



High Precision CCD Spectroradiometer & Integrating Sphere Test System LPCE-2(LMS-9000)

Brochure

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Leader in Lighting & Electrical Test Instruments

Rev. 4/2/2021



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Note the following: If you need to test the single LED or LED Chip, you should choose the items which marked by **Blue**

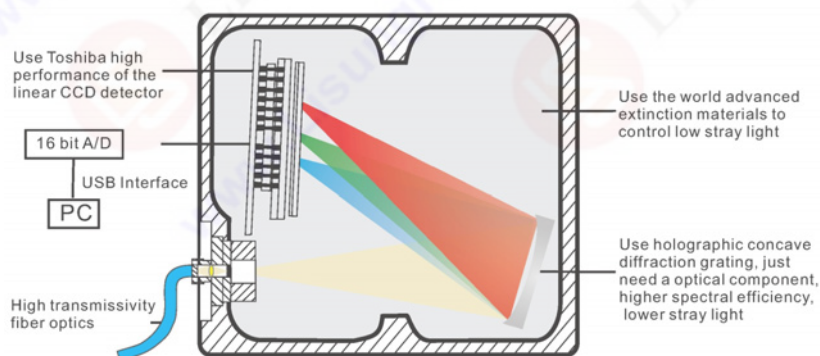
1、 High Precision CCD Spectroradiometer

LMS-9000C is adopting the world advanced Holographic grating with flat-field correction, precision optical system and the electronic shutter control technology. The test speed can be in milliseconds and the test accuracy is in the laboratory level. It has the lowest value of stray light. LMS-9000C has high repeatability and stability testing. It is fully meet CIE127-1997, IES LM-79-19 and IES LM-80.



Specifications:

- Spectral Range Wavelength: 350nm~800nm
- Spectral Wavelength Accuracy: $\pm 0.3\text{nm}$
- Wavelength Reproducibility: $\pm 0.1\text{nm}$
- Accuracy of Chromaticity Coordinate (Δx , Δy): and ± 0.002
- Correlated Color Temperature CCT: 1500K~100,000K, CCT Accuracy: $\pm 0.3\%$
- Color Rendering Index Range: 0~100.0, Accuracy: $\pm(0.3\% \text{rd} \pm 0.3)$
- Photometric linear: $\pm 0.3\%$
- Stray light: $< 0.015\%$ (600nm) and $< 0.03\%$ (435nm)
- Time of integration: 0.1ms-20s
- It can measure the temperature inside and outside of integrating sphere



LMS-9000C used the Band pass-filter Wheel Correcting Technique, Spectrometer & Broadband-radiometer & photometer Combined Technique, and modified NIST stray light correction technology, the LMS-9000C Spectroradiometer can realize ultra low stray light and super photometry linearity in overall dynamic range.

2、 Optical Fiber



CFO-1.5M is 1.5m length optical fiber used to connect the Spectroradiometer and integrating sphere. It includes the 12/16mm converter to LISUN integrating spheres.

3、 Digital CC and CV DC Power Supply

The DC Series Power Supplies are with high stability and high accuracy. The voltage and current can be adjustable and simple operation. They are suitable to supply DC Power for the standard lamps.



Specifications:

- Accuracy of Voltage and Current: $\pm(0.02 \text{ Reading} + 0.01\% \text{ Range} + 1 \text{ Digit})$
- Stability of Output Voltage/Current: $\pm 0.01\% \text{ Reading}/3\text{min}$
- Digital control for Constant Current output or Constant Voltage output
- Communicate with PC via software, the Voltage & Current set by the software and Power Output can be remote controlled.

Model	DC3005	DC3010	DC6005	DC6010	DC12005
U Range	0.0005-30.000V	0.0005-30.000V	0.0005-60.000V	0.0005-60.000V	0.0001-120.00V
I Range	0.0005-5.0000A	0.0005-10.000A	0.0005-5.0000A	0.0005-10.000A	0.0005-5.0000A

4、 Digital Power Meter



LISUN Model	Measure	Remark
LS2012	U(AC&DC), I(AC&DC), P(AC&DC), Power Factor PF(AC)	Digital Tube display
LS2050B	U(AC&DC), I(AC&DC), P(AC&DC), Power Factor PF(AC), Displacement Factor DF(AC) and Total 0-50 Harmonic in IEC/CSA	Test Accuracy is Class 0.5 with LCD touch screen display, it has special Software can be run in Win7, Win8 or Win10
LS2050C	U(AC&DC), I(AC&DC), P(AC&DC), Power Factor PF(AC), Displacement Factor DF(AC) and Total 0-50 Harmonic in IEC/CSA	Test Accuracy is Class 0.2 with LCD touch screen display, it has special Software can be run in Win7, Win8 or Win10

P.S. The LS2050C is fully meet LM-79-19 requirements and the frequency Range: 0.5Hz-100kHz

5、 AC Power Source



- AC-DC-AC frequency conversion technology, Controlled & tested by 16 bits MCU
- Protection for over hot, thundering voltage and current
- Total voltage distortion: $\leq 0.6\%$; Voltage stability: $\leq 0.1\%/30\text{min}$
- Load adjust rate: $\leq 0.1\%$; Frequency stability: $\leq 0.05\%/30\text{min}$
- Output voltage range: AC 0.0~300.0V, Output Frequency Range: 45~70Hz, 100Hz, 200Hz and 400Hz
- Input Power: 220V and 50/60Hz

- Communicate with PC via software, the Voltage & Current set by the software and Power Output can be remote controlled.

