LM-79-08 TEST REPORT

for

GREEN CREATIVE LTD

756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai

LED Lamp

Model: 9A19DIM/840/GU24/R

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

3rd Floor, Bld. 2, NO. 96 Longchuanwu Rd Qianjiang Economy Dev. Zone, YuhangDist,
Hangzhou, Zhejiang Province, China 311100
Tel: +86571 86376106
www.ledtestlab.com

Report No.: HZ19050020j

The laboratory that conducted the testing detailed in this report has been accredited for SSL by NVLAP.

Review by: April Zou

Engineer: April Zou
May 23, 2019

Approved by:

Manager: Jim Zhang
May 23, 2019

Note: This report does not imply product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

TEST SUMMARY

Sample Tested: **9A19DIM/840/GU24/R**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
110.6	961.0	8.69	0.9064

CCT (K)	CRI	Stabilization Time (Light & Power)
4106	83.8	60

Table 1: Executive Data Summary

Note: The above results are recorded/ derived from measurements made using an Integrating Sphere.

Test specifications:

Date of Receipt : May 16, 2019

Date of Test : May 20, 2019

Test item : Total Luminous Flux, Luminous Distribution Intensity, Luminous Efficacy, Correlated Color Temperature, Color Rendering Index, Chromaticity Coordinate, Electrical parameters

Reference Standard : IESNA LM-79-2008 Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products
ANSI/IES TM-30-18 IES Method for Evaluating Light Source Color Rendition

TABLE OF CONTENT

SAMPLE PHOTO

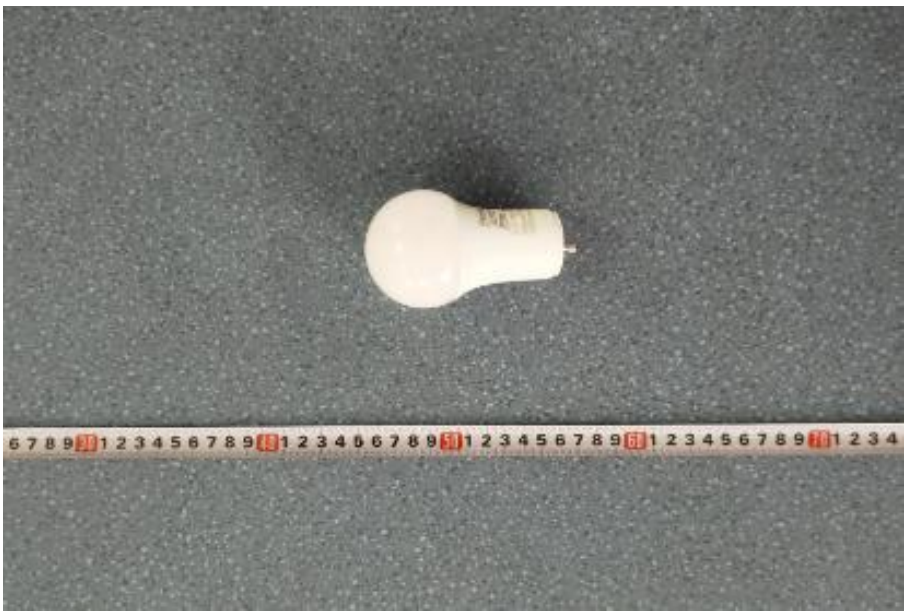


Figure 1- Overview of the sample

Equipment Under Test(EUT)	
Name	: LED Lamp
Model	: 9A19DIM/840/GU24/R
Electrical Ratings	: 120V, 60Hz, 9W
Product Description	: 4000K
Manufacturer	: GREEN CREATIVE LTD
Address	: 756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai

TEST RESULTS

Test ambient temperature was 26.0℃.

Base orientation was base up. Test was conducted without a dimmer in the circuit.

The stabilization time of the sample was 60 minutes, and the total operating time including stabilization was 65 minutes.

Sphere-Spectroradiometer Method

Parameter	Result
Test Voltage (V)	120.0
Voltage frequency (Hz)	60
Test Current (A)	0.080
Power Factor	0.9064
Test Power (W)	8.69
THD A%	34.24
Luminous Efficacy (lm/W)	110.6
Total Luminous Flux (lm)	961.0
Color Rendering Index (CRI)	83.8
R9	13.1
Correlated Color Temperature (CCT)(K)	4106
Chromaticity Chroma x	0.3759
Chromaticity Chroma y	0.3744
Chromaticity Chroma u	0.2231
Chromaticity Chroma v	0.3332
Duv	0.0003
Chromaticity Chroma u ’	0.2231
Chromaticity Chroma v’	0.4999

Special Color Rendering Indices	
R1	82.5
R2	91.8
R3	95.7
R4	80.1
R5	81.9
R6	87.5
R7	85.4
R8	65.3
R9	13.1
R10	79.2
R11	78.3
R12	61.9
R13	85.3
R14	98.2

Table 2: Test data per Sphere-Spectroradiometer Method

Note: According to CIE 1976 (u’,v’) diagram, u’ = u = 4x/(-2x+12y+3), v’ = 3v/2 = 9y/(-2x+12y+3).

Goniophotometer Method

Test ambient temperature was 25.2℃.

The photometric distance is 2.47 m.

Luminous data was taken at 0.5 °vertical intervals and 10 °horizontal intervals.

