

Spectro Solar - Example Measurements



1. Outdoor solar measurement comparison

Two SpectroSolar units were taken to Davos, Switzerland, at the PMOD/WRD (*Physikalisch-Meteorologisches Observatorium Davos, World Radiation Center*) during the *11th International Pyrheliometer Comparisons (IPC-XI)*.

Solar irradiance measured with our SpectroSolar units has been compared to data recorded by a scanning double-monochromator (*Optronic Laboratories, Inc. The OL Series 750*). Both the SpectroSolar units and the double-monochromator were mounted on sun-trackers.

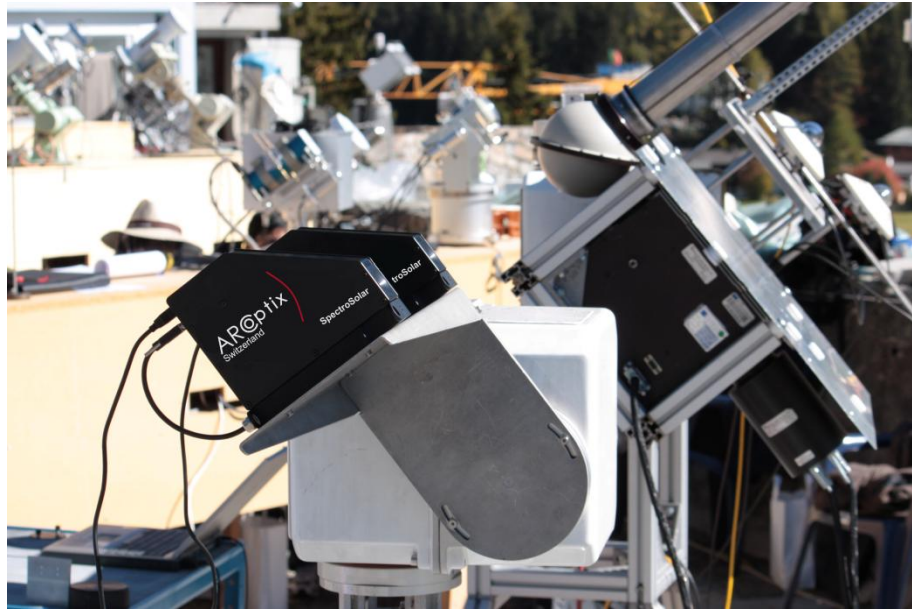


Figure 1 - Outdoor solar irradiance measurements. Two SpectroSolar units are compared to a scanning double-monochromator (which can be seen in the background).

Data from our SpectroSolar units, with 1ms integration time, is compared to measurements by the double-monochromator is presented in Figure 2.

Note that the SpectroSolar optical resolution (5nm) is slightly higher than the resolution of the double-monochromator. Differences in relative energy, integrated over 50nm bands, are below 3%.

