

Photometry and Radiometry, Chinese TAIPEI, CMS (Center for Measurement Standards)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty					Comments
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage factor	Level of Confidence	Is the expanded uncertainty a relative one?	
Luminous intensity	Tungsten lamp	Realization according to definition of candela	250	2500	cd	Correlated colour temperature	2600 K to 3200 K	0.8	%	2	95%	Yes	Approved on 27 September 2004
Luminous intensity	Tungsten lamp	Detector-based	25	1500	cd	Correlated colour temperature	2600 K to 3200 K	1.2	%	2	95%	Yes	Approved on 27 September 2004
Illuminance responsivity, tungsten source	Illuminance meter	Detector-based			A/lx, Reading/lx	Illuminance	25 lx to 1500 lx	1.2	%	2	95%	Yes	Approved on 27 September 2004
Luminous flux	Tungsten lamp	Integrating sphere	600	4500	lm	Correlated colour temperature	2500 K to 3200 K	1.7	%	2	95%	Yes	Approved on 27 September 2004
Luminance	Tungsten-based source	Spectroradiometer	5	3500	cd/m ²	Correlated colour temperature	2500 K to 3200 K	2.06	%	2	95%	Yes	Approved on 27 September 2004
Luminance responsivity	Luminance meter	Spectroradiometer			A/(cd/m ²), V/(cd/m ²), Reading/(cd/m ²)	Luminance	5 cd/m ² to 3500 cd/m ²	2.06	%	2	95%	Yes	Approved on 27 September 2004
						Correlated colour temperature	2500 K to 3200 K						
Responsivity, spectral, power	Broad band detector	Comparison			A/W, Reading/W	Wavelength range	260 nm to 1100 nm	0.72 to 4.3	%	2	95%	Yes	Approved on 27 September 2004
						Bandwidth	10 nm						
						Power level	0.25 mW to 150 mW						

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Responsivity, spectral, irradiance	Broad band detector	Comparison			$A/(W/m^2)$, $V/(W/m^2)$, Reading/(W/m^2)	Wavelengths	365 nm, 405 nm, and 436 nm	5	%	2	95%	Yes	Approved on 27 September 2004
						Bandwidth	10 nm						
						Power level	0.5 mW/cm ² to 10 mW/cm ² for 365 nm and 436 nm, 0.3 mW/cm ² to 3 mW/cm ² for 405 nm						
Responsivity, spectral, radiance	Spectroradiometer	Comparison			$A/(W/m^2/sr)/nm$, $V/(W/m^2/sr)/nm$, Reading/($W/m^2/sr$) /nm	Wavelength range	380 nm to 780 nm	2.61 to 5.0	%	2	95%	Yes	Approved on 27 September 2004
						Bandwidth	4 nm						
						Power level	4 ($\mu W/m^2/sr$)/nm to 180 (mW/m ² /sr)/nm						
Responsivity, laser, power	General detector	Comparison			A/W, V/W, Reading/W	Wavelength	300 nm to 2000 nm	1.5	%	2	95%	Yes	Approved on 27 September 2004
						Power level	0.25 mW to 150 mW						
						Type of detector	photodiode or broadband						
Irradiance, spectral	Tungsten lamp	Comparison	0.0001	0.15	(W/m ²)/nm	Wavelength range	350 nm to 800 nm	6.33 to 8.91	%	2	95%	Yes	Approved on 27 September 2004
						Bandwidth	10 nm to 20 nm						

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Radiance, spectral	Tungsten lamp	Comparison			(W/m ² /sr)/nm	Wavelength range	380 nm to 780 nm	2.61 to 3.73	%	2	95%	Yes	Approved on 27 September 2004
						Bandwidth	4 nm						
Power, spectral total radiant	Laser	Radiometer	0.00025	0.15	W	Wavelength range	300 nm to 2000 nm	1.5	%	2	95%	Yes	Approved on 27 September 2004
						Type of laser	gas, solid state, semiconductor						
Reflectance, hemispherical, spectral	General materia	Spectrophotometer	0.1	1		Wavelength range	380 nm to 780 nm	0.5 to 0.7	%	2	95%	Yes	Approved on 27 September 2004
						Bandwidth	5 nm						
						Specific measurement conditions	0/d						
Reflectance, hemispherical, spectral	General materia	Spectrophotometer	0.01	1		Wavelength range	400 nm to 750 nm	0.4 to 0.6	%	2	95%	Yes	Approved on 27 September 2004
						Bandwidth	10 nm						
						Specific measurement conditions	d/0						
Reflectance factor	General materia	Spectrophotometer	Y= 0.1	Y = 1		Specification standard used	ASTM standard on color and appearance measurement	0.54	%	2	95%	Yes	Approved on 27 September 2004
						Geometry	0/d						

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Radiance factor	General materia	Spectrophotometer	Y = 0.01	Y = 1		Specific measurement conditions	d/0	0.54 for white, 0.85 for red, 1.15 for blue, and 0.56 for green	%	2	95%	Yes	Approved on 27 September 2004
Radiance factor	General materia	Spectrophotometer	Y = 0.01	Y = 1		Specific measurement conditions	t/0	0.54	%	2	95%	Yes	Approved on 27 September 2004
Correlated colour temperature	Tungsten-based lamp	Spectroradiometer	2500	3200	K			29	K	2	95%	No	Approved on 27 September 2004
Colour, emitted, x _y	General source	Spectroradiometer	x = 0	x = 1		Bandwidth	4 nm	0.0023		2	95%	No	Approved on 27 September 2004
						Correlated colour temperature	2500 K to 3500 K						
Colour, emitted, x _y	General source	Spectroradiometer	y = 0	y = 1		Bandwidth	4 nm	0.0005		2	95%	No	Approved on 27 September 2004
						Correlated colour temperature	2500 K to 3500 K						
Chromaticity response	Colorimeter	Spectroradiometer	x = 0	x = 1		Correlated colour temperature	2500 K to 3500 K	0.0030		2	95%	No	Approved on 27 September 2004
Chromaticity response	Colorimeter	Spectroradiometer	y = 0	y = 1		Correlated colour temperature	2500 K to 3500 K	0.0006		2	95%	No	Approved on 27 September 2004

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Colour, surface, x, y, Y	General materia	Spectrophoto meter	x = 0	x = 1		Specific measurement conditions	0/d	0.0002		2	95%	No	Approved on 27 September 2004
						Type of material	general white plate						
Colour, surface, x, y, Y	General materia	Spectrophoto meter	y = 0	y = 1		Specific measurement conditions	0/d	0.0002		2	95%	No	Approved on 27 September 2004
						Type of material	general white plate						
Colour, surface, x, y, Y	General materia	Spectrophoto meter	x = 0	x = 1		Specific measurement conditions	d/0	0.0002 for white, 0.0012 for red, 0.0019 for blue, and 0.0003 for green		2	95%	No	Approved on 27 September 2004
						Type of material	general opaque plate						
Colour, surface, x, y, Y	General materia	Spectrophoto meter	y = 0	y = 1		Specific measurement conditions	d/0	0.0002 for white, 0.0011 for red, 0.0028 for blue, and 0.0002 for green		2	95%	No	Approved on 27 September 2004
						Type of material	general opaque plate						
Colour, surface, L*a*b*	General materia	Spectrophoto meter	L* = 0	L* = 100		Specific measurement conditions	0/d	0.25		2	95%	No	Approved on 27 September 2004
						Type of material	general white plate						

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Colour, surface, L*a*b*	General materia	Spectrophoto meter	a* = -200	a* = 200		Specific measurement conditions	0/d	0.10		2	95%	No	Approved on 27 September 2004
						Type of material	general white plate						
Colour, surface, L*a*b*	General materia	Spectrophoto meter	b* = -200	b* = 200		Specific measurement conditions	0/d	0.10		2	95%	No	Approved on 27 September 2004
						Type of material	general white plate						
Colour, surface, L*a*b*	General materia	Spectrophoto meter	L* = 0	L* = 100		Specific measurement conditions	d/0	0.25		2	95%	No	Approved on 27 September 2004
						Type of material	general white plate						
Colour, surface, L*a*b*	General materia	Spectrophoto meter	a* = -200	a* = 200		Specific measurement conditions	d/0	0.10		2	95%	No	Approved on 27 September 2004
						Type of material	general white plate						
Colour, surface, L*a*b*	General materia	Spectrophoto meter	b* = -200	b* = 200		Specific measurement conditions	d/0	0.10		2	95%	No	Approved on 27 September 2004
						Type of material	general white plate						