Parameter	**Result**
Test Voltage (V)	120.0
Voltage frequency (Hz)	60
Test Current (A)	0.080
Power Factor	0.9104
Power (W)	8.75
Luminous Efficacy (lm/W)	111.7
Total Luminous Flux (lm)	977.1
Beam Angle (°)	227.5 (0^o-180^o) / 226.7 (90^o-270^o)
Center Beam Candle Power (cd)	119
Maximum Beam Candle Power (cd)	119.0 (At: C=150.0, Gamma=17.5)
Spacing Criteria	1.52 (0^o-180^o) / 1.49 (90^o-270^o)
Zonal Lumens in the 0 °-60 °Zone	36.56%
Zonal Lumens in the 60 °-90 °Zone	30.52%
Zonal Lumens in the 90 °-120 °Zone	21.95%
Zonal Lumens in the 120 °-180 °Zone	10.98%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

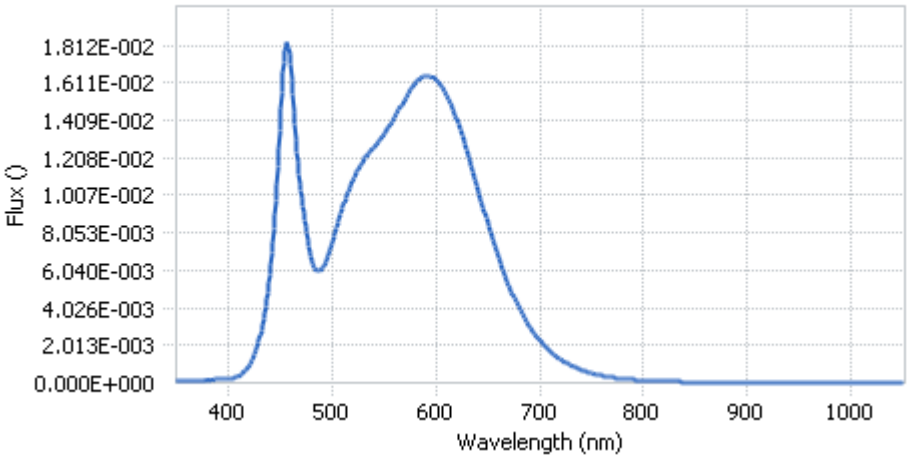
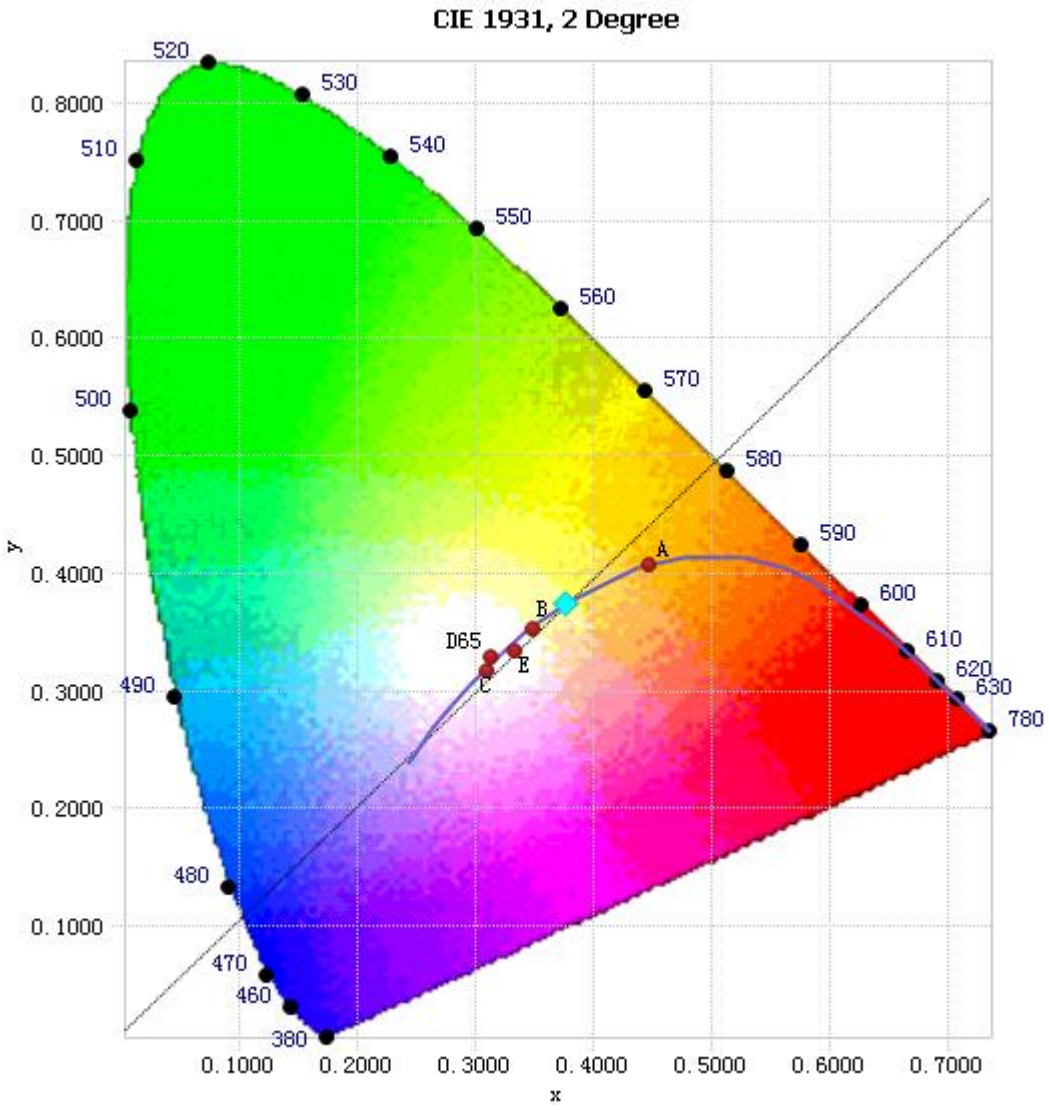


