LM-79-08 TEST REPORT

for

GREEN CREATIVE LTD

Room 3603, Level 36, Tower 1, Enterprise Square Five, 38 Wang Chiu Road, Kowloon Bay, KL, Hong Kong

LED Lamp

Model: 7.5MR16DIM/930SP15/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.: HZ20060049r

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

Review by: April Zou

Engineer: April Zou

Oct. 16, 2020

Approved by: Jim Zhang

Manager: Jim Zhang

Oct. 16, 2020

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: **7.5MR16DIM/930SP15/R**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
90.6	598.2	6.60	0.9132

CCT (K)	CRI	Stabilization Time (Light & Power)
3068	97.2	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 : Jun. 25, 2020

Date of Test : Jun. 26, 2020

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	: 7.5MR16DIM/930SP15/R
Electrical Ratings	: 12Vac, 50/60Hz, 7.5W
Product Description	: 3000K
Manufacturer	: GREEN CREATIVE LTD
Address	: Room 3603, Level 36, Tower 1, Enterprise Square Five, 38 Wang Chiu Road, Kowloon Bay, KL, Hong Kong

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)	12.0
Voltage frequency (Hz)	60
Test Current (A)	0.598
Power Factor	0.9132
Test Power (W)	6.60
THD A%	32.23
Luminous Efficacy (lm/W)	90.6
Total Luminous Flux (lm)	598.2
Color Rendering Index (CRI)	97.2
R9	85.3
Correlated Color Temperature (CCT)(K)	3068
Chromaticity Chroma x	0.4306
Chromaticity Chroma y	0.3992
Chromaticity Chroma u	0.2486
Chromaticity Chroma v	0.3457
Duv	-0.0011
Chromaticity Chroma u ’	0.2486
Chromaticity Chroma v’	0.5185

Special Color Rendering Indices	
R1	98.7
R2	99.5
R3	97.8
R4	97.6
R5	97.6
R6	97.2
R7	96.1
R8	93.2
R9	85.3
R10	96.9
R11	98
R12	82.7
R13	99.4
R14	97.8

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 25.0 ℃.

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)	12.0
Voltage frequency (Hz)	60
Test Current (A)	0.588
Power Factor	0.9167
Power (W)	6.46
Luminous Efficacy (lm/W)	93.9
Total Luminous Flux (lm)	606.9
Beam Angle (°)	14.3 (0^o-180^o) / 14.2 (90^o-270^o)
Center Beam Candle Power (cd)	5517
Maximum Beam Candle Power (cd)	5517 (At: C=0.0, Gamma=0.0)
Spacing Criteria	0.26 (0^o-180^o) / 0.26 (90^o-270^o)
Zonal Lumens in the 0 °-60 °Zone	98.09%
Zonal Lumens in the 60 °-90 °Zone	1.57%
Zonal Lumens in the 90 °-120 °Zone	0.23%
Zonal Lumens in the 120 °-180 °Zone	0.12%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