P.S. LSP-500VARC and LSP-1KVARC are the update version with big LCD screen.

LISUN Model	Output Power	Specification
LSP-500VARC (with Trigger Function)	500VA	0~150V is 4.2A and 150~300V is 2.1A
LSP-500VARC-Pst (IEC-Pst AC Source Generator)		
LSP-1KVARC (with Trigger Function)	1KVA	0~150V is 8.4A and 150~300V is 4.2A
LSP-1KVARC-Pst (IEC-Pst AC Source Generator)		

The LSP-500VARC-Pst and LSP-1KVARC-Pst are according to IEC TR 61547-1:2020 IEC61000-3-3, IEC 61000-4-15 and IEEE 1453 Pst programmable function as below:

Table 1 – Voltage fluctuations – Test specification of voltage fluctuations applied at input AC mains 120/230 V and 50/60 Hz

Rectangular amplitude modulations with duty cycle of 50 % ^{a c d f}					
Voltage changes per minute cpm	Modulation frequency f_m Hz	Relative voltage fluctuation $d = \Delta U/U$ %			
		120 V 50 Hz	120 V 60 Hz	230 V 50 Hz	230 V 60 Hz
39	0,325 0	1,045	1,040	0,894	0,895
110	0,916 7	0,844	0,844	0,722	0,723
1 056	8,8	0,353 b	0,353 b	0,275 b	0,275 b
1 620	13,5	0,545	0,548	0,407	0,409
4 000	33 1/3 ^e	3,426	Test not required	2,343	Test not required
4 800	40,0 ^e	Test not required	4,837	Test not required	3,263

^a See Table 5 of IEC 61000-4-15:2010 and Table D1 of IEC 61000-3-3:2013.

^b See Tables 2a and 2b of IEC 61000-4-15:2010 for $P_{inst} = 1$; the values of $d = 0,252$ % and $d = 0,196$ % are increased to respectively 0,353 % and 0,275 % to give $P_{st}^{LM}(I) = 1$.

^c The duration of the voltage fluctuation and recording of the illuminance is recommended to be a minimum of 180 s (60 s for the transient response of the flickermeter's filters and 120 s for the duration of the statistical evaluation of the flicker level in block d, see A.2.5). First of all, the transient response of the light flickermeter's filters should be considered, which is dominated by the illuminance adapter (block a, see A.2.2). The time constant of this filter is set at 10 s, reaching the 90 % of the value corresponding to the steady state response at approximately 50 s. In addition, the evaluation period should contain an integer number of voltage fluctuation periods. For the set of test modulation frequencies given in this table, the minimum duration to achieve an integer number of voltage fluctuation periods in all the test cases is 120 s.

^d Recommended absolute tolerance for the duty cycle is ± 2 pp, for the modulation frequency the recommended tolerance is ± 1 % and for the relative voltage fluctuation the recommended tolerance is ± 5 %.

^e The 33 1/3 Hz and 40 Hz modulation frequencies should be synchronous with the supply frequency of respectively 50 Hz and 60 Hz with a fixed phase angle as defined by Equation (1).

^f The light flicker specifications in this document are expanded such that it is aligned with the voltage flicker specifications given in IEC 61000-4-15, which is limited to 120 V and 230 V, 50 Hz and 60 Hz. No voltage fluctuation tests are available yet for 100 V, 200 V and 277 V. However, in practice the test specifications given in this table for 120 V and 230 V can be applied for 100 V and 200/277 V respectively for indicative purposes.

LSP-500VARC-Pst or LSP-1KVARC-Pst can work with LISUN LSRF-3 to do Flicker dynamic Pst LM(I) test in IEC TR 61547-1:2020

6、 New Design Integrating Sphere

Due to the LED luminaires such as LED street luminaires developed, to do 4π geometry testing, it is hard to be hold in the traditional integrating sphere design. To solve this problem, LISUN design a new kind of sphere.



