



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

## Brochure

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**Leader in Lighting & Electrical Test Instruments**

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**Note: 1. If you need to test the single LED or LED Chip, you should choose the items which marked by Blue.**

**2. Already include the upgradeable & free software which can run in Win7, 8, 10 and 11 (USB driver was register by Microsoft, it can install directly).**

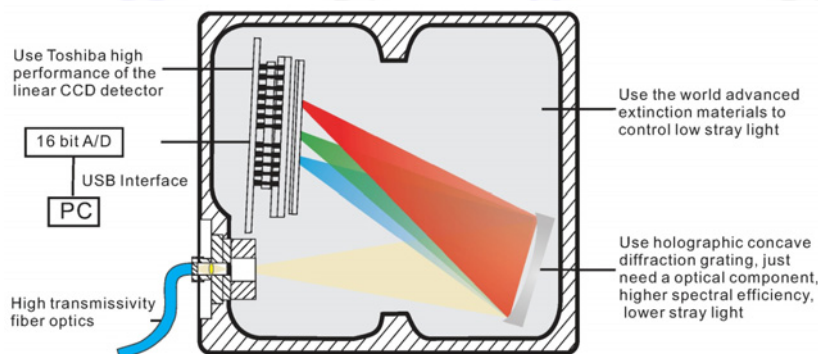
## 1、 High Precision CCD Spectroradiometer

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 Wavelength Accuracy:  $\pm 0.3\text{nm}$
- Wavelength Reproducibility:  $\pm 0.1\text{nm}$
- Accuracy of Chromaticity Coordinate ( $\Delta x, \Delta y$ ):  $\pm 0.002$  (Standard A Lamp)
- Correlated Color Temperature CCT:  $1500\text{K} \sim 100,000\text{K}$ , CCT Accuracy:  $\pm 0.3\%$
- Color Rendering Index Range:  $0 \sim 100.0$ , Accuracy:  $\pm (0.3\% \text{rd} \pm 0.3)$
- Photometric linear:  $\pm 0.3\%$ ; Time of integration:  $0.1\text{ms} \sim 20\text{s}$
- Stray light:  $< 0.015\%$  (600nm) and  $< 0.03\%$  (435nm)
- It can measure the temperature inside and outside of integrating sphere
- Flux testing method: spectrum, photometric and spectrum with photometric revision



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.

LISUN Model	LMS-9000C	LMS-9000CUV-VIS	LMS-9000CVIS-NIR
Wavelength	350-800nm	200-800nm	350-1050nm

P.S. If the UV Accuracy Test, please go here learn more: [LPCE-2\(LMS-9000CUV\)](#)

## 2、 Optical Fiber



The optical fiber is used to connect the integrating sphere with spectroradiometer.

<b>LISUN Model</b>	<b>CFO-1.5M</b>	<b>CFS-1.5M</b>
<b>Products Name</b>	1.5m Optical Fiber	1.5m Silica Optical Fiber
<b>Work in Wavelength</b>	350-1050nm	200-1050nm

P.S. The 2m or 3m length optical fiber can be design according to customers' request.

## 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: +/- (0.02 Reading + 0.01% Range + 1 Digit)
- Stability of Output Voltage/Current: +/- 0.01% Reading / 3min
- 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 % <sup>a c d f</sup>					
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 <sup>e</sup>	3,426	Test not required	2,343	Test not required
4 800	40,0 <sup>e</sup>	Test not required	4,837	Test not required	3,263

<sup>a</sup> See Table 5 of IEC 61000-4-15:2010 and Table D1 of IEC 61000-3-3:2013.

<sup>b</sup> 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  $P_{st}^{LM}(I) = 1$ .

<sup>c</sup> 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.

<sup>d</sup> Recommended absolute tolerance for the duty cycle is  $\pm 2$  pp, for the modulation frequency the recommended tolerance is  $\pm 1$  % and for the relative voltage fluctuation the recommended tolerance is  $\pm 5$  %.

<sup>e</sup> 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).