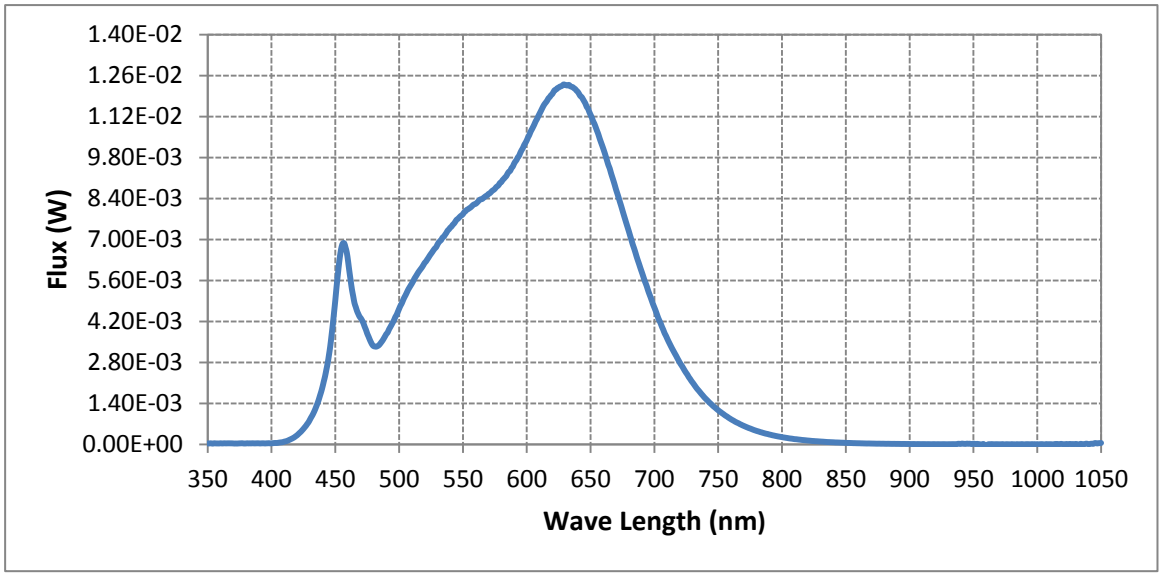
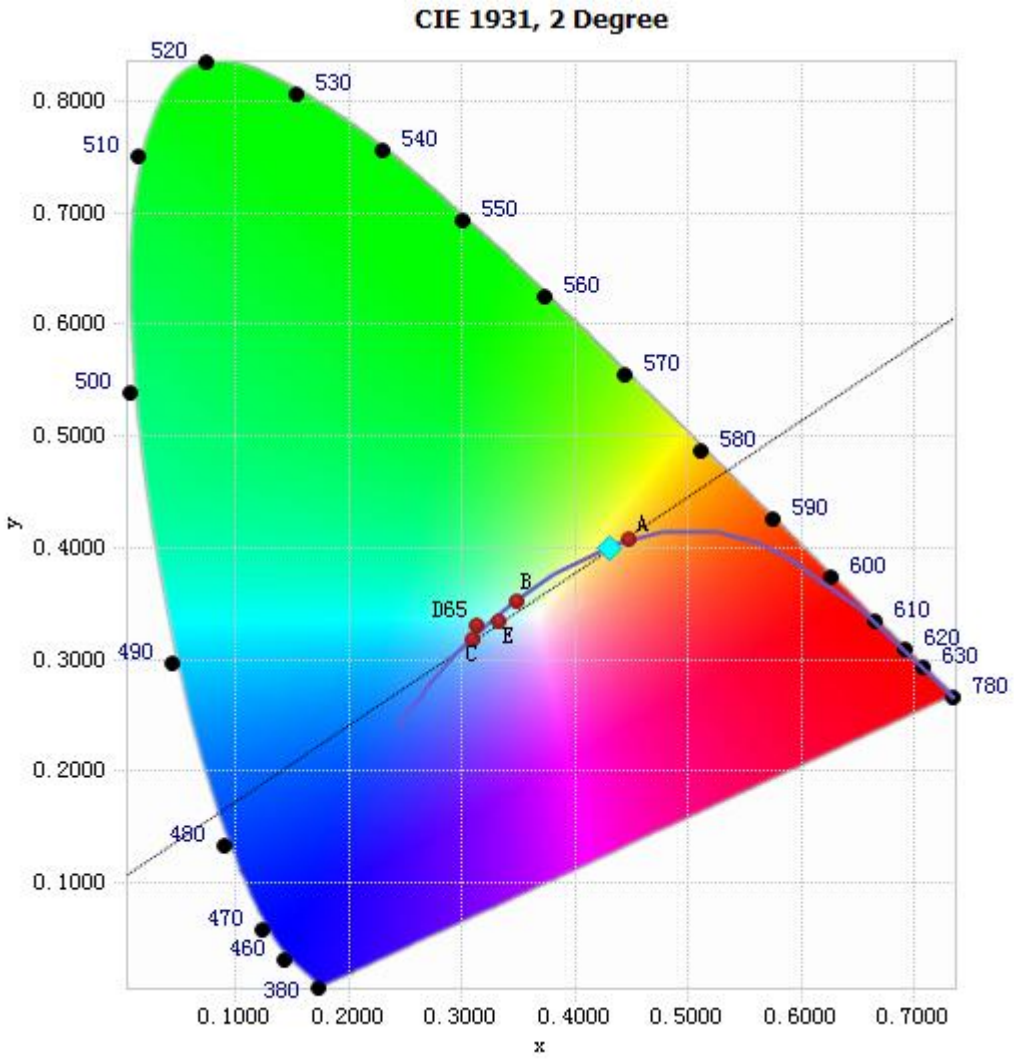


