

BROCHURE

# **SPECTROSCOPY CONFIGURATIONS FOR IRRADIANCE MEASUREMENTS**





# IRRADIANCE MEASUREMENTS

Avantes instruments and accessories have been used successfully in a multitude of radiometry applications. Use cases include display monitoring, laser characterization, direct solar and solar simulator measurements, LED metrology, UV radiometry, pulsed source measurements and many more. The flexibility of Avantes instrument platform and ability to couple collection optics (integration sphere, collimator, cosine correctors) easily via fiber optic make Avantes instruments ideal for many customers and applications. Avantes offers fully NIST traceable calibrations from 200-2500 nm as well as uncalibrated systems for customers who may have access to their own calibration facilities. Some of the many advantages of Avantes radiometry solutions include:

- Value – Avantes instruments have a superior price/performance ratio
- Micro-sampling for small sources or spot measurements– by using fiber optics
- Speed – Micro spectrometers can support sampling at KHz rates and higher
- Non-invasive/non-contact sampling
- Versatility – ability to achieve different configurations from one instrument

The following details some common configurations used in radiometry applications. It is by no means a complete list of all possible configurations but it provides some ideas. Avantes is not a manufacturer of integrated turnkey solutions, rather a component supplier for radiometry.

## COMMON APPLICATION IN IRRADIANCE



Solar Simulator



Atmospheric



Lighting



Ultra-Violet Germicidal



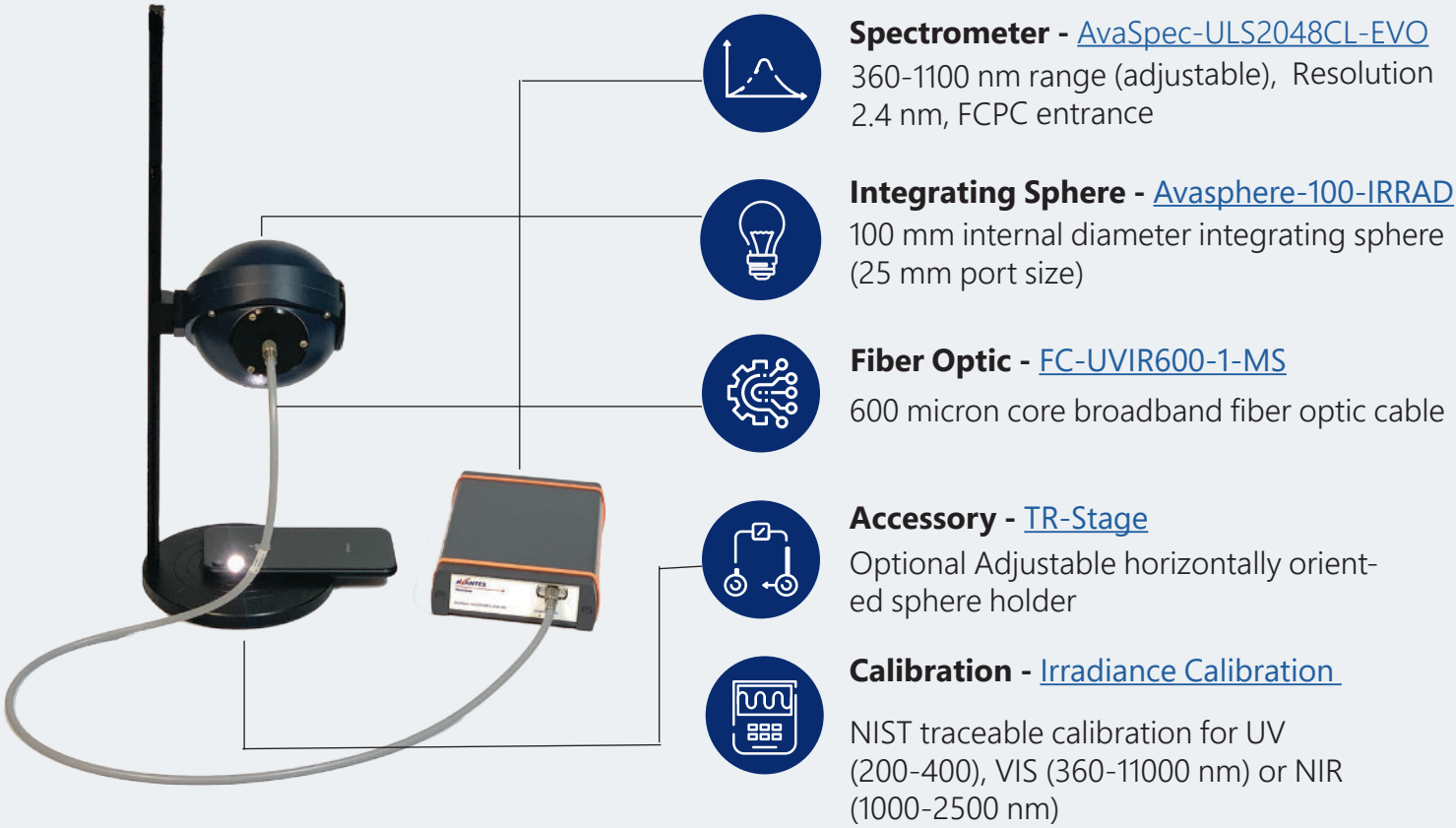
UV Field Measurement




Greenhouse/ Horticulture