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.57E-04	485	6.04E-03	590	1.65E-02	695	2.64E-03
385	1.45E-04	490	6.12E-03	595	1.65E-02	700	2.29E-03
390	1.76E-04	495	6.65E-03	600	1.63E-02	705	1.97E-03
395	1.91E-04	500	7.46E-03	605	1.60E-02	710	1.70E-03
400	2.20E-04	505	8.44E-03	610	1.55E-02	715	1.46E-03
405	2.63E-04	510	9.39E-03	615	1.49E-02	720	1.27E-03
410	3.69E-04	515	1.03E-02	620	1.42E-02	725	1.09E-03
415	6.07E-04	520	1.09E-02	625	1.34E-02	730	9.40E-04
420	8.78E-04	525	1.14E-02	630	1.25E-02	735	8.12E-04
425	1.45E-03	530	1.19E-02	635	1.15E-02	740	6.96E-04
430	2.33E-03	535	1.23E-02	640	1.05E-02	745	5.97E-04
435	3.72E-03	540	1.26E-02	645	9.53E-03	750	5.17E-04
440	5.85E-03	545	1.30E-02	650	8.58E-03	755	4.45E-04
445	9.00E-03	550	1.33E-02	655	7.69E-03	760	3.85E-04
450	1.36E-02	555	1.38E-02	660	6.85E-03	765	3.31E-04
455	1.79E-02	560	1.42E-02	665	6.03E-03	770	2.87E-04
460	1.71E-02	565	1.47E-02	670	5.30E-03	775	2.48E-04
465	1.30E-02	570	1.52E-02	675	4.64E-03	780	2.15E-04
470	1.03E-02	575	1.57E-02	680	4.05E-03		
475	8.37E-03	580	1.61E-02	685	3.53E-03		
480	6.74E-03	585	1.64E-02	690	3.05E-03		

Table 4: Spectral Power Distribution Numerical Data per Sphere - Spectroradiometer Method

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3759, 0.3744)

Chart 2: Chromaticity Diagram per Sphere - Spectroradiometer Method

Note: The location on the diagram of the tristimulus coordinates are indicated by the blue diamond.

