LM-79-08 TEST REPORT

for

GREEN CREATIVE LTD

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

LED Lamp

Model: 11A19DIM/930

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ19050037j

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 31, 2019

Approved by: Jim Zhang

Manager: Jim Zhang
May 31, 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: **11A19DIM/930**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
114.1	1281.0	11.23	0.9524

CCT (K)	CRI	Stabilization Time (Light & Power)
3071	94.3	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 23, 2019

Date of Test : May 28, 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

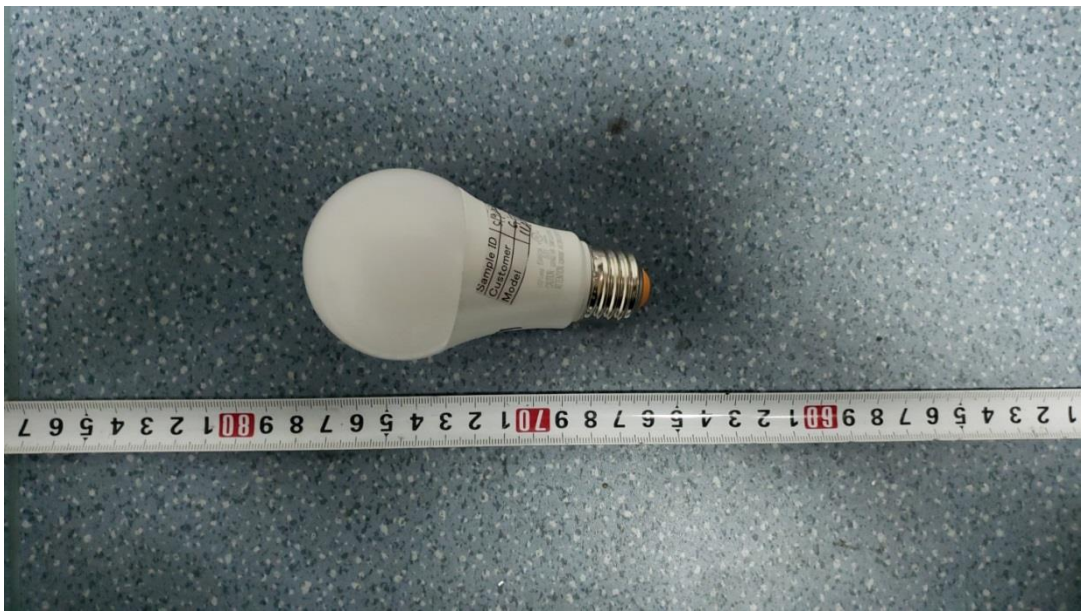


Figure 1- Overview of the sample

Equipment Under Test(EUT)	
Name	: LED Lamp
Model	: 11A19DIM/930
Electrical Ratings	: 120V, 60Hz, 11W
Product Description	: 3000K
Manufacturer	: GREEN CREATIVE LTD
Address	: 756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai

TEST RESULTS

Test ambient temperature was 25.0 ℃.

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)	0.098
Power Factor	0.9524
Test Power (W)	11.23
THD A%	17.46
Luminous Efficacy (lm/W)	114.1
Total Luminous Flux (lm)	1281.0
Color Rendering Index (CRI)	94.3
R9	61.5
Correlated Color Temperature (CCT)(K)	3071
Chromaticity Chroma x	0.4303
Chromaticity Chroma y	0.3990
Chromaticity Chroma u	0.2485
Chromaticity Chroma v	0.3456
Duv	0.0011
Chromaticity Chroma u ’	0.2485
Chromaticity Chroma v’	0.5184

Special Color Rendering Indices	
R1	97.5
R2	96.8
R3	94
R4	95.9
R5	96.3
R6	96.1
R7	93.4
R8	84.4
R9	61.5
R10	89.9
R11	94.2
R12	80.8
R13	97.9
R14	95.2

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 24.8 ℃.

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)	0.098
Power Factor	0.9561
Power (W)	11.30
Luminous Efficacy (lm/W)	115.0
Total Luminous Flux (lm)	1299.0
Beam Angle (°)	223.5 (0^o-180^o) / 223.3 (90^o-270^o)
Center Beam Candle Power (cd)	159
Maximum Beam Candle Power (cd)	159.7 (At: C=340.0, Gamma=25.5)
Spacing Criteria	1.51 (0^o-180^o) / 1.51 (90^o-270^o)
Zonal Lumens in the 0 °-60 °Zone	37.13%
Zonal Lumens in the 60 °-90 °Zone	30.74%
Zonal Lumens in the 90 °-120 °Zone	21.66%
Zonal Lumens in the 120 °-180 °Zone	10.47%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

