



**WESTBORO
PHOTONICS**

IMAGING COLORIMETER

WP6E & WP6ES

WP640E/ES, WP690E/ES, WP6120E/ES

KEY FEATURES

Electronic Focus and
Iris Control

Multiple EF Lens Options

High Sensitivity

Compact

Optional Integrated
Spectroradiometer

TE Cooled Sensor



APPLICATIONS

Characterization and
Calibration of Displays

Backlit Keyboards

Avionics and Automotive
Instruments and Panels

Beam Pattern Distribution

Solid State Lighting

The World's Most Accurate High Resolution Imaging Colorimeter

GREAT IMAGING

With 4, 9, or 12 Megapixels of resolution, the WP6E Series provides optimal solutions for luminance and chromaticity measurement of displays, illuminated keyboards, graphics and more. Unique to these instruments is the integration of electronically controlled lens functions with iris and focus control. These motorized lenses offer improved accuracy, precision and convenience for all applications.

Westboro Photonics' Photometrica® software and application packages provide users with the most productive environment for measurement and analysis. All functions can be efficiently automated with the Software Development Kit (SDK).

SENSITIVE

Stabilized Peltier-cooling of the CCD detector minimizes measurement noise and drift. With sensitivity below 0.0001 cd/m², ultra-low light signals can be reliably analyzed. Optimization of the optical system has also resulted in quicker measurement times.

COMPACT

The WP6E is feature packed, small and light weight. Mounting the instrument is easy; whether on a tripod, stage, or robot.

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WP6ES – IMAGING SPECTRAL COLORIMETER

AUTOMATIC COLOR CORRECTION

The WP6ES has the benefit of a spot spectroradiometer and an imaging colorimeter in the same instrument. The imaging colorimeter's accuracy is improved to the level of the spectroradiometer by automatic correction. The spectral data also provides radiometric information and other measurement insights.

To fulfill the measurement requirements of modern displays and lighting, Westboro Photonics offers the S3 and S4 high performance spectroradiometers with excellent dynamic range, linearity, stray light suppression and signal-to-noise ratio. Westboro Photonics can also work with other fiber optic spectroradiometers; contact us for details.



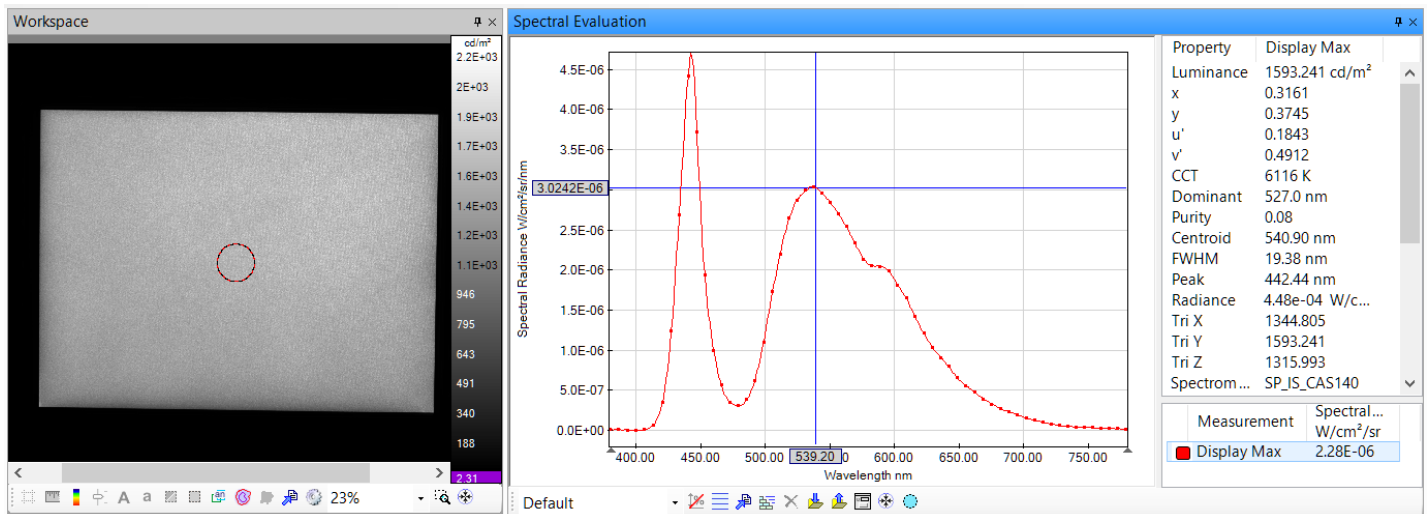
SENSITIVE AND FLICKER

The 1 mm diameter fiber assembly to the spectrometer allows for the collection of more light and yields exceptional sensitivity. As an option, a second fiber bundle can also collect light for connection to a flicker sensor.