<sup>f</sup> 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)
- BaSO<sub>4</sub> 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:**

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

**Remark:**

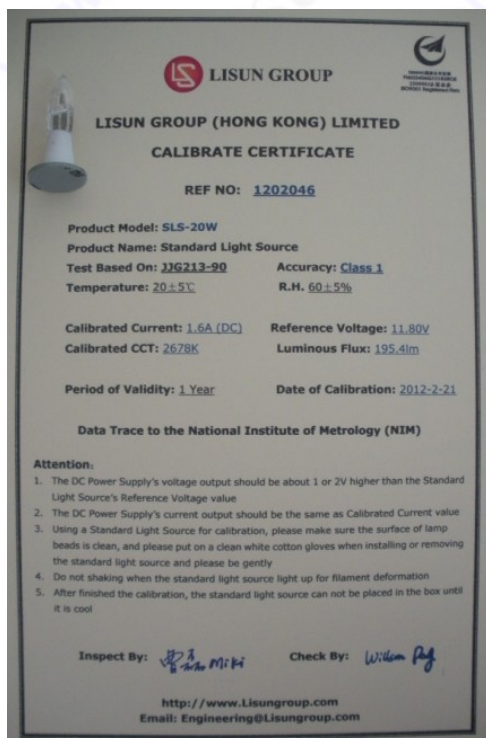
The code 55C in IS-1.5MA55C means the side opening is diameter=50cm cycle size

## 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 and LISUN 350-1050nm Spectroradiometer Test System, according to CIE request, it is necessary use an Auxiliary lamp to do flux self-absorption revise.

Integrating Sphere Size	Auxiliary Lamp (350-1050nm)
1m/1.5m/1.75m	RLS-50W
2m/2.5m/3m	RLS-100W

## 8、 Standard Light Source



The **Standard Light Source** is used to calibrate LISUN LPCE-2 Scientific Grade Spectroradiometer Integrating Sphere System or LPCE-3 CCD Spectroradiometer Integrating Sphere Compact System. The Standard Light Source Calibrate Certificate can be traced to NIM and NIST. The different size of Integrating Sphere should choose the right power of standard lamp source.

Integrating Sphere Size	Standard Light Source (350-800nm)	Standard Light Source (350-1050nm)
0.3m/0.5m	SLS-10W	SLS-10WIR
1m/1.5m/1.75m	SLS-50W	SLS-50WIR
2m/2.5m/3m	SLS-100W	SLS-100WIR



## 9、 Multi-function LED Clamps Set

The whole sets includes three good thermal conductivity clamps and an extended converter : for through hole LED, for COB LED for multi-functions SMD LED, they can work with 0.3m or 0.5m integrating sphere



## 10、 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



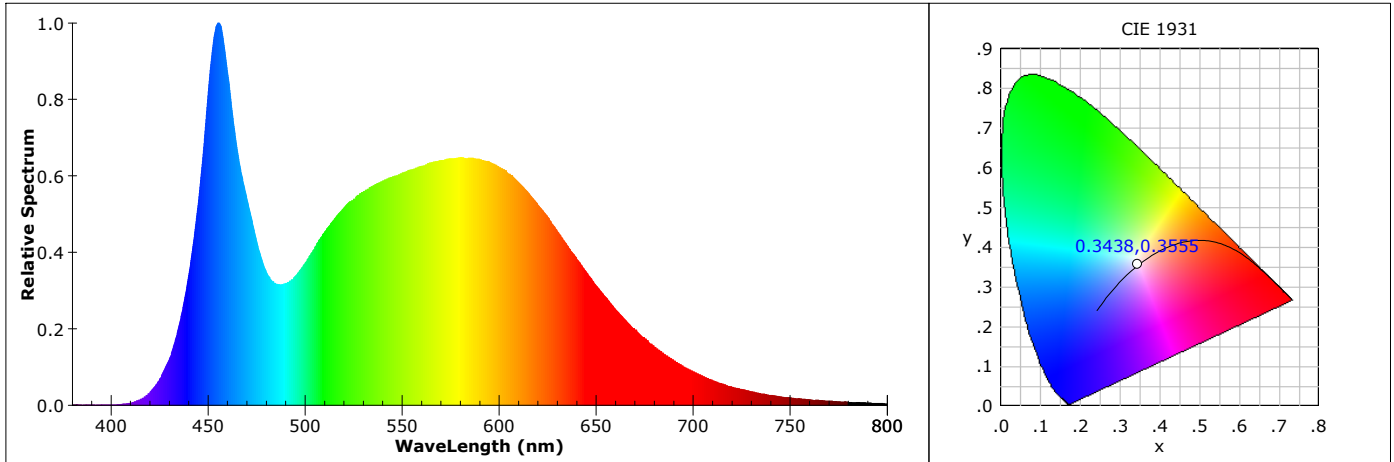
**The next pages are LPCE-2 (LMS-9000) Test Report.**

