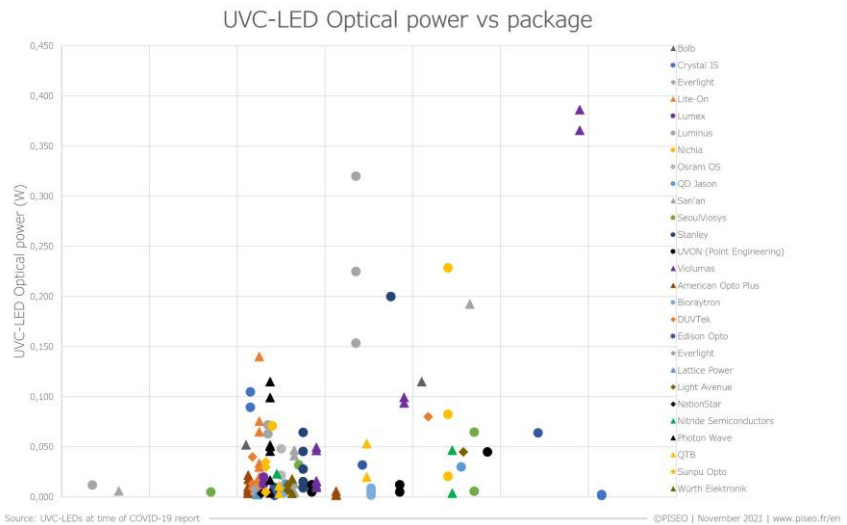
## NEW IN THIS REPORT

- Technological state-of-the-art of UV-C LEDs, prospects for further development of performance and price.
- Comparative analysis of the products of 27 manufacturers of UV-C LEDs.
- Intellectual property landscape for UV-C LEDs.
- State of the art of 222 nm wavelength: research on its effects on the human body, disinfection capability, technology of light sources.
- Developments in regulations and standardization. Positions taken by countries and the industry.
- Doses achievable today and tomorrow by disinfection systems using UV-C LEDs in connection with SARS-CoV-2.
- Presentation of equipment currently marketed for different applications.
- Markets for UV-C LEDs and current trends.

## UV-C LEDS AN EXPLOSION OF OFFERS

The need for disinfection and the opportunity to use small light sources enabling more compact systems to be created, as well as the factor of new forms, have clearly generated renewed interest on the part of manufacturers of LEDs. Therefore, Piséo’s experts have been able to identify 15 new manufacturers of UV-C LEDs compared with the 2020 version of our report.

The quantity of components currently on the market is unprecedented, and it is becoming difficult to compare them with one another as they are extremely diverse. Piséo’s experts have therefore analysed components available industrially as exhaustively and objectively as possible and compared them with one another. This approach means Piséo can offer the markets a complete overview of the current offer and provide system manufacturers with the key factors for making choices in full knowledge of the facts.



## LINKED REPORT

UV LEDs and UV Lamps – Market and Technology Trends 2021



*The UV lighting market will double or treble in size in the next five years, driven by disinfection and new functionalities. Bundle offer available - Contact us for more information*

## 222 NM DISINFECTION, AN ONGOING DEBATE

Although currently relatively scarce and expensive, several system manufacturers such as Signify, or Acuity Brands are taking a close interest in sources emitting a 222 nm wavelength due to the harmlessness of this optical radiation on the human body. Several products have already been placed on the market, and there are more to come which integrate excimer sources made by the company Ushio. Piséo’s specialists are therefore reviewing the state of medical research, the technology of sources emitting at 222 nm, the germicidal effect of this wavelength, the regulatory environment and the roadmaps produced.