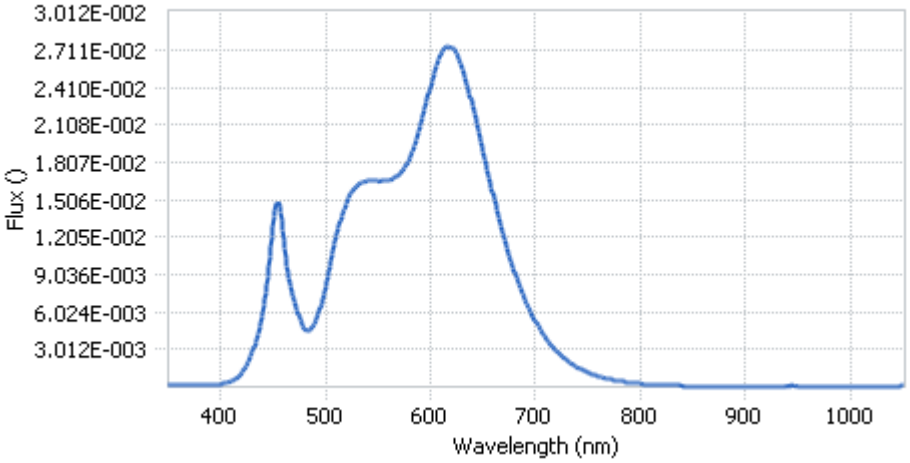
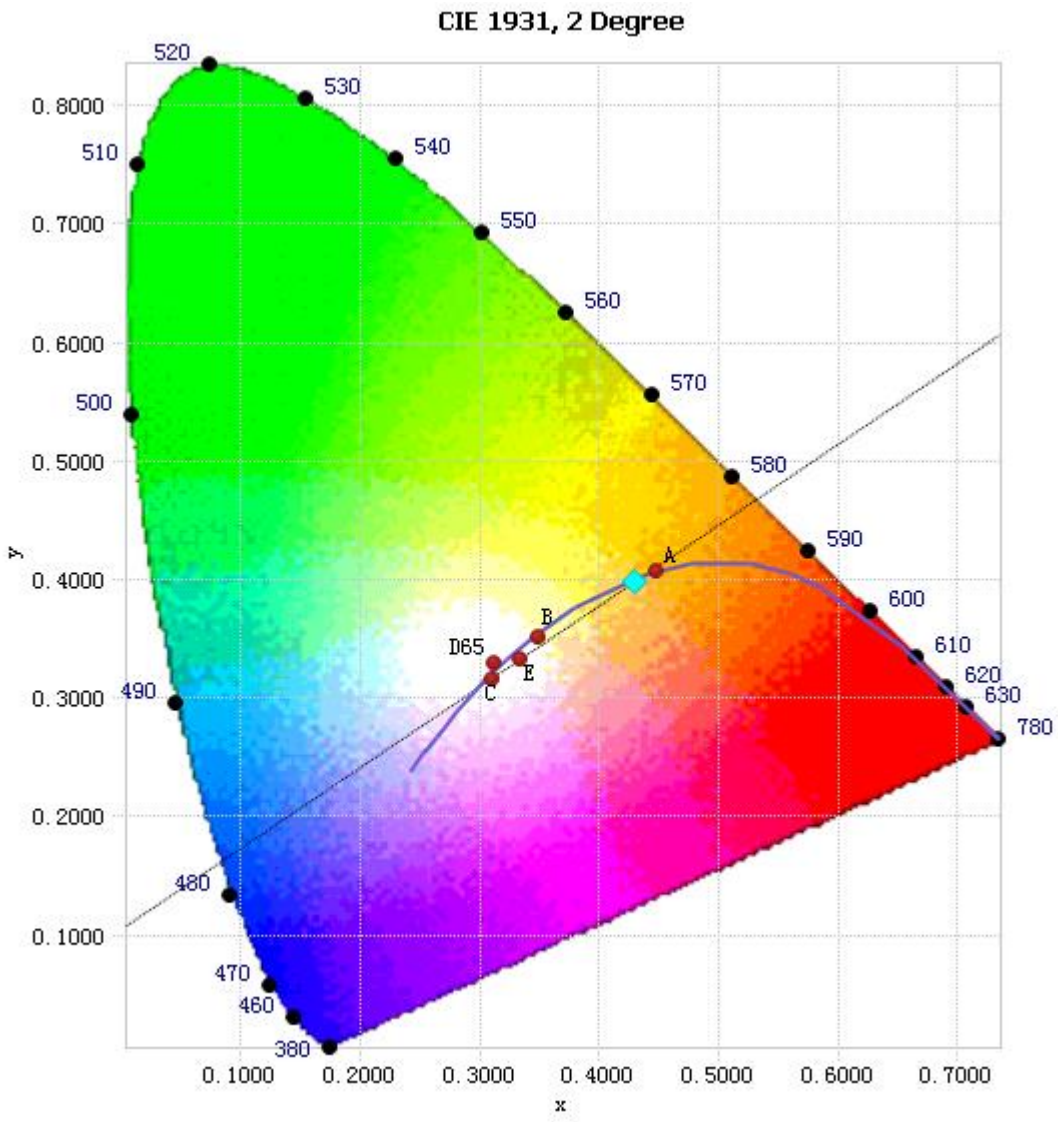


