LM-79-08 TEST REPORT

for

GREEN CREATIVE LTD

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

LED Lamp

Model: 11A19DIM/927

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ19050037k

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

Review by:

Engineer: April Zou
May 31, 2019

Approved by:

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/927**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
109.5	1191.0	10.88	0.9795

CCT (K)	CRI	Stabilization Time (Light & Power)
2751	93.7	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

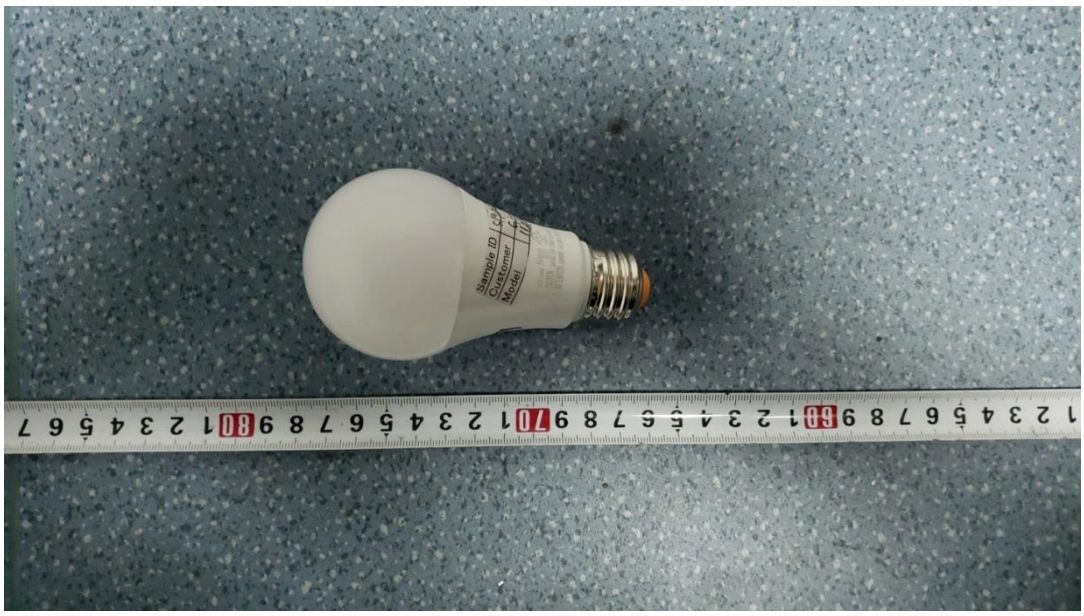


Figure 1- Overview of the sample

Equipment Under Test(EUT)	
Name	: LED Lamp
Model	: 11A19DIM/927
Electrical Ratings	: 120V, 60Hz, 11W
Product Description	: 2700K
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)	0.093
Power Factor	0.9795
Test Power (W)	10.88
THD A%	10.39
Luminous Efficacy (lm/W)	109.5
Total Luminous Flux (lm)	1191.0
Color Rendering Index (CRI)	93.7
R9	55
Correlated Color Temperature (CCT)(K)	2751
Chromaticity Chroma x	0.4557
Chromaticity Chroma y	0.4098
Chromaticity Chroma u	0.2602
Chromaticity Chroma v	0.3509
Duv	0.0001
Chromaticity Chroma u ’	0.2602
Chromaticity Chroma v’	0.5264

Special Color Rendering Indices	
R1	96.3
R2	97
R3	95.1
R4	96.5
R5	95
R6	96.8
R7	92
R8	80.8
R9	55
R10	89.6
R11	96.4
R12	81.2
R13	97.1
R14	95.6

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)	0.093
Power Factor	0.9803
Power (W)	10.92
Luminous Efficacy (lm/W)	110.9
Total Luminous Flux (lm)	1211.5
Beam Angle (°)	218.3 (0^o-180^o) / 218.4 (90^o-270^o)
Center Beam Candle Power (cd)	153
Maximum Beam Candle Power (cd)	153.5 (At: C=80.0, Gamma=6.0)
Spacing Criteria	1.49 (0^o-180^o) / 1.49 (90^o-270^o)
Zonal Lumens in the 0 °-60 °Zone	37.78%
Zonal Lumens in the 60 °-90 °Zone	30.78%
Zonal Lumens in the 90 °-120 °Zone	21.44%
Zonal Lumens in the 120 °-180 °Zone	9.99%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

