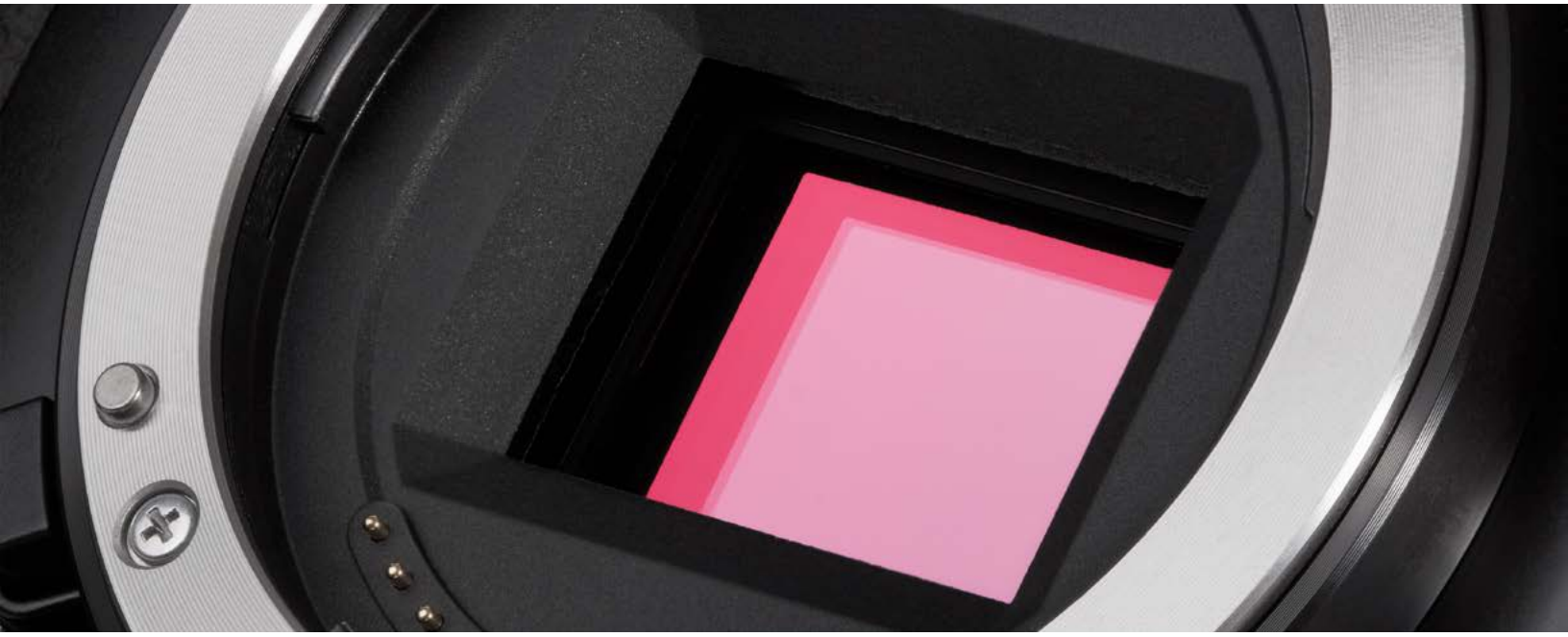


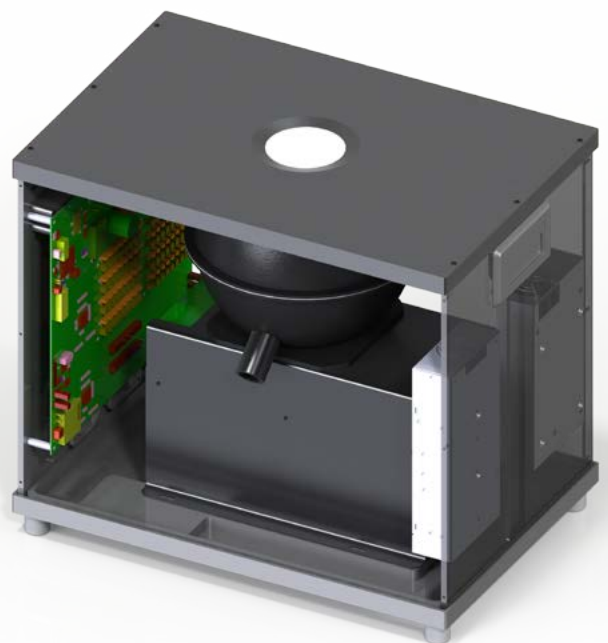
## SpectralLED™ - Tunable LED Light Source



