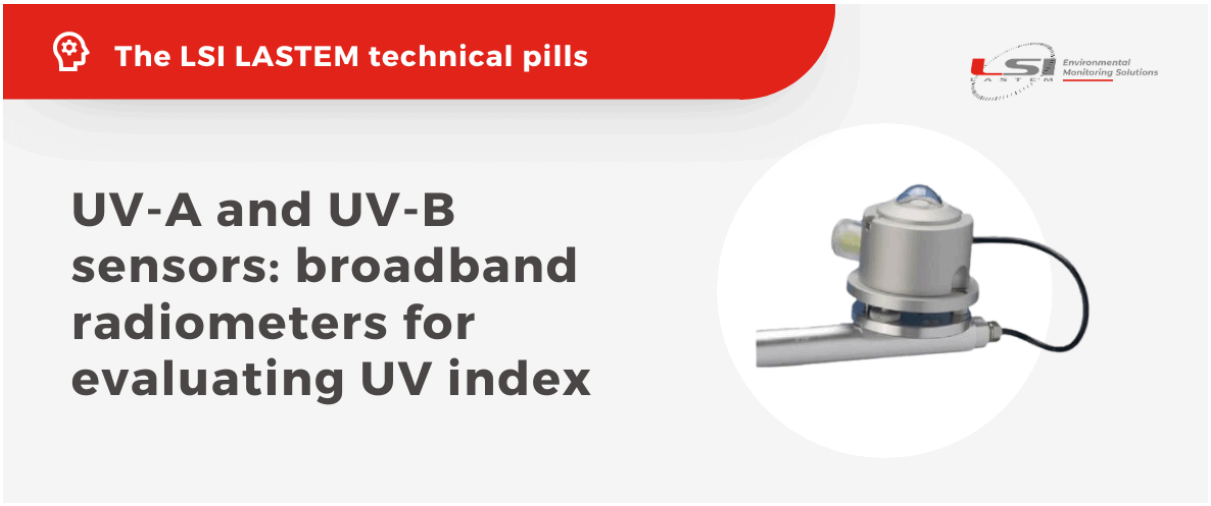
UV-A and UV-B sensors: broadband radiometers for evaluating the UV Index



UV-A and UV-B sensors are advanced devices in the field of solar radiation monitoring. These broadband radiometers are designed to **measure atmospheric irradiance** in the UV-A and UV-B spectrum, according to WMO standard n.8 chap.7. In this technical pill dive, we explore the distinctive features of these broadband radiometers and their impact in meteorological applications.

Sensitive element and cosine response

The sensing element of these sensors is a **photodiode** with optical filter and interferential deposition, which not only improves **spectral transmission**, but is also designed to ensure **optimal cosine response**. The addition of a high-quality glass dome and a Teflon diffuser further contributes to improving the precision of the irradiance measurement, especially at low angles of incidence.

Wide spectral response for outdoor measurements

One of the distinctive features of LSI LASTEM UV-A and UV-B sensors is their **broadband spectral response**. Thanks to this feature, they are able to cover the entire UV-A and UV-B spectrum, making them ideal for **outdoor measurements**, where the main source of radiation is the sun. This distinguishes them from other sensors on the market, which are often optimized to detect radiation from artificial sources in indoor environments.

Technical characteristics of UV-A and UV-B radiometers

- Good adherence to typical UV-A and UV-B radiation curves;
- Calibration performed outdoors for better response to sunlight and atmospheric conditions;
- Traceability at the ARPA Ivrea center (Italy) ISO17025;
- Excellent cosine response;
- Sensors with broadband spectral response;
- Technology with thin metal film filter and silicon photodiode suitable for UV measurements;
- In accordance with WMO Analog output 4...20 mA and power supply 10...30 VAC/DC.

Accuracy and calibration

The **uncertainty** of the **instantaneous reading** is defined through the **calibration of** a reference **sensor** performed by ARPA of Ivrea. This procedure allows you to precisely calculate the daily uncertainty, obtained by integrating the radiation throughout the day. For the **UV-A sensor**, this **uncertainty** is **12%,** while for **UV-B** it is **15%.** The evaluation of the uncertainty linked to the angular response is good, remaining within ±8%, in line with the rigorous WMO

standards (which require a value lower than 10% for incidence angles lower than 60°).

In addition to the documented uncertainty, a distinctive aspect of these sensors is the **calibration** performed in **real solar conditions**, comparing the results with those obtained from the reference sensors calibrated at ARPA in Ivrea. This process, which can span from one to several days, is an essential strength in validating and optimizing the performance of UV-A and UV-B sensors.

Use for estimating UV Index and UVI Index

Although UV-A and UV-B radiometers are not specifically designed for the measurement of erythemal spectral irradiance, the measurement of the two ultraviolet components allows an **estimate** of the **UV Index** with an error within 22%.

The UV Index is determined using an **empirical formula** derived from that defined by the World Health Organization, which has been carefully calibrated using data provided by the JRC (Joint Research Centre) of ISPRA, a European reference point for UV measurements. ultraviolet. This formula is then **integrated into** the LSI LASTEM **data loggers**. Additionally, the **Universal UV Radiation Index** (UVI) provides an assessment of the level of solar ultraviolet radiation reaching the Earth's surface in a specific geographic area. With values ranging from zero to 11, the index indicates the increasing potential damage to skin and eyes caused by sun exposure.

The creation of this index is the result of a collaboration between various organizations and commissions, with the aim of raising public awareness of the risks associated with sun exposure.

Conclusion

LSI LASTEM's UV-A and UV-B sensors prove to be essential tools for **atmospheric monitoring**, ensuring **precision** and **reliability** in measurements. Their broad spectral response and accuracy in estimating the UV Index place them at the center of advanced solutions for meteorological and environmental applications.