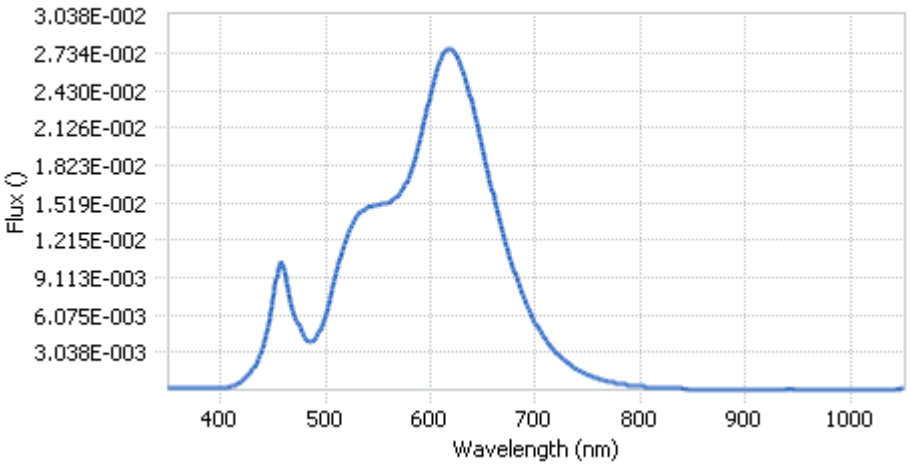
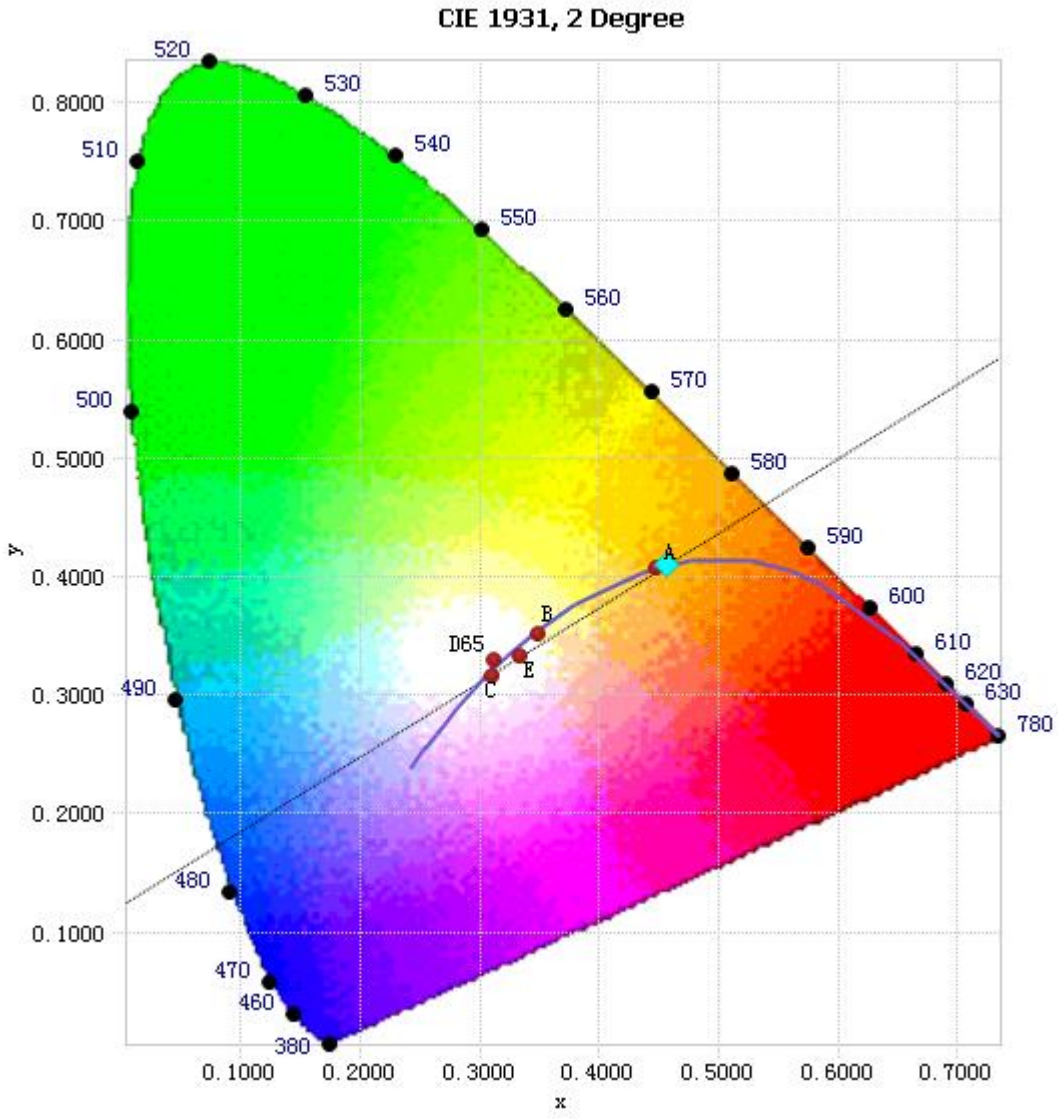