### Efficient Excimer Systems

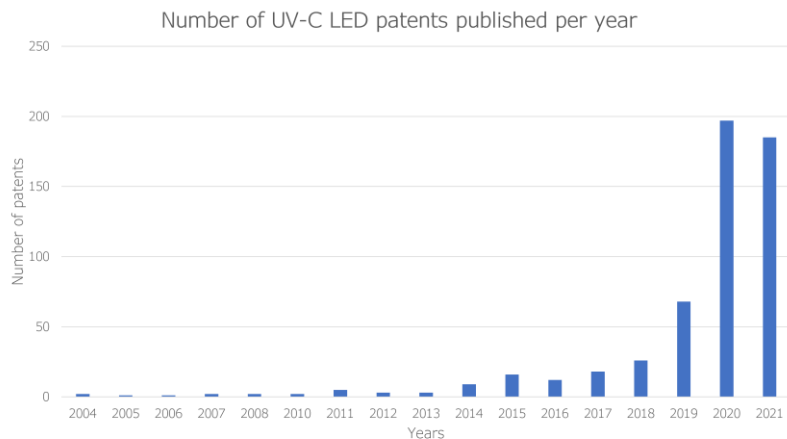
	System	Wavelength h (nm)	Applications
Rare gas-fluorine system	XeF	353	
	KrF	248	
	ArF	193	
Rare gas-chlorine system	XeCl KrCl	308 222	Drying, curing, germicidal
Rare gas-chlorine system	XeBr	282	Germicidal
Rare gas system	Xe2	172	Surface modification

Source: UVC LIGHT SOURCES, P.K. Swain - Heraeus Noblelight America)

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### COVID-19, AN OUTBURST OF PATENTS IN THE UV-C LEDS ECOSYSTEM

The number of patents filed in the last two years in the area of UV-C LEDs has exploded, thereby demonstrating the dynamism of research in this area. Apart from general trends, in this report we present the patents of 4 LED manufacturers whose content seems particularly relevant to us in view of the main challenges of the rollout of this technology: intrinsic efficacy and cost.



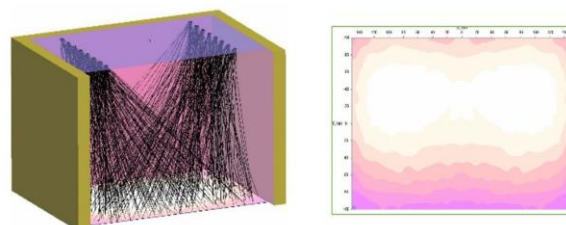
Source: UVC-LEDs at time of COVID-19 report

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### OPTICAL DESIGN, THE KEY TO GERMICIDAL EFFICACY AND SAFETY

The still relatively weak performance of UV-C LEDs makes it necessary to take the optical-electrical parameters of these components into account in order to get the best out of them and thus guarantee disinfection through the design of the system. This is also true to ensure the longevity of the LEDs and prevent the photobiological risks to which users could be exposed. The report thus presents the principles to be implemented to ensure that the design of the systems is effective and safe.

Optical simulations of UV-C radiation and irradiance performed by Piséo with LightTools software



Source: UVC-LEDs at time of COVID-19 report

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## COMPANIES QUOTED IN THIS REPORT

Acuva, American Opto Plus, AquiSense Technologies, Bioraytron, Bolb, Corning, Cree, Crystal IS, Delta Airlines, Diatal, Dowa, DUVTek, Edison Opto, Everlight, GoodFellow, HCEN, Hexatech, Höhle, Hytecon, Hyundai, KnightOptical, KoppGlass, Lattice Power, Ledil, Legrand, LG-Innotek, Light Avenue, Lite-On, Lumex, Lumileds, Luminus, NationStar, MetaWater, Nichia, Nikkiso, Nitride Semiconductors, Osram OS, Phoseon Technology, Photon Wave, Purion, QD Jason, QT-Brightek, Samsung, San'an Optoelectronics, SeoulViosys, Seti, Signify-Philips, Stanley, Sterilray, Sunpu Opto, Surenhap, Typhon Treatment System, Ushio, UV Photonics, UVON (Point Engineering), UVRER, Violumas, Watersprint, Würth Elektronik, Yole Développement and many more...