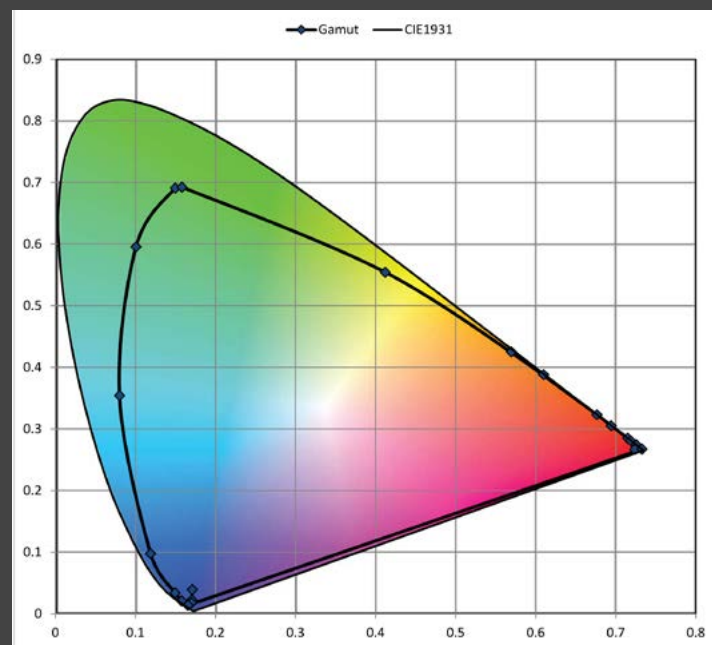
### UNPRECEDENTED RESOLUTION AND ACCURACY FOR **CAMERA AND IMAGE SENSOR CALIBRATION**

Gamma Scientific is proud to introduce its next generation **Tunable LED Light Source, the SpectralLED™**

Designed completely from the ground up, this light source builds upon over fifteen years of experience manufacturing LED based light sources.



## CIE 1931 CHROMATICITY DIAGRAM



## FEATURES & BENEFITS

- Unprecedented Resolution and Accuracy - 30 Discrete LED Wavelengths Covering the Visible and NIR
- Powerful Synthesis Engine - Quickly Simulate any CIE Illuminant or Macbeth™ / X-RITE™ Color Patch
- Flexible Interface - Built-in RMS Spectral Fitting for Simulation of Any User Imported Spectra
- Uniform 75mm Radiance Output Port or Optional Baffle Tube for Irradiance
- Easily Adaptable - for Automated Test Systems and Production Line Integration
- Pure DC Constant Current Drivers and Built-in Optical Feedback Photodiode System - Ensure Accurate Output in Real Time
- On-board Thermal Electric Cooler and Feedback - for LED Temperature Control
- ISO/IEC 17025 NVLAP Calibration Laboratory (Lab Code 200823-0) - Ensures Superior Wavelength and Color Accuracy

Incorporating some of the newest and brightest surface-mount LEDs available, the **SpectralLED™** delivers a nearly continuous spectrum comprised of 30 discrete wavelength LEDs. This allows for an unprecedented color gamut and applications otherwise impossible for traditional halogen or LED light sources.

**SpectralLED™** light sources simplify the calibration process by allowing you to quickly simulate and change between a huge variety of traditional light sources. Select a preset CIE Illuminant or Macbeth™ / X-RITE™ color patch, or import your own spectrum and let the internal RMS spectral fitting find the best match instantly.