Nominal CCT Quadrangles – Sphere Spectroradiometer Method

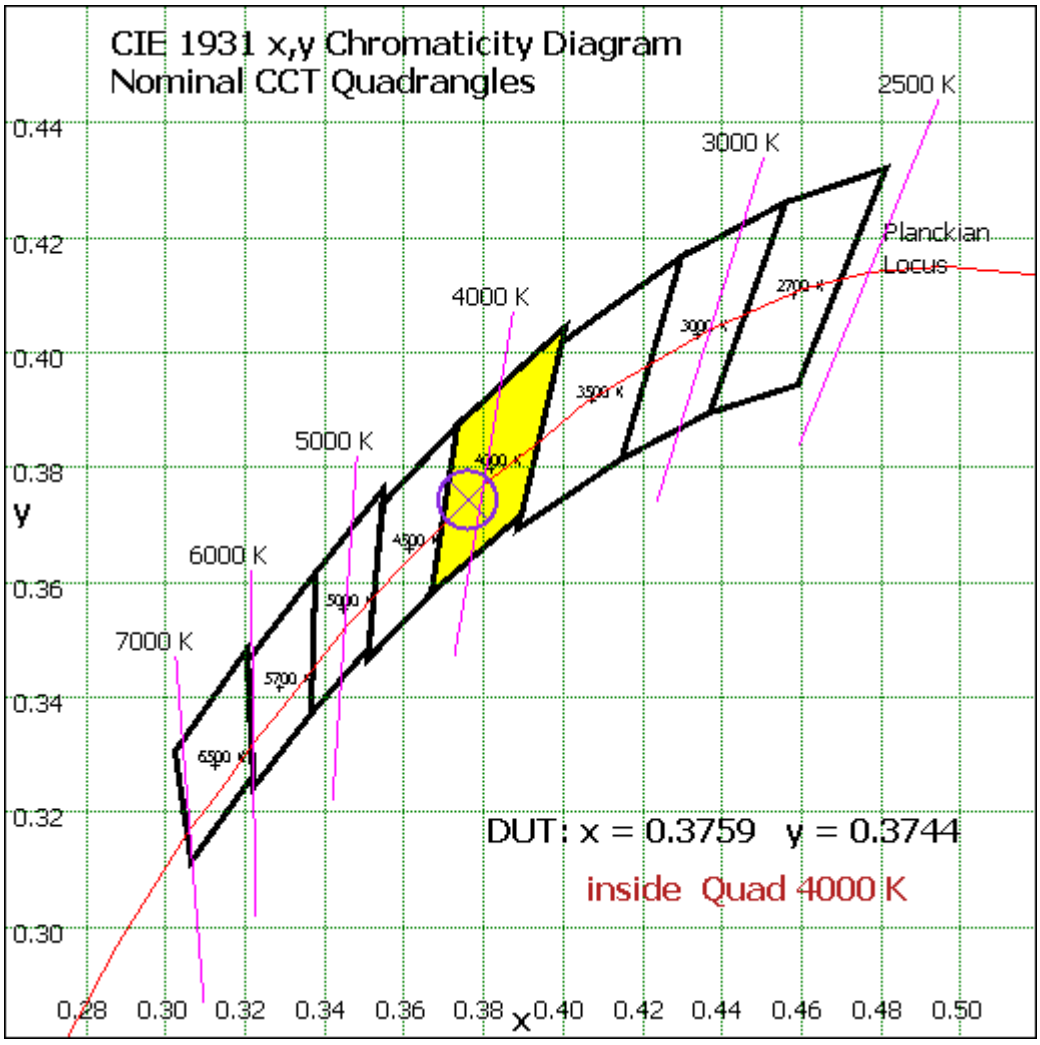
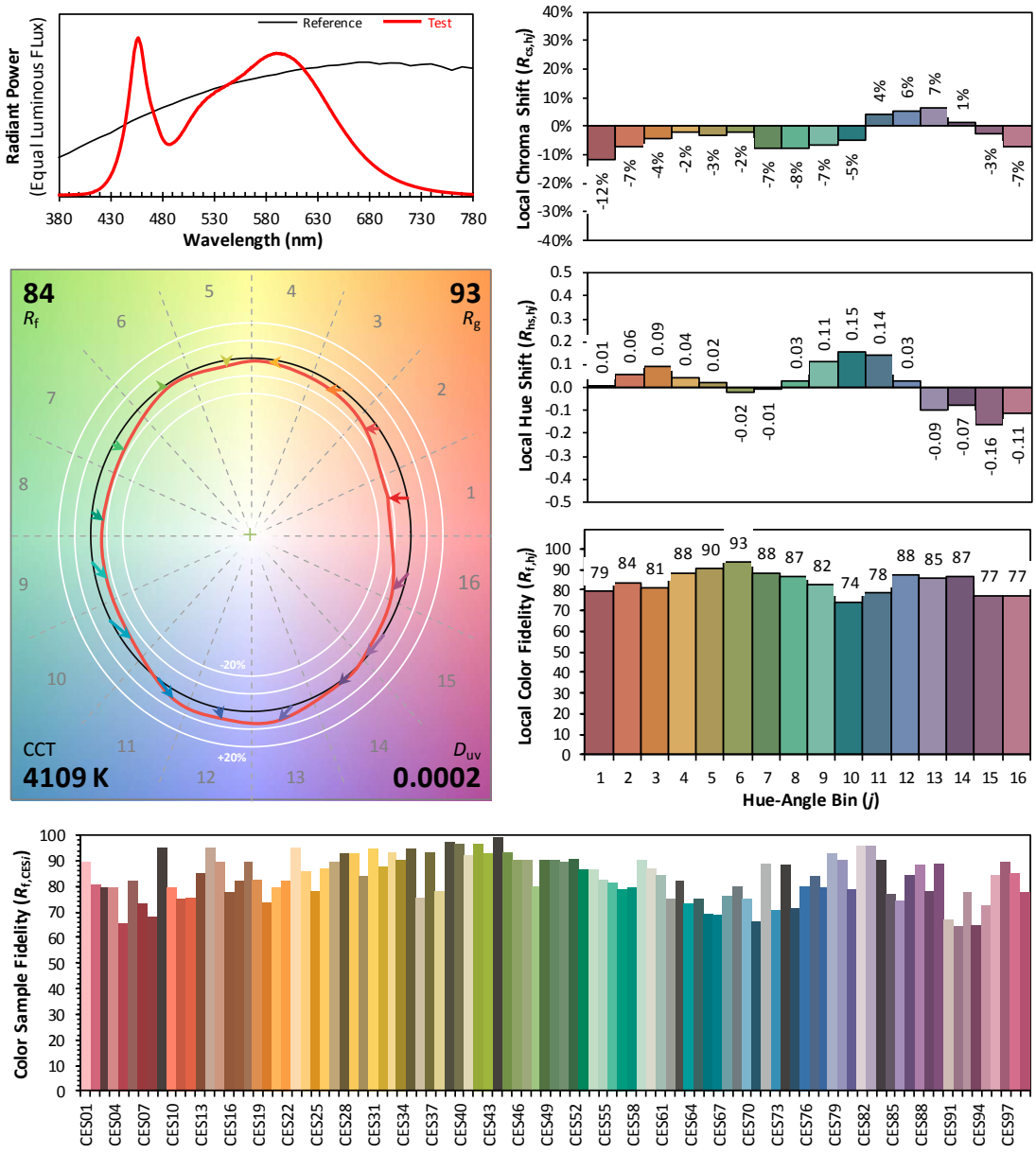


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method



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

x	0.3759
y	0.3744
u'	0.2231
v'	0.4999

Chart 4: Full Report Created with the IES TM-30 Calculator

Note: The values in this diagram might be a little different from the values in Table 2 due to rounding.

Zonal Lumen Tabulation- Goniophotometer Method

γ(°)	Lumens	% Total
0- 10	11.307	1.16%
10- 20	33.486	3.43%
20- 30	54.348	5.56%
30- 40	72.847	7.46%
40- 50	87.637	8.97%
50- 60	97.585	9.99%
60- 70	102.076	10.45%
70- 80	101.071	10.34%
80- 90	95.083	9.73%
90-100	84.898	8.69%
100-110	71.933	7.36%
110-120	57.603	5.90%
120-130	43.296	4.43%
130-140	30.215	3.09%
140-150	18.94	1.94%
150-160	10.08	1.03%
160-170	4.253	0.44%
170-180	0.484	0.05%
Total	977.1	100%

γ(°)	Lumens	% Total
0-130	913.17	93.45%
130-180	63.972	6.55%
0-180	977.1	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