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.71E-04	485	4.61E-03	590	2.10E-02	695	6.07E-03
385	1.84E-04	490	5.23E-03	595	2.26E-02	700	5.27E-03
390	1.95E-04	495	6.40E-03	600	2.42E-02	705	4.52E-03
395	2.19E-04	500	8.12E-03	605	2.57E-02	710	3.91E-03
400	2.51E-04	505	1.01E-02	610	2.68E-02	715	3.35E-03
405	3.25E-04	510	1.21E-02	615	2.74E-02	720	2.89E-03
410	4.72E-04	515	1.38E-02	620	2.73E-02	725	2.49E-03
415	7.43E-04	520	1.49E-02	625	2.68E-02	730	2.14E-03
420	1.15E-03	525	1.57E-02	630	2.57E-02	735	1.83E-03
425	1.82E-03	530	1.61E-02	635	2.43E-02	740	1.57E-03
430	2.79E-03	535	1.64E-02	640	2.26E-02	745	1.35E-03
435	4.15E-03	540	1.66E-02	645	2.08E-02	750	1.16E-03
440	6.05E-03	545	1.66E-02	650	1.89E-02	755	1.00E-03
445	8.93E-03	550	1.65E-02	655	1.71E-02	760	8.59E-04
450	1.29E-02	555	1.65E-02	660	1.53E-02	765	7.41E-04
455	1.48E-02	560	1.66E-02	665	1.36E-02	770	6.36E-04
460	1.18E-02	565	1.67E-02	670	1.20E-02	775	5.55E-04
465	8.67E-03	570	1.71E-02	675	1.06E-02	780	4.79E-04
470	7.06E-03	575	1.76E-02	680	9.26E-03		
475	5.62E-03	580	1.84E-02	685	8.09E-03		
480	4.65E-03	585	1.95E-02	690	7.00E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4303, 0.3990)