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.36E-04	485	3.89E-03	590	2.04E-02	695	6.29E-03
385	1.43E-04	490	4.13E-03	595	2.22E-02	700	5.45E-03
390	1.57E-04	495	4.88E-03	600	2.40E-02	705	4.70E-03
395	1.68E-04	500	6.10E-03	605	2.56E-02	710	4.06E-03
400	1.80E-04	505	7.71E-03	610	2.69E-02	715	3.50E-03
405	2.22E-04	510	9.47E-03	615	2.75E-02	720	3.02E-03
410	3.04E-04	515	1.12E-02	620	2.76E-02	725	2.62E-03
415	4.55E-04	520	1.24E-02	625	2.71E-02	730	2.24E-03
420	7.10E-04	525	1.34E-02	630	2.61E-02	735	1.93E-03
425	1.08E-03	530	1.41E-02	635	2.47E-02	740	1.64E-03
430	1.62E-03	535	1.45E-02	640	2.30E-02	745	1.42E-03
435	2.38E-03	540	1.48E-02	645	2.12E-02	750	1.22E-03
440	3.49E-03	545	1.49E-02	650	1.94E-02	755	1.05E-03
445	5.05E-03	550	1.50E-02	655	1.75E-02	760	9.14E-04
450	7.35E-03	555	1.51E-02	660	1.58E-02	765	7.86E-04
455	9.90E-03	560	1.52E-02	665	1.40E-02	770	6.77E-04
460	9.94E-03	565	1.54E-02	670	1.24E-02	775	5.88E-04
465	7.74E-03	570	1.58E-02	675	1.09E-02	780	5.06E-04
470	6.13E-03	575	1.65E-02	680	9.55E-03		
475	5.16E-03	580	1.74E-02	685	8.36E-03		
480	4.25E-03	585	1.87E-02	690	7.28E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4557, 0.4098)