A Molding Integrating Sphere VS the traditional Integrating Sphere

LISUN new Integrating sphere has the following advantages:

- The hold base can bear max 20kg, it can test all kinds of luminaires and light source such as E27/E40, all tubes such as T5/T8/T12 and all kinds of luminaires
- The hold base can be installed in the ceiling or down, height can be adjustable
- The test hold base has four power cables connect to the outside Power Supply and max is 5KW
- Build-in Cross laser system which help to install the standard lamp and testing lamp in the centre of the integrating sphere



Build-in Cross Laser System

Specification:

- Diameter: 0.3m, 0.5m, 1.0m, 1.5m, 1.75m, 2.0m, 2.5m and 3.0m
- The painting of integrating spheres is according to CIE Pub.No.84(1989)
- BaSO₄ coating: $\rho(\lambda) \geq 0.96(450\text{nm} \sim 800\text{nm})$ and $\rho(\lambda) \geq 0.92(380\text{nm} \sim 450\text{nm})$
- Fine diffuse reflection: Reflectance $\rho \approx 0.8$ and accuracy of $\rho(\lambda) < 1.5\%$

Order Number:

Sphere Diameter	1.0m	1.5m	1.75m	2m
LISUN Model	IS-1.0MA	IS-1.5MA	IS-1.75MA	IS-2.0MA
Cycle side opening	IS-1.0MA33C	IS-1.5MA55C	IS-1.75MA66C	IS-2.0MA77C

Remark:

The code 55C in IS-1.5MA55C means the side opening is diameter=50cm cycle size

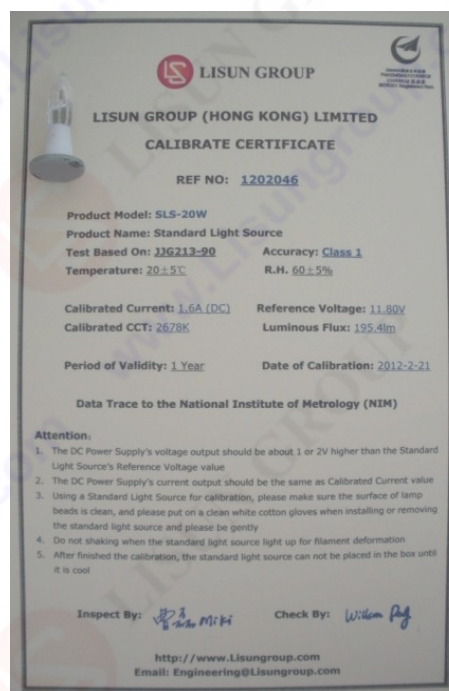
7、 Auxiliary Lamp (RLS-50W)

Due to the luminaires material has self-absorption, the test flux will be a bit difference than the original flux when test the luminaires in the integrating sphere, according to CIE request, it is necessary use an Auxiliary lamp to do flux self-absorption revise.

8、 Standard Lamp Source

OSRAM Standard Lamp to calibrate the spectrum and luminous flux with Lisun Lab certification. The data can be traced NIM. The Standard Lamp Source is used to calibrate the integrating sphere system. The different size of Integrating Sphere should choose the right power of standard lamp source

Integrating Sphere Size	Standard Lamp Source
0.3m/0.5m	SLS-10W
1m/1.5m/1.75m	SLS-50W
2m/2.5m/3m	SLS-100W

**9、 19Inch Cabinet (CASE-19IN)**

Combine all of the test instruments in a 19 inch standard Cabinet, makes the whole systems looks nice and is simple to use

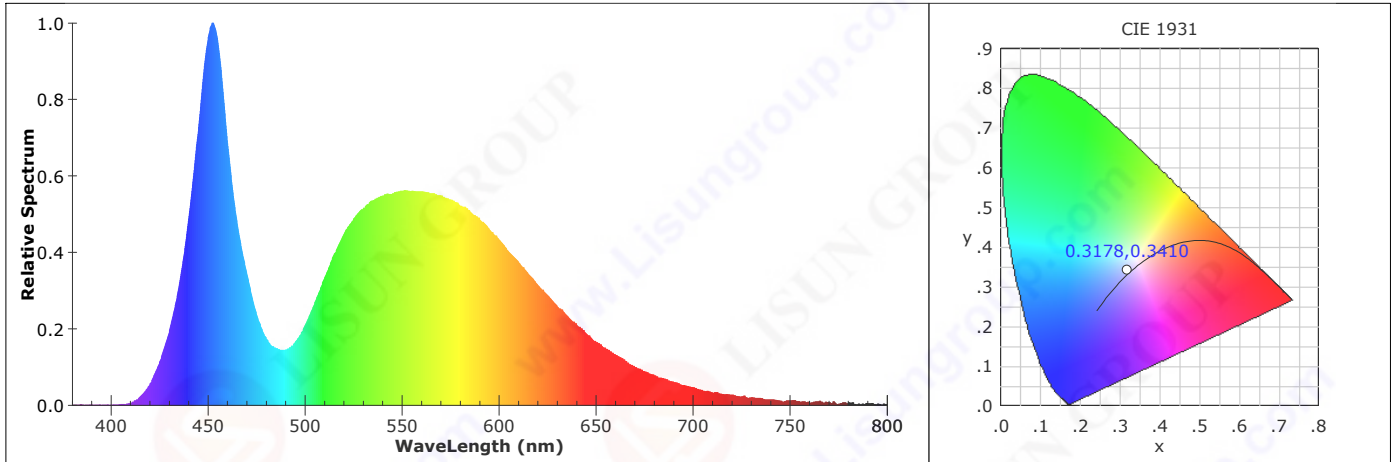
The next pages are LPCE-2 (LMS-9000) Test Report.