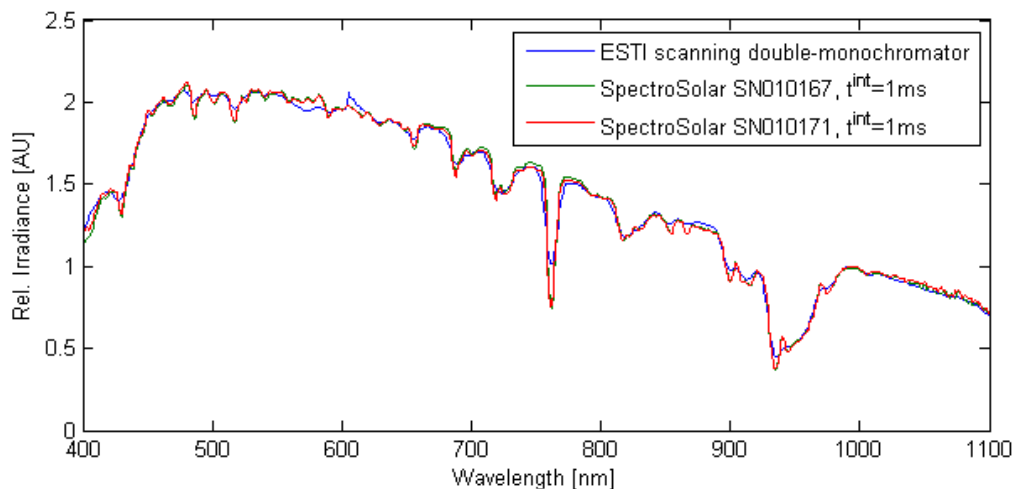


Figure 2 -Comparison of relative irradiance measured with two SpectroSolar units and the scanning double-monochromator, Davos 07.10.2010 11:43 GMT

2. Measurement of pulsed-type solar simulators

The SpectroSolar has been designed with special emphasis on measuring pulse-type solar simulators. It is capable of measuring the relative irradiance of short-pulsed solar simulators in 1ms exposure time. Figure 3 shows data recorded by the SpectroSolar on two different pulsed solar simulators. This data was recorded with an integration (exposure) time of 1ms, and using a delay of 4ms between the trigger signal generated by the integrated photocell and the start of the exposure.

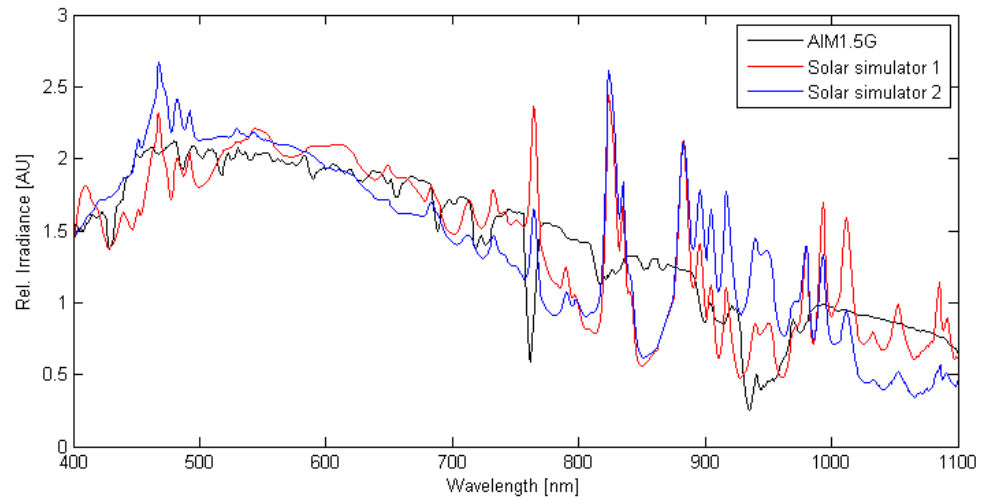


Figure 3 – Normalized irradiance measured on two different solar simulators (red and blue) compared to the AIM1.5G standard solar spectrum (black line).

The international norm **IEC 609604-9** for solar simulators classifies solar simulators (class A, B or C) according to their spectral-match to sunlight at Air Mass 1.5 Global as defined in IEC 60904-3. For 6 wavelength intervals of interest, the fraction of energy measured on the simulator is compared to this “standardized” solar energy distribution. A value of 100% means that the fraction of energy produced by the solar simulator exactly corresponds to the energy fraction specified for that band in the IEC 609604-9 norm. “Class A” requires that the energy fraction lies between 75 and 125% of the standard value *for all wavelength intervals*.

Table 1 – Band energy comparison to IEC609604-9

Wavelength interval [nm]	Simulator 1 [% of IEC60904-9]	Simulator 2 [% of IEC60904-9]
400-500	95.04	109.07
500-600	103.55	106.04
600-700	101.71	93.29
700-800	100.55	83.20
800-900	91.45	101.40
900-1100	105.53	104.34

In this example, both solar simulators produce a spectral-match of Class A, because the all wavelength intervals have energy fractions lying between 75 and 125% of the IEC 609604-9 norm.

The software included with the SpectroSolar automatically makes these calculations, thus results are immediately available after the measurement!