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

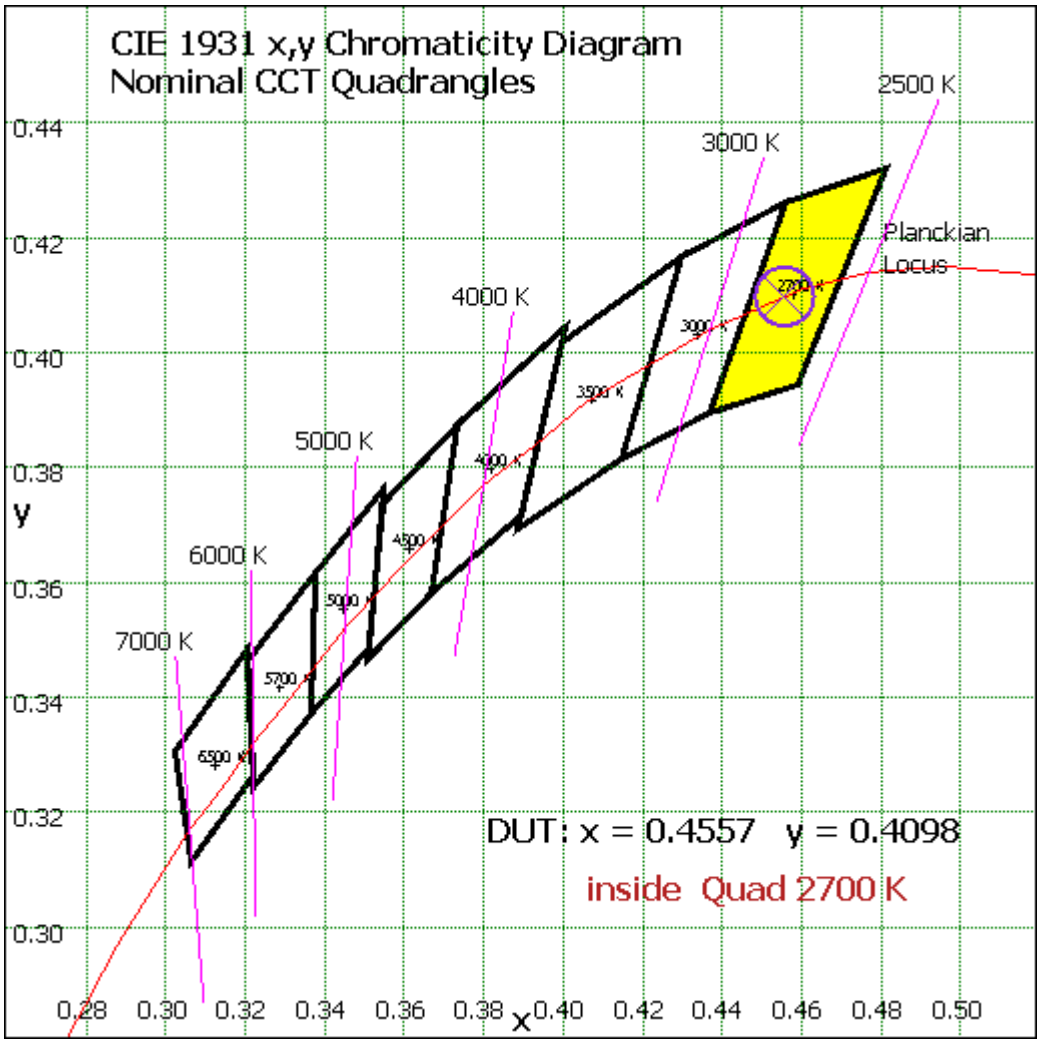
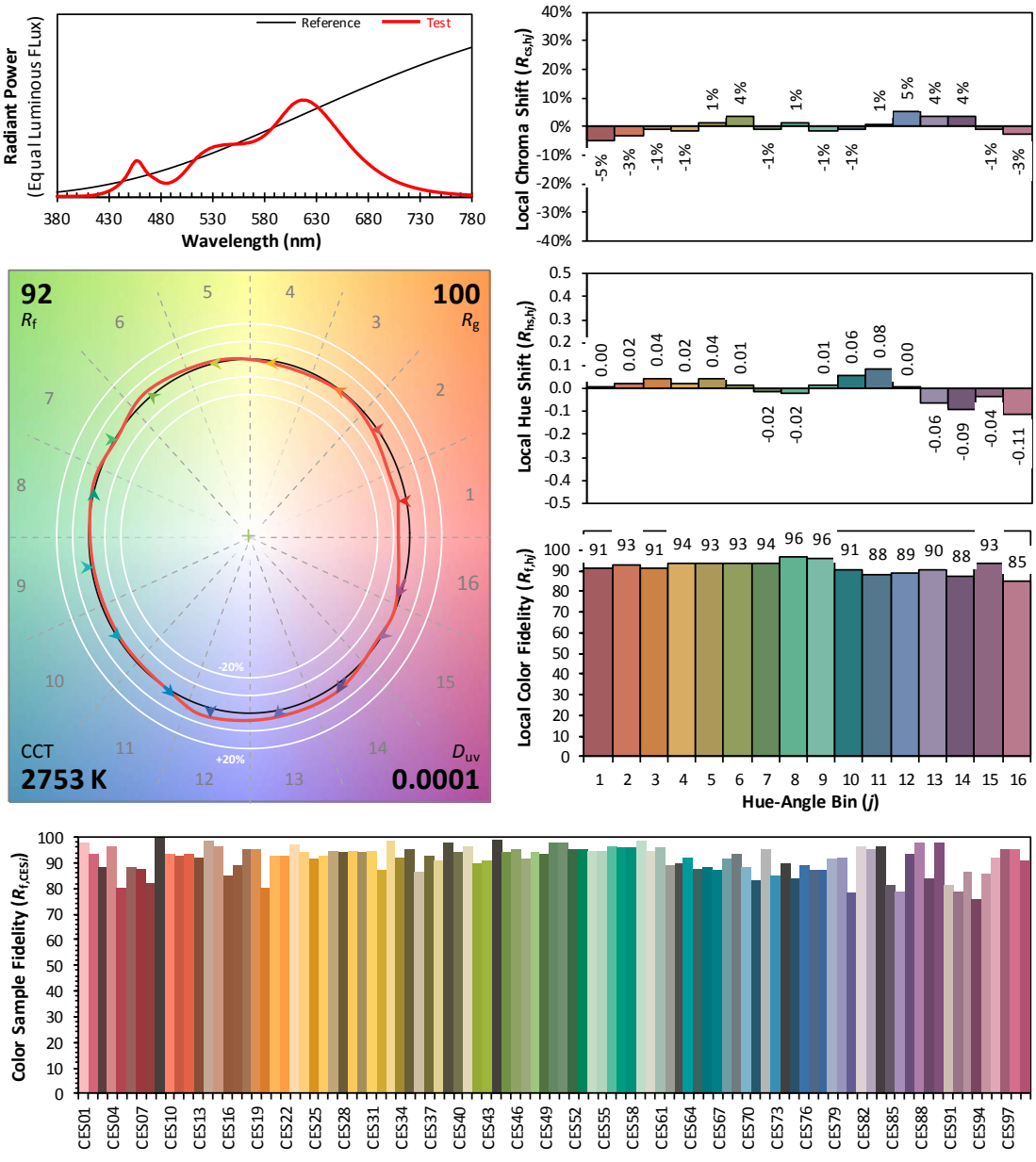