## Lightsource Test Report

**Report No:** 47

**Test Time:** 2022-11-25 10:19:40

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

 Type:  
 Number: 47  
 Submitter:

**CIE Colorimetric Parameters**

CIE(x,y): 0.3438,0.3555	CIE(u,v): 0.2090,0.3243	CIE(u',v'): 0.2090,0.4864
CCT: 5064 K (Duv=0.002485)	Dominant Wavelength: 569.4 nm	Color Purity: 0.099
Peak Wavelength: 455.5 nm	Half Width: 27.7 nm	Color Ratio: R:0.157, G:0.792, B:0.051

Color Render Index: Ra:84.1 , avgR(1~14):77.7 , avgR(1~15):77.8

R1: 83	R2: 91	R3: 95	R4: 81	R5: 82	R6: 86	R7: 87	R8: 68
R9: 13	R10: 77	R11: 80	R12: 62	R13: 85	R14: 97	R15: 78	

Color Quality Scale: Qa:81.9 , Qf:82.2 , Qp:81.3 , Qg:91.6 ,

Q1: 82	Q2: 98	Q3: 80	Q4: 73	Q5: 78	Q6: 80	Q7: 85	Q8: 89
Q9: 97	Q10: 89	Q11: 84	Q12: 83	Q13: 83	Q14: 73	Q15: 77	

TM-30-18: Rf:84 , Rg:94

Gamut Area Index (GAI): GAI\_EES:80.9 , GAI\_BB\_8:91.4 , GAI\_BB\_15:97.3

**Photometric Parameters**

Luminous Flux: 4105.49 lm	Radiant Power: 12.940 W	Efficiency: 112.09 lm/W
Energy Efficiency Class:E (EU 2019/2015 $\eta$ TM:112.09lm/W)		S/P: 2.007
M/P Ratio (WELL): 0.856	Kmel,v: 1.028 mW/lm	Kmel,v(D65): 0.775

Pupil Flux: 7069.12 Plm (Kp=1.722)

Pupil Lumens per Watt: 193.01 Plm/W

Cirtopic Flux: 16583.41 lm

Mesopic Flux (CIE R.): 5383.41 lm (Lp=0.100)

Mesopic Flux (USP): 6325.51 lm (Lp=0.100)

Mesopic Flux (MOVE): 5599.07 lm (Lp=0.100)

**Electric Parameters**

Voltage: 220.068 V	Current: 0.1745 A	Power: 36.627 W
Power Factor: 0.9535	Frequency: 50.00 Hz	Displacement Factor: 0.9635

**TMP Temperature Data**

 Welding foot T1: 23.7°C Aluminum plate T2: 83.8°C Upper the outer wall T3: 23.1°C Middle the outer wall T4: 23.4°C  
 Under the outer wall T5: 22.8°C Lamp holder T6: 22.7°C