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

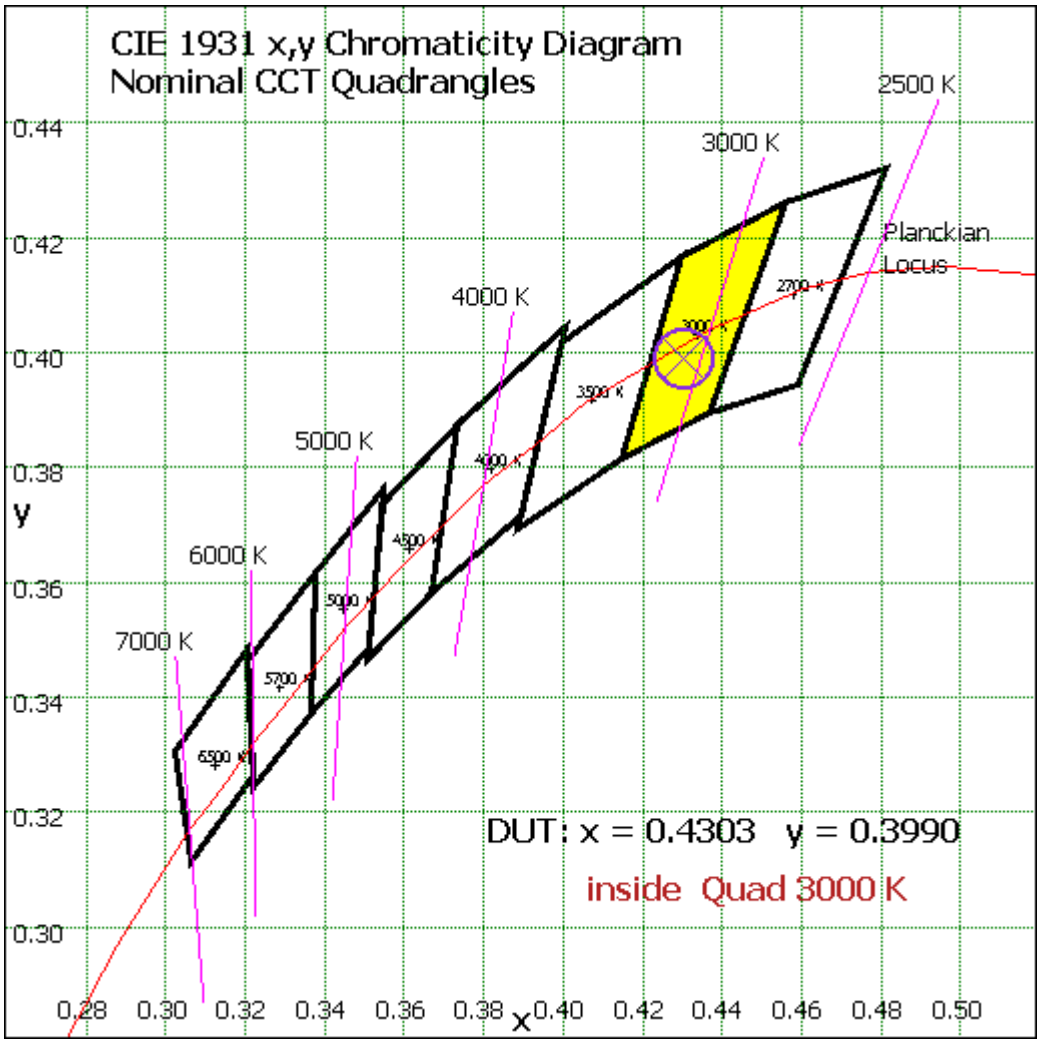
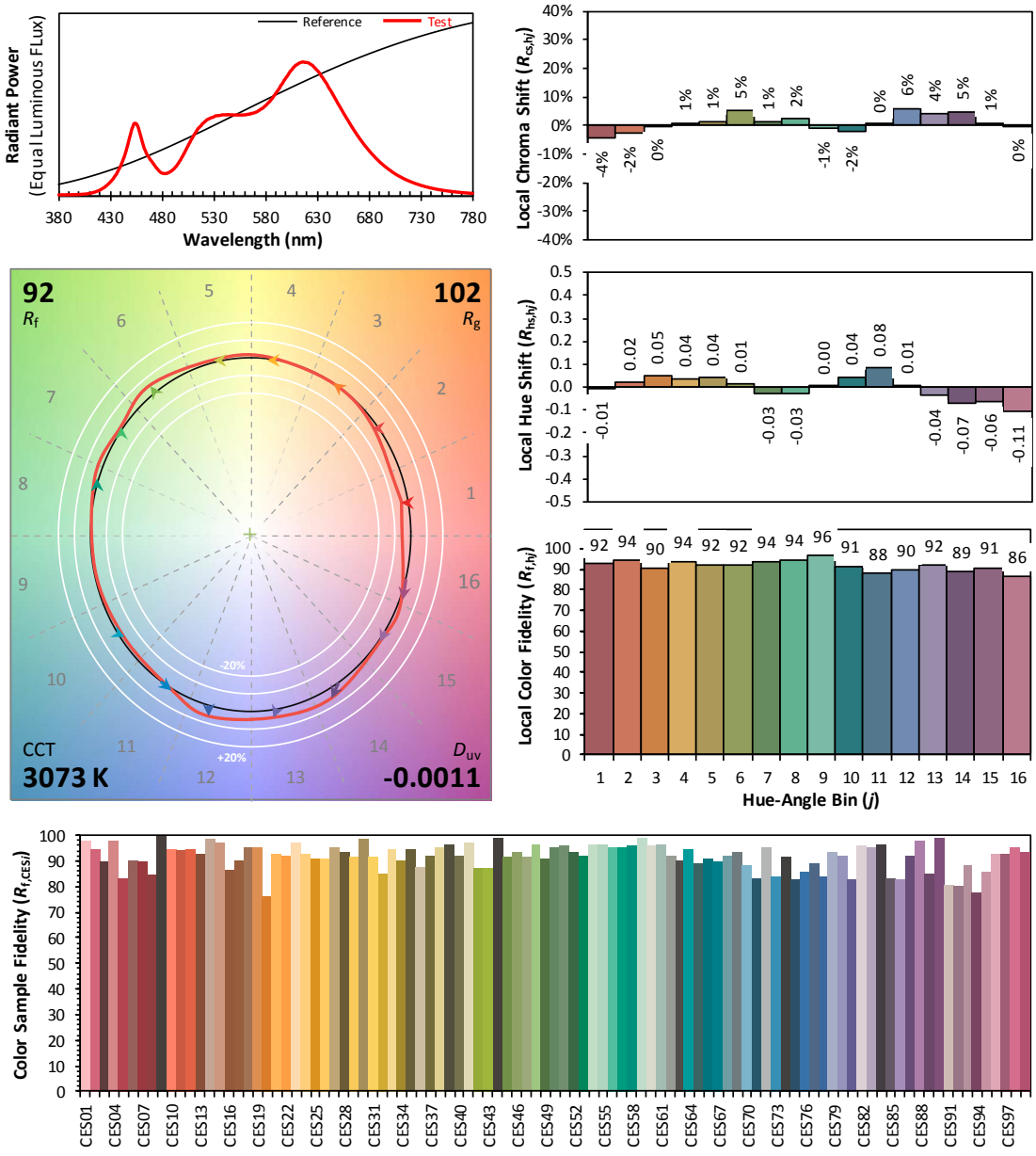


