Spectroradiometers for Classifying Solar Simulators
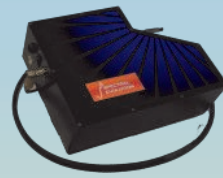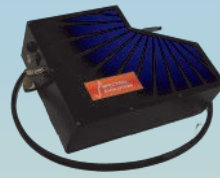
	SR-3501	SR-1901	SR-1901PT	SR-2501PT
Spectral Range	280–2500nm	280–1900nm	280–1900nm	280–2500nm
Spectral Resolution	4nm (@ 280-1000nm) 9.5nm @ 1500nm 7nm @ 2100nm	4nm (@280-1000nm) 10nm @ 1000-1900nm	4nm (@280-1000nm) 10nm @ 1000-1900nm	4nm (@280-1000nm) 22nm @ 1000-2500nm
Sampling Interval	Data output in 1nm increments; 2221 channels reported	Data output in 1nm increments; 1621 channels reported	Data output in 1nm increments; 1621 channels reported	Data output in 1nm increments; 2221 channels reported
Si Photodiode Detector	512 element Si array (280–1000nm)	512 element Si array (280–1000nm)	512 element Si array (280–1000nm)	512 element Si array (280–1000nm)
InGaAs Photodiode Detectors (TE-cooled)	256 element extended wavelength array (970–1900nm) 256 element extended wavelength array (1900-2500nm)	256 element extended wavelength array (970–1900nm)	256 element extended wavelength array (970–1900nm)	256 element extended wavelength array (1000– 2500nm)
Suggested FOV Options	Right angle diffuser with fiberoptic, integrating sphere	Right angle diffuser with fiberoptic, integrating sphere	Right angle diffuser with internal phototrigger, integrating sphere	Right angle diffuser with internal phototrigger, integrating sphere
Calibration	Factory calibrated to NIST traceable irradiance source	Factory calibrated to NIST traceable irradiance source	Factory calibrated to NIST traceable irradiance source	Factory calibrated to NIST traceable irradiance source
Integration Time	1 -1000 ms	1-1000 ms	1-50 ms	1-50 ms
Wavelength Reproducibility	0.1nm	0.1nm	0.1nm	0.1nm
Wavelength Accuracy	±0.5 bandwidth	±0.5 bandwidth	±0.5 bandwidth	±0.5 bandwidth
Communications interface	USB or Class I Bluetooth– laptop or PDA compatible	USB or Class I Bluetooth– laptop or PDA compatible	USB or Class I Bluetooth– laptop or PDA compatible	USB or Class I Bluetooth– laptop or PDA compatible
Size	8.5" x 11" x 3.5"	8.5" x 11" x 3.5"	8.5" x 11" x 3.5"	8.5" x 11" x 3.5"
A/D Converter	16 bit	16 bit	16 bit	16 bit
Weight	7.5 lbs	7.5 lbs	7.5lbs	7.5lbs
Power	7.5V, 23W	7.5V, 18W	7.5V, 15W	7.5V, 15W
Spectral Match	AM0, AM1.5, AM 1.5 global tilt	AM0, AM1.5, AM15 global tilt	AM0, AM1.5, AM 1.5 global tilt	AM0, AM1.5, AM 1.5 global tilt
TTL	Yes	Yes	Yes	Yes
Phototriggering	No	No	Yes	Yes

SPECTRAL EVOLUTION

Classifying Continuous and Pulsed Solar Simulators with Portable Spectroradiometers

SPECTRAL EVOLUTION

# Test solar simulators for spectral match, uniformity, and stability

Continuous

Spectral Evolution spectroradiometers provide accurate, affordable solar simulator measurement for validating the classification of any commercial continuous or pulsed solar simulators.

Solar simulators are used by PV module and solar panel manufacturers to ensure that their products deliver the promised power and performance over an extended period of time—often 25 years. Uncertainty or error in power and performance ratings can have an impact on a manufacturers profit. To ensure that they are providing accurate ratings, solar manufacturers use solar simulators to test cells, modules and panels by reproducing outdoor operating conditions in natural sunlight. Solar simulators can be either continuous (steady-state) or pulsed (short or long pulsed).

For continuous solar simulators — the SR-3501 and SR-1901 can collect spectral data using a right angle diffuser and compare the measured light to the Class A, B, and C specifications for spectral match, uniformity, and stability over time. The instruments include a NIST-traceable irradiance calibration to ensure accurate and reproducible measurements. The spectroradiometers measure for the ability of the simulator to meet standards for spectral match, spatial uniformity and temporal stability.