 Geometry: 4 $\pi$ , 1.5m

Self-absorption Factor: 1.000

Photometric Method: sphere-spectroradiometer

Warmup Time: 5 Minutes 1 Seconds

Integration Time: 68 ms

Peak of Signal: 47733

Spectroradiometer: LMS-9000C

Digital Power Meter: LS2050C

Power Source: LSP Series

 Test Lab: LISUN  
 Operator: Michael Asiami

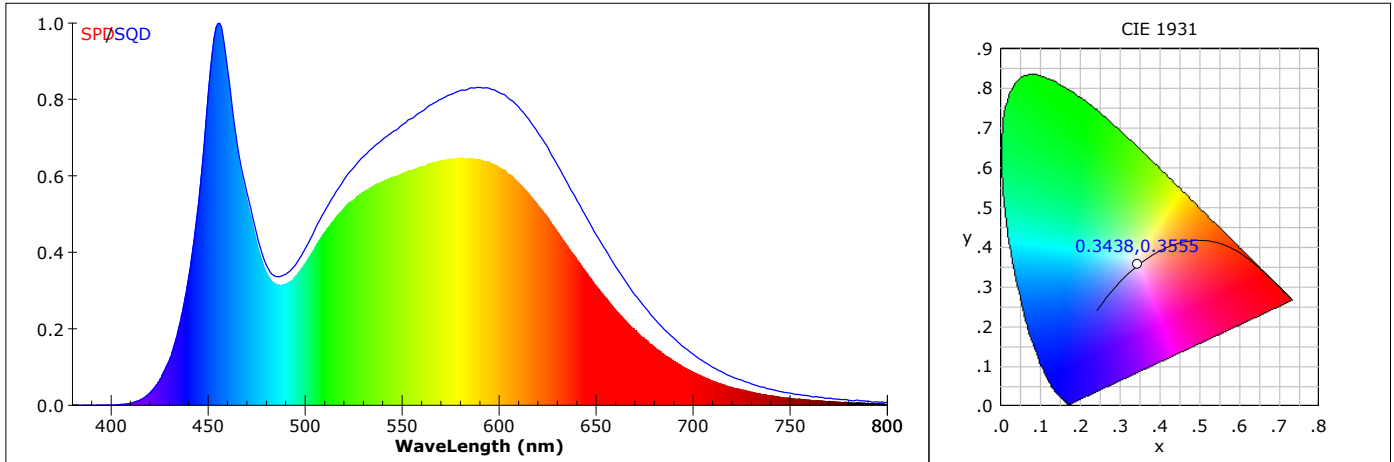
 Testing Environment: Ts:20.5°C, Ta:20.6°C,65%  
 Approver:

## Plant Growth Lamp Test Report

**Report No:** 47

**Test Time:** 2022-11-25 10:19:40

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

 Type:  
 Number: 47  
 Submitter:


### CIE Colorimetric Parameters

CIE(x,y): 0.3438,0.3555	CIE(u,v): 0.2090,0.3243	CIE(u',v'): 0.2090,0.4864
CCT: 5064 K (Duv=0.002485 )	Dominant Wavelength: 569.4 nm	Color Purity: 0.099
Peak Wavelength: 455.5 nm	Half Width: 27.7 nm	Color Ratio: R:0.157, G:0.792, B:0.051

Color Render Index: Ra:84.1 , avgR(1~14):77.7 , avgR(1~15):77.8

R1: 83	R2: 91	R3: 95	R4: 81	R5: 82	R6: 86	R7: 87	R8: 68
R9: 13	R10: 77	R11: 80	R12: 62	R13: 85	R14: 97	R15: 78	

### Photometric Parameters

Luminous Flux: 4105.49 lm	Efficiency: 112.09 lm/W
Radiant Power: 12.940 W	Radiant Efficiency ( $\eta$ ): 0.353
Photosynthetic Photon Flux ( $\Phi_p$ ): 58.142 $\mu\text{mol/s}$	Photosynthetic Photon Efficacy ( $K_p$ ): 1.587 $\mu\text{mol/J}$
Photosynthetic Radiant Flux ( $\Phi_e$ ): 12.666 W	Photosynthetic Radiant Efficiency ( $\eta_e$ ): 0.346
Photon Flux (400~500nm): 13.753 $\mu\text{mol/s}$	Photon Flux (500~600nm): 26.587 $\mu\text{mol/s}$
Photon Flux (600~700nm): 17.802 $\mu\text{mol/s}$	Photon Flux (PFfr 700~800nm): 1.653 $\mu\text{mol/s}$
Photon Flux (PFuv 280~400nm): 0.007 $\mu\text{mol/s}$	Photon Flux (PF_PBAR): 59.801 $\mu\text{mol/s}$
Radiant Flux (400~500nm): 3.560 W	Radiant Flux (500~600nm): 5.752 W
Radiant Flux (600~700nm): 3.353 W	Radiant Flux (700~800nm): 0.272 W
Radiant Flux (280~400nm): 0.002 W	R/B: 0.9 R/FR: 12.3
YPF (320~780nm): 50.279 $\mu\text{mol/s}$	YPF (400~500nm): 9.922 $\mu\text{mol/s}$
YPF (500~600nm): 23.145 $\mu\text{mol/s}$	YPF (600~700nm): 16.869 $\mu\text{mol/s}$
YPF (700~780nm): 0.339 $\mu\text{mol/s}$	YPF (320~400nm): 0.004 $\mu\text{mol/s}$
Radiant Flux (Chl-A): 0.834 W	Radiant Flux (Chl-B): 2.058 W