# SPHERE BASED RADIOMETRY SYSTEMS


Avantes sphere based systems are designed for measurements of LED source or distance measurements of omni-directional point sources. Avantes offers 30, 50, 80, 100, 200 and 300 mm internal diameter integrating spheres designed for measuring external sources. All integrating sphere detector ports are baffled to avoid direct illumination. Avantes 30, 50 and 100 mm sphere are made from machined PTFE while the 100, 200 and 300 mm spheres are Spectralon coated spheres from our partner LabSphere. Avantes uses a keyed FCPC entrance connections for the spectrometer on all radiometry configurations and FCPC terminated fibers allowing for connection/reconnection without violation of the calibration.




SMALL SPHERE RADIOMETRY SYSTEM




**Spectrometer** - [AvaSpec-ULS2048CL-EVO](#)  
360-1100 nm range (adjustable), Resolution 2.4 nm, FCPC entrance




**Fiber Optic** - [FC-UVIR600-1-MS](#)  
600 micron core broadband fiber optic cable, FCPC termination end 1, SMA905 termination end 2




**Integrating Sphere** - [Avasphere-50-IRRAD](#)  
Integrated light source  
50 mm integrating sphere



**Accessory** - [TR-Stage](#)  
Transmission stage  
Optional integrating sphere holder



**Calibration** - [Irradiance Calibration \(Not Pictured\)](#)  
NIST traceable calibration for UV (200-400), VIS (360-11000 nm) or NIR (1000-2500 nm)

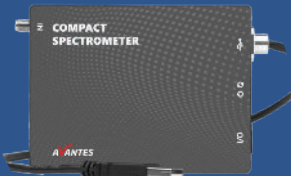


Optional Instrument Choices:

The spectrometer may be upgraded to the [AvaSpec-ULS2048X64-EVO](#) for improved signal to noise, and extended sensitivity in the 800-1100nm region. A more economical configuration can be offered with the [AvaSpec-PCT2048CL](#) For measurements in the 1000-1700 nm please consider the [Avantes NIR spectrometer](#) for 900-1700 nm (AvaSpec-NIR256-1.7.-HSC-EVO or AvaSpec-NIR256-1.7-EVO).



Avaspec-ULS2048X64-EVO




AvaSpec-PCT2048CL




NIR Spectrometer

LASER POWER AND WAVELENGTH METROLOGY SYSTEM


Laser power and wavelength validation systems provide for simultaneous power and wavelength metrology.