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method



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

x	0.4557
y	0.4098
u'	0.2602
v'	0.5264

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	14.621	1.21%
10- 20	43.261	3.57%
20- 30	70.077	5.78%
30- 40	93.618	7.73%
40- 50	112.09	9.25%
50- 60	124.058	10.24%
60- 70	128.814	10.63%
70- 80	126.432	10.44%
80- 90	117.699	9.72%
90-100	103.981	8.58%
100-110	87.048	7.19%
110-120	68.712	5.67%
120-130	50.701	4.19%
130-140	34.499	2.85%
140-150	20.751	1.71%
150-160	10.594	0.87%
160-170	4.195	0.35%
170-180	0.321	0.03%
Total	1211.5	100%

γ(°)	Lumens	% Total
0-130	1141.112	94.19%
130-180	70.36	5.81%
0-180	1211.5	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

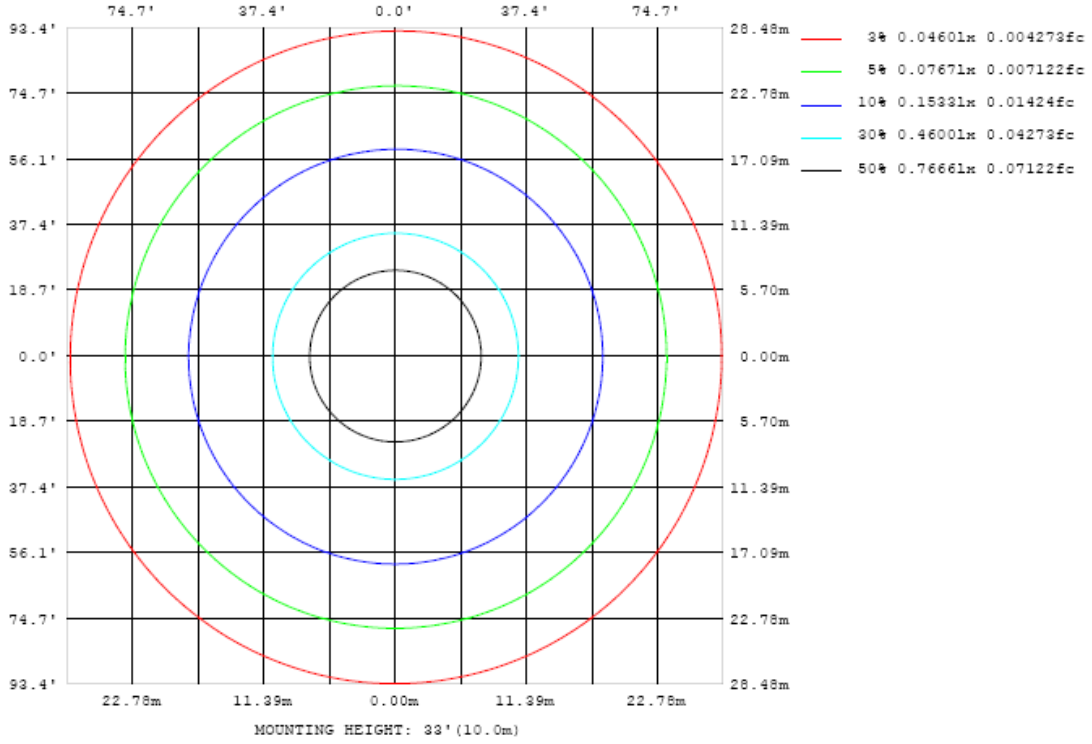


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

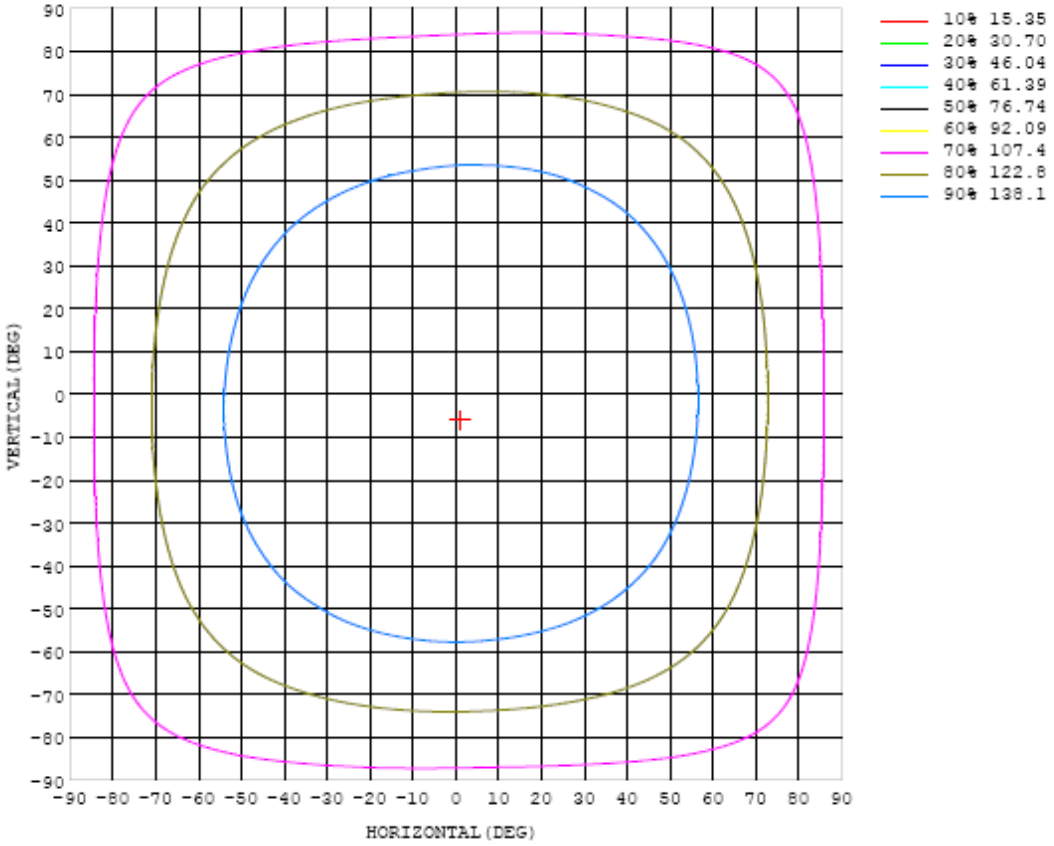


Chart 6: Isocandela Plot

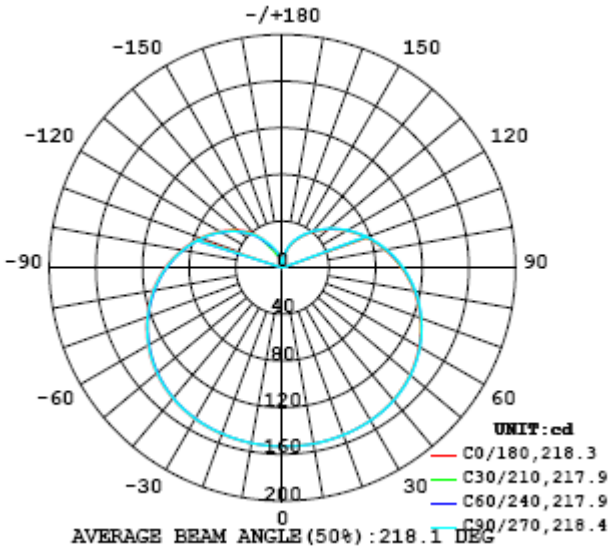


Chart 7: Polar Candela Distribution

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	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153
5	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153
10	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153
15	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153
20	153	153	153	153	153	153	153	153	153	153	153	153	153	153	152	152	152	152	152
25	152	152	152	152	152	152	152	152	152	152	152	152	152	152	152	152	152	151	151
