

# Spectra of the Month (July 2022)

**Conducted by:** David Ademe, Avantes Inc.

**Theme:** Solar Simulator/Irradiance

## Background/Applications:

Spectral irradiance is the irradiance of a surface per unit frequency or wavelength, depending on whether the spectrum is taken as a function of frequency or of wavelength. The two forms have different dimensions: spectral irradiance of a frequency spectrum is measured in watts per square meter per hertz ( $\text{W}\cdot\text{m}^{-2}\cdot\text{Hz}^{-1}$ ), while spectral irradiance of a wavelength spectrum is measured in watts per square meter per meter ( $\text{W}\cdot\text{m}^{-3}$ ), or more commonly watts per square meter per nanometer ( $\text{W}\cdot\text{m}^{-2}\cdot\text{nm}^{-1}$ ). Irradiance is often called intensity because it has the same physical dimension.

Spectral irradiance is extremely useful in measuring the sun and solar simulators. A solar simulator (also artificial sun) is a device that provides illumination approximating natural sunlight. The purpose of a solar simulator is to provide a controllable indoor test facility under laboratory conditions, used for the testing of solar cells, sunscreen, plastics, and other materials and devices. Therefore, it is important to properly test and characterize solar simulators

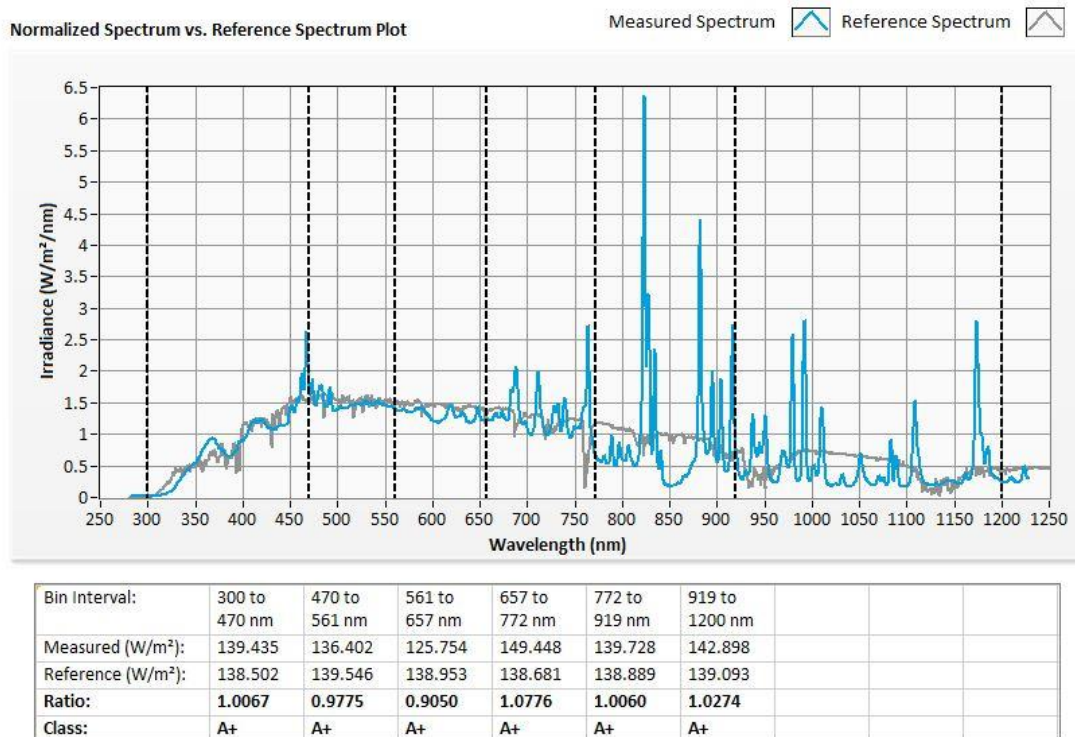
## Description of System:

The setup for this system is our Avaspec-SolarXM Solar Simulator Spectroradiometer system. This consists of the AvaSpec-ULS2048XL-EVO spectrometer and the AvaSpec-NIR256-1.7-HSC-EVO which are converged together via a fiber optic cable (FCB-UVIR600-2-BX). The terminal end of the fiber has a 0 degree cosine corrector attached which allows for a 180 degree field of view collection of light spectrum



from the solar simulator (see image below). Sinton Instruments ([www.sintoninstruments.com](http://www.sintoninstruments.com)) manufactures pulsed solar simulators and the following data shows the measurements of their solar simulator along with the characterization of the solar simulator using the IEC-60904-9 certified method. Sinton also offers a turnkey control software for Avantes spectrometers which facilitates the data collection, spectral binning and classification per the IEC standard. provided courtesy of Sinton Instruments. The data that is analyzed has been collected from one of the solar simulators at Sinton Instruments.

## Test Data and Results:



The Sinton Instruments software provides for a user selectable (AM 1.5) reference spectrum and this is automatically loaded during spectral acquisition of the simulator for comparison. The calculation of the spectral bands is fully automated with A, B and C sorting. The software supports both the 2007 and 2020 IEC 60904 standards. The software provides for full data export for post process analysis. The system supports steady state simulators and with the addition of an external trigger (AvaTrigger-USB2), the system can support pulsed solar simulators.

For more information about the AvaSpec-SolarXM, please visit:

[https://avantesusa.com/wp-content/uploads/2022/07/SolarXM\\_2022-1.pdf](https://avantesusa.com/wp-content/uploads/2022/07/SolarXM_2022-1.pdf)

## Conclusion:

The spectra from the AvaSpec-Solar XM demonstrates that the Avantes instruments combined with Sinton Instruments software provide an excellent solution for solar simulator measurements and classification. Please contact your Avantes sales representative to determine how Avantes instruments can assist your application.