The SR-3501 uses three detectors (1 silicon photodiode array detector and 2 InGaAs array detectors) to cover the spectral range from 280-2500nm. The SR-1901 uses a silicon photodiode array detector and a single InGaAs array detector to cover the spectral range from 280-1900nm.
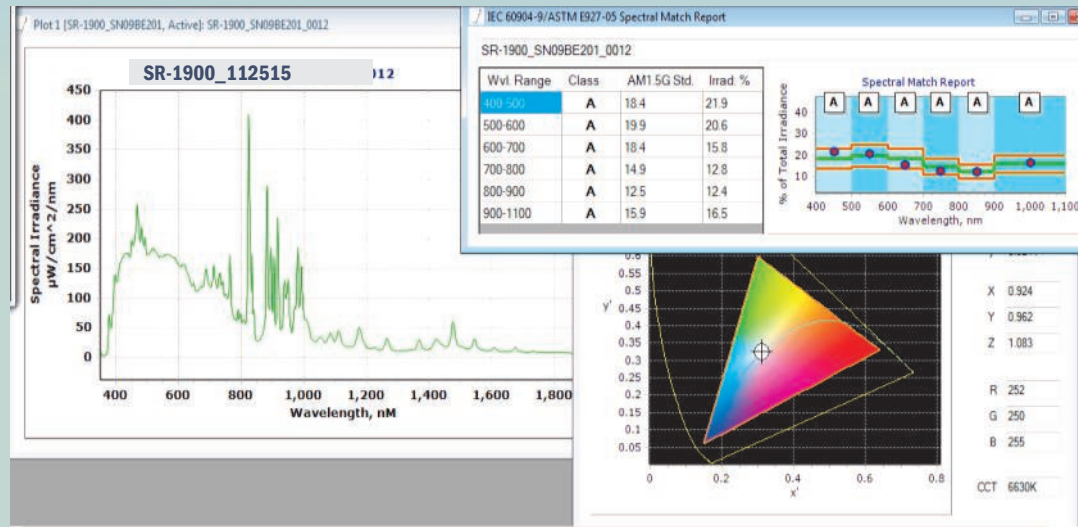

Our exclusive DARWin SP Data Acquisition software includes pull down menus to access our simulator classification report and CIE color chart. Above, the SR-1901 was used to classify a solar simulator according to IEC60904-9/ASTM E927-05. The software contains subroutines to analyze class performance and create spectral match reports as seen here.

