

LM-79-08 Test Report

for

GREEN CREATIVE LTD

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

LED lamp

Model: 9.5PLV/827/DIR/R

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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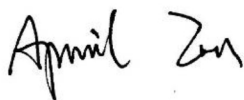
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Report No.: HZ18100024k

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

Review by:



Engineer: April Zou
Nov. 02, 2018

Approved by:



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/827/DIR/R**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)/2	Power Factor
94.0	1057.0	11.25	0.9950
CCT (K)	CRI	Stabilization Time (Light & Power)	
2722	82.7	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 : 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

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Sample Photos

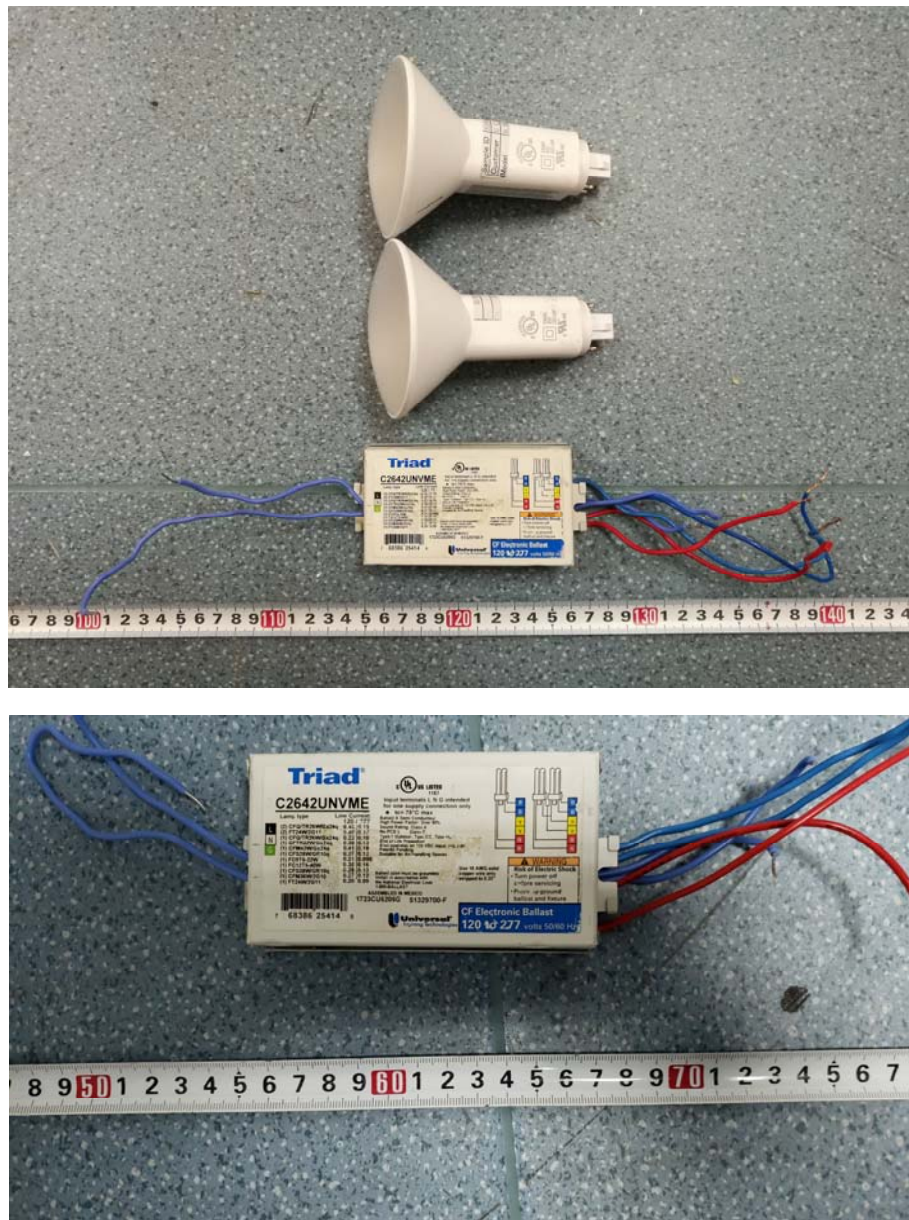


Figure 1- Overview of the sample

Equipment Under Test (EUT)

Name	: LED lamp
Model	: 9.5PLV/827/DIR/R
Electrical Ratings	: 120-277V, 50/60Hz, 9.5W
Product Description	: 2700K 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°C.

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)	0.189	0.084
Power Factor	0.9950	0.9764
Test Power (W)/2	11.25	11.33
THD A%	8.54	8.46
Luminous Efficacy (lm/W)	94.0	93.3
Total Luminous Flux (lm)	1057.0	1057.0
Color Rendering Index (CRI)	82.7	
R9	9.9	
Correlated Color Temperature (CCT)(K)	2722	
Chromaticity Chroma x	0.4568	
Chromaticity Chroma y	0.4082	
Chromaticity Chroma u	0.2616	
Chromaticity Chroma v	0.3507	
Duv	0.0009	
Chromaticity Chroma u'	0.2616	
Chromaticity Chroma v'	0.5260	

Special Color Rendering Indices	
R1	82.8
R2	95.3
R3	90.5
R4	78.9
R5	83.5
R6	95.3
R7	79
R8	56.6
R9	9.9
R10	89.7
R11	78.8
R12	79.8
R13	86.2
R14	95.4
Rf	82
Rg	92

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 24.9°C.

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)	0.188
Power Factor	0.9951
Test Power (W)/2	11.21
Luminous Efficacy (lm/W)	96.1
Total Luminous Flux (lm)	1077.2
Beam Angle (°)	91.5
Center Beam Candle Power (cd)	473
Spacing Criteria	1.14 (0°-180°)/ 1.12 (90°-270°)
Zonal Lumens in the 0°-60°Zone	82.05%
Zonal Lumens in the 60°-90°Zone	16.80%
Zonal Lumens in the 90°-120°Zone	1.05%
Zonal Lumens in the 120°-180°Zone	0.09%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

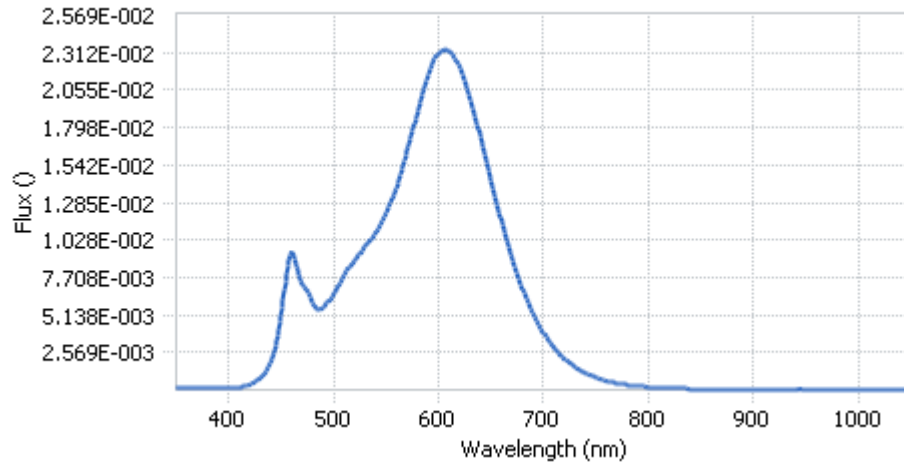


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.17E-04	485	5.51E-03	590	2.15E-02	695	4.53E-03
385	1.11E-04	490	5.65E-03	595	2.25E-02	700	3.91E-03
390	1.18E-04	495	6.03E-03	600	2.30E-02	705	3.35E-03
395	1.32E-04	500	6.57E-03	605	2.33E-02	710	2.89E-03
400	1.33E-04	505	7.22E-03	610	2.32E-02	715	2.48E-03
405	1.49E-04	510	7.82E-03	615	2.28E-02	720	2.13E-03
410	1.78E-04	515	8.41E-03	620	2.21E-02	725	1.83E-03
415	2.49E-04	520	8.90E-03	625	2.11E-02	730	1.57E-03
420	3.64E-04	525	9.34E-03	630	2.00E-02	735	1.34E-03
425	5.39E-04	530	9.84E-03	635	1.87E-02	740	1.14E-03
430	8.16E-04	535	1.03E-02	640	1.73E-02	745	9.80E-04
435	1.24E-03	540	1.08E-02	645	1.58E-02	750	8.39E-04
440	1.93E-03	545	1.14E-02	650	1.43E-02	755	7.19E-04
445	3.05E-03	550	1.21E-02	655	1.29E-02	760	6.20E-04
450	5.10E-03	555	1.30E-02	660	1.15E-02	765	5.30E-04
455	8.02E-03	560	1.39E-02	665	1.02E-02	770	4.56E-04
460	9.50E-03	565	1.51E-02	670	9.04E-03	775	3.95E-04
465	8.38E-03	570	1.64E-02	675	7.93E-03	780	3.37E-04
470	7.34E-03	575	1.77E-02	680	6.93E-03		
475	6.73E-03	580	1.91E-02	685	6.06E-03		
480	5.93E-03	585	2.05E-02	690	5.23E-03		

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

The diagram is a CIE 1931, 2 Degree color space plot. The x-axis is labeled 'x' and ranges from 0.1000 to 0.7000. The y-axis is labeled 'y' and ranges from 0.1000 to 0.8000. The plot shows the visible spectrum as a curved boundary with color labels: 380, 460, 470, 480, 490, 500, 510, 520, 530, 540, 550, 560, 570, 580, 590, 600, 610, 620, 630, 780. A straight line represents the line of equal energy. A curved line represents the locus of constant saturation. Points A, B, C, D65, and E are marked on the locus of constant saturation. Point A is at approximately (0.45, 0.41), B is at (0.35, 0.35), C is at (0.30, 0.32), D65 is at (0.31, 0.33), and E is at (0.32, 0.34).

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

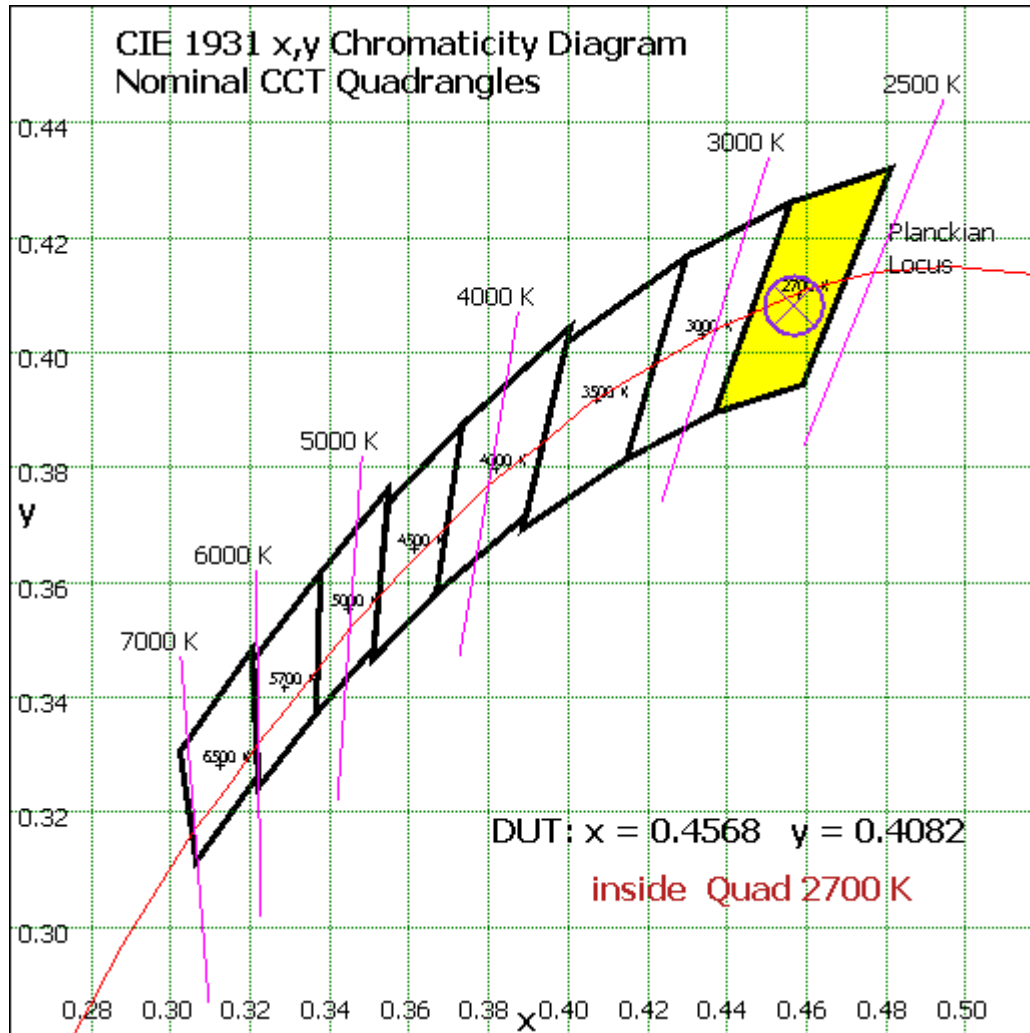


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	44.526	4.13%
10- 20	124.611	11.57%
20- 30	179.821	16.69%
30- 40	200.898	18.65%
40- 50	187.064	17.37%
50- 60	146.989	13.65%
60- 70	97.703	9.07%
70- 80	56.064	5.20%
80- 90	27.2	2.53%
90-100	9.427	0.88%
100-110	1.708	0.16%
110-120	0.198	0.02%
120-130	0.15	0.01%
130-140	0.207	0.02%
140-150	0.238	0.02%
150-160	0.215	0.02%
160-170	0.147	0.01%
170-180	0.05	0.00%
Total	1077.2	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	883.909	82.05%
60- 90	180.967	16.80%
0-90	1064.876	98.85%
90- 180	12.34	1.15%
0- 180	1077.2	100%

Table 5: Zonal Lumen Data

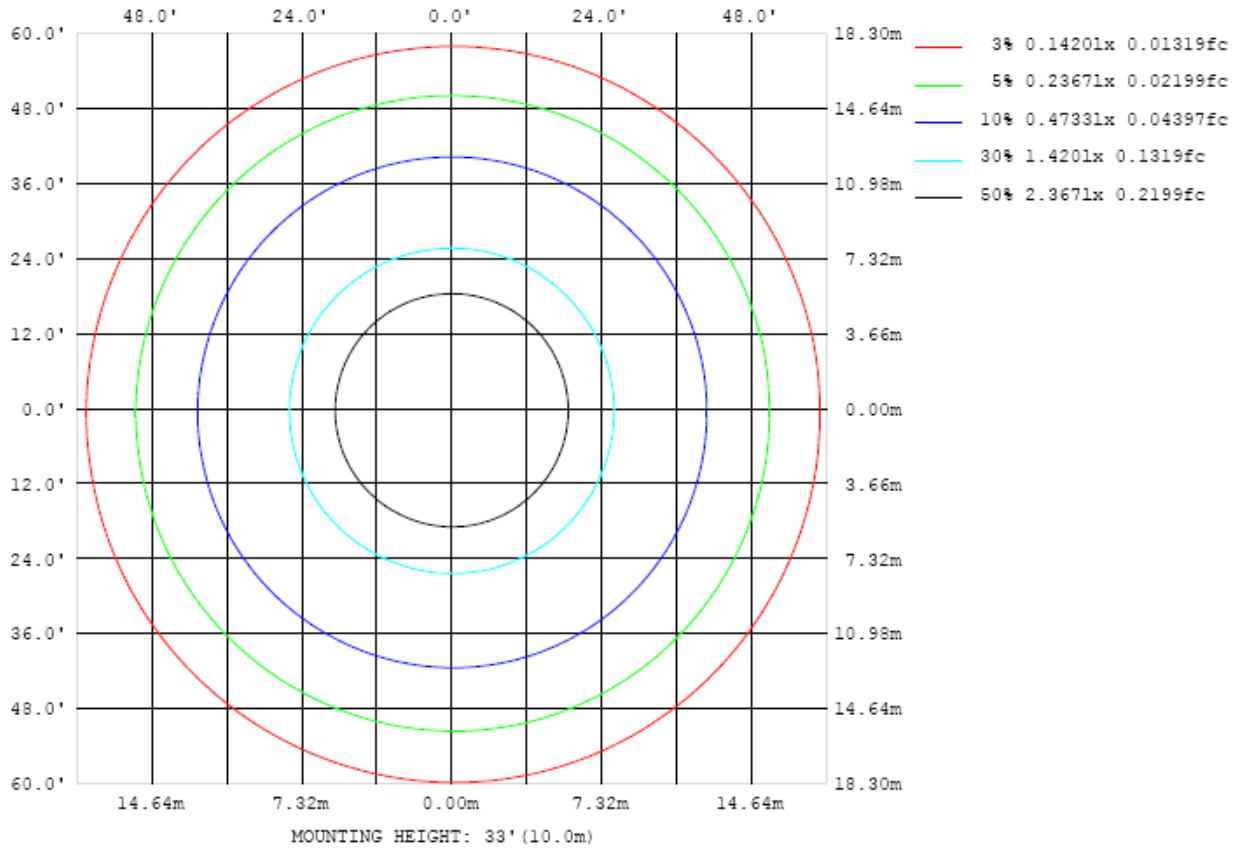


Chart 4: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

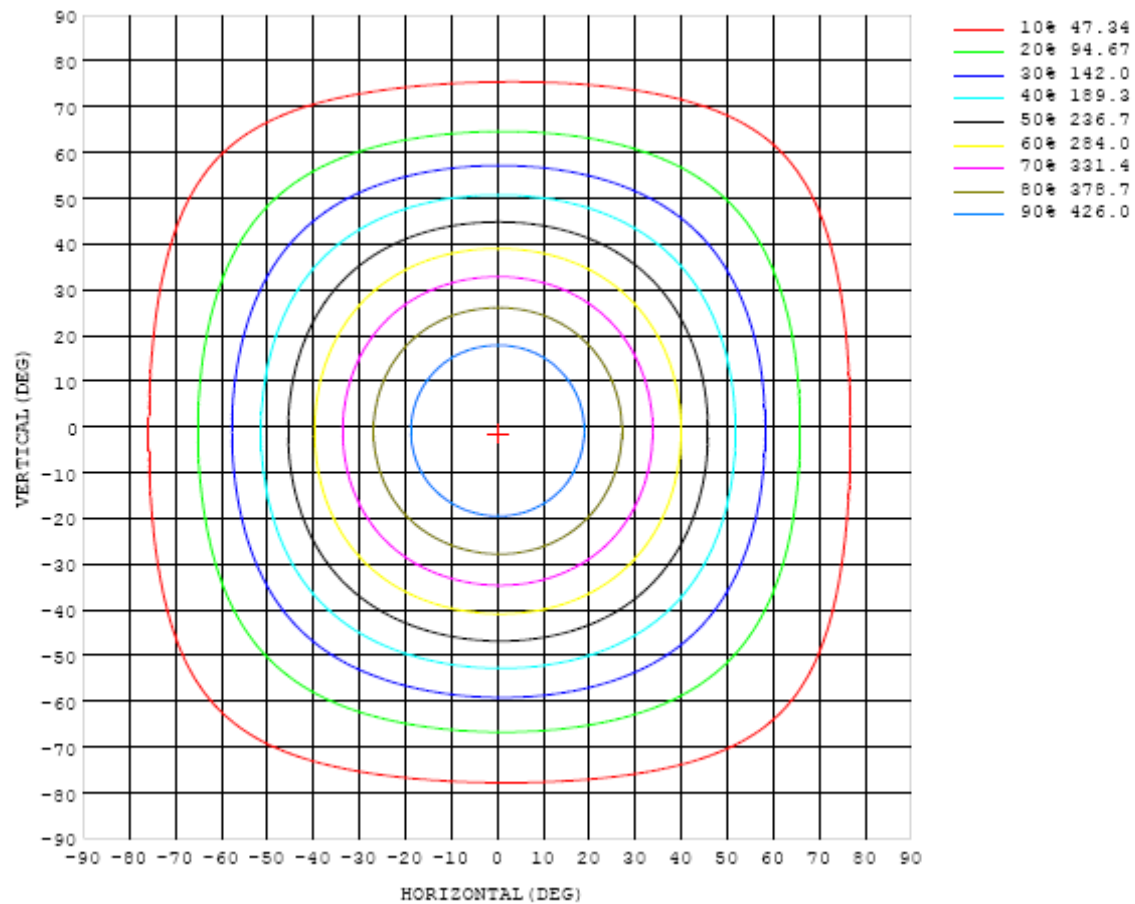


Chart 5: Isocandela Plot

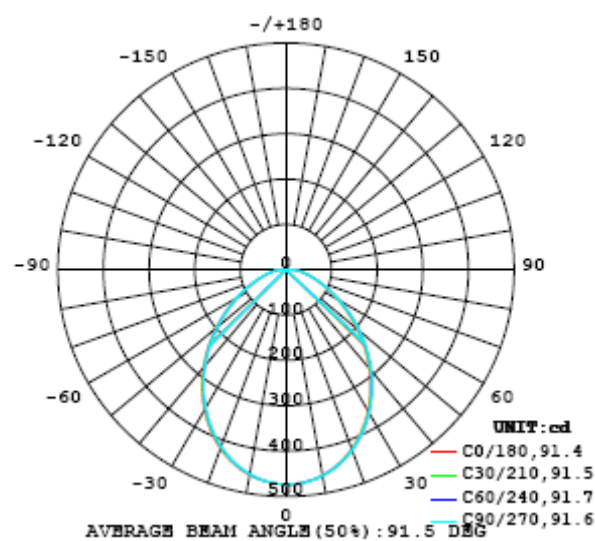


Chart 6: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1

UNIT: cd

C (DGG) y (DGG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	473	473	473	473	473	473	473	473	473	473	473	473	473	473	473	473	473	473	473
5	470	470	470	470	471	471	471	471	471	471	471	471	471	471	471	471	470	470	470
10	460	460	461	461	461	461	462	462	462	462	462	462	461	461	461	461	461	460	460
15	443	444	444	445	445	446	446	446	446	446	446	446	445	445	445	445	444	444	443
20	420	421	422	422	423	424	424	424	424	424	424	423	423	423	423	422	421	421	420
25	392	393	394	394	395	396	396	397	397	397	396	395	395	395	395	394	393	392	391
30	359	360	361	362	363	364	365	365	365	365	364	363	363	362	362	361	360	359	358
35	322	323	325	326	327	328	329	330	330	329	328	327	327	326	326	325	324	322	321
40	283	285	286	288	289	290	291	292	292	291	290	290	289	288	287	286	285	283	282
45	243	245	246	248	249	251	252	252	252	252	251	250	249	248	247	246	244	243	241
50	203	205	206	208	209	210	211	212	212	212	211	210	208	208	206	205	204	202	201
55	165	166	168	169	170	172	173	173	173	173	172	171	169	169	167	166	165	163	162
60	130	131	132	134	134	136	136	137	137	137	136	135	134	133	132	130	129	127	127
65	99.3	100	101	102	103	104	105	105	105	105	104	103	102	102	100	99.2	97.7	96.3	95.6
70	73.3	74.4	75.4	76.2	76.9	77.5	78.1	78.3	78.3	78.1	77.5	76.9	76.1	75.3	74.3	73.3	72.3	71.1	70.1
75	53.6	54.4	55.1	55.8	56.3	56.9	57.3	57.4	57.5	57.3	56.9	56.3	55.7	55.0	54.1	53.2	52.2	51.2	50.3
80	37.6	38.2	38.8	39.4	39.9	40.3	40.6	40.7	40.7	40.6	40.2	39.8	39.3	38.7	38.0	37.2	36.5	35.7	34.9
85	25.2	25.6	26.1	26.6	27.0	27.3	27.6	27.7	27.7	27.5	27.2	26.9	26.4	26.0	25.4	24.8	24.3	23.6	23.1
90	15.6	15.9	16.3	16.6	17.0	17.3	17.5	17.6	17.6	17.4	17.2	16.9	16.6	16.2	15.8	15.3	14.9	14.4	14.0
95	8.53	8.77	9.02	9.27	9.50	9.70	9.87	9.96	9.98	9.91	9.76	9.56	9.33	9.07	8.76	8.41	8.09	7.77	7.43
100	3.83	3.95	4.09	4.24	4.39	4.54	4.66	4.75	4.79	4.77	4.70	4.60	4.46	4.30	4.09	3.86	3.64	3.40	3.23
105	1.30	1.34	1.39	1.46	1.53	1.63	1.72	1.79	1.85	1.88	1.86	1.83	1.77	1.69	1.57	1.43	1.29	1.15	1.05
110	0.30	0.29	0.31	0.34	0.38	0.43	0.48	0.54	0.59	0.62	0.64	0.65	0.64	0.61	0.55	0.47	0.39	0.32	0.27
115	0.10	0.10	0.10	0.10	0.12	0.13	0.14	0.16	0.18	0.21	0.24	0.25	0.26	0.24	0.21	0.17	0.13	0.10	0.11
120	0.13	0.13	0.13	0.13	0.13	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.14
125	0.16	0.16	0.16	0.16	0.16	0.16	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.16	0.17
130	0.20	0.20	0.21	0.21	0.20	0.20	0.20	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.23
135	0.25	0.25	0.25	0.26	0.25	0.25	0.24	0.24	0.24	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.24	0.30
140	0.30	0.30	0.30	0.31	0.30	0.30	0.29	0.29	0.28	0.28	0.28	0.27	0.27	0.27	0.27	0.27	0.27	0.29	0.37
145	0.35	0.34	0.35	0.35	0.35	0.34	0.33	0.33	0.32	0.32	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.34	0.44
150	0.40	0.37	0.39	0.39	0.39	0.38	0.37	0.37	0.36	0.36	0.35	0.35	0.35	0.35	0.35	0.35	0.34	0.38	0.49
155	0.44	0.40	0.42	0.43	0.43	0.42	0.42	0.41	0.41	0.40	0.39	0.39	0.39	0.39	0.39	0.39	0.38	0.43	0.53
160	0.48	0.43	0.44	0.45	0.46	0.46	0.45	0.45	0.44	0.44	0.43	0.43	0.43	0.42	0.42	0.42	0.42	0.47	0.56
165	0.51	0.44	0.46	0.47	0.48	0.48	0.48	0.48	0.48	0.47	0.47	0.46	0.46	0.46	0.46	0.46	0.45	0.51	0.57
170	0.53	0.46	0.47	0.48	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.48	0.55	0.57
175	0.52	0.51	0.49	0.49	0.49	0.50	0.50	0.50	0.50	0.50	0.50	0.51	0.51	0.52	0.53	0.53	0.55	0.56	0.56
180	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50

Table 6: Luminous Intensity Data

Table--2

UNIT: cd

C (DGG) y (DGG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	473	473	473	473	473	473	473	473	473	473	473	473	473	473	473	473	473		
5	470	470	469	469	469	469	469	469	469	469	469	469	469	469	469	469	470	470	
10	459	459	459	458	458	458	457	457	457	457	457	458	458	458	459	459	460		
15	442	442	441	440	440	440	439	439	439	439	439	440	440	441	442	442	443		
20	419	418	417	416	416	415	415	414	415	415	415	416	416	417	418	419	420		
25	390	389	388	387	386	386	385	385	385	385	386	387	387	388	389	390	391		
30	357	355	354	353	353	352	352	351	351	352	352	353	353	354	355	356	358		
35	320	319	318	317	316	315	315	314	314	315	315	316	316	317	318	320	321		
40	281	280	279	278	277	276	276	275	275	276	276	277	277	278	279	281	282		
45	240	239	238	237	236	235	235	235	235	235	235	236	237	238	239	240	242		
50	199	198	197	196	196	195	194	194	194	195	195	196	196	198	199	200	202		
55	161	160	159	158	157	157	157	157	157	157	158	158	159	160	161	163	164		
60	125	124	123	123	122	122	122	122	122	123	123	124	124	125	127	128	130		
65	94.4	93.5	92.7	92.2	91.8	91.6	91.5	91.7	92.1	92.7	93.3	94.0	94.5	95.5	96.6	97.7	98.8		
70	69.1	68.3	67.6	67.2	67.0	66.8	66.9	67.2	67.6	68.1	68.7	69.3	69.8	70.4	71.3	72.2	73.1		
75	49.4	48.7	48.3	48.0	47.8	47.7	47.8	48.1	48.5	49.0	49.5	50.0	50.4	50.9	51.4	52.2	52.8		
80	34.3	33.7	33.4	33.2	33.1	33.0	33.2	33.4	33.7	34.0	34.4	34.8	35.1	35.5	36.0	36.5	37.0		
85	22.6	22.2	21.9	21.8	21.7	21.6	21.8	22.0	22.1	22.4	22.6	22.9	23.2	23.6	23.9	24.3	24.7		
90	13.6	13.3	13.1	13.0	12.9	12.9	13.0	13.1	13.2	13.4	13.7	13.9	14.1	14.3	14.6	15.0	15.3		
95	7.19	7.00	6.87	6.79	6.75	6.75	6.81	6.90	7.01	7.16	7.33	7.48	7.62	7.77	7.91	8.10	8.28		
100	3.07	2.95	2.88	2.84	2.84	2.86	2.93	3.02	3.12	3.25	3.37	3.47	3.53	3.57	3.63	3.68	3.77		
105	0.96	0.90	0.87	0.87	0.89	0.93	0.99	1.08	1.16	1.25	1.32	1.36	1.37	1.36	1.33	1.31	1.30		
110	0.23	0.21	0.21	0.22	0.24	0.28	0.32	0.38	0.44	0.49	0.54	0.55	0.55	0.51	0.46	0.40	0.35		
115	0.11	0.11	0.11	0.11	0.11	0.12	0.12	0.14	0.17	0.20	0.22	0.23	0.23	0.21	0.18	0.15	0.12		
120	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14		
125	0.17	0.17	0.17	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18		
130	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.24	0.24	0.23	0.23	0.23		
135	0.30	0.30	0.29	0.29	0.29	0.29	0.29	0.30	0.30	0.30	0.30	0.30	0.31	0.31	0.30	0.30	0.30		
140	0.37	0.36	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	0.37	0.37		
145	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.44	0.44	0.44	0.44	0.45	0.45	0.45	0.45	0.44	0.44		
150	0.48	0.48	0.48	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.50	0.51	0.51	0.51	0.50	0.49	0.49		
155	0.52	0.52	0.52	0.53	0.53	0.53	0.53	0.53	0.52	0.53	0.54	0.55	0.55	0.55	0.54	0.53	0.53		
160	0.55	0.55	0.55	0.55	0.55	0.55	0.56	0.55	0.54	0.56	0.56	0.57	0.58	0.57	0.56	0.55	0.55		
165	0.56	0.56	0.57	0.57	0.57	0.57	0.57	0.56	0.57	0.58	0.58	0.59	0.59	0.59	0.58	0.56	0.55		
170	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.58	0.58	0.58	0.58	0.59	0.59	0.58	0.57	0.56	0.55		
175	0.56	0.56	0.56	0.55	0.54	0.54	0.55	0.55	0.56	0.57	0.57	0.56	0.55	0.55	0.53	0.52	0.52		
180	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50		

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 expanded 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 expanded uncertainty is 2.3% with a coverage factor $k=2$.

Color Characteristics Measurements

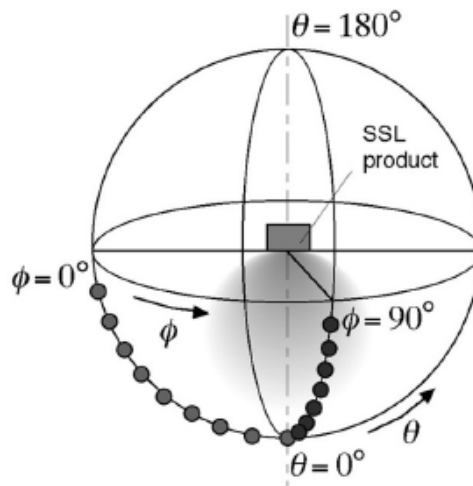
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as 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 ($C=0^\circ/180^\circ$ and $C=90^\circ/270^\circ$) 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, $\Delta u'v'$, 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 ***

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