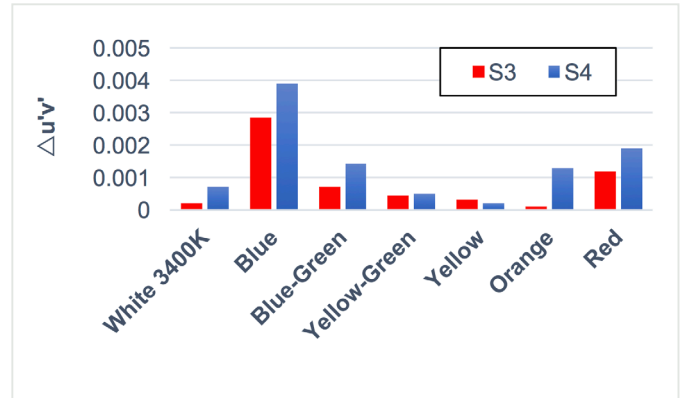
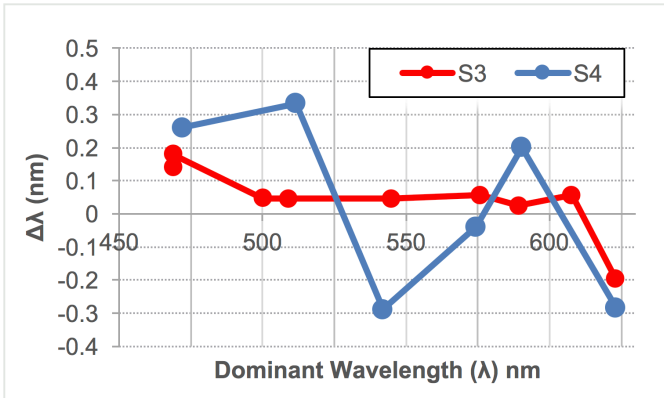
RELIABLE AND SIMPLIFIED

As compared to using a stand alone spot spectroradiometer and an imaging colorimeter, the integrated functionality of the WP6ES is superior.

WP6ES Imaging Spectral Colorimeter	Spot Spectroradiometer and Separate Imaging Colorimeter
The imaging paths for both the colorimeter and spectroradiometer match, thereby assuring the compared measurement locations and geometries precisely correlate.	Spot sizes, locations and measurement angles can differ, making correlation problematic.
The spectral measurement is acquired immediately following the colorimeter measurement. The WP6ES minimizes sample luminance and chromaticity drift.	Measurements cannot be closely sequenced in time as one instrument needs to be mechanically replaced by the other in the imaging path.
All measurements are fast and the corrections automatic.	Correction method is time consuming and is done infrequently.



Partial screenshot of Photometrica software displaying the spectral measurement spot centered in the 2-D image and the corresponding spectrum and spectral data.



Deviation of the dominant wavelength (left) and delta $u'v'$ (right) for different test LED sources using the S3 and S4 spectroradiometers.

Spectroradiometer Model	S3	S4
Detector	Back-thinned CCD	Back-thinned CCD
Number of Pixels	1024 x 58	2048 x 64
Wavelength Range	380-1100 nm	380-880 nm
Optics	Symmetrical Czerny-Turner, 100 mm focal length	Symmetrical Czerny-Turner, 75 mm focal length
Digital Resolution	16 bit	16 bit
Data Point Interval	0.7 nm	0.26 nm
Spectral Bandwidth	2.9 nm	2.3 nm
Wavelength Accuracy	± 0.5 nm	± 0.3 nm
Stray Light (150 nm to the left of red LED peak, unweighted spectrum)	0.000 04	0.000 1
Integration Time	5.2 ms - 65 s	9.7 ms - 65 s
Linearity	0.8 %	0.8 %
Cooling	TE Cooled, stabilized at 5 °C	Three stage TE Cooled, stabilized at 5 °C
Luminance Range **	0.004 to 75,000 cd/m ²	0.004 to 24,000 cd/m ²
Luminance Accuracy (vs. NIST luminance standard)	3 %	3 %
Luminance Repeatability	0.2 %	0.2 %
Measurement Capabilities	Luminance, Illuminance, Luminous Intensity, Chromaticity, Correlated Color Temperature, Dominant Wavelength	
PC Interface	USB 3.0 or GigE	USB 2.0
Dimensions (H, W, D)	185 x 161 x 185 mm	250 x 179 x 144 mm
Power Consumption	12 VDC, 1.5 A	100-240 VAC, 50 W
Weight	3.5 kg	3.6 kg
Compliance	RoHS, CE	RoHS, CE