30	151	151	151	151	151	151	151	151	151	151	151	151	151	151	151	151	151	150	150
35	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	149	149	149	149
40	148	148	148	148	148	148	149	149	149	149	148	148	148	148	148	148	147	147	147
45	146	146	146	146	146	146	146	146	146	146	146	146	146	146	145	145	145	144	144
50	143	143	143	143	143	143	144	144	144	144	143	143	143	143	143	142	142	141	141
55	139	139	140	140	140	140	140	140	140	140	140	140	140	139	139	139	138	138	137
60	135	135	136	136	136	136	136	136	136	136	136	136	136	135	135	135	134	134	133
65	131	131	131	131	131	132	132	132	132	132	132	132	131	131	131	130	130	129	129
70	126	126	126	126	127	127	127	127	127	127	127	127	127	126	126	125	125	124	124
75	120	120	121	121	121	121	121	122	122	122	122	122	121	121	121	120	120	119	119
80	115	115	115	115	115	116	116	116	116	116	116	116	116	115	115	114	114	113	113
85	109	109	109	109	109	110	110	110	110	110	110	110	110	109	109	109	108	107	107
90	102	102	103	103	103	103	103	104	104	104	104	104	104	103	103	102	102	101	101
95	95.8	96.0	96.2	96.4	96.7	96.9	97.0	97.2	97.3	97.4	97.5	97.5	97.3	96.9	96.5	96.0	95.5	94.9	94.4
100	89.2	89.4	89.7	89.9	90.2	90.3	90.5	90.6	90.7	90.8	90.9	90.8	90.7	90.4	90.0	89.5	89.1	88.4	88.0
105	82.7	82.8	83.1	83.3	83.6	83.8	83.9	84.0	84.1	84.2	84.2	84.2	84.1	83.8	83.5	83.0	82.6	82.0	81.5
110	76.1	76.3	76.5	76.8	77.0	77.2	77.3	77.4	77.5	77.6	77.6	77.5	77.5	77.2	76.9	76.4	76.0	75.5	75.1