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method



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

x	0.4303
y	0.3990
u'	0.2485
v'	0.5184

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	15.21	1.17%
10- 20	45.082	3.47%
20- 30	73.406	5.65%
30- 40	98.481	7.58%
40- 50	118.462	9.12%
50- 60	131.72	10.14%
60- 70	137.363	10.57%
70- 80	135.378	10.42%
80- 90	126.536	9.74%
90-100	112.217	8.64%
100-110	94.31	7.26%
110-120	74.903	5.77%
120-130	55.915	4.30%
130-140	38.593	2.97%
140-150	23.75	1.83%
150-160	12.395	0.95%
160-170	4.946	0.38%
170-180	0.356	0.03%
Total	1299.0	100%

γ(°)	Lumens	% Total
0-130	1218.983	93.84%
130-180	80.04	6.16%
0-180	1299.0	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

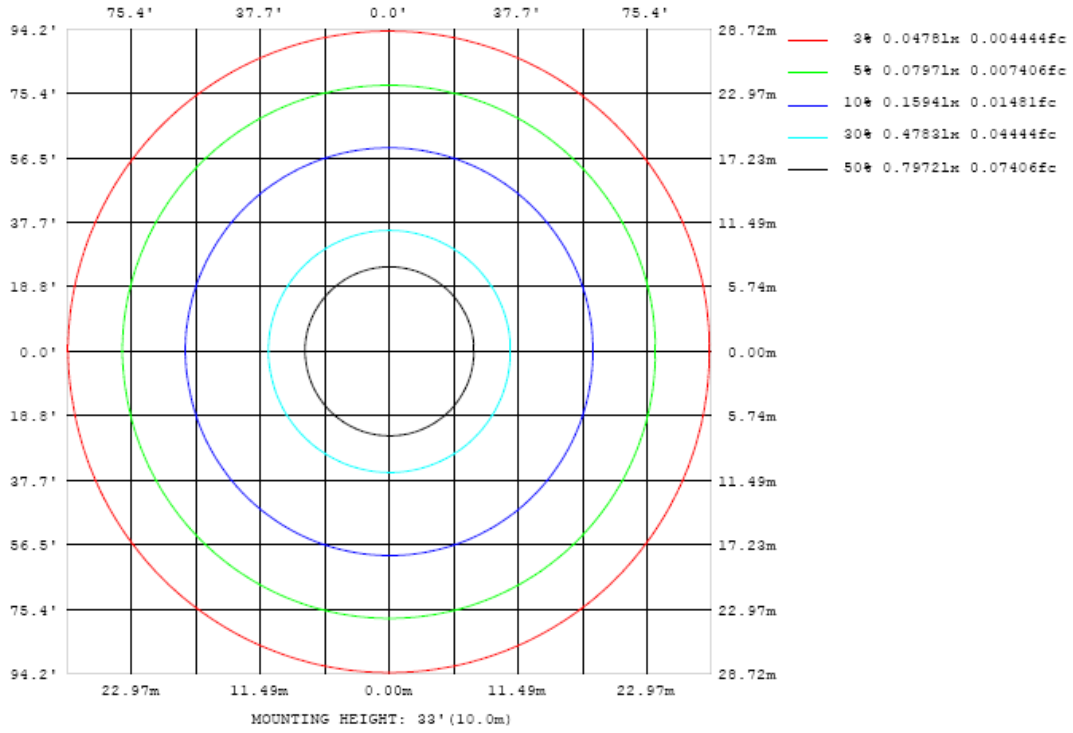


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

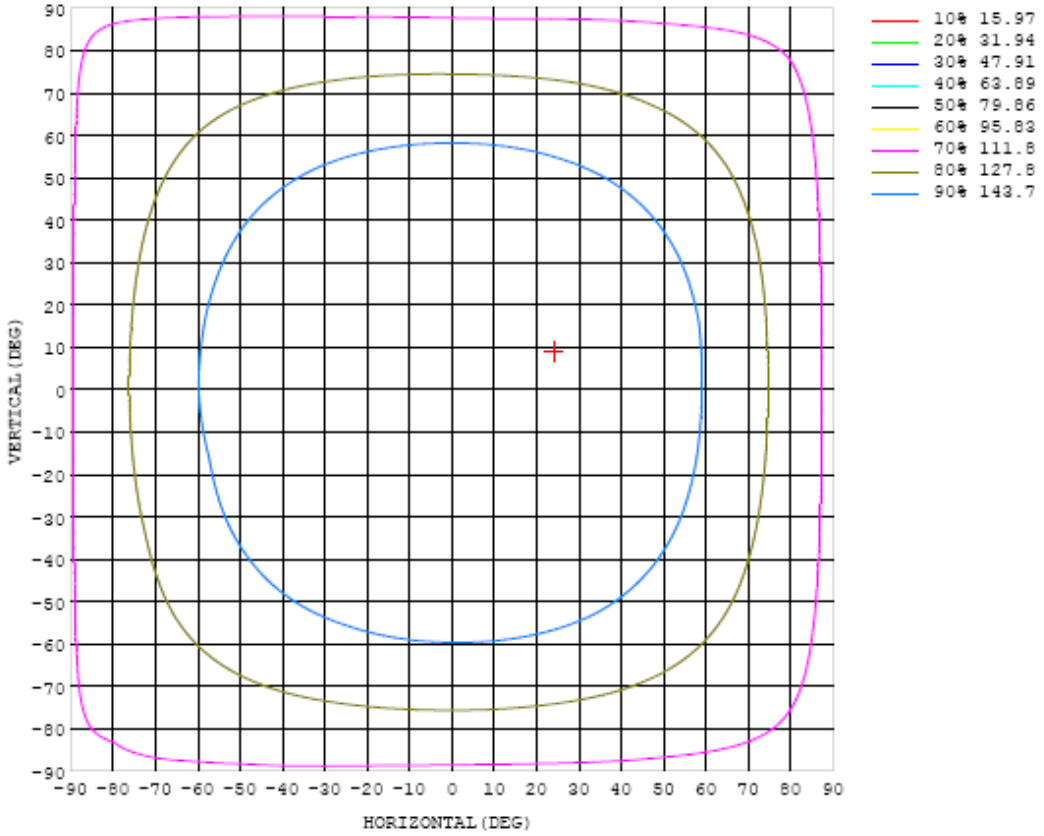


Chart 6: Isocandela Plot

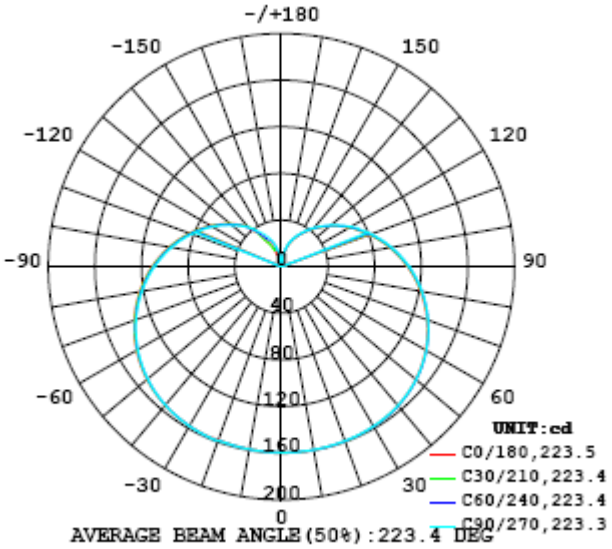


Chart 7: Polar Candela Distribution

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	159	159	159	159	159	159	159	159	159	159	159	159	159	159	159	159	159	159	159
5	160	160	160	160	160	160	159	159	159	159	159	159	159	159	159	159	159	159	159
10	160	160	160	160	160	160	160	159	159	159	159	159	159	159	159	159	159	159	159
15	160	160	160	160	160	160	159	159	159	159	159	159	159	159	159	159	159	159	159
20	159	159	159	159	159	159	159	159	159	159	159	159	159	158	158	158	158	158	158