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## AUTHORS



### Matthieu VERSTRAETE – Innovation Leader and Electronics & Software Architect – Piséo

Matthieu Verstraete has more than 20 years' experience acquired mainly within the Philips Group. In the first few years, this experience led him to participate in the development of set-top boxes for digital television and optical reading and recording systems for DVDs in the Netherlands. He was also in charge of the worldwide technical specification of the portfolio of drivers for LED lighting equipment in the Philips Group. Before joining Piséo, he held the position of Global System Architect for external LED lighting solutions at Signify (formerly Philips Lighting). At Piséo, he leads and participates in studies of innovative photonic systems for all application areas. His role as system architect leads him to analyze applications and propose technical solutions which integrate the most recent photonic, electronic, and software components



### Joël THOME- General Manager - Piséo

Joël Thomé has more than 25 years industrial experience in innovation. For many years he has held international positions in R&D and business line management within the lighting division of the Philips Group. He has participated, in particular, in the transformation of the company's product portfolio through the integration of LED technology and lighting control functions. Joël Thomé has led and developed Piséo since 2013, regularly carrying out studies of the market and the technological state-of-the-art in collaboration with the company Yole Développement.

## RELATED REPORTS



- [UV LEDs and UV Lamps – Market and Technology Trends 2021](#)

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**ABOUT PISEÓ**

Piséo is a French independent Innovation Center that helps industrial companies to innovate by providing analysis, design, realization and characterization services for illumination, detection, and imaging systems.

Created in 2011 under the leadership of Yole Développement, its main shareholder, the company has successfully carried out 200+ customer projects and 4000+ characterization tests in its accredited lab. Active in many application fields, such as personal devices, domestic appliances, defense and security, automotive and transportation, general lighting, healthcare and well-being, Piséo has about 150 regular customers, including global leaders and high-tech start-ups.

**Application and technical analyses**

- Reverse engineering of photonic components and systems
- Performance analysis reports of components and systems
- Application and technical reports of photonic components and systems
- Benchmarking of component and system performance and construction
- Regulatory and normative intelligence
- Technology intelligence
- Patent intelligence
- Photobiological and laser risk assessment

**System design and Realization**


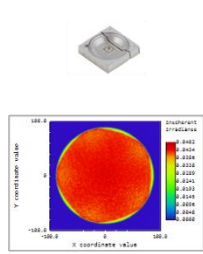
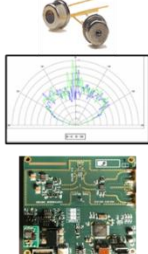
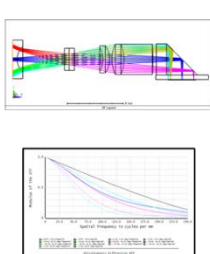


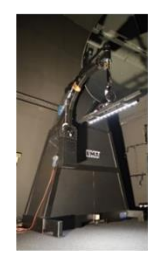
- Application requirements of photonic systems (UV, VIS, IR)
- Concept generation
- Feasibility studies
- Optical, mechanical, electronic and software design
- Simulations
- Thermal management
- System integration
- Prototyping, pre-series and small volume production with partners
- Redesign to cost, to quality
- Design for reliability

**Test lab**

- Photometric and colorimetric measurements (accredited)
- Spectral and radiometric measurements (UV, VIS, IR)
- Photobiological risk assessment (accredited)
- Luminance and color maps of displays, light panels, etc....
- Electrical measurements
- Temperature measurements
- Characterization of cameras, modules, and imaging sensors (VIS, IR): NUC, NETD, responsiveness, MTF ...)

Piséo can test any sensor/module/camera or help you with similar systems' benchmarks.  
 All you have to do is contact us!

**Examples of completed projects and services:**

						
Freeform optic design and realization for streetlighting	UV-C illuminator design and realization	VCSEL based system design and realization	Imaging optical system design and realization	IR camera performance analysis	UV measurements and photobiological risk assessment	Goniophotometry

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