

UV/VIS/NIR Spectrometer for Qualification of Pulsed Solar Simulators

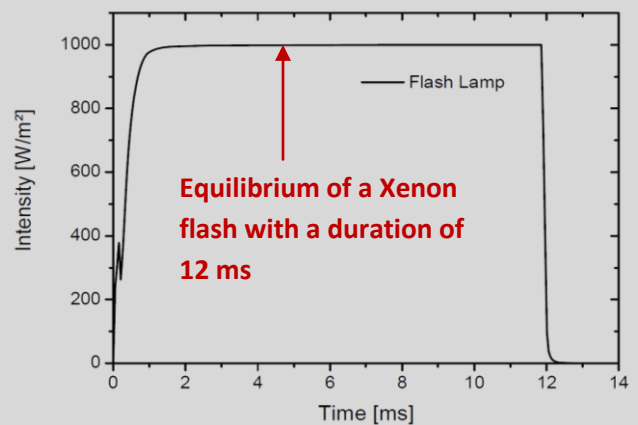
Efficient manufacturing processes and uniform quality of solar cells and modules rely on a series of quality control measurements. In order to estimate the efficiency of cells and modules, tests with solar simulators are performed and a classification is done. The quality monitoring of the solar simulator, is necessary to get consistent information.

Pulsed solar simulators are prevailing in the market, as they provide some unique features continuous light sources lack. On the other hand, their short pulses of less than 15ms are a challenge for time resolved measurement of the pulse spectrum. Consequently, very fast spectral acquisition tools are required.

Furthermore, the classification of the flash, according to its spectral properties, can only be performed when the intensity has reached a stable level. The settling time may vary

depending on the solar simulator and flash lamp itself.

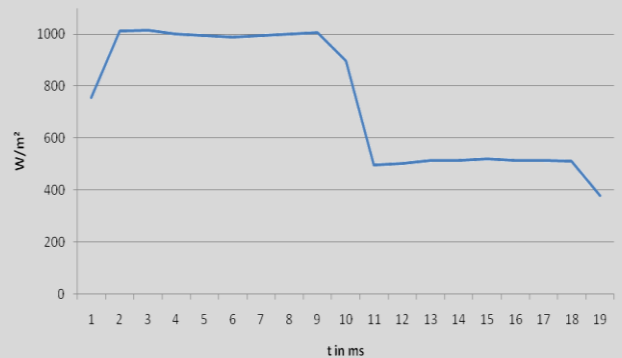
In close cooperation with one of our customers, measurement criteria for the characterization of solar flashers have been defined and a measurement system has been developed accordingly.



Measurement Principle (Experimental)

The time distribution of the flash lamp is carried out by measuring the intensity at defined intervals.

The data can be used to determine the stable level of the flash. During this time frame, the classification of the flash has to be performed according to its spectral distribution (class A, B or C). A time delayed triggering of the measurement ensures the spectral data acquisition only in the stable level of the pulse.



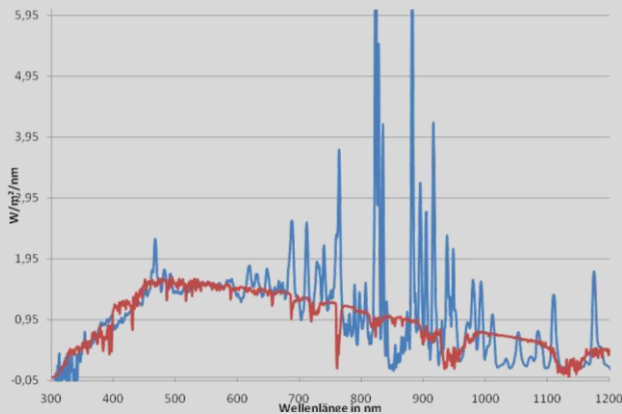
Measurement System

The diode array based MultiSpec spectrometer systems of **tec5** are ideally suited for this kind of measurement, due to their high sensitivity and optimum signal to noise ratio. Additional advantages are the extremely short post-trigger delay time and permanently calibrated spectral

sensors. Integration times as short as 1 ms or less allow highly time-resolved measurements for monitoring intensity profiles over time.

Application Notes – MultiSpec System Vol. 37

In addition, the spectral characteristics of each intensity measurement are available for the wavelength range between 300 and 2200 nm.



The acquired data can be used for the qualification and classification of the pulsed solar simulator. The visualization of the time dependent behavior is achieved by displaying the intensities of one or multiple wavelengths over time.



In order to measure the flash intensity at a stable level a time delay has to be used. **tec5** provides a trigger box with a photodiode for starting the measurement with a suitable time delay. The measurement head with integrated diffuser allows the angle-independent measurement of the flash intensity.

Your Partner in Spectroscopy



Since 1993 **tec5 AG** has been developing fiber-optic spectrometer systems based on diode array technology. Today, tec5 is operating worldwide with subsidiaries in the USA and UK and global representatives are positioned to better serve the market.

At tec5 we pair our core competencies in high speed diode array readout technology, optical, mechanical, electronic and software engineering with excellent customer support. Our high quality products range from standard OEM electronics modules to complete application specific solutions. In close cooperation with our customers, a multitude of applications have been successfully implemented in different industries.

We are proud to be at the frontend in the field of spectroscopy and to provide cutting edge technology – today and in future.



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