### Electric Parameters

Voltage: 220.068 V	Current: 0.1745 A	Power: 36.627 W
Power Factor: 0.9535	Frequency: 50.00 Hz	Displacement Factor: 0.9635

 Geometry: 4n, 1.5m  
 Warmup Time: 5 Minutes 1 Seconds  
 Spectroradiometer: LMS-9000C

 Self-absorption Factor: 1.000  
 Integration Time: 68 ms  
 Digital Power Meter: LS2050C

 Photometric Method: sphere-spectroradiometer  
 Peak of Signal: 47733  
 Power Source: LSP Series

 Test Lab: LISUN  
 Operator: Michael Asiami

 Testing Environment: Ts:20.5°C, Ta:20.6°C,65%  
 Approver:

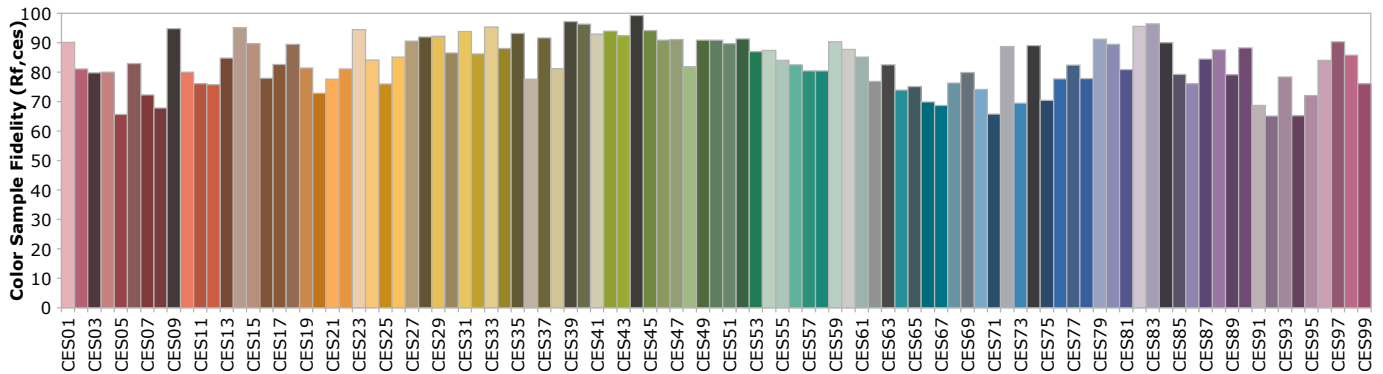
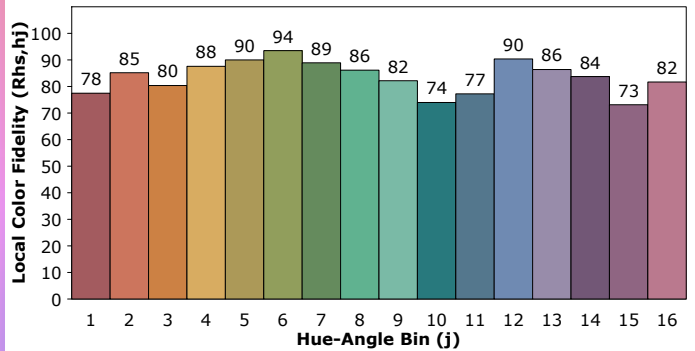
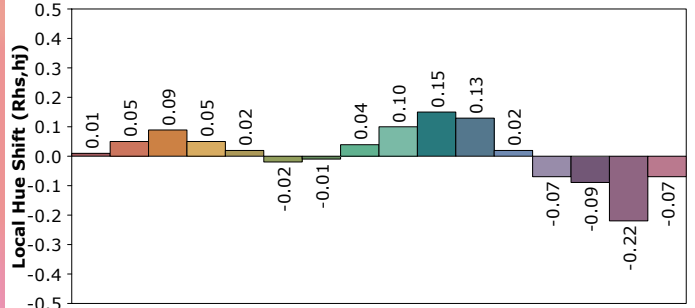
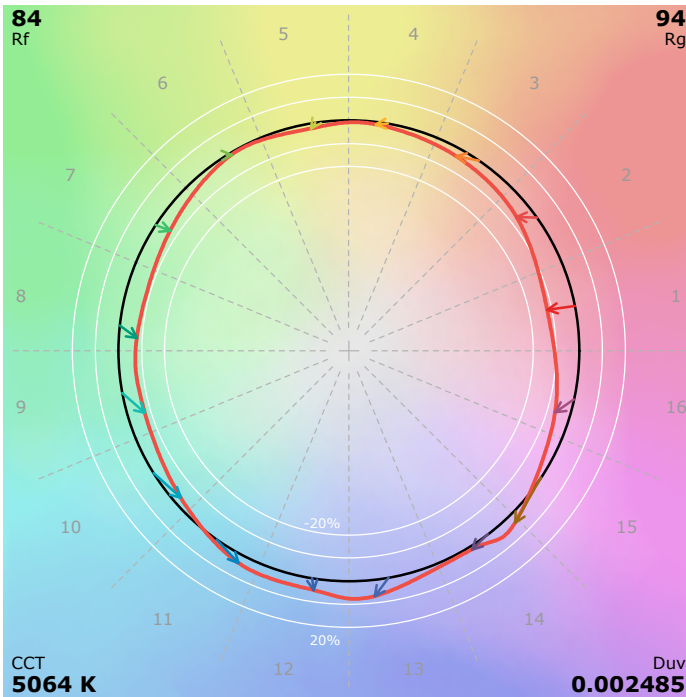