Lightsource Test Report

Report No: RT2021012

Test Time: 2021-02-26 10:52:53

Category:
 Spec: LED Bulb
 Manufacturer: Philips Lighting B.V.

Type:
 Number: 12
 Submitter:


CIE Colorimetric Parameters

CIE(x,y): 0.3178,0.3410	CIE(u,v): 0.1969,0.3169	CIE(u',v'): 0.1969,0.4753
CCT: 6172 K (Duv=0.006714)	Dominant Wavelength: 498.2 nm	Color Purity: 0.048
Peak Wavelength: 452.3 nm	Half Width: 24.0 nm	Color Ratio: R:0.120, G:0.838, B:0.042

Color Render Index: Ra:72.3 , avgR(1~14):61.0 , avgR(1~15):61.1

R1: 68	R2: 77	R3: 82	R4: 71	R5: 69	R6: 68	R7: 83	R8: 58
R9: -36	R10: 45	R11: 67	R12: 40	R13: 70	R14: 90	R15: 64	

Color Quality Scale: Qa:71.2 , Qf:71.0 , Qp:72.3 , Qg:86.7 ,

Q1: 80	Q2: 96	Q3: 66	Q4: 57	Q5: 66	Q6: 70	Q7: 75	Q8: 84
Q9: 92	Q10: 76	Q11: 70	Q12: 71	Q13: 72	Q14: 57	Q15: 66	

TM-30-18: Rf:74 , Rg:91

Gamut Area Index (GAI): GAI_EES:80.5 , GAI_BB_8:83.8 , GAI_BB_15:90.8

Photometric Parameters

Luminous Flux: 900.08 lm	Radiant Power: 2.732 W	Efficiency: 121.63 lm/W
Energy Efficiency Class:E (EU 2019/2015 η _{TM} :121.63lm/W)		S/P: 2.022

Pupil Flux: 1558.65 Plm (K _p =1.732)	Pupil Lumens per Watt: 210.63 Plm/W
Cirtopic Flux: 3594.10 lm	Mesopic Flux (CIE R.): 1183.97 lm (L _p =0.100)
Mesopic Flux (USP): 1392.60 lm (L _p =0.100)	Mesopic Flux (MOVE): 1231.87 lm (L _p =0.100)

Electric Parameters

Voltage: 219.70 V	Current: 0.0730 A	Power: 7.40 W
Power Factor: 0.4590	Frequency: 50.05 Hz	

 Geometry: 4n, 1.5m
 Warmup Time: 30 Minutes
 Spectroradiometer: LMS-9000C

 Self-absorption Factor: 1.000
 Integration Time: 403 ms
 Digital Power Meter: LS2050B

 Photometric Method: sphere-spectroradiometer
 Peak of Signal: 46676
 Power Source: LSP Series

 Test Lab: LISUN
 Operator: Michael Asiaml

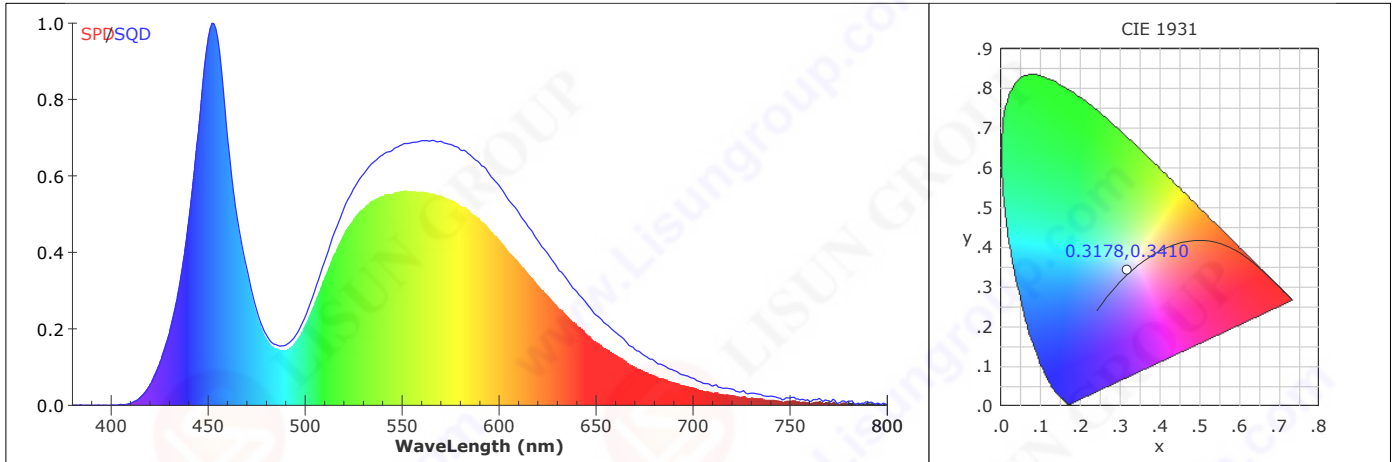
 Testing Environment: Ts:26.5°C, Ta:25.5°C,65%
 Approver:

Plant Growth Lamp Test Report

Report No: RT2021012

Test Time: 2021-02-26 10:52:53

 Category:
 Spec: LED Bulb
 Manufacturer: Philips Lighting B.V.

 Type:
 Number: 12
 Submitter:


CIE Colorimetric Parameters

CIE(x,y): 0.3178,0.3410	CIE(u,v): 0.1969,0.3169	CIE(u',v'): 0.1969,0.4753
CCT: 6172 K (Duv=0.006714)	Dominant Wavelength: 498.2 nm	Color Purity: 0.048
Peak Wavelength: 452.3 nm	Half Width: 24.0 nm	Color Ratio: R:0.120, G:0.838, B:0.042

Color Render Index: Ra:72.3 , avgR(1~14):61.0 , avgR(1~15):61.1

R1: 68	R2: 77	R3: 82	R4: 71	R5: 69	R6: 68	R7: 83	R8: 58
R9: -36	R10: 45	R11: 67	R12: 40	R13: 70	R14: 90	R15: 64	

Photometric Parameters

Luminous Flux: 900.08 lm	Efficiency: 121.63 lm/W
Radiant Power: 2.732 W	Radiant Efficiency (η): 0.369
Photosynthetic Photon Flux (Φ_p): 12.093 $\mu\text{mol/s}$	Photosynthetic Photon Efficacy (K_p): 1.634 $\mu\text{mol/J}$
Photosynthetic Radiant Flux (Φ_e): 2.691 W	Photosynthetic Radiant Efficiency (η_e): 0.364
Photon Flux (400~500nm): 3.252 $\mu\text{mol/s}$	Photon Flux (500~600nm): 6.051 $\mu\text{mol/s}$
Photon Flux (600~700nm): 2.790 $\mu\text{mol/s}$	Photon Flux (PFfr 700~800nm): 0.247 $\mu\text{mol/s}$
Photon Flux (PFuv 280~400nm): 0.001 $\mu\text{mol/s}$	Photon Flux (PF_PBAR): 12.341 $\mu\text{mol/s}$
Radiant Flux (400~500nm): 0.854 W	Radiant Flux (500~600nm): 1.310 W
Radiant Flux (600~700nm): 0.528 W	Radiant Flux (700~800nm): 0.041 W
Radiant Flux (280~400nm): 0.000 W	R/B: 0.6 R/FR: 13.0
YPF (320~780nm): 10.342 $\mu\text{mol/s}$	YPF (400~500nm): 2.376 $\mu\text{mol/s}$
YPF (500~600nm): 5.259 $\mu\text{mol/s}$	YPF (600~700nm): 2.658 $\mu\text{mol/s}$
YPF (700~780nm): 0.049 $\mu\text{mol/s}$	YPF (320~400nm): 0.001 $\mu\text{mol/s}$
Radiant Flux (Chl-A): 0.181 W	Radiant Flux (Chl-B): 0.514 W

Electric Parameters

Voltage: 219.70 V	Current: 0.0730 A	Power: 7.40 W
Power Factor: 0.4590	Frequency: 50.05 Hz	

 Geometry: 4 π , 1.5m
 Warmup Time: 30 Minutes
 Spectroradiometer: LMS-9000C

 Self-absorption Factor: 1.000
 Integration Time: 403 ms
 Digital Power Meter: LS2050B

 Photometric Method: sphere-spectroradiometer
 Peak of Signal: 46676
 Power Source: LSP Series

