LM-79-08 Test Report

for

GREEN CREATIVE LTD

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

LED lamp

Model: 9.5PLV/840/DIR/RC

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ181000241

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

Review by: April Zou

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Nov. 02, 2018

Approved by: Jim Zhang

Manager: Jim Zhang

Nov. 02, 2018

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: **9.5PLV/840/DIR/RC**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)/2	Power Factor
106.9	1197.0	11.20	0.9948

CCT (K)	CRI	Stabilization Time (Light & Power)
3972	83.4	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	: Oct. 30, 2018
Date of Test	: Oct. 30, 2018
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

TABLE OF CONTENT

Sample Photos

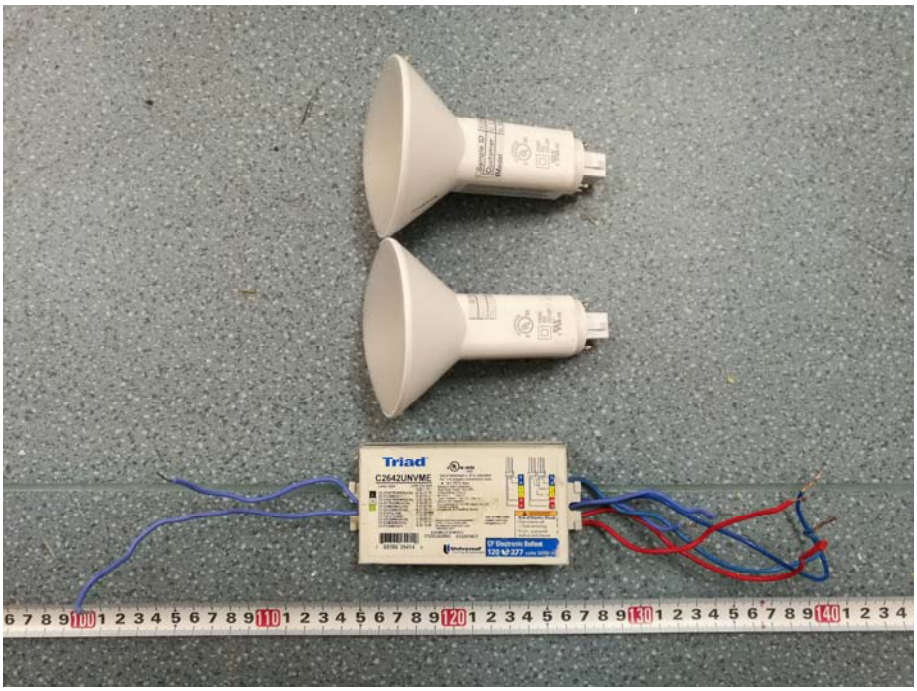


Figure 1- Overview of the sample

Equipment Under Test (EUT)	
Name	: LED lamp
Model	: 9.5PLV/840/DIR/RC
Electrical Ratings	: 120-277V, 50/60Hz, 9.5W
Product Description	: 4000K LED Tubes supplied by a high frequency fluorescent lamp ballast: C2642UNVME
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 light down. 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 70 minutes.

Sphere-Spectroradiometer Method

Parameter	Result	
Test Voltage (V)	120.0	277.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.188	0.083
Power Factor	0.9948	0.9760
Test Power (W)/2	11.20	11.28
THD A%	8.49	8.51
Luminous Efficacy (lm/W)	106.9	106.2
Total Luminous Flux (lm)	1197.0	1197.0
Color Rendering Index (CRI)	83.4	
R9	9	
Correlated Color Temperature (CCT)(K)	3972	
Chromaticity Chroma x	0.3827	
Chromaticity Chroma y	0.3817	
Chromaticity Chroma u	0.2246	
Chromaticity Chroma v	0.3361	
Duv	0.0016	
Chromaticity Chroma u ’	0.2246	
Chromaticity Chroma v’	0.5041	

Special Color Rendering Indices	
R1	81.4
R2	90.2
R3	96
R4	81.3
R5	81.5
R6	86.4
R7	86
R8	64.3
R9	9
R10	76.6
R11	80.1
R12	63.9
R13	83.7
R14	98.1
Rf	83
Rg	94

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 25.1℃.

The photometric distance is 2.47m.