115	69.6	69.8	70.0	70.2	70.5	70.7	70.8	70.9	71.0	71.0	71.0	71.0	70.9	70.7	70.4	69.9	69.5	69.0	68.7
120	63.2	63.4	63.7	63.9	64.1	64.3	64.4	64.5	64.6	64.6	64.6	64.6	64.5	64.2	63.9	63.5	63.2	62.7	62.4
125	57.0	57.2	57.5	57.7	57.9	58.0	58.1	58.3	58.3	58.3	58.3	58.2	58.2	57.9	57.7	57.3	57.0	56.5	56.3
130	51.0	51.3	51.5	51.7	51.8	52.0	52.1	52.2	52.3	52.3	52.2	52.2	52.1	51.9	51.6	51.3	51.0	50.6	50.4
135	45.2	45.5	45.8	45.9	46.1	46.3	46.4	46.4	46.5	46.5	46.4	46.4	46.3	46.1	45.9	45.6	45.3	44.9	44.7
140	39.7	40.0	40.3	40.5	40.7	40.8	40.9	41.0	41.1	41.1	41.0	40.9	40.8	40.6	40.4	40.1	39.9	39.6	38.1
145	34.6	34.9	35.2	35.4	35.5	35.7	35.8	35.9	35.9	35.9	35.9	35.8	35.7	35.5	35.3	35.1	34.8	34.3	31.1
150	29.7	30.1	30.4	30.6	30.8	30.9	31.0	31.1	31.2	31.2	31.1	31.1	31.0	30.8	30.6	30.4	29.5	28.4	22.2
155	25.2	25.5	25.8	26.1	26.3	26.5	26.6	26.8	26.8	26.7	26.7	26.7	26.6	26.5	26.3	26.2	24.8	20.9	17.8
160	20.5	21.0	21.4	21.7	21.8	22.0	22.2	22.3	22.2	22.3	22.4	22.4	22.3	22.2	22.0	21.8	21.6	17.7	10.0
165	15.9	16.4	16.7	16.9	16.7	17.0	17.4	17.5	17.3	17.5	17.6	17.6	17.5	17.4	17.2	17.0	16.8	14.9	13.1
170	9.62	9.97	10.2	10.1	10.5	11.1	11.4	11.5	11.4	11.1	11.4	11.6	11.5	11.4	11.2	11.0	10.3	8.98	7.73
175	0.21	0.21	0.21	0.22	0.23	0.26	0.32	0.39	0.48	0.53	0.54	0.51	0.43	0.33	0.28	0.27	0.25	0.23	0.23
180	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20