### Light sources are only as accurate as the calibration.

As a world leader in high performance spectroradiometers, and with an in-house ISO/IEC 17025 NVLAP Accredited Calibration Laboratory (Lab Code 200823-0), you can trust the NIST calibration that comes programmed into every **SpectralLED™** source.

### Replace multiple instruments with a single device.

With a fully spectrally tunable output spectrum, all you need is one **SpectralLED™** to generate any arbitrary spectral power distribution. Whether it be blackbody, daylight, fluorescent, LED, or something completely unique, the **SpectralLED™** can give you an accurate match.

Replace monochromators with a solid stage design. By sweeping through individual LED channels, the **SpectralLED™** can emulate a traditional monochromator light source. With no moving parts and no halogen input illumination, the solid state **SpectralLED™** is the clear choice for demanding applications.

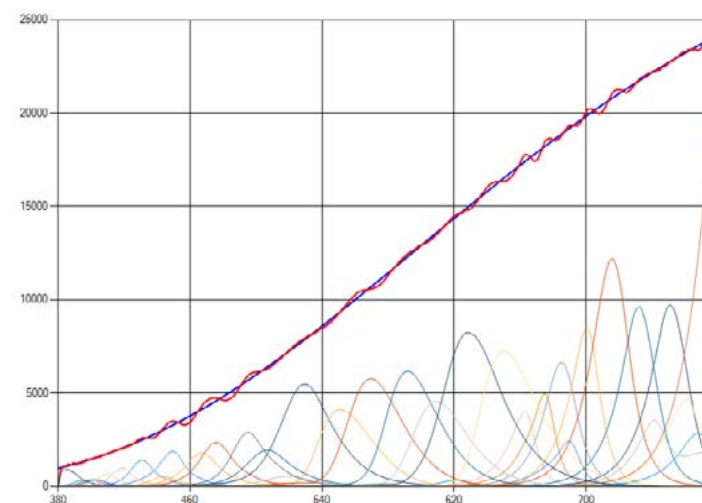
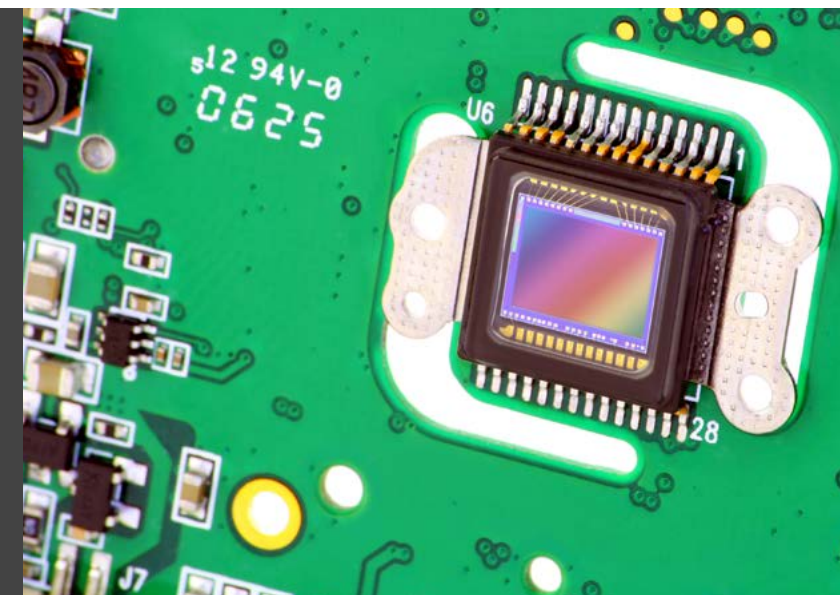
### Unlimited possibilities for limitless spectra.