25	159	159	159	159	159	159	159	159	159	159	158	158	158	158	158	158	158	158	159
30	158	158	158	158	158	158	158	158	158	158	158	158	157	157	157	157	157	157	158
35	157	157	157	157	157	157	157	157	157	157	157	157	156	156	156	156	156	156	157
40	155	156	156	156	156	156	156	156	156	155	155	155	155	155	155	155	155	154	155
45	153	153	154	154	154	154	154	154	154	153	153	153	153	153	153	153	153	152	153
50	150	151	151	151	151	151	151	151	151	151	151	150	150	150	150	150	150	150	151
55	147	147	147	147	148	148	148	148	147	147	147	147	147	147	147	147	147	147	147
60	143	143	143	143	143	144	144	144	144	143	143	143	143	143	143	143	143	143	144
65	138	138	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	138	139
70	133	133	133	134	134	134	134	134	134	134	134	134	134	134	134	134	134	134	135
75	127	128	128	128	128	128	128	128	129	129	129	129	129	129	129	129	129	128	129
80	121	121	122	122	122	122	122	122	123	123	123	123	123	123	123	123	123	123	123
85	115	115	115	115	116	116	116	116	116	116	116	117	117	117	117	117	117	117	117
90	108	108	109	109	109	109	109	110	110	110	110	110	110	110	110	110	110	110	111
95	101	102	102	102	102	102	103	103	103	103	103	104	104	104	104	104	104	104	105
100	94.5	94.6	94.7	94.9	95.1	95.4	95.6	95.8	96.0	96.2	96.4	96.7	96.9	96.9	96.9	96.9	97.1	97.0	97.8
105	87.4	87.6	87.7	87.8	88.0	88.4	88.6	88.8	89.0	89.2	89.5	89.7	89.9	89.9	90.0	90.1	90.2	90.1	90.9