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	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153		
5	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153		
10	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153		
15	152	152	152	152	152	152	152	152	152	152	152	152	152	153	153	153	153		
20	152	152	152	151	151	151	151	152	152	152	152	152	152	152	152	152	152		
25	151	151	151	151	150	151	151	151	151	151	151	151	151	151	152	152	152		
30	150	150	149	149	149	149	149	149	150	150	150	150	150	150	151	151	151		
35	148	148	148	148	148	148	148	148	148	148	149	149	149	149	149	150	150		
40	146	146	146	146	146	146	146	146	146	146	147	147	147	147	147	148	148		
45	144	143	143	143	143	143	143	143	144	144	144	144	145	145	145	145	145		
50	141	140	140	140	140	140	140	140	140	141	141	141	142	142	142	142	143		
55	137	137	136	136	136	136	136	137	137	137	138	138	138	138	139	139	139		
60	133	132	132	132	132	132	132	132	133	133	134	134	134	134	135	135	135		
65	128	128	128	127	127	127	128	128	128	129	129	129	130	130	130	130	131		
70	123	123	123	122	122	122	123	123	123	124	124	124	125	125	125	125	126		
75	118	118	117	117	117	117	117	117	118	118	119	119	119	120	120	120	120		
80	112	112	112	111	111	111	111	112	112	113	113	113	113	114	114	114	114		
85	106	106	106	105	105	105	105	106	106	107	107	107	107	108	108	108	108		
90	100	99.8	99.5	99.3	99.2	99.2	99.3	99.4	99.8	100	101	101	101	101	102	102	102		
95	93.9	93.5	93.2	93.0	92.9	92.9	92.9	93.1	93.4	93.9	94.2	94.5	94.7	95.0	95.2	95.4	95.6		
100	87.5	87.1	86.9	86.6	86.5	86.5	86.5	86.6	86.9	87.3	87.7	87.9	88.1	88.4	88.7	88.9	89.1		
105	81.0	80.7	80.4	80.2	80.1	80.0	80.1	80.1	80.4	80.8	81.0	81.2	81.4	81.8	82.1	82.3	82.5		
110	74.6	74.3	74.0	73.5	73.5	73.5	73.5	73.6	73.8	74.2	74.4	74.4	74.7	75.2	75.5	75.7	76.0		
115	68.3	68.0	67.7	67.0	67.0	67.0	67.1	67.1	67.3	67.5	67.6	67.4	67.7	68.5	68.9	69.2	69.5		
120	62.0	61.7	61.3	60.4	60.5	60.5	60.6	60.6	60.7	60.9	60.9	60.6	60.9	61.8	62.4	62.8	63.1		
125	55.9	55.7	54.9	54.0	54.1	54.1	54.2	54.2	54.3	54.4	54.3	53.8	54.2	55.3	56.1	56.5	56.9		
130	50.1	49.8	48.7	47.8	47.8	47.9	48.0	47.9	48.0	48.0	47.8	47.3	47.8	49.0	49.9	50.4	50.9		
135	44.2	44.0	42.8	41.8	41.8	41.7	41.9	41.9	41.9	41.8	41.5	41.1	41.7	43.0	43.9	44.6	45.1		
140	38.2	37.2	36.8	35.7	35.0	35.0	36.1	36.0	35.9	35.8	35.5	35.2	36.1	37.3	38.3	39.0	39.5		
145	30.4	27.2	27.0	28.4	28.0	28.2	30.6	30.4	30.4	30.2	30.0	29.8	31.0	32.1	33.0	33.8	34.3		
150	13.5	11.0	18.5	20.3	20.8	22.1	25.4	25.3	25.2	25.1	24.9	25.2	26.3	27.3	28.2	28.9	29.5		
155	18.8	13.1	12.7	14.3	15.3	18.5	20.2	20.5	20.5	20.3	20.6	21.2	22.1	22.8	23.5	24.3	24.9		
160	8.77	10.0	12.8	13.5	14.3	15.1	15.1	15.8	16.0	16.1	16.3	17.1	17.7	18.1	18.9	19.6	20.2		
165	12.8	12.6	12.2	11.7	11.0	10.7	10.5	11.0	11.5	11.5	11.5	12.2	12.7	12.9	13.5	14.4	15.2		
170	7.58	6.87	7.29	6.91	5.98	5.20	5.05	5.13	4.75	4.68	5.18	5.62	6.31	7.31	7.81	8.44	9.20		
175	0.24	0.24	0.24	0.24	0.25	0.26	0.26	0.26	0.27	0.27	0.26	0.25	0.23	0.23	0.22	0.22	0.22		
180	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20		

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

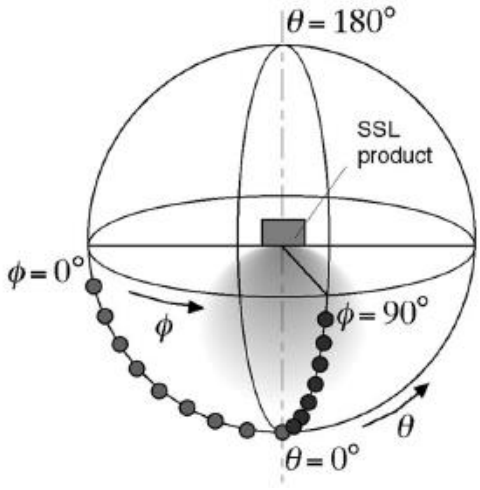
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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