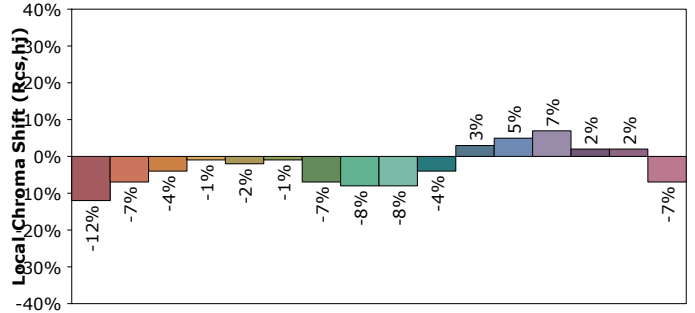
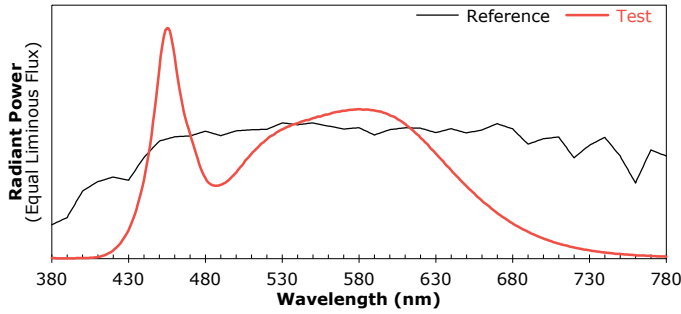
## IES TM-30-18 Color Rendition Report

**Report No:** 47

**Test Time:** 2022-11-25 10:19:40

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

Type:  
 Number: 47  
 Submitter:



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

x **0.3438**  
 y **0.3555**  
 u' **0.2090**  
 v' **0.4864**

CIE13.3-1995  
 (CRI)  
 Ra **84**  
 R9 **13**

Test Lab: LISUN  
 Operator: Michael Asiami

Testing Environment: Ts:20.5°C, Ta:20.6°C,65%  
 Approver:



## Spectral Power Distribution Data

**Report No:** 47**Test Time:** 2022-11-25 10:19:40

Category:

Type:

Spec: LED Bulb

Number: 47

Manufacturer: Philips Lighting B.V.

