SPECTRAL EVOLUTION

Measuring Your Solar Simulator for Uniformity

Solar simulators allow for the accurate measurement of the conversion of light to electrical current by solar photovoltaic cells, modules, and panels under controlled conditions. There are two basic types of solar simulator: continuous and pulsed. Continuous simulators provide a steady illumination for a longer period of time; pulsed apply a flash type illumination of shorter duration. Both types of solar simulators are classified as A, B, or C simulators according to their ability to meet IEC and ASTM standards for spectral content, spatial uniformity and temporal stability. It is important to test a solar simulator to ensure that it is meeting its stated output requirements since cells, modules and panels are typically binned and priced according to simulator data.

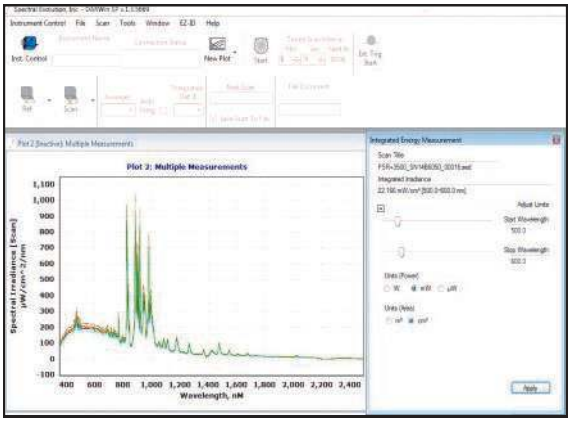


The SR-1901PT spectroradiometer for classifying pulsed solar simulators. The SR-3501 and SR-1900 are available for classifying continuous solar simulators.

Measuring your solar simulator for uniformity or more accurately, non-uniformity is a means of ensuring that the defined area covered by your solar simulator is accurately illuminating the cell, module, or panel. While the sun's radiation is very uniform, this is a difficult characteristic for a solar simulator to meet consistently. The international standards specify the allowable non-uniformity for each class.

- Class A— ≤2% for an area of illumination ≤30cm x 30cm (or diameter 30cm) and ≤3% for an area of illumination ≥30cm x 30cm (or diameter 30cm)
- Class B— ≤5%
- Class C—≤10%

The ASTM standard also specifies the procedure, detector area, number of positions, and locations to be used by solar simulator manufacturers in measuring and calculating non-uniformity.



A PSR+ spectroradiometer fitted with a right angle diffuser calibrated for irradiance was used to measure uniformity of a commercial solar simulator. Measurements were taken by moving the right angle diffuser to different parts of the output light. Our DARWin software (screen shot shown) includes an energy integration utility that allows the user to integrate total energy detected over a user-defined wavelength range.

Measuring uniformity can be accomplished for both continuous and pulsed solar simulators using spectroradiometers from Spectral Evolution. The SR-3501 and SR-1900 can be used with a right angle diffuser to check uniformity of light output by a continuous solar simulator within its defined illumination area. In addition, The SR-1901PT can provide the same measurement capability for pulsed solar simulators. These instruments collect spectral data and include a software program that compares the measured light to the Class A, B, and C specifications. The instruments include NIST-traceable irradiance calibration.

By measuring the uniformity of a solar simulator's output, you can make any minor adjustments to accurately align the solar simulator to achieve uniform irradiation for the cell, module, or panel under test.

Solar simulators allow designers and manufacturers of PV cells, modules and panels to test the output of their products without depending on the highly variable availability of outdoor solar radiation.

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