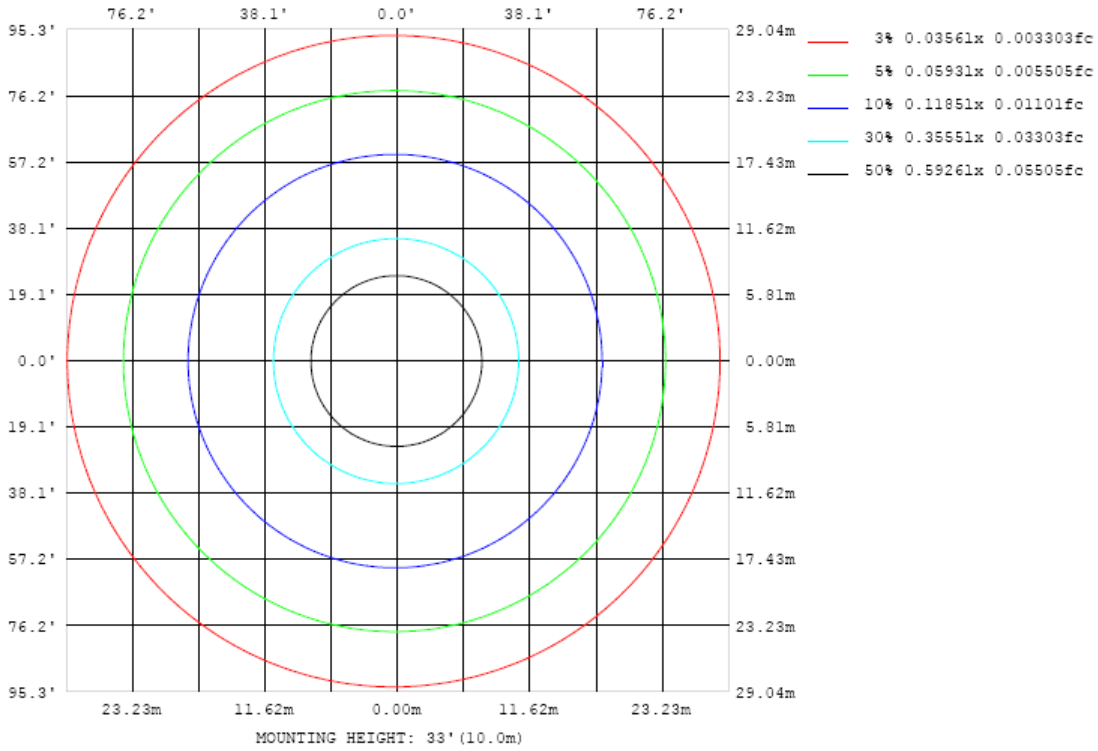


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

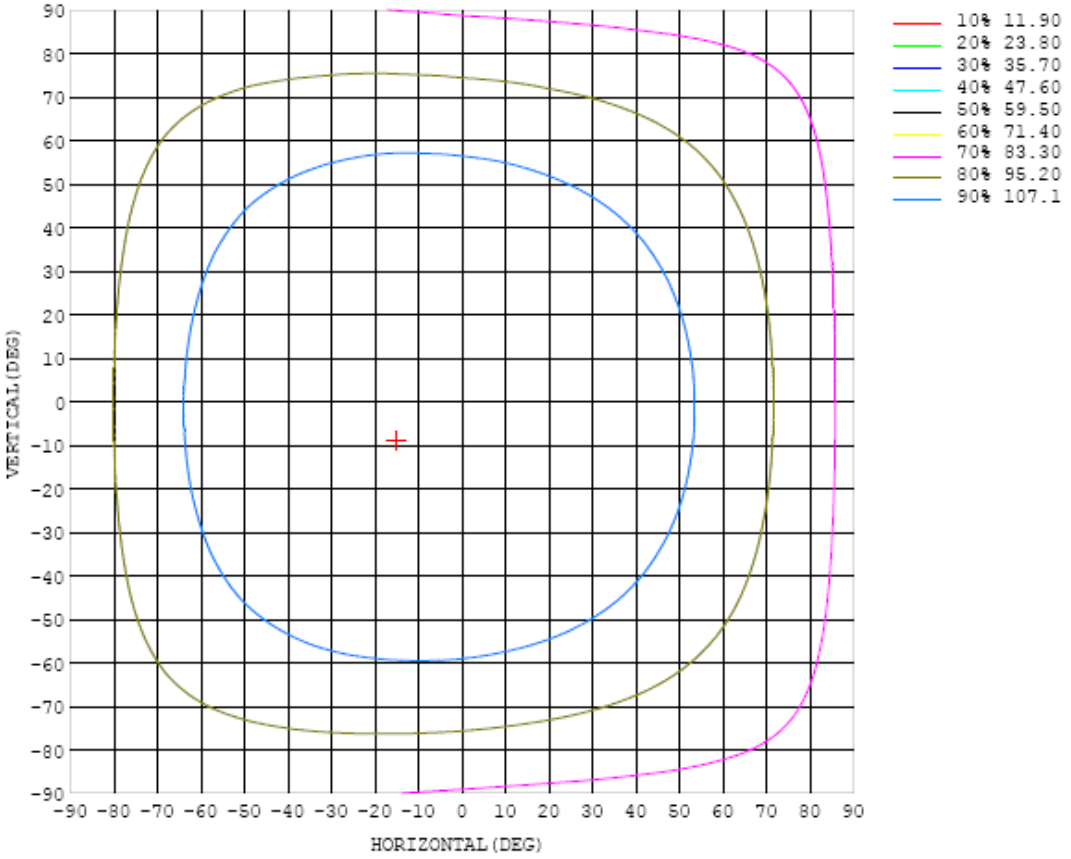


Chart 6: Isocandela Plot

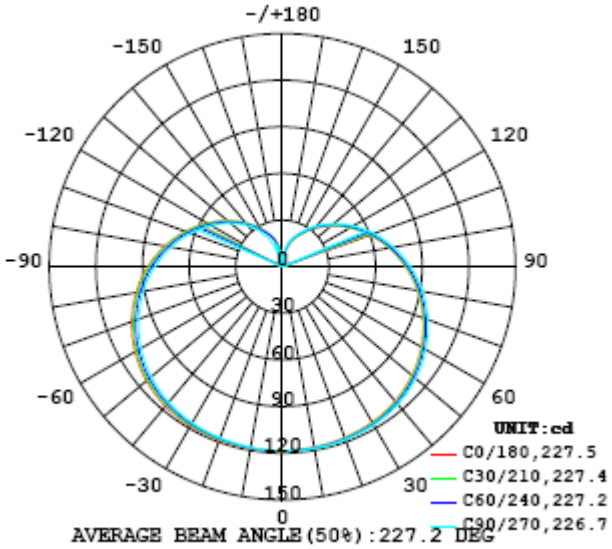


Chart 7: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1 UNIT: cd

γ (DEG) \ C (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	119	119	119	119	119	119	119	119	119	119	119	119	119	119	119	119	119	119	119
5	118	118	118	118	118	119	119	119	119	119	119	119	119	119	119	119	119	119	119
10	118	118	118	118	118	118	118	119	119	119	119	119	119	119	119	119	119	119	119
15	118	118	118	118	118	118	118	118	119	119	119	119	119	119	119	119	119	119	119
20	117	117	117	117	118	118	118	118	118	118	119	119	119	119	119	119	119	119	119
25	116	117	117	117	117	117	118	118	118	118	118	118	119	119	119	119	119	119	119
30	116	116	116	116	116	117	117	117	117	118	118	118	118	118	119	119	119	119	118
35	115	115	115	115	115	116	116	116	116	117	117	117	118	118	118	118	118	118	118
40	113	113	113	114	114	114	115	115	115	116	116	116	117	117	117	117	117	117	117
45	111	111	111	112	112	112	113	113	113	114	114	115	115	115	116	116	116	116	116
50	109	109	109	109	110	110	111	111	111	112	112	113	113	114	114	114	114	114	114
55	106	106	107	107	107	108	108	108	109	109	110	110	111	111	112	112	112	112	112
60	103	103	104	104	104	105	105	105	106	107	107	108	108	109	109	109	110	110	109
65	100	100	100	101	101	101	102	102	103	103	104	104	105	106	106	106	106	107	107
70	96.4	96.6	96.7	96.9	97.2	97.6	98.1	98.5	99.1	99.7	100	101	101	102	102	103	103	103	103
75	92.5	92.6	92.8	92.9	93.3	93.6	94.1	94.6	95.1	95.8	96.4	97.0	97.6	98.1	98.6	99.0	99.3	99.5	99.6
80	88.4	88.4	88.6	88.8	89.1	89.4	89.9	90.4	91.0	91.6	92.2	92.8	93.4	94.0	94.5	94.9	95.3	95.4	95.4
85	84.0	84.0	84.2	84.4	84.7	85.0	85.5	86.0	86.6	87.2	87.8	88.4	89.0	89.6	90.1	90.6	90.9	91.1	91.3