110	80.5	80.6	80.7	80.8	81.0	81.3	81.5	81.8	82.0	82.2	82.5	82.7	82.9	83.0	83.1	83.2	83.4	83.3	84.1
115	73.5	73.7	73.7	73.8	74.0	74.3	74.6	74.8	75.0	75.3	75.5	75.8	75.9	76.1	76.2	76.3	76.5	76.5	77.2
120	67.3	67.3	67.4	67.5	67.7	68.0	68.2	68.4	68.7	68.9	69.2	69.4	69.6	69.8	69.9	70.0	70.2	70.2	70.4
125	60.6	60.7	60.8	60.8	61.0	61.3	61.5	61.7	62.0	62.2	62.5	62.7	63.0	63.2	63.3	63.4	63.6	63.6	63.8
130	54.3	54.3	54.4	54.4	54.6	54.9	55.1	55.3	55.5	55.8	56.0	56.2	56.5	56.7	56.8	56.9	57.1	57.1	57.3
135	48.2	48.2	48.2	48.3	48.5	48.7	48.9	49.1	49.4	49.6	49.9	50.1	50.3	50.5	50.7	50.8	50.9	50.9	51.1
140	42.4	42.4	42.5	42.6	42.7	42.9	43.1	43.3	43.5	43.8	44.0	44.2	44.4	44.6	44.8	44.9	45.0	45.0	44.0
145	37.0	37.1	37.1	37.2	37.3	37.5	37.6	37.8	38.1	38.3	38.5	38.7	38.9	39.1	39.3	39.4	39.4	39.3	35.4
150	32.0	32.1	32.1	32.2	32.3	32.5	32.6	32.8	33.0	33.3	33.5	33.6	33.8	34.0	34.1	34.2	33.0	32.5	24.7
155	27.4	27.4	27.4	27.5	27.5	27.8	27.9	28.1	28.3	28.4	28.7	28.9	29.1	29.2	29.4	29.4	27.4	23.3	21.2
160	22.4	22.5	22.5	22.6	22.5	22.8	23.1	23.3	23.3	23.7	23.9	24.1	24.3	24.4	24.5	24.6	24.3	18.7	10.9
165	16.8	16.8	16.9	17.0	16.6	17.2	17.7	17.8	17.7	18.3	18.5	18.7	18.9	19.0	19.1	19.2	18.8	17.0	15.3
170	8.46	8.70	8.75	8.77	9.62	10.3	10.6	10.9	10.9	11.0	11.7	12.0	12.2	12.4	12.5	12.5	11.8	10.7	9.48
175	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.24	0.27	0.28	0.30	0.30	0.31	0.36	0.38	0.38	0.32	0.26
180	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21