**Spectrometer** - [AvaSpec-ULS2048CL-EVO](#)  
360-1100 nm range (adjustable), Resolution 2.4 nm, FCPC entrance




**Integrating Sphere** - [Avasphere-50-IRRAD](#)  
Integrated light source  
50 mm integrating sphere



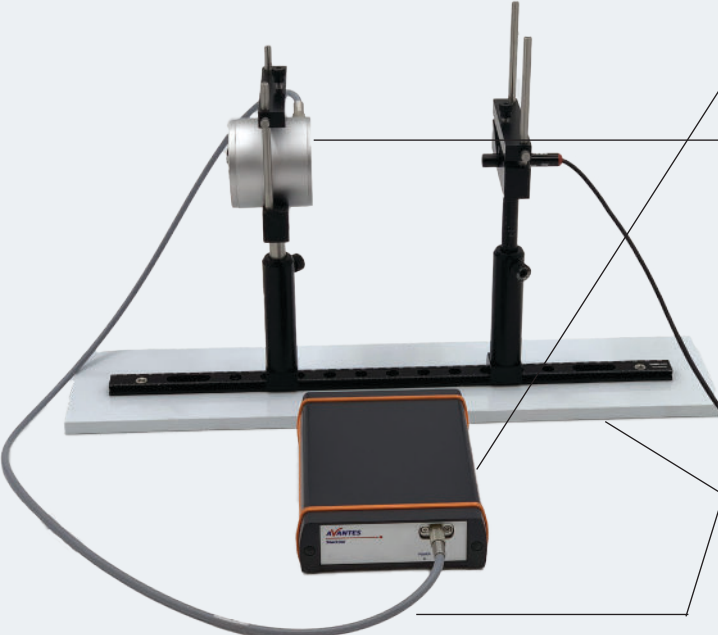
**Fiber Optic** - [FC-UVIR600-1-MS](#)  
600 micron core broadband fiber optic cable, FCPC termination end 1, SMA termination end 2



**Accessory** - [TR-Rail-US](#)  
(Optional) Adjustable horizontal rail holder for transmission and irradiance measurements



**Calibration** - [Irradiance Calibration](#)  
NIST traceable calibration for UV (200-400), VIS (360-11000 nm) or NIR (1000-2500 nm)



Optional Instrument Choices:

For pulsed lasers, the IC-DB26-Extrig-2-BNC external triggering cable may be used or Avantes [Avatrigger](#) external triggering box can be used if optical triggering is required. For measurements in the 1000-1700 nm please consider the Avantes [NIR spectrometer](#) for 900-1700 nm (AvaSpec-NIR256-1.7.-HSC-EVO or AvaSpec-NIR256-1.7-EVO).



AvaTrigger




NIR Spectrometer




UV, VIS OR VIS/NIR IRRADIANCE SYSTEM


A cost-effective alternative to the integrating sphere is the cosine corrector which has a 180 degree field of view fore-optic which attaches to a fiber optic and after calibration provides for an effective tool for irradiance measurements. Avantes offers a variety of sizes of cosine correctors




**Spectrometer** - [AvaSpec-ULS2048CL-EVO](#)  
UV – 200-400 nm; VIS – 360-800 nm; VIS/NIR – 360-1100 nm




**Fiber Optic** - [FC-UVIR600-1-MS](#)  
600 micron core broadband fiber optic cable, FCPC termination end 1, SMA905 termination end 2



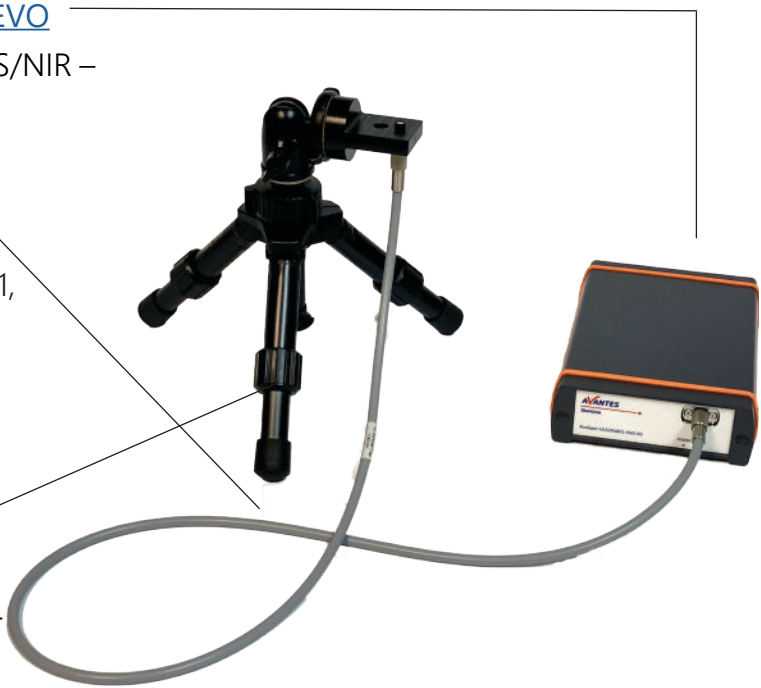
**Accessory** - [CC-VIS/NIR](#)  
cosine corrector