90	79.4	79.4	79.5	79.7	80.0	80.3	80.8	81.2	81.8	82.4	83.1	83.7	84.3	85.0	85.5	85.9	86.3	86.5	86.5
95	74.7	74.7	74.8	74.9	75.2	75.5	75.9	76.4	76.9	77.5	78.1	78.7	79.4	80.0	80.5	81.0	81.4	81.6	81.6
100	69.9	69.8	69.9	70.1	70.4	70.7	71.1	71.5	72.0	72.6	73.2	73.8	74.4	75.0	75.5	76.0	76.3	76.6	76.5
105	65.0	65.0	65.1	65.2	65.5	65.8	66.1	66.6	67.1	67.6	68.2	68.7	69.3	69.9	70.4	70.9	71.2	71.4	71.7
110	60.1	60.1	60.1	60.3	60.5	60.8	61.2	61.6	62.1	62.6	63.1	63.6	64.2	64.8	65.3	65.7	66.0	66.2	66.4
115	55.2	55.2	55.3	55.4	55.7	55.9	56.3	56.7	57.1	57.6	58.1	58.6	59.1	59.7	60.1	60.5	60.8	61.0	61.0
120	50.4	50.4	50.5	50.6	50.8	51.1	51.4	51.8	52.2	52.7	53.1	53.6	54.1	54.6	55.0	55.4	55.7	55.9	56.0
125	45.7	45.7	45.8	45.9	46.1	46.4	46.7	47.0	47.4	47.8	48.2	48.7	49.2	49.6	50.0	50.3	50.6	50.8	50.9
130	41.1	41.1	41.2	41.3	41.5	41.7	42.0	42.3	42.7	43.1	43.5	43.9	44.4	44.8	45.1	45.4	45.7	45.9	46.0
135	36.6	36.7	36.8	36.9	37.1	37.3	37.6	37.9	38.2	38.6	38.9	39.3	39.7	40.1	40.4	40.7	40.9	41.1	41.3
140	32.4	32.5	32.6	32.7	32.8	33.0	33.3	33.6	33.9	34.2	34.6	34.9	35.3	35.6	35.9	36.2	36.4	36.5	36.7
145	28.4	28.5	28.6	28.7	28.9	29.0	29.3	29.5	29.8	30.1	30.4	30.8	31.1	31.4	31.7	31.9	32.1	32.2	32.4
150	24.4	24.8	24.9	25.0	25.1	25.3	25.5	25.7	26.0	26.3	26.6	26.9	27.2	27.4	27.7	27.9	28.0	28.2	28.3
155	21.1	21.5	21.5	21.6	21.8	21.9	22.1	22.3	22.6	22.8	23.0	23.3	23.6	23.8	24.0	24.2	24.3	24.4	24.6
160	17.8	18.2	18.3	18.4	18.5	18.8	18.9	19.1	19.3	19.5	19.8	20.0	20.3	20.5	20.6	20.7	20.8	21.0	21.1
165	13.5	14.1	14.5	14.5	14.6	14.8	15.2	15.3	15.4	15.8	16.1	16.3	16.5	16.7	16.9	17.0	17.0	17.1	17.3
170	8.30	9.01	9.23	9.11	9.32	9.75	10.2	10.3	10.4	10.9	11.2	11.4	11.7	11.9	12.1	12.2	12.2	12.2	12.4
175	0.17	0.17	0.17	0.16	0.15	0.19	0.33	0.61	0.88	1.26	1.47	1.71	2.05	2.41	2.62	2.81	3.03	3.11	2.94
180	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15