* Specifications are for typical lenses at F/2.8 unless noted otherwise.

** Low level of luminance range represents 10X signal to noise level at 8s exposure. High level represents maximum level using F/11.

WP6E & WP6ES SERIES

SPECIFICATIONS [†]		WP640E/ES	WP690E/ES	WP6120E/ES
Sensor Model, Diagonal Size, Pixel Pitch		True Sense KAI-04022, 21.4 mm, 7.4 μm	Sony ICX814, 16.0 mm, 3.69 μm	Sony ICX834, 15.8 mm, 3.1 μm
Sensor Type		16-bit, interline transfer CCD image sensor with microlens		
Sensor Megapixels		4.2	9.1	12
Pixel Array		2048 x 2048	3388 x 2712	4250 x 2838
Dynamic Range		74 db	75 db	75 db
High Dynamic Range (multi-exposure)		> 1 000 000:1	> 1 000 000:1	> 1 000 000:1
Luminance Minimum (cd/m ²)*	Limit of Detection	0.000 01	0.000 01	0.000 02
	SNR = 60	0.000 1	0.000 1	0.000 2
	SNR = 100	0.000 2	0.000 2	0.000 3
Luminance Maximum (cd/m ²)**		4 000	5 000	5 000
Luminance Maximum with ND Filters (cd/m ²)**		400 000	500 000	500 000
System Accuracy***		Luminance (Y) ± 4 % CIE Chromaticity Coordinates (x,y) ± 0.003		
Short-Term Repeatability		Luminance (Y) ± 0.03 % CIE Chromaticity Coordinates (x,y) ± 0.000 05		
EF Lenses: Field of View (H x V)	14 mm	57° x 57°	40° x 48°	35° x 51°
	24 mm	35° x 35°	23° x 29°	21° x 31°
	35 mm	24° x 24°	16° x 21°	14° x 21°
	50 mm	17° x 17°	11° x 14°	10° x 15°
	100 mm	9° x 9°	6° x 7°	5° x 8°
Minimum Measurement Time at 40 cd/m ² – Native, 2x2 Binned, 4x4 Binned (s)		Luminance - 2.5, 1.4, 0.9 Color - 10.9, 6.4, 5.1	Luminance - 3.1, 1.6, 1.0 Color - 13.5, 7.3, 5.2	Luminance - 3.8, 1.8, 1.1 Color - 16.5, 8.2, 5.7
Spatial Measurement Capabilities		Luminance, Radiance, Illuminance, Irradiance, Luminous Intensity, Radiant Intensity, CIE Chromaticity Coordinates, Correlated Color Temperature (CCT), Dominant Wavelength, L*a*b*, Gamma, Gamut, Uniformity, ΔE*, User Defined		
Units		cd/m ² , fL, W/sr/m ² , lux, fc, W/m ² , cd, W/sr, CIE (x,y), CIE (u',v'), K (CCT), nm		
Integrated Spectroradiometer		WP6ES		
Optional Filters		Scotopic, Radiometric, Circadian, IR, Custom		
Communication Interface		USB2		
Power		12 V, 24 W max.		
Dimensions Excluding Lens (H x W x D)		160 mm x 146 mm x 78 mm		
Weight		3.1 kg with typical lens, 2.8 kg without lens		
Operating Temperature		5 °C to 35 °C		
Operating Humidity		10 % to 90 % (no condensation)		

† Specifications are subject to change

* Using 7x7 pixel area

** Using iris F/11 without ND filters

*** Based on measurements of illuminant A, 20x20 pixel area

