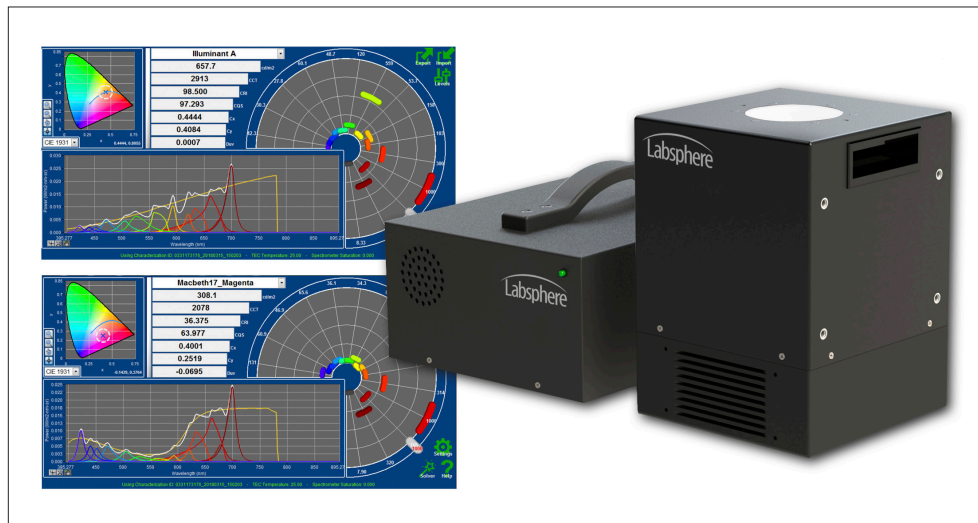


# Wide Angle FOV Color Tunable Sources for Image Sensor Characterization



## Highly uniform illumination over wide FOV

The 7.5 cm diameter port enables test and calibration with highly uniform illumination over 360° x 200° field of view. **Ideal for flat fielding fish eye lens imagers.**

## 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 production testing and calibration.

## Save money, save space

One instrument produces multiple spectrums. Large area uniform luminance field in a compact and robust instrument. The sources are designed to easily mount in a production test station with available active spectral monitoring, feedback loop 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.

## 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 LED channels in the Visible and NIR with options for 23 and 32+ channels  
User Spectral Optimization – Quickly simulate any continuous spectrum, CIE Illuminant or Macbeth®/X-RITE® Color Patch  
Performance Metrics – Built-in spectral 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  
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 200° 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 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