Submitter:

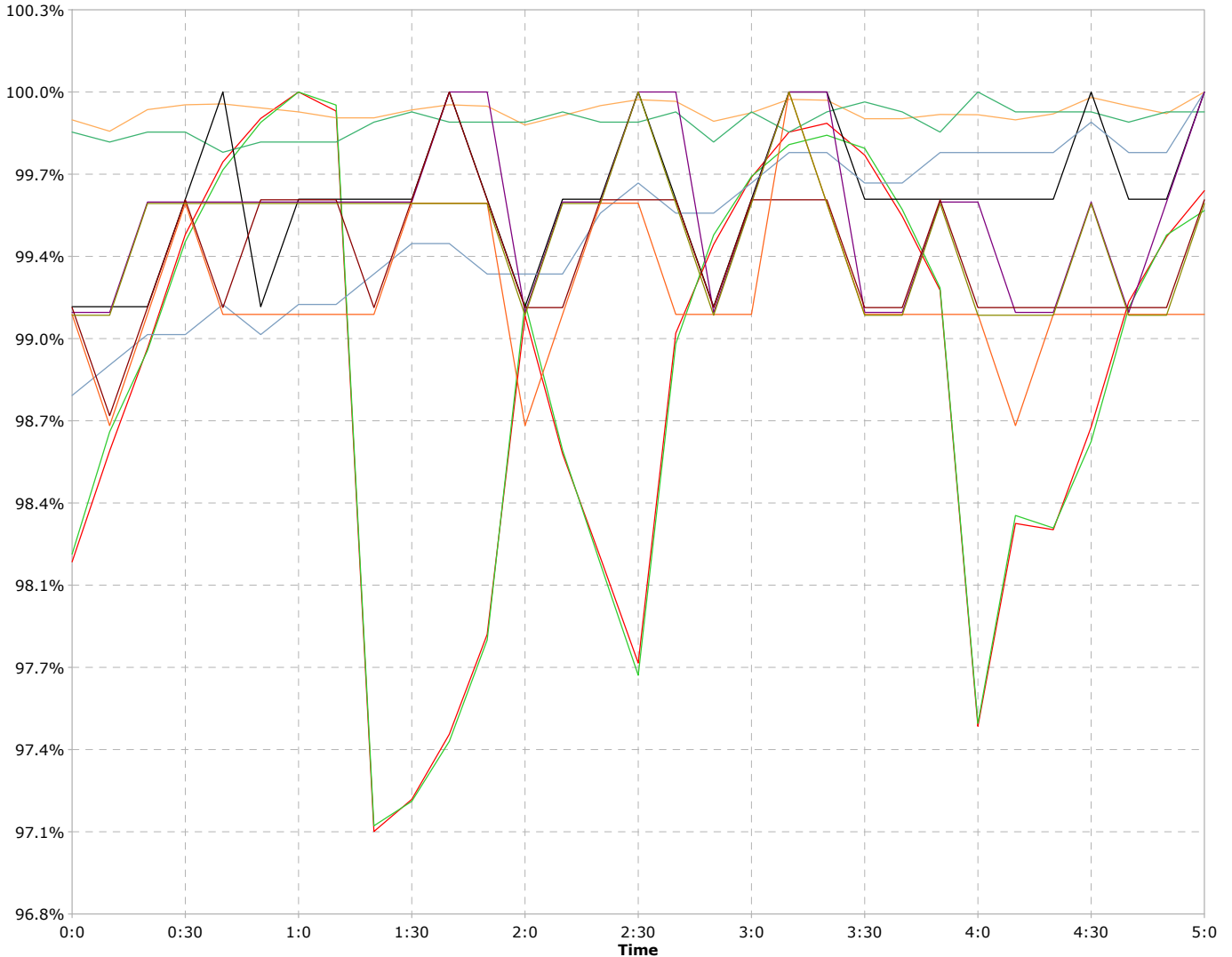
WL(nm)	PL	PE(mW/nm)	WL(nm)	PL	PE(mW/nm)	WL(nm)	PL	PE(mW/nm)
380	0.0014	0.1437	525	0.5402	53.7655	670	0.1972	19.6254
385	0.0004	0.0445	530	0.5603	55.7659	675	0.1737	17.2924
390	0.0012	0.1146	535	0.5748	57.2066	680	0.1524	15.1665
395	0.0010	0.1024	540	0.5872	58.4446	685	0.1331	13.2497
400	0.0015	0.1460	545	0.5988	59.6005	690	0.1164	11.5804
405	0.0030	0.2994	550	0.6088	60.5930	695	0.1003	9.9811
410	0.0065	0.6435	555	0.6166	61.3672	700	0.0874	8.6959
415	0.0163	1.6187	560	0.6260	62.3093	705	0.0751	7.4716
420	0.0351	3.4980	565	0.6353	63.2297	710	0.0643	6.3966
425	0.0690	6.8628	570	0.6409	63.7923	715	0.0560	5.5768
430	0.1230	12.2378	575	0.6452	64.2171	720	0.0475	4.7288
435	0.2098	20.8846	580	0.6484	64.5314	725	0.0416	4.1419
440	0.3403	33.8736	585	0.6471	64.4023	730	0.0353	3.5154
445	0.5380	53.5468	590	0.6430	63.9992	735	0.0301	2.9983
450	0.8215	81.7637	595	0.6357	63.2668	740	0.0261	2.6022
455	1.0000	99.5307	600	0.6219	61.8965	745	0.0225	2.2418
460	0.8763	87.2176	605	0.6052	60.2368	750	0.0195	1.9440
465	0.6693	66.6114	610	0.5835	58.0796	755	0.0169	1.6864
470	0.5411	53.8593	615	0.5566	55.4001	760	0.0147	1.4601