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)	0.187
Power Factor	0.9950
Test Power (W)/2	11.16
Luminous Efficacy (lm/W)	108.9
Total Luminous Flux (lm)	1215.2
Beam Angle (°)	91.9
Center Beam Candle Power (cd)	531
Spacing Criteria	1.14 (0°-180°)/ 1.15 (90°-270°)
Zonal Lumens in the 0°-60°Zone	82.03%
Zonal Lumens in the 60°-90°Zone	16.86%
Zonal Lumens in the 90°-120°Zone	1.02%
Zonal Lumens in the 120°-180°Zone	0.09%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

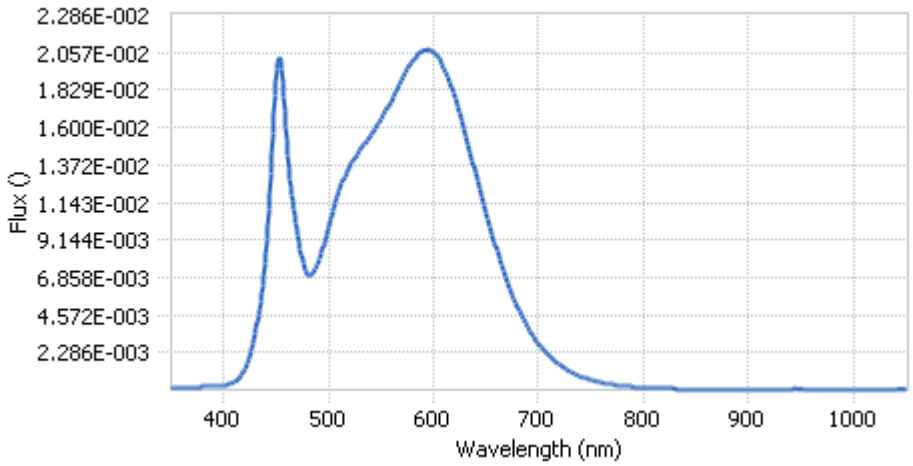
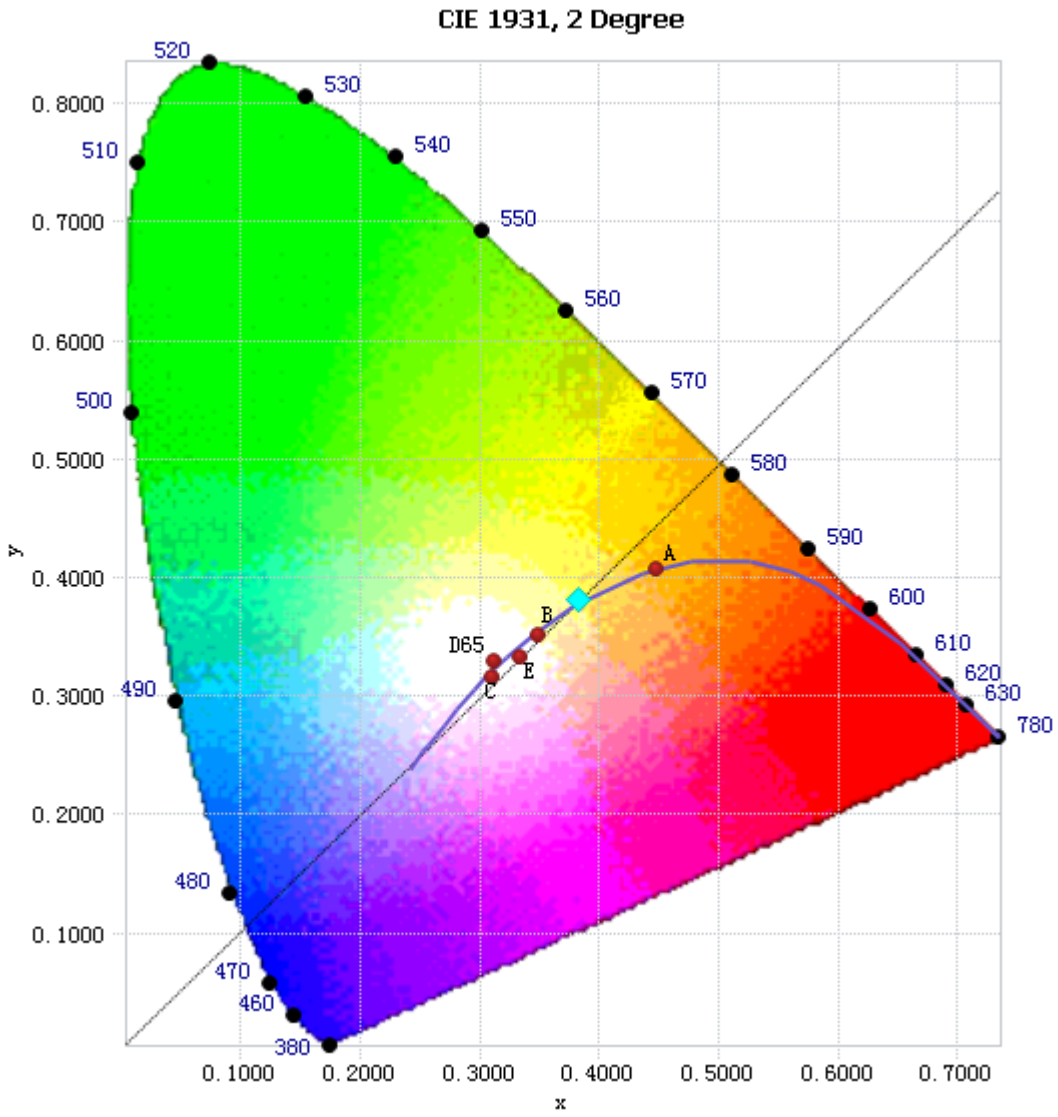