Light Source:	Integrating Sphere - 15 mm Tunable LED Light Engine and Discrete Color Channels Current Regulated DC Driver Control Spectral Range: CCS-1000-WAF: Visible, 850 nm and 940 nm CCS-1100-WAF: Visible, 850 nm and Calibration Lamp																																																															
Spectral Presets:	<table border="0"> <thead> <tr> <th>Source Spectra</th> <th>CRI (Typical)</th> <th>Duv Tolerance</th> </tr> </thead> <tbody> <tr><td>Illuminant A</td><td>98</td><td>± 0.001</td></tr> <tr><td>Illuminant B</td><td>96</td><td>± 0.002</td></tr> <tr><td>Illuminant C</td><td>95</td><td>± 0.002</td></tr> <tr><td>Illuminant D50</td><td>98</td><td>± 0.002</td></tr> <tr><td>Illuminant D55</td><td>98</td><td>± 0.002</td></tr> <tr><td>Illuminant D65</td><td>98</td><td>± 0.002</td></tr> <tr><td>Illuminant D75</td><td>98</td><td>± 0.002</td></tr> <tr><td>Neutral E</td><td>94</td><td>± 0.002</td></tr> <tr><td>SSL-CW</td><td>85</td><td>± 0.002</td></tr> <tr><td>SSL-WW</td><td>88</td><td>± 0.002</td></tr> <tr><td>RGB</td><td></td><td></td></tr> <tr><td>Orange, 7</td><td></td><td></td></tr> <tr><td>Purple, 10</td><td></td><td></td></tr> <tr><td>Blue, 13</td><td></td><td></td></tr> <tr><td>Green, 14</td><td></td><td></td></tr> <tr><td>Yellow, 16</td><td></td><td></td></tr> <tr><td>Magenta, 17</td><td></td><td></td></tr> <tr><td>Cyan, 18</td><td></td><td></td></tr> <tr><td>840 nm</td><td></td><td></td></tr> <tr><td>950 nm</td><td></td><td></td></tr> </tbody> </table>	Source Spectra	CRI (Typical)	Duv Tolerance	Illuminant A	98	± 0.001	Illuminant B	96	± 0.002	Illuminant C	95	± 0.002	Illuminant D50	98	± 0.002	Illuminant D55	98	± 0.002	Illuminant D65	98	± 0.002	Illuminant D75	98	± 0.002	Neutral E	94	± 0.002	SSL-CW	85	± 0.002	SSL-WW	88	± 0.002	RGB			Orange, 7			Purple, 10			Blue, 13			Green, 14			Yellow, 16			Magenta, 17			Cyan, 18			840 nm			950 nm		
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Luminance Spatial Uniformity: $(1 - (\max - \min)) \times 100\%$	>94% over 360° x 200° FOV																																																															
Output Port:	75 mm diameter																																																															
Luminance Range:	10 to 1000 cd/m <sup>2</sup>																																																															
Long Term Stability:	+/- 1%																																																															
Short Term Stability:	+/- 0.1% COV after 500 msec																																																															
Initial Warm-Up Time:	500 msec																																																															
Control: Software Development Kit and LabVIEW User Software	Individual Light Channel Control Preset Functions for Illuminant Spectrums Luminance, x, y, CCT, CRI, Duv Stability Indicator Active Spectral Feedback Loop Embedded User Recalibration Process User Recharacterization																																																															
With Spectrometer Monitor Option	Spectral Radiance (W/m <sup>2</sup> -sr-nm) Luminance (cd/m <sup>2</sup> ) Illuminance (lux) (optional) CRI Duv																																																															
Operating Temperature:	20 - 40°C, 0 - 70% RH																																																															
Computer Requirements:	Windows®, 32 bit or 64 bit USB																																																															
Power Input:	110/220 VAC, 50/60 Hz																																																															
Dimensions: Integrating Sphere Source Module	25 cm x 18 cm x 18 cm (H x W x L)																																																															
Power Module	14 cm x 23 cm x 37 cm (H x W x L)																																																															
Weight: Integrating Sphere Source Module	8 kg																																																															
Power Module	6 kg																																																															

# Ordering Information

Order Number	Model Number	Description
AA-01367-200	CCS-1000-WAF	Tunable LED Source Without Spectrometer Wide angle field of view. Includes visible, 850 nm and 940 nm LEDs
AA-01367-300	CCS-1100-WAF	Tunable LED Source With Spectrometer Wide angle field of view. Includes visible, 850 nm LED and calibration lamp
AS-03025-100		OSC-1000 Software

## Additional Optical Specifications

Spectral Range:	380 nm - 1000 nm (User Configurations Available)
Spectral Output:	Standard 15 and 16 channels. 1 to 32+ channels available.
Spectral Bandwidth:	Visible Typical $\approx 20$ nm FWHM, NIR Typical $\approx 50$ nm FWHM
Source Geometry:	75 mm Diameter Uniform Output, Lambertian Radiant Source
Spatial Uniformity:	$\geq 97\%$ under $120^\circ$ FOV $\geq 94\%$ $360^\circ \times 200^\circ$ FOV
CCT Range:	1,900K – 40,000K
Preset Spectra: Visible	CIE Illuminants A, B, C, D50, D55, D65, D75, E, SSL-WW Macbeth®/X-Rite® Color Patches
Custom Preset Spectra:	Arbitrary spectra can be configured as presets using Labsphere's OSC-1000 optimization option

### Accuracy Specifications

Color Stability:	$\leq 0.001$ x,y
Illumination Accuracy:	$< 1.0\%$
Spectral Accuracy:	$\leq 0.006$ in x,y
Temperature Stability:	Active Thermoelectric Cooler with Feedback, Temperature Control within $\pm 1^\circ\text{C}$
Long Term Drift:	Output: $\leq 0.2\%$ Spectral: $\leq 1$ nm (Typical, Channel Dependent)

### Electrical Specifications

Dynamic Range Adjustment:	3 - 4 Decades
LED Control:	DC Constant Current regulated with feature of optical spectral feedback control

### General Specifications

Software:	Firmware contains: <ul style="list-style-type: none"><li>- Full Spectral Calibration and Handles Spectral Fitting</li><li>- Preset Stored Spectral</li><li>- User Spectrum Matching</li><li>- Real-time Spectral Feedback Loop</li><li>- Spectrometer Calibration</li><li>- Systems Field Characterization and Calibration</li><li>- Radiometric, Photometric and Color Matching Metrics</li></ul>
Interface:	USB 2.0 Type B Connector and DB-9 Connector