Table 6: Luminous Intensity Data

Table--2 UNIT: cd

γ (DEG) \ C (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	119	119	119	119	119	119	119	119	119	119	119	119	119	119	119	119	119		
5	119	119	119	119	119	118	118	118	118	118	118	118	118	118	118	118	118		
10	119	119	119	118	118	118	118	118	118	118	118	118	118	118	118	118	118		
15	119	119	118	118	118	118	118	118	118	118	117	117	117	117	117	117	117		
20	119	118	118	118	118	118	118	117	117	117	117	117	117	117	117	117	117		
25	118	118	118	118	118	117	117	117	117	116	116	116	116	116	116	116	116		
30	118	118	118	117	117	117	117	116	116	116	116	115	115	115	115	115	115		
35	118	117	117	117	116	116	116	115	115	115	115	114	114	114	114	114	114		
40	117	117	116	116	115	115	115	114	114	114	113	113	113	113	113	113	113		
45	116	115	115	115	114	114	113	113	112	112	112	111	111	111	111	111	111		
50	114	114	113	113	112	112	111	111	110	110	109	109	109	109	109	109	109		
55	112	111	111	111	110	110	109	108	108	107	107	107	106	106	106	106	106		
60	109	109	108	108	107	107	106	106	105	105	104	104	103	103	103	103	103		
65	106	106	105	105	104	104	103	103	102	101	101	101	100	100	100.0	99.9	99.9		
70	103	103	102	102	101	100	99.8	99.2	98.6	98.0	97.5	97.1	96.8	96.5	96.4	96.4	96.4		
75	99.2	98.8	98.5	97.9	97.4	96.6	96.2	95.4	94.8	94.2	93.7	93.3	93.0	92.7	92.6	92.6	92.5		
80	95.2	94.9	94.4	94.0	93.4	92.8	92.3	91.5	90.8	90.3	89.7	89.3	88.9	88.7	88.5	88.4	88.4		
85	91.0	90.6	90.3	89.7	89.2	88.6	88.0	87.3	86.6	86.0	85.6	85.0	84.8	84.4	84.1	84.1	84.0		
90	86.3	86.2	85.8	85.3	84.7	84.2	83.5	82.8	82.1	81.6	81.0	80.5	80.2	79.8	79.7	79.5	79.5		
95	81.7	81.4	81.0	80.5	79.9	79.5	78.8	78.1	77.5	76.9	76.4	75.8	75.5	75.2	74.9	74.8	74.8		
100	76.6	76.4	76.1	75.6	75.1	74.5	74.0	73.3	72.7	72.1	71.6	71.0	70.7	70.4	70.2	70.0	69.9		
105	71.5	71.4	71.1	70.6	70.1	69.5	69.0	68.4	67.8	67.2	66.7	66.2	65.8	65.5	65.4	65.2	65.0		
110	66.3	66.2	65.9	65.5	65.0	64.6	64.1	63.4	62.8	62.3	61.8	61.3	61.0	60.6	60.4	60.2	60.1		
115	61.2	61.1	60.8	60.4	60.0	59.5	59.0	58.4	57.9	57.4	56.9	56.5	56.1	55.8	55.5	55.3	55.2		
120	56.0	55.9	55.7	55.3	54.9	54.5	54.0	53.5	52.9	52.5	52.0	51.6	51.3	50.9	50.8	50.6	50.4		
125	50.9	50.9	50.6	50.3	49.9	49.6	49.1	48.6	48.2	47.7	47.3	46.8	46.5	46.3	46.0	45.8	45.7		
130	46.0	46.0	45.8	45.5	45.1	44.8	44.3	43.9	43.4	43.0	42.6	42.2	41.9	41.7	41.4	41.2	41.1		
135	41.3	41.2	41.0	40.8	40.5	40.1	39.7	39.3	38.9	38.5	38.1	37.8	37.5	37.2	37.0	36.8	36.7		
140	36.8	36.7	36.5	36.3	36.0	35.7	35.3	34.9	34.5	34.1	33.6	33.5	33.1	32.8	32.8	32.6	32.5		
145	32.4	32.4	32.2	32.0	31.8	31.5	31.1	30.8	30.0	28.8	27.9	27.7	26.5	27.7	28.6	28.7	28.5		
150	28.4	28.3	28.2	28.0	27.8	27.5	27.3	26.7	24.1	19.9	10.6	9.97	18.3	24.2	24.3	24.4	24.3		
155	24.6	24.6	24.5	24.3	24.1	23.9	23.2	20.3	19.7	15.9	15.7	16.4	17.6	18.2	18.9	18.8	18.4		
160	21.2	21.1	21.0	20.8	20.7	20.6	19.4	16.2	10.8	6.43	8.71	12.8	13.3	12.5	11.9	12.7	15.5		
165	17.3	17.2	17.0	16.9	16.8	16.6	16.5	14.9	14.6	13.4	12.4	10.1	10.9	11.2	11.4	12.4	13.2		
170	12.5	12.2	11.9	11.7	11.7	11.5	11.2	11.0	9.15	9.40	8.24	7.29	7.43	7.61	7.56	7.51	7.71		
175	3.04	3.41	2.61	2.19	1.68	1.15	0.65	0.37	0.24	0.19	0.20	0.19	0.20	0.20	0.20	0.18	0.18		
180	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15		