475	0.4326	43.0572	620	0.5249	52.2461	765	0.0127	1.2640
480	0.3487	34.7096	625	0.4927	49.0342	770	0.0112	1.1143
485	0.3173	31.5810	630	0.4555	45.3321	775	0.0094	0.9370
490	0.3195	31.7999	635	0.4195	41.7575	780	0.0083	0.8255
495	0.3390	33.7362	640	0.3822	38.0436	785	0.0080	0.7957
500	0.3735	37.1746	645	0.3477	34.6086	790	0.0066	0.6582
505	0.4144	41.2466	650	0.3137	31.2203	795	0.0052	0.5186
510	0.4545	45.2355	655	0.2825	28.1159	800	0.0049	0.4912
515	0.4879	48.5637	660	0.2510	24.9860			
520	0.5171	51.4675	665	0.2239	22.2821			

## Warmup Curve

**Report No:** 47

**Test Time:** 2022-11-25 10:19:40

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

 Type:  
 Number: 47  
 Submitter:


Stable time: 5:0

Uptime: 0:0

Parameters	Maximum	Minimum	Change
Luminous Flux ,lm	4171.71	4050.55	121.16
Power ,W	36.623	36.566	0.057
Efficiency ,lm/W	114.00	110.71	3.28
CCT ,k	5068	5056	12
Welding foot T1 ,°C	23.7	23.5	0.2
Aluminun plate T2 ,°C	83.9	82.9	1.0
Upper the outer wall T3 ,°C	23.1	22.9	0.2
Middle the outer wall T4 ,°C	23.6	23.3	0.3
Under the outer wall T5 ,°C	22.9	22.6	0.3
Lamp holder T6 ,°C	22.8	22.6	0.2

 Test Lab: LISUN  
 Operator: Michael Asiami

 Testing Environment: Ts:20.5°C, Ta:20.6°C,65%  
 Approver: