
MEASUREMENT REPORT

Nr	M-R xxxx	
Report version	v1.0	
Customer	Company Oy	
Luminaire under test	LED luminaire sample	
Measured quantities	Effective and angular color coordinates, correlated color temperature, color rendering indices	
Measurement date	29.1.2015	
Date	5.11.2015	
Signatures	Dr. Pasi Manninen CEO / Optics Specialist	Mr. Joni Riipinen Test scientist
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Distribution	Customer SSL Resource Ltd.	

MEASUREMENT METHOD

The measurements were made by a goniospectrometer at the dark room of SSL Resource Ltd. The spectral radiant intensities of a light source at different directions were measured with a calibrated spectrometer located at a known distance from the light source. The color parameters shown in table 2 were analyzed from the measured spectra in different angles according to the IESNA LM-79-08 standard.

MEASUREMENT UNCERTAINTY

The measurement uncertainty of the spectrometer (GL Spectis 1.0, Calibration certificate 612J0079) for $u'v'$, CCT, and Ra are ± 0.003 , ± 80 K, and ± 2.0 ($k = 2$), respectively.

MEASUREMENTS

Table 1 describes the measurement conditions. The luminaire under test and spectrometer were mounted onto the same optical axis and perpendicular by an alignment laser and auxiliary mirror. The measurement distance from the rotation axis to the photometer optical receiving surface was measured by laser distance meter and a caliper.

Table 1. Measurement information.

Parameter	Value
Ambient temperature of the laboratory	$(25 \pm 1)^\circ\text{C}$
Supply voltage	(230.0 ± 0.2) V
Measurement distance	7 000 mm
Location of the rotation axis (behind the outermost surface of the optics)	40 mm
Angular step, C plane	90°
Angular step, γ angle	10°
Maximum γ angle	80°
Stabilization time	120 min

RESULTS

The measurement results are shown in tables 2-3 and in figures 1-3.

Table 2. Measurement results.

Quantity	Symbol	Value
Color coordinates in CIE 1931 diagram ⁽¹⁾	x, y	(0.387, 0.391)
Color coordinates in CIE 1976 diagram ⁽¹⁾	u', v'	(0.224, 0.509)
Correlated color temperature ⁽¹⁾	CCT	3930 K
Special color rendering indices ⁽¹⁾	R ₁ , R ₂ , R ₃ , R ₄ , R ₅ , R ₆ , R ₇ , R ₈ , R ₉ , R ₁₀ , R ₁₁ , R ₁₂ , R ₁₃ , R ₁₄ ,	69.9, 78.5, 83.9, 71.2, 68.1, 67.9, 84.5, 58.0, 0.0, 47.2, 64.3, 35.0, 71.1, 90.5
General color rendering index, CRI ⁽¹⁾	$R_a = \frac{1}{8} \sum_{i=1}^8 R_i$	72.7
Spatial color uniformity ^{(2), (3)}	SDCM	14.0
Distance from Planckian locus ⁽¹⁾	$\Delta u'v'$	0.006

⁽¹⁾ Weighted average of the angular measurements

⁽²⁾ Maximum deviation of the angular u', v' measurements from the weighted average

⁽³⁾ 1 SDCM corresponds 1-step MacAdam Ellipse, 1 SDCM $\Leftrightarrow \Delta u'v' \approx 0.001$

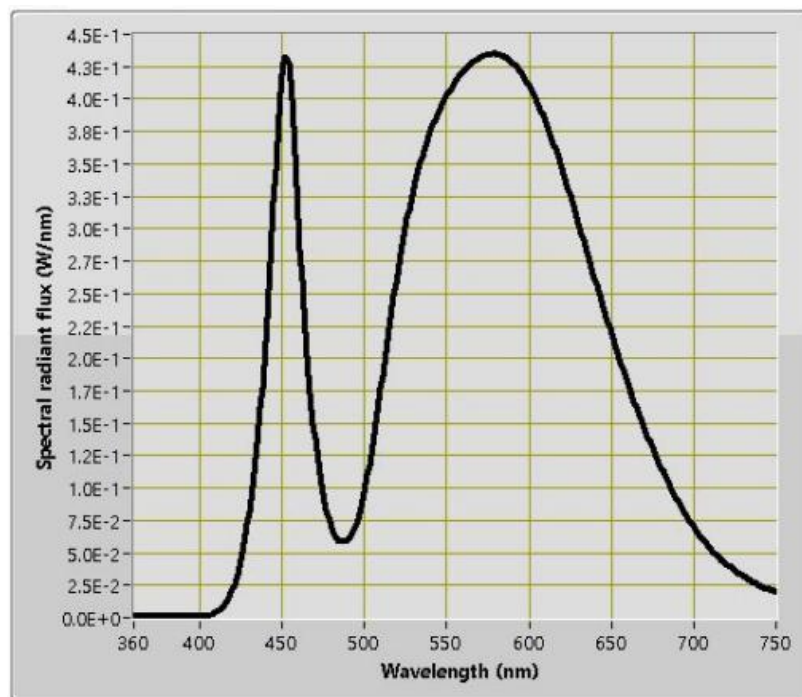


Figure 1. Total spectral radiant flux.

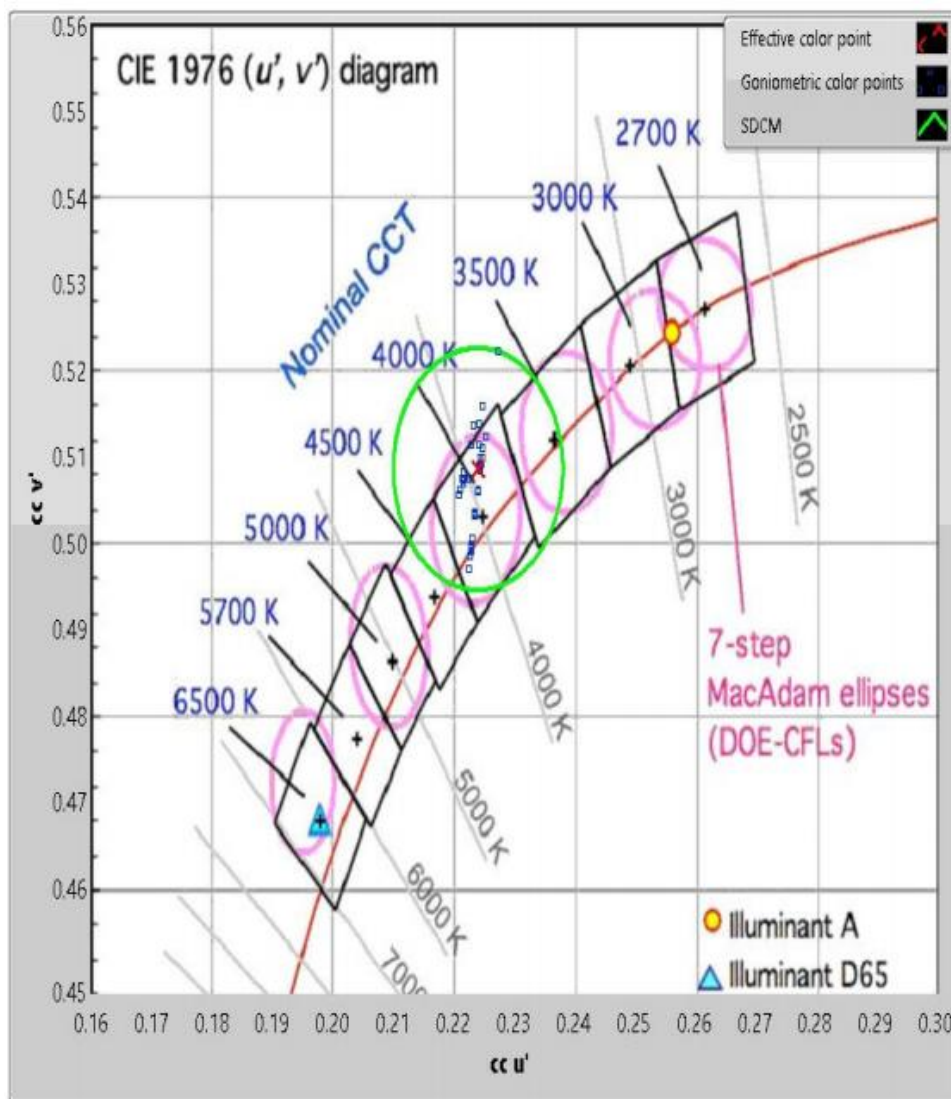


Figure 2. Color coordinates u', v' in different angles, weighted average color coordinate u', v' and SDCM.

Table 3. Angular color coordinates u', v' .

C-plane	γ (deg)	u'	v'	C-plane	u'	v'
0	80	$I \leq 10\%$	$I \leq 10\%$	180	$I \leq 10\%$	$I \leq 10\%$
0	70	0.225	0.516	180	0.224	0.514
0	60	0.225	0.511	180	0.224	0.510
0	50	0.224	0.508	180	0.224	0.509
0	40	0.224	0.506	180	0.224	0.506
0	30	0.223	0.503	180	0.224	0.504
0	20	0.223	0.500	180	0.223	0.501
0	10	0.223	0.498	180	0.223	0.499
0	0	0.223	0.499	180	0.223	0.499
90	80	$I \leq 10\%$	$I \leq 10\%$	270	$I \leq 10\%$	$I \leq 10\%$
90	70	$I \leq 10\%$	$I \leq 10\%$	270	$I \leq 10\%$	$I \leq 10\%$
90	60	0.222	0.507	270	$I \leq 10\%$	$I \leq 10\%$
90	50	0.222	0.507	270	0.224	0.511
90	40	0.227	0.522	270	0.224	0.509
90	30	0.225	0.510	270	0.224	0.509
90	20	0.223	0.503	270	0.225	0.509
90	10	0.223	0.497	270	0.225	0.512
90	0	0.223	0.499	270	0.223	0.500

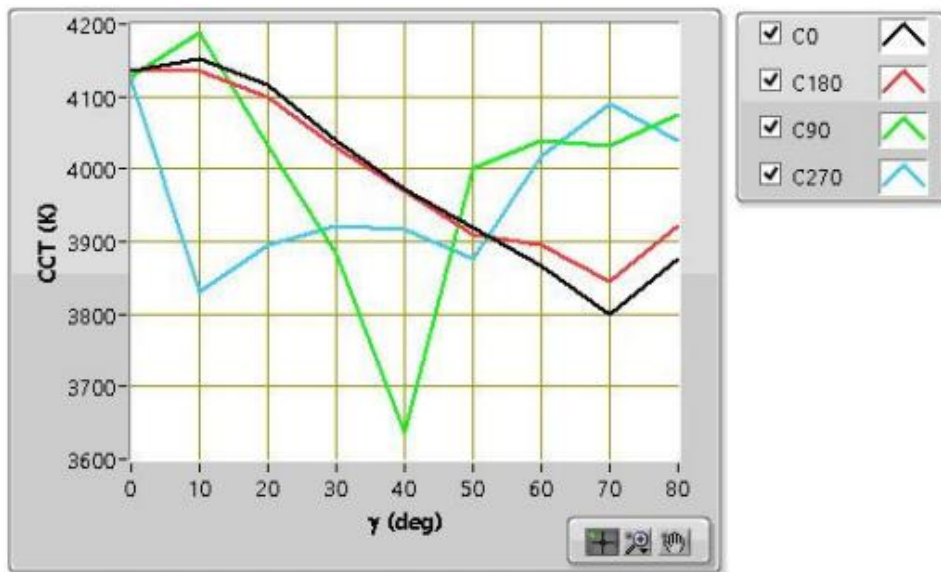


Figure 3. CCT as a function of γ in different C planes.

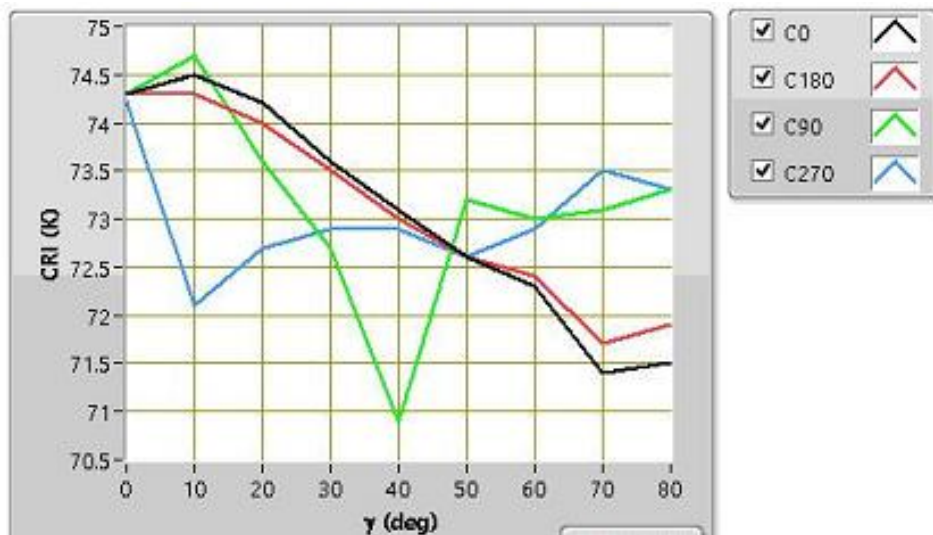


Figure 4. CRI, Ra as a function of γ in different C planes.