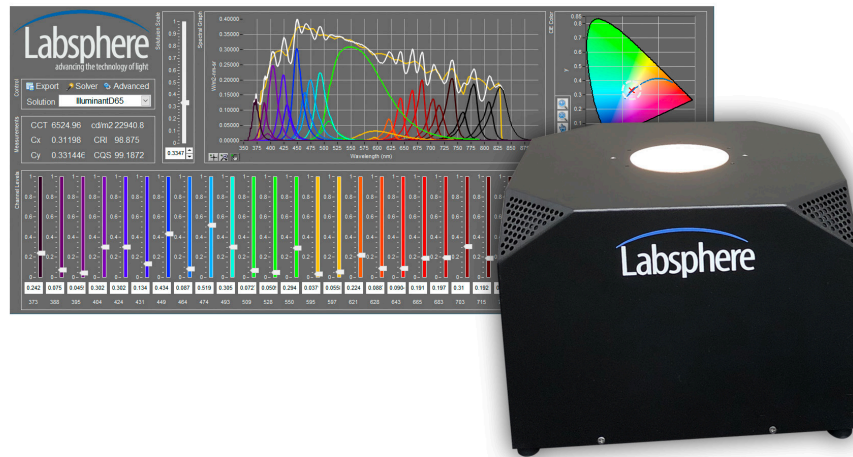


# VIS-NIR Tunable Spectral Sources for Image Sensor Characterization



## Trusted test data

Labsphere is a recognized leader in image sensor calibration sources. Our Tunable Image Sensor Characterization Sources are engineered for the high performance requirements in image sensor research, development and production testing and calibration.

## Save money, save space

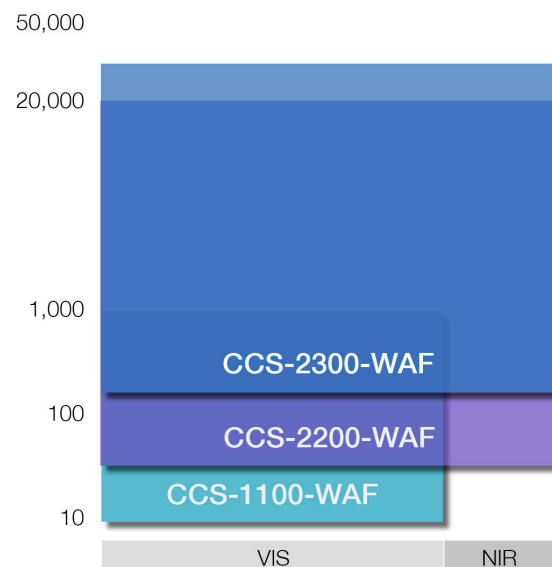
One instrument produces unlimited spectrums. Large area uniform radiance field in a compact and robust instrument. The sources are designed to easily mount in a production test station with active spectral feedback and user recalibration features.

## Repeatable, reproducible results

With Labsphere's diffuse reflectance material, Spectralon®, and thermal-controlled LED module, long term repeatability and reproducibility are ensured.

## Highly uniform sources of spectral radiance that can accurately reproduce almost any spectrum from 390 nm to 1000 nm

- Uniformly irradiate imagers and optical sensors with a flat field of light over 360° x 200° FOV
- VIS and VIS/NIR options covering 10 cd/m<sup>2</sup> to 35,000 cd/m<sup>2</sup>
- Users have unlimited spectrum reproduction options and spectral weighting



# Features and Applications

## Measurement Applications

- Cross Talk
- Color Balance
- Distortion
- Dynamic Range
- Flat Fielding
- ISO Speed
- Linearity
- Pixel Defects
- Pixel Shading
- PRNU
- Quantum Efficiency
- Saturation Exposure
- Sensitivity
- Signal-to-Noise
- Spatial and Angular Non-Uniformity
- Vignetting Correction
- White Balance, White Noise

## Industry Applications

- Ambient Light Sensor Calibration
- Automotive Camera Calibration
- CMOS Image Sensor Test
- Lens Testing
- Mobile Camera Calibration
- Photodiode Responsivity
- RGB Sensor Test
- Spectrum/Illuminant Simulation
- Technical and Industrial Photography

## Features

- Resolution and Accuracy – 15, and 32 channels (18, 42, 84 LEDs) in the Visible and NIR
- User Spectral Optimization – Quickly simulate any spectrum
- Create and match the combination of multiple spectrums
- Performance Metrics – Built-in spectral fidelity metric A' and color performance matching metrics of any simulated spectra
- Built-in spectrometer monitor and feedback loop to ensure accurate spectral output and correction for every wavelength channel
- Built-in user spectral radiance reference for user recalibration
- Convert between radiance and irradiance values and geometries
- Extended use life with built in user recharacterization and calibration features
- No down time returning unit for recalibration
- DC constant current drivers and thermal control for continuous stable performance
- Viewing Area – Large area 75 mm uniform radiance port
- Exceptional uniformity from narrow to 180° field of view (FOV)
- Quick Integration – Compact and robust for tester and production line integration

## Calibration\*

The spectral radiance of the source is monitored with an embedded spectroradiometer. The systems include a stable quartz tungsten halogen reference source used to recalibrate the spectral radiance responsivity of the spectroradiometer at the discretion of the user. This ensures NIST traceable continuous accurate spectral monitoring of the performance of the systems.

## Active Feedback Control\*

Achieve reproducible results with the active feedback control feature enabled. The calibrated embedded spectroradiometer can be used to measure and correct for any spectral radiance changes due to ambient conditions, inter reflections during test or long term drift, ensuring stability and optimal performance over time. Unlike broadband monitors the spectral feedback measures the total spectral distribution and corrects for individual LED input to the total spectral output.

## System LED Characterization\*

Limit down time by not having to return your source to the supplier for recharacterization with this embedded analytical feature! Characterization data are used to create the underlying predictive output model of the tunable calibration source system used for optimizing the spectral radiance to desired target spectra. The characterization feature is performed with the internal spectroradiometer of the tunable calibration source. The user can use this feature after long term use to recalibrate the spectral radiance of the source.

\*applies to Labsphere's tunable calibration sources with the embedded spectroradiometer



# Specifications

	CCS-1100-WAF AA-01367-300	CCS-2200-WAF AA-01577-000	CCS-2300-WAF AA-01577-001
Source Geometry:	75 mm diameter uniform output with 180° FOV Lambertian radiant source. Mid Range	75 mm diameter uniform output with 180° FOV Lambertian radiant source. High Range	75 mm diameter uniform output with 180° FOV Lambertian radiant source. Extreme Range
Spectral Resolution A':	12%	6 to 10%	6 to 10%
Initial Warm-Up Time:	500 msec	500 msec	500 msec
Operating Temp:	20 - 40°C, 0 - 70% RH	20 - 40°C, 0 - 70% RH	20 - 40°C, 0 - 70% RH
Spatial Uniformity:	≥96% over 180°	≥98% over 180°	≥98% over 180°
Optical Geometry:	Labsphere Integrating Sphere Technology	Labsphere Integrating Sphere Technology	Labsphere Integrating Sphere Technology
Typical Radiance Range:			
Illuminant E:	VIS maximum of 25 W/m <sup>2</sup> -sr-μm VIS minimum of 2 W/m <sup>2</sup> -sr-μm (spectrum dependent)	VIS-NIR maximum of 250 W/m <sup>2</sup> -sr-μm VIS-NIR minimum of 15 W/m <sup>2</sup> -sr-μm (spectrum dependent)	VIS-NIR maximum of 325 W/m <sup>2</sup> -sr-μm VIS-NIR minimum of 20 W/m <sup>2</sup> -sr-μm (spectrum dependent)
Typical Luminance Range:			
III A:	Typical range of 10 to 800 cd/m <sup>2</sup>	Typical range of 200 to 10,000 cd/m <sup>2</sup>	Typical range of 260 to 13,000 cd/m <sup>2</sup>
D65:	Typical range of 10 to 1000 cd/m <sup>2</sup>	Typical range of 300 to 16,000 cd/m <sup>2</sup>	Typical range of 400 to 25,000 cd/m <sup>2</sup>
Spectral Range:	400 nm to 700 nm, 850 nm	380 nm to 1000 nm	380 nm to 1000 nm
Spectral Output:	15 channels, 405 nm, 420 nm, 435 nm, 451 nm, 475 nm, 505 nm, 525 nm - 530 nm, 565 nm, 584.5 nm - 594.5 nm, 610 nm - 620 nm, 645 nm, 660 nm, 680 nm, 700 nm, 850 nm, 940 nm, and Calibration Lamp  Visible resolution ~ 15 nm, NIR resolution ~ 50 nm (typical channel spacing)	32 channels, 42 LEDs 375 nm, 385 nm, 395 nm, 405 nm, 420 nm, 435 nm, 450 nm, 460 nm, 470 nm, 490 nm, 505 nm, 520 nm, 590 nm, 620 nm, 630 nm, 645 nm, 660 nm, 680 nm, 700 nm, 720 nm, 740 nm, 760 nm, 780 nm, 810 nm, 830 nm, 850 nm, 880 nm, 910 nm, 940 nm, 980 nm, Lime Green, Amber, and Calibration Lamp Visible resolution ~ 15 nm, NIR resolution ~ 50 nm (typical channel spacing)	32 channels, 84 LEDs 375 nm, 385 nm, 395 nm, 405 nm, 420 nm, 435 nm, 450 nm, 460 nm, 470 nm, 490 nm, 505 nm, 520 nm, 590 nm, 620 nm, 630 nm, 645 nm, 660 nm, 680 nm, 700 nm, 720 nm, 740 nm, 760 nm, 780 nm, 810 nm, 830 nm, 850 nm, 880 nm, 910 nm, 940 nm, 980 nm, Lime Green, Amber, and Calibration Lamp Visible resolution ~ 15 nm, NIR resolution ~ 50 nm (typical channel spacing)
Color Accuracy:	0.001 - 0.003	0.0001 - 0.002	0.0001 - 0.002
Spectral Bandwidth:	Typical: Visible 20 nm FWHM, NIR 50 nm FWHM	Typical: Visible 20 nm FWHM, NIR 50 nm FWHM	Typical: Visible 20 nm FWHM, NIR 50 nm FWHM
CCT Range:	1900K to 40000K	1900K to 40000K	1900K to 40000K
Preset Spectra:	CIE Illuminants A, B, C, D50, D55, D65, D75, E, X-Rite Macbeth ColorChecker®, SSL Custom preset spectra upon request <b>NO LIMITS to the spectra the customer can upload and optimize output</b>	CIE Illuminants A, B, C, D50, D55, D65, D75, E, 3000K, 4000K, 5000K X-Rite Macbeth ColorChecker®, SSL Custom preset spectra upon request <b>NO LIMITS to the spectra the customer can upload and optimize output</b>	CIE Illuminants A, B, C, D50, D55, D65, D75, E, 3000K, 4000K, 5000K X-Rite Macbeth ColorChecker®, SSL Custom preset spectra upon request <b>NO LIMITS to the spectra the customer can upload and optimize output</b>
Electrical Resolution:	12 bit DAC for channel current drivers	16 bit DAC for channel current drivers	16 bit DAC for channel current drivers
LED Control:	DC constant current	DC constant current	DC constant current
<b>Software:</b>	<b>Includes full spectral calibration with spectral fitting, preset storage, real-time optical feedback, radiometric and photometric units supported, user optimization, and recharacterization and recalibration programs</b>	<b>Includes full spectral calibration with spectral fitting, preset storage, real-time optical feedback, radiometric and photometric units supported, user optimization, and recharacterization and recalibration programs</b>	<b>Includes full spectral calibration with spectral fitting, preset storage, real-time optical feedback, radiometric and photometric units supported, user optimization, and recharacterization and recalibration programs</b>
Interface Connectors:	USB 2.0 type B	USB 2.0 type B	USB 2.0 type B
Interface Protocol:	TPC Command Sets	TPC Command Sets	TPC Command Sets
Supported Operating System:	Windows 10	Windows 10	Windows 10
Input Voltage and Power:	110 to 240 VAC at 50 - 60 Hz	110 to 240 VAC at 50 - 60 Hz	110 to 240 VAC at 50 - 60 Hz
Dimensions:	Source: H 25 cm, W 18 cm, D 18 cm Power Module: H 14 cm, W 23 cm, D 37 cm	Source: H 23 cm, W 29.5 cm, D 29.5 cm Power Module: H 5.5 cm, W 16.7 cm, D 31 cm	Source: H 23 cm, W 29.5 cm, D 29.5 cm Power Module: H 5.5 cm, W 16.7 cm, D 31 cm
Weight:	Source: 8 kg Power Module: 6 kg	Source: 5.9 kg Power Module: 10.2 kg	Source: 8 kg Power Module: 12 kg

