



SR-4500 and SR-4500A Spectroradiometers

Radiometric Calibration Transfer



Radiometric Calibration Transfers with Precise, Stable, and Repeatable Performances

Integrating spheres, with their uniform radiance distribution, are used in a range of testing and calibration applications for imaging and non-imaging sensors, such as focal plane arrays and hyperspectral cameras. The integrating spheres are used to perform pixel gain normalization, photographic sensitometry, and remote observation system calibration. Integrating spheres may require calibration with system lamps that have high operating hours, light sources more than two years old, or simply to meet mandates for periodic calibration. Shipping the spheres back to the manufacturer for calibration takes time and money and can be difficult since many are quite large. Radiometric calibration transfer from a smaller instrument provides a solution.

An ideal transfer standard according to NIST would have uniform and smooth power distribution with high correlated color temperature across the intended spectral range, low aging rate, uniform spatial intensity distribution, and good reproducibility.

The Spectral Evolution SR-4500 and SR-4500A spectroradiometers deliver the ultimate in high performance radiometric calibration transfer with stable temperature control across a range of ambient temperatures and environments.

Using all thermoelectrically cooled photodiode arrays, this spectroradiometer is built specifically for the performance demands of calibration transfer applications. The SR-4500 and SR-4500A spectroradiometers are portable so you can take the calibration process to the sphere—eliminating unnecessary downtime and cumbersome shipment back to the manufacturer. They also deliver twice the Noise Equivalence Radiance capabilities.

SR-4500:

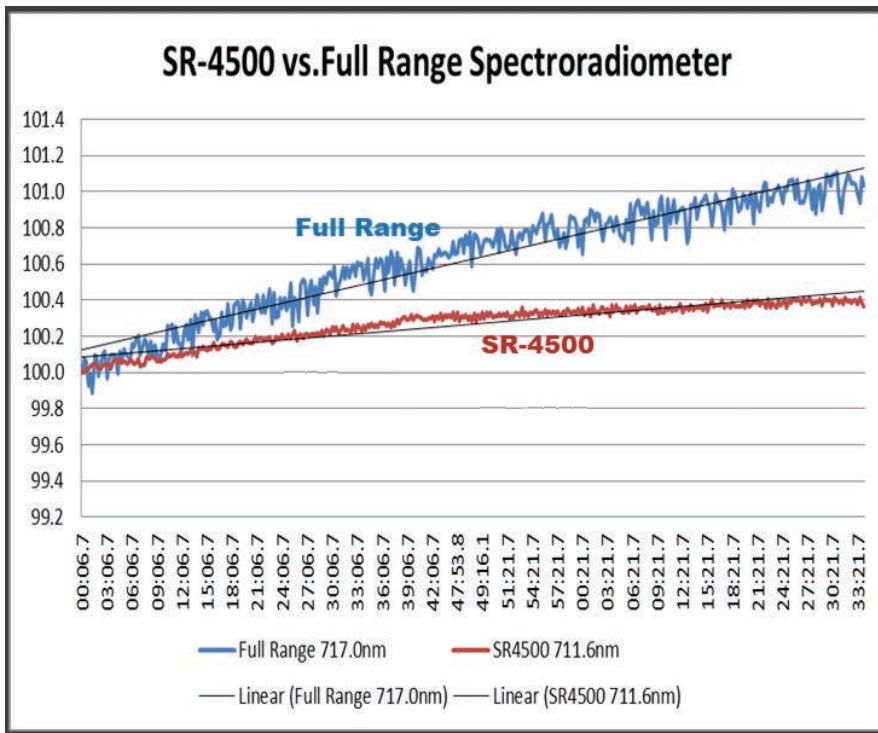
- Spectral range 350-2500nm
- 512 element TE-cooled silicon photodiode array (350-1000nm)
- 256 element TE-cooled extended InGaAs photodiode array (1000-1900nm)
- 256 element TE-cooled extended InGaAs photodiode array (1900-2500nm)

SR-4500A:

- Drift stability improved to 0.1% for greater accuracy for long-term stability measurements of integrating spheres and light sources
- Stability achieved through heating and cooling thermal management features
- A temperature controller maintains the instrument housing at a stable temperature along with the individually temperature stabilized detector arrays
- All temperatures are integrated into DARWin™ SP Data Acquisition software readout for monitoring



The SR-4500 has a fixed fiber mount that pairs the optical slit and fiber at the connection. The mount allows fibers to be interchanged if longer fibers are needed for a unique application.



Comparison of Si detector stability – SR-4500 vs. a full range spectroradiometer without a TE-cooled silicon array

The Spectral Evolution SR-4500 and a full range spectroradiometer were run side-by-side at room temperature (23°C), measuring the radiance of the same 50-watt tungsten halogen source using a 1.2 meter fiber optic cable reflected off the same 5x5 inch reflectance panel. The x axis shows elapsed time from the start of the test; the y axis represents the ratio of the measured radiance value to the starting radiance value, over a period of 154 minutes. The SR-4500 uses a 512-element silicon photodiode array which was thermoelectrically cooled to 10°C.

The full range spectroradiometer uses a 512-element silicon photodiode array which is not thermoelectrically cooled. After a 30-minute period, the SR-4500 shows very little drift. The spectroradiometer demonstrates a slightly wider variation over the course of the test. Both instruments use identical thermoelectrically cooled extended range InGaAs photodiode arrays for NIR performance. The SR-4500 also offers improved NER measurement—better than 2x the performance available with a typical full range spectroradiometer.

SR-4500A—Maximum Drift Stability

The Spectral Evolution SR-4500A is designed to provide maximum 0.1% drift stability. This offers the ability to more accurately calibrate spheres and light sources that calibrate precision sensors in satellites, hyperspectral systems, and UAVs. Better sensor calibration results in better quality and interpretability of remote sensing data.

The SR-4500 and SR-4500A with three thermoelectrically cooled photodiode arrays deliver the ultimate stability in radiometric calibration transfer.

SR-4500/SR-4500A Technical Specifications:

Spectral range: 350-2500nm

Photodiode Arrays:

- 512 element TE cooled Si (350-1000nm)
- 256 element TE cooled extended InGaAs (1000-1900nm)
- 256 element TE cooled extended InGaAs (1900-2500nm)

All dispersive optics fixed in place – no moving parts

Auto dark current shutter & auto-exposure control

Fixed metal clad fiber optic cable with SMA-905 input

(fiber is user removable with 4 bolts)

Wireless Connection and USB interfaces

Comes complete with DARWin SP Data Acquisition Software

(Windows XP/Vista/System 7 compatible)

Minimum scan speed: 100milliseconds

Spectral resolution:

- 3nm (350-1000nm)
- 8nm @ 1500nm
- 6nm @ 2100nm

Sampling bandwidth:

- 1.5nm (350-1000nm)
- 3.8nm @1500nm
- 2.5nm @ 2100nm

Noise Equivalence Radiance (with 1.2 meter fiber optic):

- 0.2×10^{-9} W/cm²/nm/sr @ 400nm
- 0.2×10^{-9} W/cm²/nm/sr @ 700nm
- 0.9×10^{-9} W/cm²/nm/sr @ 900nm
- 1.2×10^{-9} W/cm²/nm/sr @ 1500nm
- 1.8×10^{-9} W/cm²/nm/sr @ 2100nm

Max Radiance @ 700nm (1.2m fiber optic): 3.0×10^{-4} W/cm²/nm/sr

SR-4500 Stability Specification

2.0% drift stability

SR-4500A Stability Specification

0.1% drift stability



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