With independent 16-bit control on 30 LED channels, there are virtually infinite possibilities for what the **SpectralLED™** can do for you. Compared with other “next-gen” LED light sources, the **SpectralLED™** offers more channels, brighter output, higher accuracy, and more powerful features for simulation. No external software is required, the **SpectralLED™** firmware controls RMS fitting, calibration storage, and presets. Direct integrating into production lines or test systems is easy with universally compatible USB and RS-232 interfaces.

Gamma Scientific **SpectralLED™** light sources feature a proprietary electrical design for superior accuracy and reliability. The completely redesigned drive electronics provide a pure DC constant current LED drive with floating differential sensing. This means there is no flicker and no uncertainty in the drive current. Couple that with built-in optical feedback, and the **SpectralLED™** is able to accurately control optical output power to within a fraction of a percent. On-board thermal control maintains the LED substrate temperature to ensure spectrum is stable even at high drive currents.

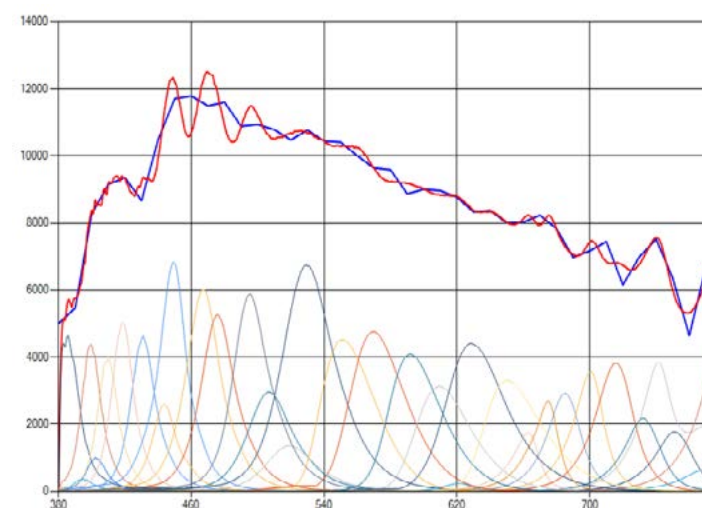
## INDUSTRY APPLICATIONS

- Camera and Image Sensor Calibration (CCD, CMOS, etc.)
- Ambient Light Sensor Calibration
- Detector Responsivity
- OEM Camera Manufacturing
- Spectrum/Illuminant Simulation
- Diagnostic Medical Imaging
- Technical and Industrial Photography



**SpectralLED™ Illuminant A (Blackbody)**

Simulation using RMS Spectrum Fitting. Target (Blue) Output (Red)



**SpectralLED™ Illuminant D65 (Daylight 6500K)**

Simulation using RMS Spectrum Fitting. Target (Blue) Output (Red)

## MEASUREMENT APPLICATIONS

- White Balance
- Quantum Efficiency
- Spatial Non-Uniformity
- Pixel Defects
- Cross Talk
- Vignetting Correction
- Sensitivity
- Responsivity
- Signal-to-Noise
- Linearity
- ISO Speed
- Saturation Exposure
- Dynamic Range

OPTICAL SPECIFICATIONS	
Spectral Range	380nm - 1000nm (Standard Version, Custom Configurations Available)
Spectral Output	30 Discrete LED Channels, 2 Broadband LED Channels Visible Resolution ≈15nm, NIR Resolution ≈50nm (Typical Channel Spacing)
Spectral Peaks	395nm, 405nm, 420nm, 430nm, 450nm, 460nm, 475nm, 495nm, 505nm, 520nm, 525nm, 545nm, 590nm, 595nm, 620nm, 630nm, 637nm, 660nm, 675nm, 685nm, 700nm, 715nm, 730nm, 750nm, 760nm, 805nm, 850nm, 910nm, 940nm, 985nm, 2700K Warm White, 6500K Cool White (Standard Version, Custom Configurations Available)
Spectral Bandwidth	Channel Dependent Visible Typical ≈20nm FWHM, NIR Typical ≈50nm FWHM
Source Geometry	75mm Diameter Uniform Output, Lambertian Radiant Source
Spatial Uniformity <sup>1</sup>	≥ 97%
Optical Geometry	Built-in Integrating Sphere, 200mm Diameter (Other Output Geometries Available for Projection or Illuminator Applications)
Radiance Range <sup>2</sup>	Typical Maximum ≈ 7,500μW/cm <sup>2</sup> /sr Typical Minimum ≈ 10μW/cm <sup>2</sup> /sr (Spectrum Dependent)
Luminance Range <sup>2</sup>	Typical Maximum ≈ 15,000cd/m <sup>2</sup> Typical Minimum ≈ 20cd/m <sup>2</sup> (Spectrum Dependent)
CCT Range	1,900K - 40,000K
Preset Spectra	CIE Illuminants A, B, C, D50, D55, D65, D75, E, F1-F12, Macbeth™/X-Rite™ Color Patches
Custom Preset Spectra	Arbitrary Spectra can be Configured as Presets Using API Gamma can Provide Factory Loaded Custom Presets, Use Part Number RS-7-PRE (Spectral Information must be Provided by Customer at Time of Order)
ACCURACY SPECIFICATIONS	
Illumination Stability	≥ 99.99% after settling (Channel Dependent, Settling Occurs After ≈50ms for Radiance and ≈2000ms for Color)
Illumination Accuracy	± 1% Absolute NIST Traceable, Calibration Stored Internally
Spectral Accuracy	± 1nm Centroid Wavelength
Color Accuracy	CIE 1931 x,y = ±0.003
Linearity	< 0.1% RMS of full scale
Temperature Stability	Active Thermoelectric Cooler with Feedback, Temperature Control within ± 1 C°
Long Term Drift	Output: ≤ 0.2% Spectral: ≤ 1nm (Typical, Channel Dependent)
ELECTRICAL SPECIFICATIONS	
Electrical Resolution	16 bit DAC for Channel Current Drivers (32 Independent DACs, 1 for each LED Channel) 24 bit ADC for Internal Radiance Monitor/Feedback
Dynamic Range Adjustment	Spectrum Dependent, 4-5 Decades Typical
LED Control	Pure DC Constant Current with Floating Differential Sensing
GENERAL SPECIFICATIONS	
Software	Firmware Contains Full Spectral Calibration and Handles Spectral Fitting, Preset Storage, Real-time Optical Feedback, Radiometric and Photometric Units Supported.
Interface	USB 2.0 Type B Connector and DB-9 Connector
Interface Protocol	Simple ASCII Commands with Optional Binary Block Transfer
Supported Operating Systems	USB Drivers for Windows, OSX, and Linux via FTDI virtual COM port Legacy RS-232 Serial Port for Integration into Automated Systems (no OS required)
Input Voltage	110-240 VAC, 50-60Hz
Maximum Power Consumption	600W
System Dimensions	Height: 405mm, Width: 460mm, Depth: 305mm, Weight: 25kg
PART NUMBER CONFIGURATIONS	
RS-7-1	SpectralLED Tunable Light Source - 75mm Output, Radiance Full Spectral Radiance/Irradiance Calibration, Absolute NIST Traceable, Stored Internally
RS-7-PRE	Custom Preset Spectrum, Spectral Power Distribution to be Provided by Customer
43447	SpectralLED Software - Spectral Simulation Assistant
RS-7-2	SpectralLED Tunable Light Source - Baffle Tube Output, Irradiance Calibration
RS-7-3	SpectralLED Tunable Light Source - Fiber Optic Output, Irradiance Calibration

1. Uniformity measured using an 8° FOV at the output plane of the device while simulating illuminant E over a wavelength range of 380-1000nm. Uniformity spec is measured over the entire Ø 75mm active area, when considering only the center Ø 50mm area uniformity exceeds 98%

2. Spectra fit over a wavelength range of 380-780nm, maximum output is dependent on spectral content of the target spectra. Most CIE illuminants and color patches can fit to at least this level, typically spectra can far exceed this maximum, however some spectra cannot achieve this maximum