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	159	159	159	159	159	159	159	159	159	159	159	159	159	159	159	159	159		
5	159	159	159	159	159	159	159	159	159	159	159	159	159	159	159	160	160		
10	159	159	159	159	159	159	159	159	159	159	159	159	159	159	159	160	159		
15	159	159	159	159	159	159	159	159	159	159	159	159	159	159	159	159	159		
20	158	158	159	159	159	159	159	159	159	159	159	159	159	159	159	159	159		
25	159	159	159	159	159	159	159	159	159	159	159	159	159	159	159	160	159		
30	158	158	158	158	158	158	158	158	158	158	158	158	158	159	159	159	159		
35	157	157	157	157	157	157	157	157	157	157	157	157	157	157	158	158	158		
40	155	155	155	155	155	155	155	155	155	155	155	155	155	156	156	156	156		
45	153	153	153	153	153	153	153	153	153	153	153	153	153	153	154	154	154		
50	151	150	150	150	150	150	150	150	150	150	150	150	150	150	151	151	151		
55	147	147	147	147	147	147	146	146	146	146	146	146	147	147	147	147	148		
60	144	143	143	143	143	143	142	142	142	142	142	142	143	143	143	143	143		
65	139	139	139	138	138	138	138	138	138	138	138	138	138	138	138	139	139		
70	134	134	134	134	133	133	133	133	133	133	133	133	133	133	133	133	134		
75	129	129	129	128	128	128	128	127	127	127	127	127	127	127	128	128	128		
80	123	123	123	123	122	122	122	122	121	121	121	122	122	122	122	122	122		
85	117	117	117	117	116	116	116	115	115	115	115	115	115	115	115	116	116		
90	111	111	110	110	110	110	109	109	109	109	109	109	109	109	109	109	109		
95	104	104	104	104	103	103	103	103	102	102	102	102	102	102	102	102	102		
100	97.7	97.4	97.2	96.9	96.6	96.4	96.1	95.8	95.5	95.3	95.3	95.2	95.1	95.1	95.1	95.2	95.2		
105	90.8	90.6	90.4	90.1	89.9	89.6	89.3	89.0	88.7	88.5	88.4	88.3	88.2	88.1	88.2	88.2	88.1		
110	84.0	83.7	83.6	83.3	83.0	82.8	82.5	82.2	81.9	81.7	81.6	81.4	81.3	81.2	81.2	81.2	81.2		
115	77.1	76.9	76.7	76.5	76.2	76.0	75.7	75.4	75.1	74.9	74.8	74.6	74.5	74.4	74.3	74.3	74.2		
120	70.3	70.1	70.0	69.8	69.5	69.3	69.0	68.8	68.4	68.2	68.1	67.9	67.8	67.6	67.6	67.5	67.4		
125	63.7	63.5	63.4	63.2	63.0	62.7	62.5	62.2	61.9	61.7	61.6	61.4	61.2	61.1	61.0	60.9	60.8		
130	57.3	57.2	57.0	56.8	56.6	56.4	56.1	55.9	55.6	55.4	55.2	55.0	54.9	54.8	54.7	54.6	54.5		
135	50.8	51.0	50.9	50.7	50.5	50.2	50.1	49.8	49.6	49.4	49.2	49.0	48.8	48.7	48.6	48.5	48.4		
140	44.3	44.2	44.9	44.7	43.7	43.8	44.3	44.0	43.8	43.6	43.4	43.3	43.1	43.0	42.9	42.8	42.6		
145	36.0	33.9	35.2	37.2	36.6	36.7	38.7	38.6	38.4	38.2	38.0	37.9	37.7	37.6	37.5	37.4	37.3		
150	15.8	15.7	24.8	28.2	29.2	29.8	33.7	33.6	33.4	33.2	33.0	32.9	32.7	32.6	32.5	32.4	32.3		
155	22.2	17.2	18.3	20.9	22.1	25.7	28.6	28.9	28.7	28.5	28.3	28.2	28.1	27.9	27.7	27.7	27.6		
160	9.85	12.3	16.1	18.2	20.3	22.4	22.9	23.5	23.8	23.7	23.3	23.3	23.2	22.8	22.7	22.8	22.7		
165	14.5	15.1	15.9	16.7	16.9	17.0	17.0	17.5	18.1	18.0	17.4	17.5	17.4	17.1	16.5	17.1	17.0		
170	9.44	9.15	9.89	9.64	9.55	9.60	9.69	10.3	10.2	9.57	9.26	9.29	9.01	8.84	8.61	7.97	8.15		
175	0.30	0.27	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.23	0.23	0.23	0.23	0.23		
180	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21		

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.

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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

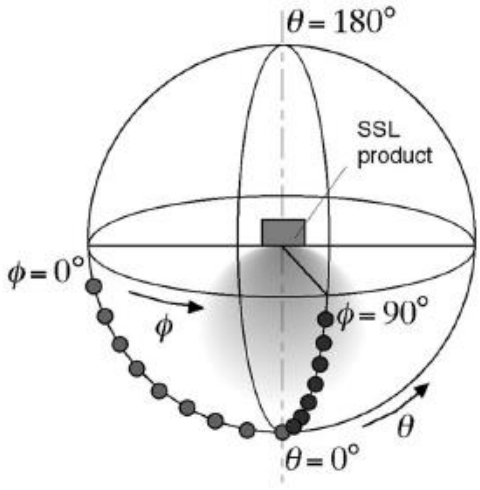
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as 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 ***