**Accessory** - [Ava-Tripod](#)  
Cosine corrector/collimating lens holder



**E. Calibration** - [Irradiance Calibration](#)  
NIST traceable calibration for UV (200-400), VIS (360-11000 nm) or NIR (1000-2500 nm)

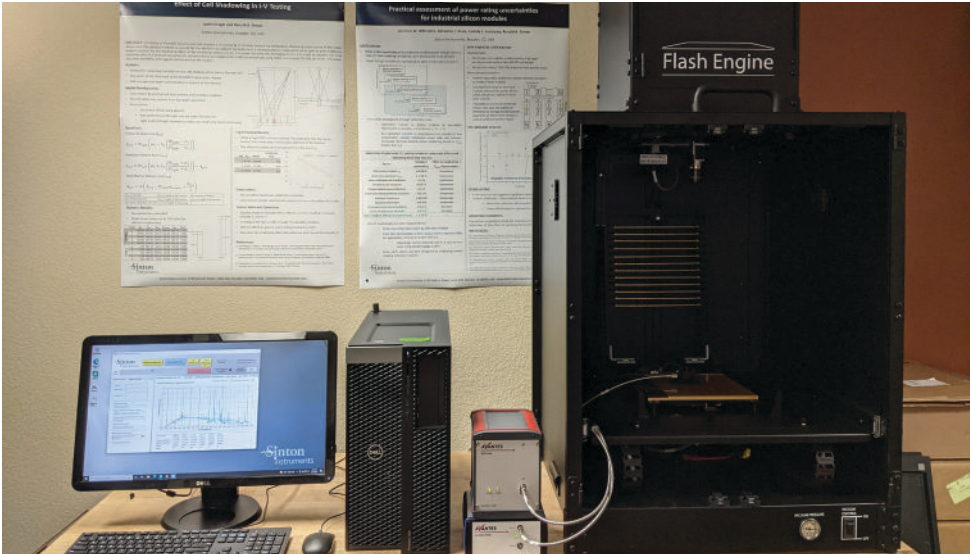


ALTERNATIVE SPECTROMETER OPTION



**AvaSpec-NIR256-1.7-HSC-EVO or AvaSpec-NIR256-1.7-EVO:**  
For measurements in the 1000-1700 nm please consider the Avantes NIR spectrometer for 900-1700 nm

AVASPEC-SOLARXM - SOLAR SIMULATOR  
(AVAILABLE IN NORTH AMERICA ONLY)



Solar simulator characterization is made easy with the [AvaSpec-SolarXM](#) and AvaSpec-SolarXM-Dual spectroradiometer system. These calibrated systems consists of the [AvaSpec-ULS2048XL-EVO](#) back-thinned CCD spectrometer, [AvaSpec-NIR256-1.7-HSC-EVO](#) (Dual only), 2 meter fiber optic (bifurcated fiber for the dual system), 90 degree cosine receptor, dedicated software application and NIST traceable calibration. The system and software are fully compliant with IEC 60409-9 (2016) for pulsed or steady state solar simulators providing A, B or C classification across six spectral bands. The previous 2007 IEC standard covered the range from 400-1100 nm but the new standard covers 300-1200 nm.