Table 7: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Aug. 14, 2018	Aug. 13, 2019
Digital Power Meter	PF2010A	HZTE028-01	Sep. 12, 2018	Sep. 11, 2019
AC Power Supply	DPS1060	HZTE001-06	Aug. 09, 2018	Aug. 08, 2019
DC Power Supply	WY12010	HZTE004-03	Aug. 09, 2018	Aug. 08, 2019
Temperature recorder	JM624U	HZTE018-08	Aug. 09, 2018	Aug. 08, 2019
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 09, 2018	Aug. 08, 2019
Standard source	D908	HZTE012-01	Aug. 14, 2018	Aug. 13, 2019
Integrate Sphere system	3M	HZTE015-04	Aug. 16, 2018	Aug. 15, 2019
Digital Power Meter	WT210	HZTE008-01	Aug. 02, 2018	Aug. 01, 2019
AC Power Supply	PCR 500L	HZTE001-07	Aug. 09, 2018	Aug. 08, 2019
DC Power Supply	IT6154	HZTE004-04	Aug. 09, 2018	Aug. 08, 2019
Standard source	SCL-1400	HZTE012-02	Aug. 16, 2018	Aug. 15, 2019
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 09, 2018	Aug. 08, 2019
Temperature Meter	TES1310	HZTE017-01	Aug. 09, 2018	Aug. 08, 2019

Table 8: Test Equipment List

TEST METHODS

Seasoning of SSL Product

For the purpose of rating new SSL products, SSL products shall be tested with no seasoning.
Therefore, no seasoning was performed.

Sphere-Spectroradiometer Method- Photometric and Electrical Measurements

A Labsphere Model CDS 2100 Spectroradiometer and Two Meter Sphere was used to measure correlated color temperature, chromaticity coordinates, and the color rendering index for each SSL unit. The coating reflectance of each sphere is 98%. The measure geometry is 4π. Self-absorption correction is conducted in testing. Bandwidth of spectroradiometer is 350nm-1050nm.

Ambient temperature was measured at a position inside the sphere. Each SSL unit was operated on the client provided driver at the rated input voltage in its designated orientation.

The stabilization time typically ranges from 30 min (small integrated LED lamps) to 2 or more hours for large SSL luminaires). It can be judged that stability is reached when the variation (maximum – minimum) of at least 3 readings of the light output and electrical power over a period of 30 min, taken 15 minutes apart, is less than 0.5 %.

Electrical measurements including voltage, current, and power were measured using the Yokogawa Power Analyzer.

The standard reference of the integrated sphere system is halogen incandescent lamp, the intensity distribution type is omni-directional, and is traceable to the National Institute of Standards and Technology.

3rd Floor, Bld. 2, NO. 96 Longchuanwu Rd Qianjiang Economy Dev. Zone, YuhangDist,
Hangzhou, Zhejiang Province, China 311100
Tel: +86 571 86376106 www.ledtestlab.com

The uncertainty of integrating sphere system reported in this document is expended uncertainty is 2.1% with a coverage factor k=2.

Goniophotometer Method

Photometric and Electrical Measurements

An EVERFINE Type C Model GO-R5000 Goniophotometer was used to measure the intensity at each angle of distribution for each sample. The photometric distance is 2.475m for near-field measurement or 30m for far-field measurement. Bandwidth of spectroradiometer is 380nm-780nm.
Ambient temperature was measured at the same height of the sample mounted on the Goniophotometer equipment. Each SSL unit was operated on the client provided driver at the rated input voltage in its designated orientation.
The stabilization time typically ranges from 30 min (small integrated LED lamps) to 2 or more hours for large SSL luminaires). It can be judged that stability is reached when the variation (maximum – minimum) of at least 3 readings of the light output and electrical power over a period of 30 min, taken 15 minutes apart, is less than 0.5 %.
Electrical measurements including voltage, current, and power were measured using the Everfine Digital Power Meter.
Some graphics were created with Photometric Plus software.
The standard reference of the Goniophotometer system is halogen incandescent lamp, the intensity distribution type is omni-directional, and is traceable to the National Institute of Metrology P.R. China.
The uncertainty of goniophotometer system reported in this document is expended uncertainty is 2.3% with a coverage factor k=2.

Color Characteristics Measurements

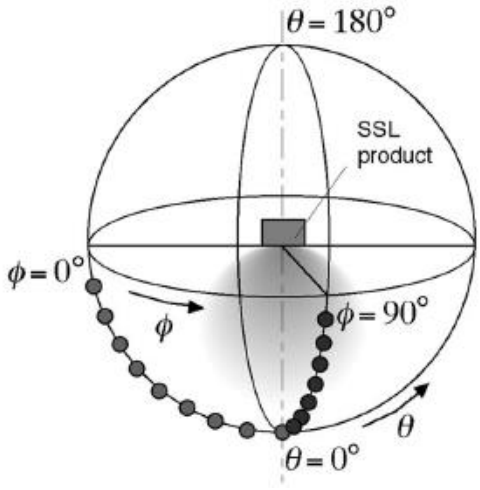
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as values that are spatially average, weighted to intensity, over the angular range where light is intentionally emitted from the SSL product. The color characteristics measurements are using gonio-spectroradiometer.

Color Spatial Uniformity

The characteristics of SSL products may be spatially non-uniform, the chromaticity coordinate shall be measured at two vertical planes (C=0°/180° and C=90°/270°) and at 10° or less intervals for vertical angle until the light output dropped to below 10% of the peak intensity. The averaged weighted chromaticity coordinate

was calculated from these points. The data was then analyzed to check for delta color differences of the u', v' chromaticity coordinates. The spatial non-uniformity of chromaticity, Δu'v', is determined as the maximum deviation (distance on the CIE (u', v') diagram) among all measured points from the spatially averaged chromaticity coordinate.

The geometry for the chromaticity measurement using gonio-spectroradiometer is shown as following.



*** End of Report ***

3rd Floor, Bld. 2, NO. 96 Longchuanwu Rd Qianjiang Economy Dev. Zone, YuhangDist,
Hangzhou, Zhejiang Province, China 311100
Tel: +86 571 86376106 www.ledtestlab.com