 Test Lab: LISUN
 Operator: Michael Asiaml

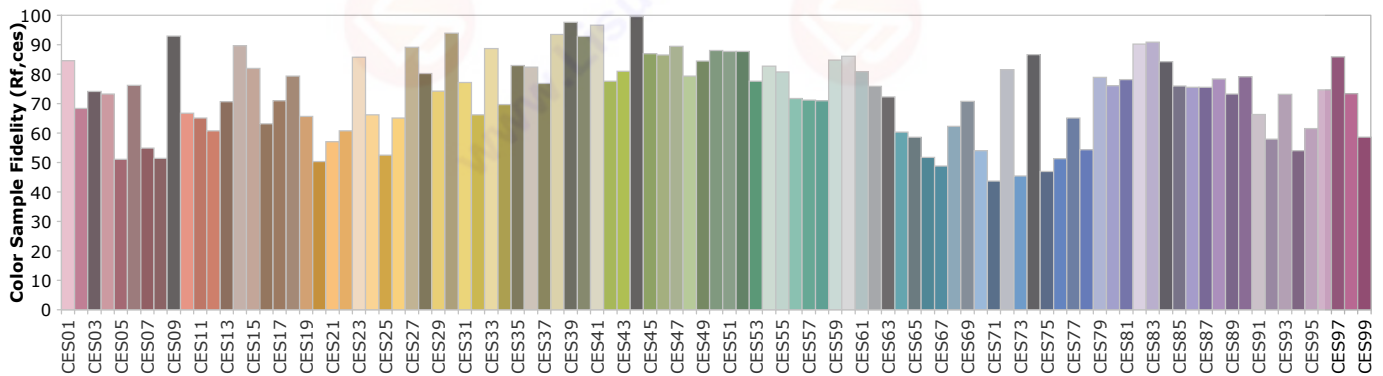
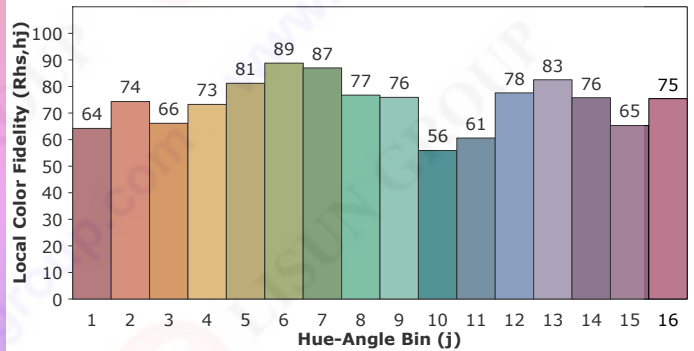
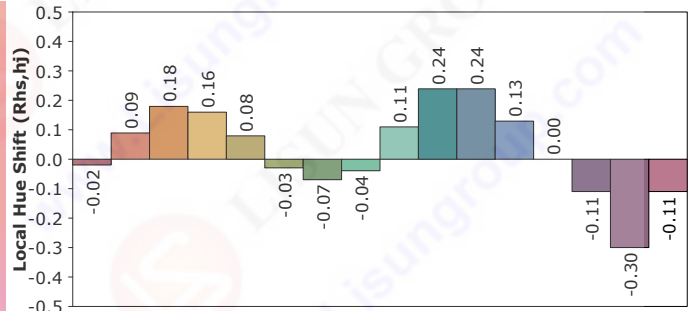
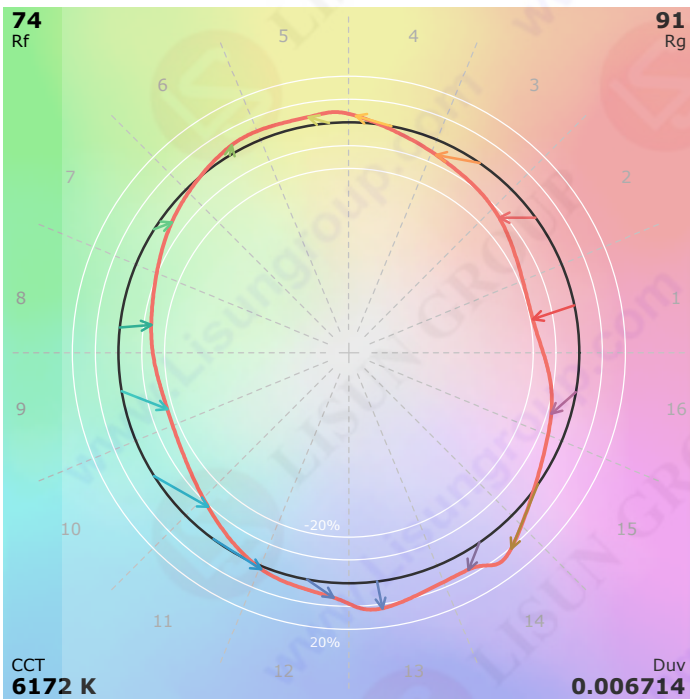
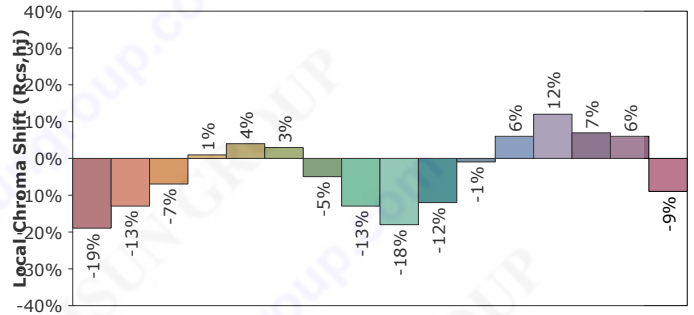
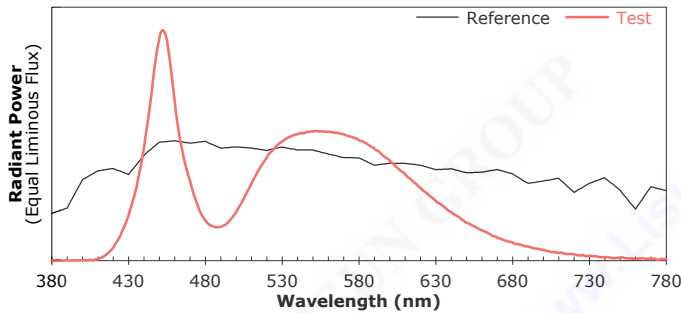
 Testing Environment: Ts:26.5°C, Ta:25.5°C,65%
 Approver:

IES TM-30-18 Color Rendition Report

Report No: RT2021012

Test Time: 2021-02-26 10:52:53

Category:
 Spec: LED Bulb
 Manufacturer: Philips Lighting B.V.

Type:
 Number: 12
 Submitter:

Notes: This is a recommended method for displaying IES TM-30-18 information.

 x **0.3178**
 y **0.3410**
 u' **0.1969**
 v' **0.4753**

CIE13.3-1995	
(CRI)	
Ra	72
R9	-36

Test Lab: LISUN
Operator: Michael Asiaml

Testing Environment: Ts:26.5°C, Ta:25.5°C,65%
Approver:

Spectral Power Distribution Data

Report No: RT2021012

Test Time: 2021-02-26 10:52:53

Category:
Type:
Spec: LED Bulb

Number: 12

Manufacturer: Philips Lighting B.V.

Submitter:

WL(nm)	PL	PE(mW/nm)	WL(nm)	PL	PE(mW/nm)	WL(nm)	PL	PE(mW/nm)
380.0	0.0004	0.0105	525.0	0.5059	13.1842	670.0	0.1028	2.6797
385.0	0.0012	0.0325	530.0	0.5356	13.9585	675.0	0.0907	2.3630
390.0	0.0014	0.0355	535.0	0.5570	14.5156	680.0	0.0808	2.1052
395.0	0.0008	0.0200	540.0	0.5692	14.8332	685.0	0.0714	1.8609
400.0	0.0006	0.0145	545.0	0.5747	14.9763	690.0	0.0623	1.6229
405.0	0.0030	0.0781	550.0	0.5816	15.1563	695.0	0.0541	1.4092
410.0	0.0066	0.1716	555.0	0.5816	15.1573	700.0	0.0480	1.2503
415.0	0.0235	0.6133	560.0	0.5804	15.1246	705.0	0.0388	1.0116
420.0	0.0586	1.5276	565.0	0.5750	14.9838	710.0	0.0334	0.8701
425.0	0.1177	3.0672	570.0	0.5687	14.8212	715.0	0.0299	0.7802
430.0	0.2042	5.3216	575.0	0.5571	14.5176	720.0	0.0280	0.7288
435.0	0.3248	8.4655	580.0	0.5411	14.1002	725.0	0.0237	0.6187
440.0	0.5068	13.2078	585.0	0.5263	13.7149	730.0	0.0209	0.5443
445.0	0.7554	19.6853	590.0	0.5034	13.1179	735.0	0.0186	0.4855
450.0	1.0000	26.0597	595.0	0.4767	12.4233	740.0	0.0156	0.4054
455.0	0.9908	25.8211	600.0	0.4501	11.7300	745.0	0.0118	0.3086
460.0	0.7188	18.7314	605.0	0.4168	10.8618	750.0	0.0125	0.3268
465.0	0.4935	12.8593	610.0	0.3884	10.1220	755.0	0.0093	0.2420
470.0	0.3577	9.3216	615.0	0.3568	9.2986	760.0	0.0065	0.1705
475.0	0.2485	6.4748	620.0	0.3266	8.5104	765.0	0.0113	0.2956
480.0	0.1804	4.7022	625.0	0.2983	7.7726	770.0	0.0072	0.1868
485.0	0.1541	4.0150	630.0	0.2682	6.9896	775.0	0.0040	0.1042
490.0	0.1510	3.9348	635.0	0.2439	6.3549	780.0	0.0070	0.1836
495.0	0.1733	4.5170	640.0	0.2179	5.6790	785.0	0.0038	0.0997
500.0	0.2175	5.6671	645.0	0.1946	5.0723	790.0	0.0049	0.1282
505.0	0.2792	7.2752	650.0	0.1707	4.4480	795.0	0.0035	0.0922
510.0	0.3470	9.0434	655.0	0.1529	3.9847	800.0	0.0012	0.0301
515.0	0.4116	10.7254	660.0	0.1359	3.5413			
520.0	0.4648	12.1121	665.0	0.1195	3.1144			