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.93E-04	485	7.14E-03	590	2.07E-02	695	3.29E-03
385	1.99E-04	490	7.75E-03	595	2.08E-02	700	2.84E-03
390	2.13E-04	495	8.76E-03	600	2.06E-02	705	2.44E-03
395	2.31E-04	500	9.95E-03	605	2.02E-02	710	2.09E-03
400	2.73E-04	505	1.12E-02	610	1.96E-02	715	1.79E-03
405	3.36E-04	510	1.21E-02	615	1.89E-02	720	1.54E-03
410	4.80E-04	515	1.30E-02	620	1.79E-02	725	1.33E-03
415	7.78E-04	520	1.37E-02	625	1.68E-02	730	1.14E-03
420	1.27E-03	525	1.42E-02	630	1.57E-02	735	9.75E-04
425	2.09E-03	530	1.47E-02	635	1.45E-02	740	8.27E-04
430	3.43E-03	535	1.51E-02	640	1.32E-02	745	7.11E-04
435	5.42E-03	540	1.56E-02	645	1.20E-02	750	6.13E-04
440	8.38E-03	545	1.60E-02	650	1.08E-02	755	5.26E-04
445	1.32E-02	550	1.65E-02	655	9.65E-03	760	4.57E-04
450	1.89E-02	555	1.71E-02	660	8.58E-03	765	3.93E-04
455	1.96E-02	560	1.77E-02	665	7.56E-03	770	3.39E-04
460	1.52E-02	565	1.83E-02	670	6.65E-03	775	2.93E-04
465	1.18E-02	570	1.90E-02	675	5.81E-03	780	2.52E-04
470	9.79E-03	575	1.95E-02	680	5.07E-03		
475	7.92E-03	580	2.01E-02	685	4.41E-03		
480	6.99E-03	585	2.05E-02	690	3.80E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3827, 0.3817)

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

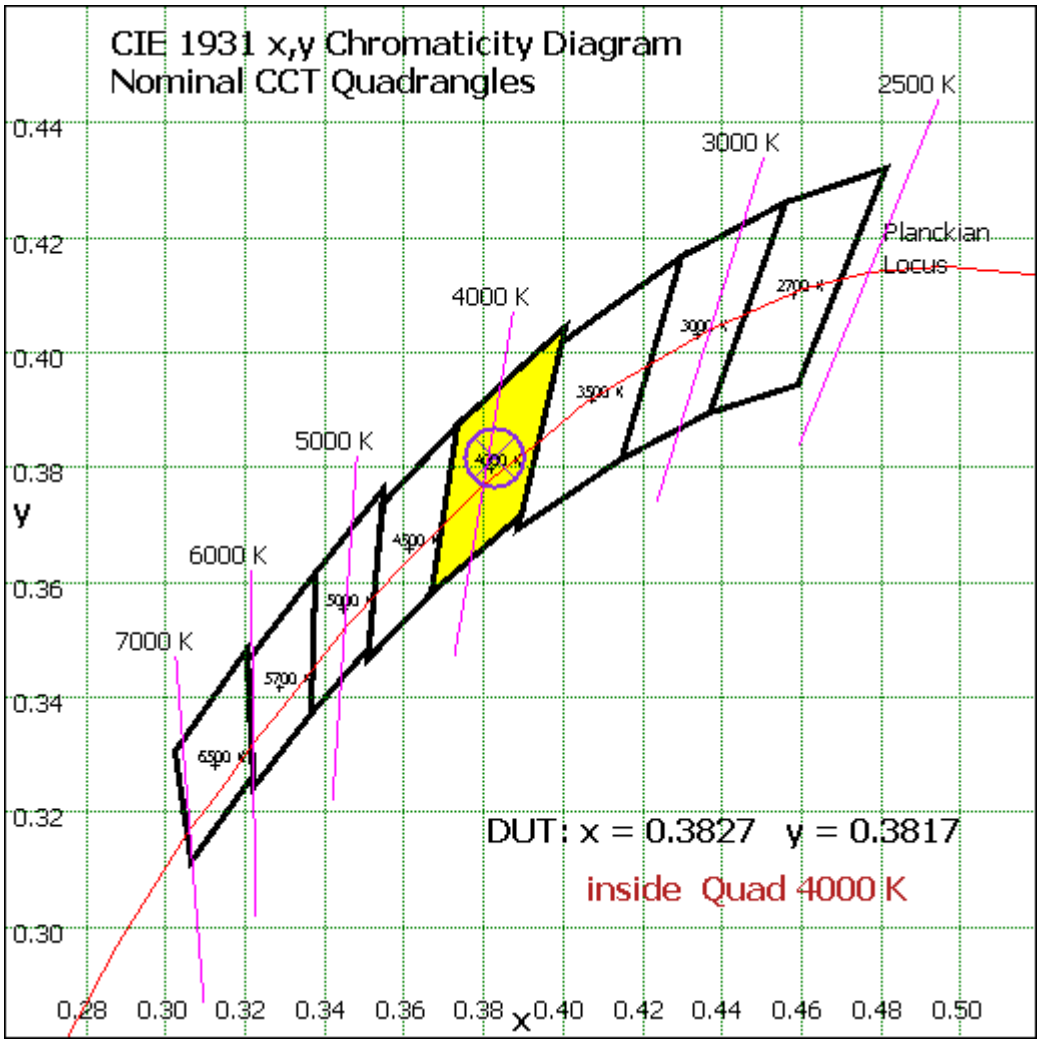


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Zonal Lumen Tabulation- Goniophotometer Method

γ(°)	Lumens	% Total
0- 10	49.989	4.11%
10- 20	139.998	11.52%
20- 30	202.285	16.65%
30- 40	226.486	18.64%
40- 50	211.55	17.41%
50- 60	166.581	13.71%
60- 70	110.915	9.13%
70- 80	63.412	5.22%
80- 90	30.542	2.51%
90-100	10.439	0.86%
100-110	1.796	0.15%
110-120	0.192	0.02%
120-130	0.162	0.01%
130-140	0.221	0.02%
140-150	0.25	0.02%
150-160	0.221	0.02%
160-170	0.148	0.01%
170-180	0.052	0.00%
Total	1215.2	100%

γ(°)	Lumens	% Total
0- 60	996.889	82.03%
60- 90	204.869	16.86%
0-90	1201.758	98.89%
90- 180	13.481	1.11%
0- 180	1215.2	100%

Table 5: Zonal Lumen Data

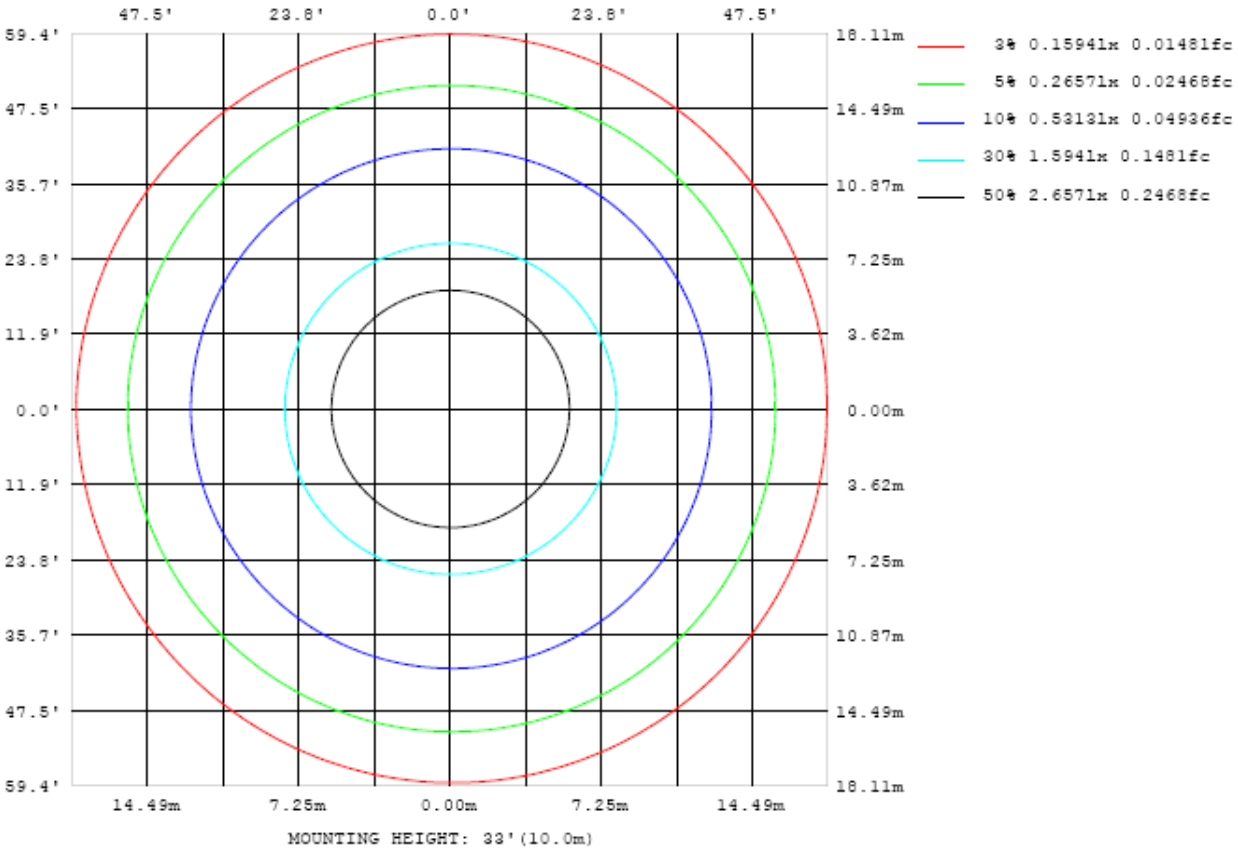


Chart 4: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

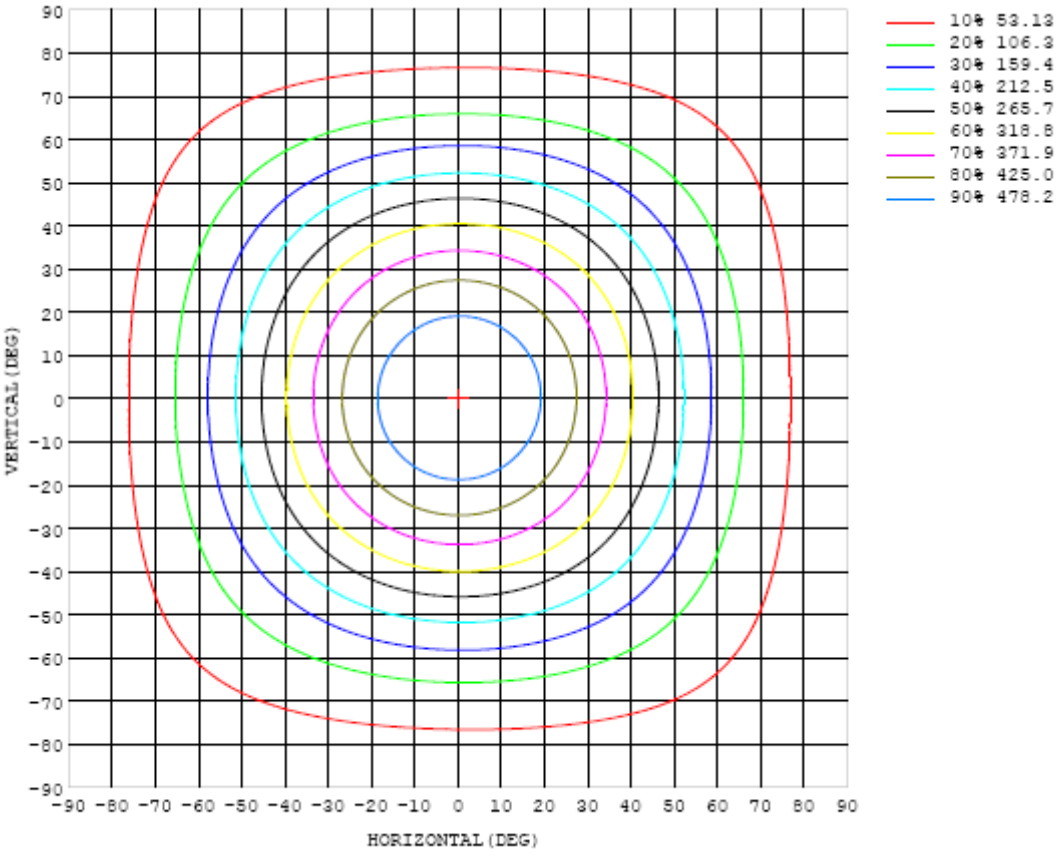


Chart 5: Isocandela Plot

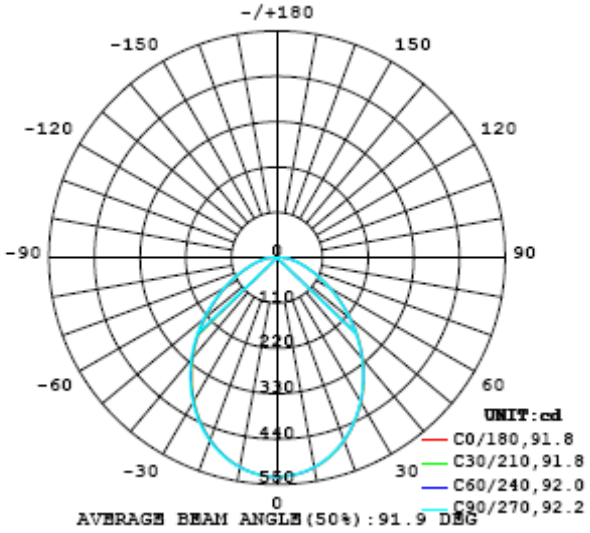


Chart 6: Polar Candela Distribution

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	531	531	531	531	531	531	531	531	531	531	531	531	531	531	531	531	531	531	531
5	528	528	528	528	527	527	527	527	527	527	527	527	527	527	527	527	527	527	527
10	517	517	517	516	516	516	516	516	516	516	516	516	515	515	515	515	515	515	515
15	499	498	498	498	497	497	497	497	497	497	497	496	496	496	496	496	496	496	496
20	473	473	473	472	472	471	471	471	471	471	471	471	470	470	470	470	470	470	470
25	442	441	441	440	440	440	439	439	439	439	439	438	438	438	438	438	438	438	438
30	405	405	404	404	403	403	403	402	402	402	402	401	401	400	400	400	400	400	401
35	365	365	364	364	363	363	362	362	362	361	361	360	360	359	359	359	359	359	359
40	323	322	321	321	320	320	319	319	319	318	318	317	316	315	315	315	315	315	316
45	277	277	277	276	276	275	275	274	274	273	272	272	271	270	269	269	270	270	270
50	232	232	232	231	231	230	230	229	229	228	227	227	226	225	224	224	224	225	225
55	189	188	188	188	188	187	187	186	186	185	184	183	182	182	181	181	182	182	182
60	148	148	148	148	148	148	147	147	146	146	145	144	143	142	142	142	142	142	144
65	113	113	113	113	113	113	112	112	111	111	110	109	109	108	108	108	108	108	109
70	83.4	83.5	83.8	84.0	84.0	83.8	83.3	82.8	82.3	81.7	81.1	80.7	80.3	79.8	79.5	79.6	79.7	79.8	80.6
75	60.4	60.6	61.0	61.2	61.3	61.1	60.7	60.2	59.7	59.2	58.7	58.3	58.0	57.7	57.5	57.6	57.7	57.8	57.9
80	42.4	42.7	42.9	43.2	43.2	43.0	42.6	42.2	41.7	41.2	40.8	40.5	40.2	40.0	39.8	39.9	40.0	40.1	40.2
85	28.5	28.7	28.9	29.0	29.0	28.8	28.4	28.0	27.7	27.4	27.0	26.7	26.5	26.3	26.1	26.1	26.2	26.2	26.4
90	17.8	18.0	18.1	18.2	18.1	17.9	17.6	17.4	17.1	16.8	16.5	16.3	16.0	15.9	15.7	15.7	15.7	15.7	15.9
95	9.94	10.0	10.2	10.2	10.2	10.0	9.80	9.57	9.36	9.13	8.91	8.71	8.51	8.34	8.20	8.13	8.11	8.12	8.17
100	4.58	4.68	4.77	4.82	4.83	4.75	4.62	4.46	4.28	4.11	3.92	3.77	3.62	3.49	3.39	3.34	3.33	3.36	3.44
105	1.67	1.75	1.84	1.90	1.93	1.89	1.81	1.70	1.57	1.45	1.32	1.21	1.12	1.04	0.99	0.97	0.98	1.01	1.08
110	0.49	0.56	0.63	0.69	0.72	0.70	0.65	0.58	0.50	0.41	0.34	0.28	0.24	0.22	0.21	0.20	0.21	0.23	0.28
115	0.15	0.19	0.24	0.27	0.29	0.28	0.25	0.22	0.17	0.13	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.12
120	0.13	0.13	0.13	0.13	0.14	0.14	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.14	0.14	0.14	0.14	0.16
125	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.21
130	0.19	0.19	0.19	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.21	0.21	0.21	0.21	0.22	0.22	0.22	0.28
135	0.24	0.24	0.23	0.24	0.24	0.24	0.24	0.24	0.25	0.25	0.25	0.25	0.25	0.26	0.26	0.26	0.26	0.26	0.35
140	0.28	0.28	0.28	0.28	0.28	0.28	0.29	0.29	0.29	0.29	0.30	0.30	0.30	0.30	0.30	0.31	0.31	0.30	0.42
145	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.33	0.47
150	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.38	0.38	0.38	0.38	0.38	0.37	0.51
155	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.41	0.41	0.42	0.42	0.42	0.42	0.41	0.54
160	0.43	0.43	0.43	0.43	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.45	0.45	0.44	0.55
165	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.47	0.47	0.48	0.48	0.48	0.49	0.48	0.55
170	0.48	0.48	0.48	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.50	0.50	0.50	0.50	0.51	0.52	0.53
175	0.51	0.50	0.50	0.50	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.52	0.53	0.54	0.55	0.55	0.56	0.56	0.56
180	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55

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	531	531	531	531	531	531	531	531	531	531	531	531	531	531	531	531	531		
5	527	527	527	527	527	527	527	528	528	528	528	528	528	528	528	528	528		
10	516	516	516	516	516	516	516	516	517	517	517	517	517	517	517	517	517		
15	496	496	496	497	497	497	498	498	498	499	499	499	499	499	499	499	499		
20	470	470	470	471	471	472	472	473	473	474	474	474	474	474	474	474	474		
25	438	438	438	439	439	440	441	442	442	442	442	442	442	443	443	443	443		
30	401	401	401	402	403	404	405	405	406	406	406	406	406	406	406	406	406		
35	360	360	360	361	362	363	364	365	366	366	366	366	366	366	366	366	366		
40	316	316	317	317	319	320	321	323	323	324	324	324	323	323	324	324	323		
45	271	271	271	272	273	275	276	277	278	279	279	279	278	279	279	278	278		
50	226	226	226	227	228	229	231	232	233	233	233	233	233	233	233	233	233		
55	183	183	183	183	184	185	187	188	189	189	189	189	189	189	190	189	189		
60	144	144	144	144	145	146	147	148	148	149	149	149	149	149	150	149	149		
65	109	109	109	110	110	111	111	112	112	113	113	113	113	114	114	114	114		
70	80.7	80.6	80.8	80.9	81.0	81.5	82.0	82.4	82.8	83.0	83.2	83.5	83.6	83.7	83.7	83.7	83.8		
75	58.1	58.1	58.2	58.3	58.4	58.7	58.9	59.2	59.5	59.8	60.0	60.1	60.1	60.2	60.3	60.2	60.4		
80	40.4	40.4	40.5	40.4	40.7	40.8	41.0	41.3	41.5	41.7	41.9	42.0	42.1	42.2	42.2	42.1	42.3		
85	26.5	26.6	26.7	26.7	26.8	26.9	27.2	27.4	27.5	27.7	27.9	28.0	28.1	28.2	28.2	28.3	28.4		
90	16.0	16.0	16.2	16.2	16.3	16.4	16.6	16.8	17.0	17.1	17.3	17.4	17.5	17.6	17.7	17.7	17.8		
95	8.25	8.33	8.42	8.51	8.60	8.70	8.82	8.93	9.03	9.16	9.30	9.42	9.51	9.60	9.67	9.72	9.81		
100	3.50	3.57	3.65	3.72	3.77	3.84	3.91	3.97	4.03	4.10	4.17	4.24	4.31	4.39	4.44	4.48	4.56		
105	1.14	1.18	1.22	1.25	1.28	1.30	1.32	1.34	1.35	1.37	1.41	1.44	1.47	1.51	1.54	1.57	1.63		
110	0.32	0.36	0.39	0.40	0.40	0.38	0.36	0.36	0.35	0.36	0.37	0.38	0.39	0.40	0.41	0.42	0.46		
115	0.13	0.14	0.15	0.15	0.15	0.14	0.13	0.12	0.12	0.12	0.13	0.13	0.13	0.13	0.12	0.12	0.13		
120	0.16	0.16	0.16	0.16	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.14	0.14	0.14	0.14	0.14		
125	0.21	0.21	0.21	0.21	0.21	0.20	0.20	0.20	0.19	0.19	0.18	0.18	0.18	0.18	0.18	0.18	0.17		
130	0.29	0.28	0.28	0.28	0.28	0.27	0.26	0.26	0.25	0.25	0.24	0.24	0.23	0.23	0.23	0.22	0.22		
135	0.36	0.36	0.36	0.35	0.35	0.35	0.34	0.33	0.33	0.32	0.31	0.31	0.30	0.29	0.29	0.29	0.28		
140	0.43	0.43	0.43	0.43	0.42	0.42	0.41	0.41	0.40	0.39	0.39	0.38	0.38	0.37	0.37	0.37	0.36		
145	0.49	0.49	0.49	0.49	0.48	0.48	0.48	0.47	0.47	0.46	0.46	0.45	0.45	0.45	0.44	0.44	0.43		
150	0.54	0.53	0.53	0.53	0.53	0.53	0.53	0.52	0.52	0.52	0.52	0.51	0.51	0.51	0.51	0.51	0.48		
155	0.57	0.56	0.56	0.56	0.56	0.56	0.56	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.56	0.52		
160	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.57	0.57	0.57	0.58	0.54		
165	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.60	0.60	0.55		
170	0.57	0.57	0.57	0.58	0.58	0.58	0.58	0.58	0.58	0.59	0.59	0.59	0.59	0.59	0.60	0.60	0.54		
175	0.56	0.56	0.56	0.56	0.56	0.56	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.58	0.58	0.56	0.52		
180	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55		

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	2M	HZTE015-01	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.

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

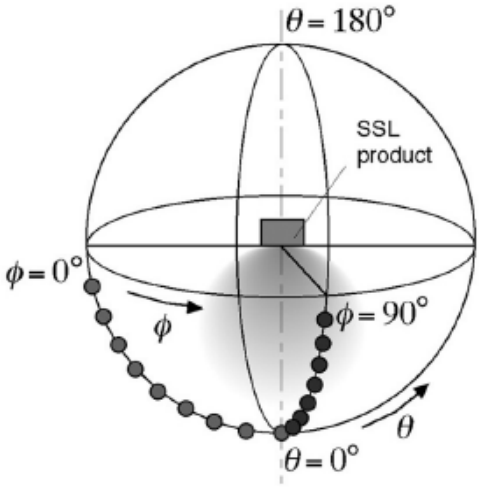
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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