|                        |   |  |
|------------------------|---|--|
| Model                  | AvaSpec-SolarXM   | AvaSpec-SolarXM-Dual   |
| Spectrometer           | AvaSpec-ULS2048XL-EVO   | AvaSpec-ULS2048XL-EVO;<br>AvaSpec-NIR256-1.7-EVO   |
| Grating(s)             | Grating VA – 300 grooves/mm   | Grating VA- 300 grooves/mm<br>Grating NIR 400-1.2 – 400 grooves/mm                                   |
| Slit Size              | Slit-50   | UV/VIS – Slit 50<br>NIR – Slit 50 replaceable  |
| Wavelength range       | 300-1100 nm   | Channel 1: 300-1100 nm<br>Channel 2: 950-1200 nm   |
| Signal to Noise        | 525:1   | UV/VIS 525:1<br>NIR: 5000:1  |
| Calibration            | Wavelength calibration, irradiance calibration to NIST traceable standard 360-1100 nm               | Wavelength calibration, irradiance calibration to NIST traceable standard 360-1200 nm                |
| Integration time range | 2 µs to 20 seconds  | 2 µs to 20 seconds   |
| Dynamic range          | 13,700  | 13,700   |
| Fiber Optic            | FC-UVIR400-2-BX-FC/SMA  | FCB-UVIR400-2-BX-FC/SMA  |
| Collection Optic       | COL-90-UV/VIS-CC-CRADLE   | COL-90-UV/VIS-CC-CRADLE  |
| Avatrigger             | Optional External trigger box<br>Requires upgrade to bifurcated fiber (FCB-UVIR400-2-BX-FC/SMA-SP1) | Optional External trigger box<br>Requires upgrade to trifurcated fiber (FC3-UVIR400-2-BX-FC/SMA-SP1) |



# AVASPEC SOLARXM SOFTWARE

(AVAILABLE IN NORTH AMERICA ONLY)

## AvaSoft Software

This calibrated system can be operated using Avantes proprietary AvaSoft software which has a special module (AvaSoft-IRRAD) dedicated to radiometry. The software provides the following parameters: Average LED Intensity, X, Y, Z, x, y, z, u, v, CRI, Color Temperature, Dominant Wavelength, Complementary Dominant Wavelength, FWHM, Centroid, Peak Wavelength & Purity

## Sinton Instruments Software

Sinton instruments is a leading company in the world of solar metrology technologies. Sinton provides the controlling software for the AvaSpec-SolarXM/Dual. The software provided by Sinton Instruments is fully compatible with Avantes DLL so it is capable of controlling the spectrometers settings including integration time, averaging, external trigger delay, merging of spectra. It is also capable of supporting both pulsed or continuous solar simulators.

The software also provides a reference spectrum for AM 1.5 which is loaded automatically during spectral acquisition for comparison to the acquired spectra. Both the 2007 and 2016 proposed IEC 60904 standards are supported for the software. All spectral bands are calculated with A, B, C scoring provided. The software provides for report and certificate print outs as well as data file exporting. The application has the ability to determine spectral mismatch factor between the measured and reference spectrums for a given device by uploading device quantum efficiency curves. Additionally, it supports the ability to compare measured and reference spectrums either by irradiance (as defined by the IEC standard), or by photon flux, which is more relevant for determining the impact on measured current.

# SUPPORT & ADVICE

Providing high-quality equipment is only part of what we do. The other equally important factor is the high level of service we deliver. Our organization includes various specializations to provide you with the best service and advice:

## Feasibility studies

Our sales engineers perform feasibility studies to find the right solution.

## Support team

Our support team never sleeps and provides you with the best service.

## Demo program

Our demo program allows you to try our products for free to ensure you find the perfect solution.

## MyAvantes

Personal platform where you'll find AvaSoft Software and other material.

## Online support

Helpful documents and tutorial videos for extra help with your products.



# ABOUT AVANTES

Avantes is the leading innovator in the development of fiber-optic spectroscopy instruments and systems with nearly 30 years of experience developing customer-defined configurations.

With a long history of consulting with clients across diverse industries and applications, **Avantes is an experienced partner, equipped to guide customers who want a solution tailored to their application and research needs.** By building world-class spectrometers and providing second-to-none customer service, Avantes offers customers the peace of mind that the Avantes solutions they purchase will meet, and exceed, their expectations.

Through our headquarters in Apeldoorn, the Netherlands and offices in the USA and China, our sales engineers work closely with our customers to recommend the optimal measurement solution. In addition to our direct offices, **Avantes has a worldwide network of distributors in over 35 countries who are ready to assist you.** Our production team, which is located at our headquarters in the Netherlands, is dedicated to quality workmanship and has a relentless drive to exceed customer expectations.

Curious how spectroscopy can help you reveal answers by measuring all kind of materials in-line at your production facility, in a lab or in the field? **Please contact one of our technical experts, we are happy to help!**

## CONTACT

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# WE'RE HAPPY TO HELP

Curious how spectroscopy can help you reveal answers by measuring all kind of materials, in-line, at your production facility, in a lab or even in the field? Please visit our [website](#) or contact one of our technical experts, we're happy to help you.

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