Test Lab: LISUN
Operator: Michael Asiaml

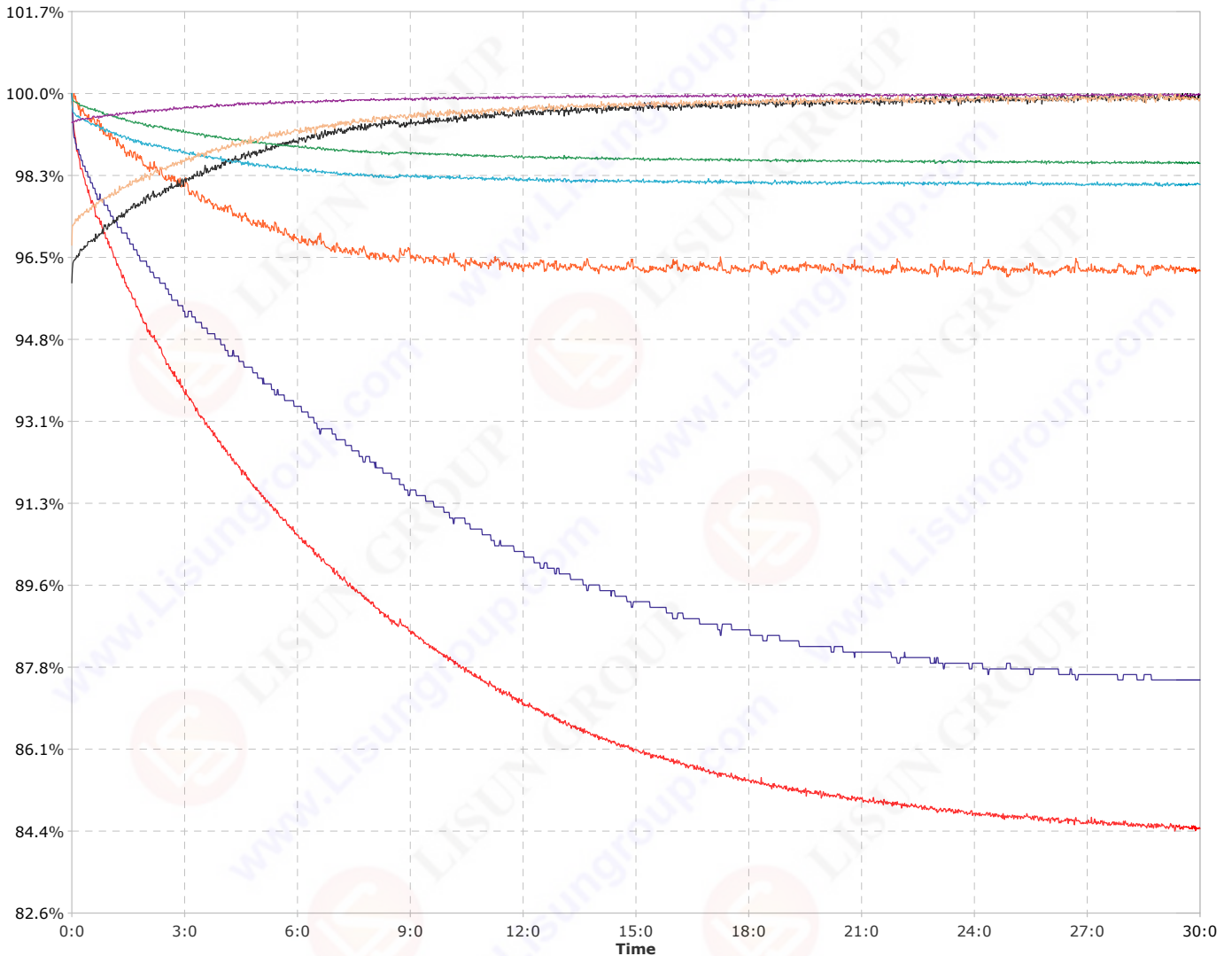
Testing Environment: Ts:26.5°C, Ta:25.5°C,65%
Approver:

Warmup Curve

Report No: RT2021012

Test Time: 2021-02-26 10:52:53

Category:
Spec: LED Bulb
Manufacturer: Philips Lighting B.V.

Type:
Number: 12
Submitter:


Stable time: 30:0

Uptime: 0:0

Parameters	Maximum	Minimum	Change
Luminous Flux ,lm	1065.78	899.28	166.50
Power ,W	8.45	7.40	1.05
Efficiency ,lm/W	126.35	121.43	4.92
CCT ,K	6178	5930	248
CIE x	0.3226	0.3177	0.0048
CIE y	0.3477	0.3408	0.0069
Peak Wavelength ,nm	452.5	449.7	2.8
Ra	72.3	70.0	2.3

Test Lab: LISUN
Operator: Michael Asiaml

Testing Environment: Ts:26.5°C, Ta:25.5°C,65%
Approver: