

Application Notes, *Eigenlite*™ Sources and *Eigenfield*™ Illuminators

TESTING AND CALIBRATION APPLICATIONS

Gamma Scientific *Eigenlite* Digital Light Sources and *Eigenfield* Uniform Illuminator Systems can significantly simplify the testing and calibration of a variety of optical instruments, as well as calibration tasks over a wide range of optical and imaging applications. *Eigenfield* and *Eigenlite* products offer the finest and most versatile controlled light energy technology available. When equipped with a Gamma Scientific *Eigen* product, the test and calibration engineer is armed with the most stable, uniform, and reliable illumination reference

instrument available commercially. *Eigen* products exhibit incredible stability and uniformity combined with an ultra-linear brightness adjustment that is unmatched in the industry. They offer interactive spectral programmability along with NIST-traceable absolute calibrations. *Eigen* products save time and money, while reducing the uncertainties associated with the testing and calibration of components and systems.

	Eigenlite Sources and Eigenfield illuminators	Tungsten/xenon/halide and spectral line lamps
Technology	Solid state cool operation with long lamp lifetimes.	Thermal heat generating sources with short lamp lifetimes.
Monolithic Detectors	12-16 bit linear digital brightness control.	ND filters, radiometer monitoring, low resolution.
	Spectrally programmable with simple commands.	Interference filters and mechanical monochromators.
	Illuminants, narrow line, and arbitrary broadband spectrums.	Narrow line and single illuminants only.
Image Sensors	Low profile projectors with ultra flat illumination fields.	Spheres and light guides with lower flatness and un-natural par-axial illumination fields.
	Spectrally programmable by simple commands.	Interference filters and mechanical monochromators.
	Colorimetrically programmable with simple commands.	Awkward or impossible. Tristimulus filters only.
	12-16 bit Linear digital brightness control.	ND filters, radiometer monitoring, and comparatively lower ad-justment resolution.
Cameras and Imager Modules	Controlled f# illumination fields.	Limited by sphere port plane characteristics.
	Colorimetrically programmable with simple commands.	Awkward or impossible. Tristimulus filters only.
	12-16 bit linear digital brightness control.	ND filters, radiometer monitoring, and comparatively lower ad-justment resolution.



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	Eigenlite Sources and Eigenfield illuminators	Tungsten/xenon/halide and spectral line lamps
Spectrometers	10-point wavelength index calibrations possible.	Only several wavelength index calibration points.
	Multiple sources and flat illuminant responsivity calibrations.	Several sources required for rigorous calibration.
	High output power at extremes of calibration range.	Limited by specific thermal source characteristics.
	Rigorous stray light probing easy.	Awkward or impossible.
	12-16 bit linear digital brightness control.	ND filters, radiometer monitoring, and comparatively lower adjustment resolution.
Colorimeters	Multiple illuminants and wide gamut arbitrary color calibration.	Only one or several standard illuminants practical.
	High output power at extremes of colorimetric range.	Limited by specific thermal source characteristics.
	Rigorous stray light probing easy.	Awkward or impossible.
	12-16 bit linear digital brightness control.	ND filters, radiometer monitoring, and comparatively lower adjustment resolution.
Display Systems	Easily invoke standard and/or arbitrary color balances.	Awkward or impossible.
	Identically emulate LED display system characteristics.	Impossible.
	Multiple illuminants and ultra-wide gamut arbitrary color calibration.	Only one or several standard illuminants practical.
Aerial Photogrammetry	NIST-traceable luminant source with battery pack option.	Awkward or impossible.
	12-16 bit Linear digital brightness control.	ND filters, radiometer monitoring, and comparatively lower adjustment resolution.
	Spectrally programmable with simple commands.	Interference filters and mechanical monochromators.
	Colorimetrically programmable with simple commands.	Awkward or impossible. Tristimulus filters only.
Image Intensifiers	Instantaneous high dynamic operating range.	ND filters, radiometer monitoring, and comparatively lower resolution.
	Low uncertainty single photon flux levels possible.	Awkward or impossible.
	Lowest uncertainty precision NVIS reference.	Awkward and with substantially higher uncertainties.



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CONTROLLED ILLUMINATION APPLICATIONS

When used for controlled illumination, the robust calibration reference features of the Eigen products, along with their interactive programmability, allow them to surpass the performance and reliability of virtually all other light source technologies. Their ultra-linearity and stability, combined with the interactive spectral/colorimetric programmability of the companion SynthiColor software,

enable a user to select a calibrated spectrum or color coordinate and brightness level with the click of a mouse. For example, the Eigenlite RS-5B can take the place of numerous standard sources, and can be linearly adjusted with resolution and accuracy not normally possible when using the native sources themselves.

	Eigenlite Sources and Eigenfield illuminators	Tungsten/xenon/halide and spectral line lamps
Chemical Fluorescence and Luminescence	'Push button' calibrated flux levels at arbitrary wavelengths. 12-16 bit Linear digital brightness control.	Requires ND filters and radiometric monitoring, with comparatively lower adjustment resolution.
	Spectrally programmable with simple commands.	Requires filters and/or mechanical monochromators.
	Low profile projectors with ultra flat illumination fields.	Spheres and light guides with higher nonuniformity.
Technical and Industrial Photography	Emulation of arbitrary and standard illuminants	Only one or several standard illuminants practical.
	Programmable illuminants for any photographic scene.	Awkward or impossible.
	Continuous and/or flashed operation for stop motion.	Source is either continuous or flashed.
Diagnostic Medical Imaging	Programmable spectrum enables optimum diagnostic images.	Awkward or impossible.
Optimization of Vision Algorithms	Programmable spectrum enables high contrast imagery.	Awkward or impossible.
	Continuous and/or flashed operation for stop motion.	Source is usually either continuous or flashed.
Vision Research and Color Science	Independent 'push button' generation of arbitrary spectrums, color coordinates, color temperatures, brightness levels, and pulsewidths. Multiple arbitrary NIST calibrations possible.	Not possible with a single source.
	Evaluate color differences to within 1JND unit.	Awkward or impossible, requiring multiple sources and targets with limited brightness adjustment capability.
Paint and Pigment Chemistry	Define arbitrary colors, hues, and saturation levels. Evaluate metamerisms under an almost unlimited number of illuminants and/or other arbitrary illuminant conditions.	Not possible with a single source.
	Evaluate color differences to within 1JND unit.	Awkward or impossible, requiring multiple sources and targets with limited brightness adjustment capability.



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