Pulsed
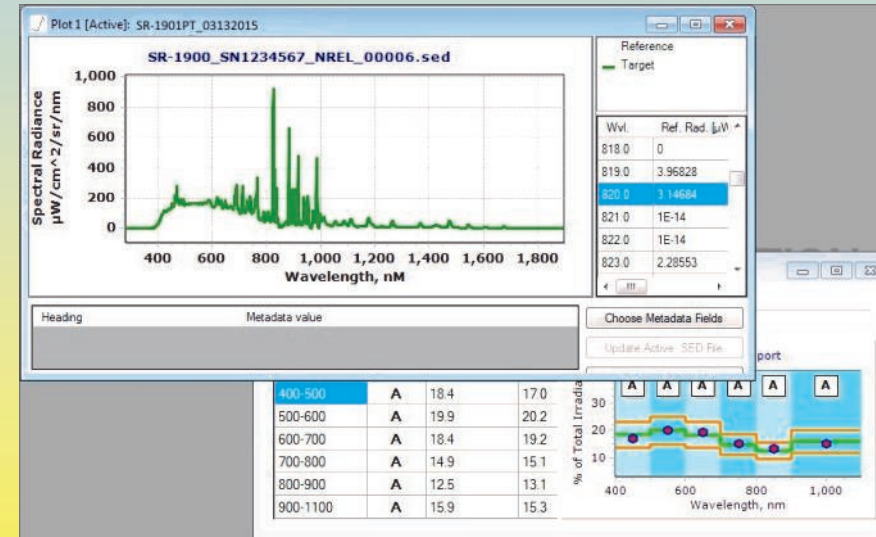
DARWin SP provides similar capabilities for pulse/flash solar simulators for spectral match reports, uniformity reports, and stability over time reports. Above is an example of a spectral match for the SR-1901PT. Below is a sample report for spectral uniformity that integrates total energy detected over a user-defined wavelength.
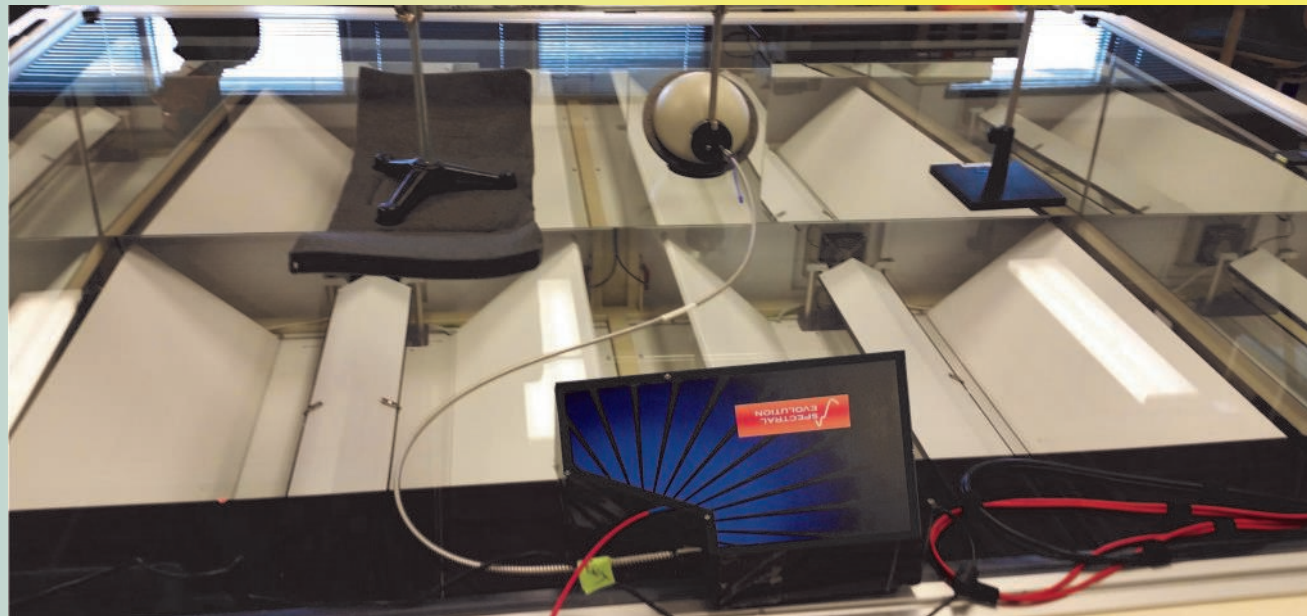
The SR-3501 and SR-1901 are designed for use with continuous solar simulators; the SR-1901PT (pictured) and SR-2501PT are designed for classifying pulsed (sometimes called flash) simulators. Our spectroradiometers can be configured with a straight or right angle diffuser for solar simulator measurement and classification. The SR-1901PT and SR-2501PT also include a phototrigger sensor integrated into the cosine corrected right angle diffuser.

For pulsed solar simulators, Spectral Evolution offers the revolutionary SR-1901PT and SR-2501PT. These spectroradiometers are able to classify both long and short pulse solar simulators to IEC and ASTM standards. Pulsed solar simulators apply a flash-type illumination for a short duration. Engineers using pulsed solar simulators to test cells, panels, and modules for spectral match, uniformity, and stability over time, like pulsed simulators because they are accurate, faster, and have less impact on the module/panel being tested. It's also easier to fit the testing into a production process.

The SR-1901PT and SR-2501PT measure spectral match to ensure that the simulator is outputting the equivalent of natural sunlight to established standards. They measure uniformity to ensure that the simulator is providing the amount of light it promises over the entire area it covers. They measure stability to ensure that the amount of light provided is constant over time.

Equipped (like all Spectral Evolution instruments) with our DARWin SP Data Acquisition software, the SR-1901PT and SR-2501PT can produce a spectral match report showing system classification, a spectral uniformity report including an integration utility that allows the user to integrate total energy detected over a user-defined wavelength range, and a spectral stability report. Using this information, a solar simulator can be aligned and corrected with minor adjustments to maximize key benefits.

The SR-1901PT has a spectral range of 280-1900nm while the SR-2501PT has a range of 280-2500nm. They both feature adjustable integration and scan averaging time, internal phototrigger with SMA-905 port, 0-100 millisecond trigger delay increment, external TTL triggering input port, and NIST-traceable irradiance calibration.