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	3.56E-05	485	3.43E-03	590	9.59E-03	695	5.27E-03
385	4.10E-05	490	3.77E-03	595	9.97E-03	700	4.68E-03
390	3.99E-05	495	4.16E-03	600	1.04E-02	705	4.13E-03
395	3.54E-05	500	4.64E-03	605	1.09E-02	710	3.62E-03
400	4.00E-05	505	5.10E-03	610	1.13E-02	715	3.19E-03
405	5.63E-05	510	5.50E-03	615	1.17E-02	720	2.79E-03
410	9.71E-05	515	5.88E-03	620	1.20E-02	725	2.44E-03
415	1.79E-04	520	6.20E-03	625	1.22E-02	730	2.11E-03
420	3.14E-04	525	6.51E-03	630	1.23E-02	735	1.83E-03
425	5.32E-04	530	6.83E-03	635	1.22E-02	740	1.57E-03
430	8.39E-04	535	7.10E-03	640	1.20E-02	745	1.36E-03
435	1.29E-03	540	7.41E-03	645	1.17E-02	750	1.17E-03
440	1.98E-03	545	7.68E-03	650	1.13E-02	755	1.01E-03
445	3.05E-03	550	7.87E-03	655	1.07E-02	760	8.63E-04
450	4.93E-03	555	8.07E-03	660	1.01E-02	765	7.42E-04
455	6.76E-03	560	8.22E-03	665	9.43E-03	770	6.36E-04
460	6.26E-03	565	8.38E-03	670	8.70E-03	775	5.47E-04
465	4.83E-03	570	8.56E-03	675	8.00E-03	780	4.65E-04
470	4.31E-03	575	8.73E-03	680	7.28E-03		
475	3.79E-03	580	8.96E-03	685	6.58E-03		
480	3.36E-03	585	9.25E-03	690	5.91E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4306, 0.3992)

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

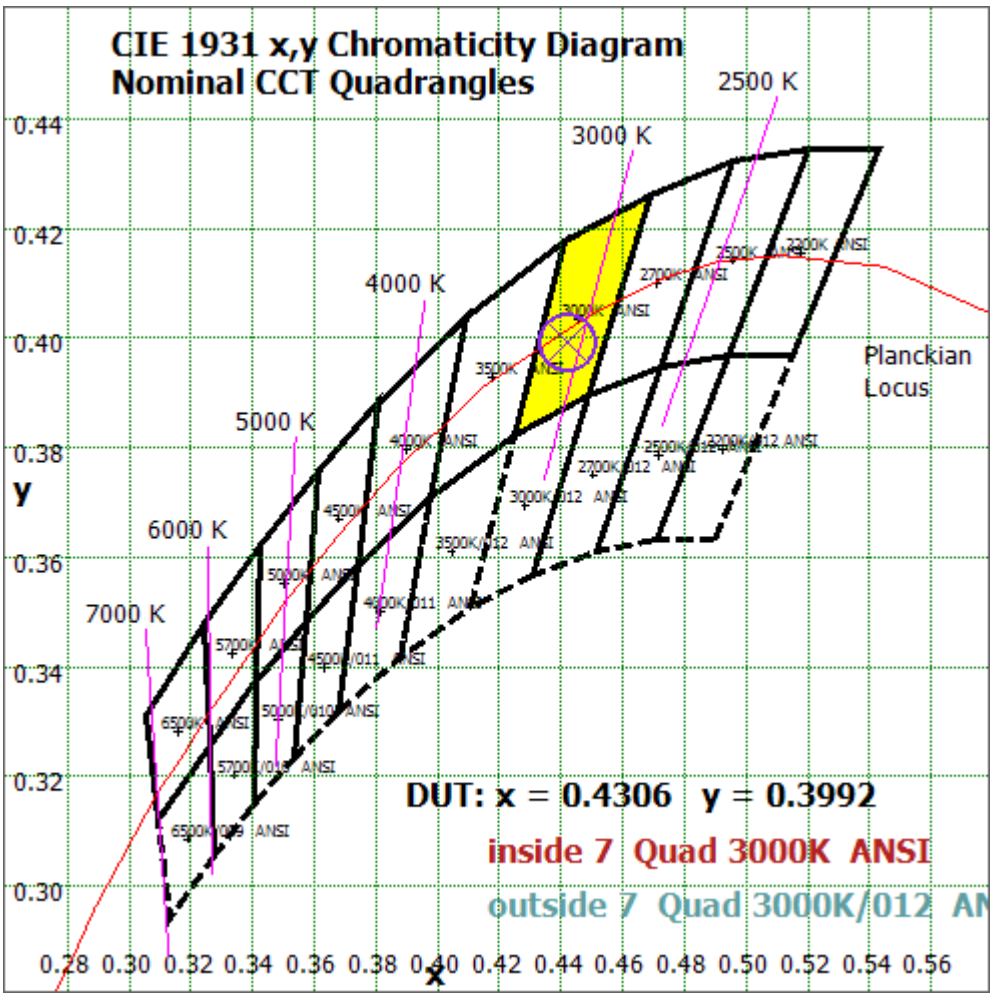


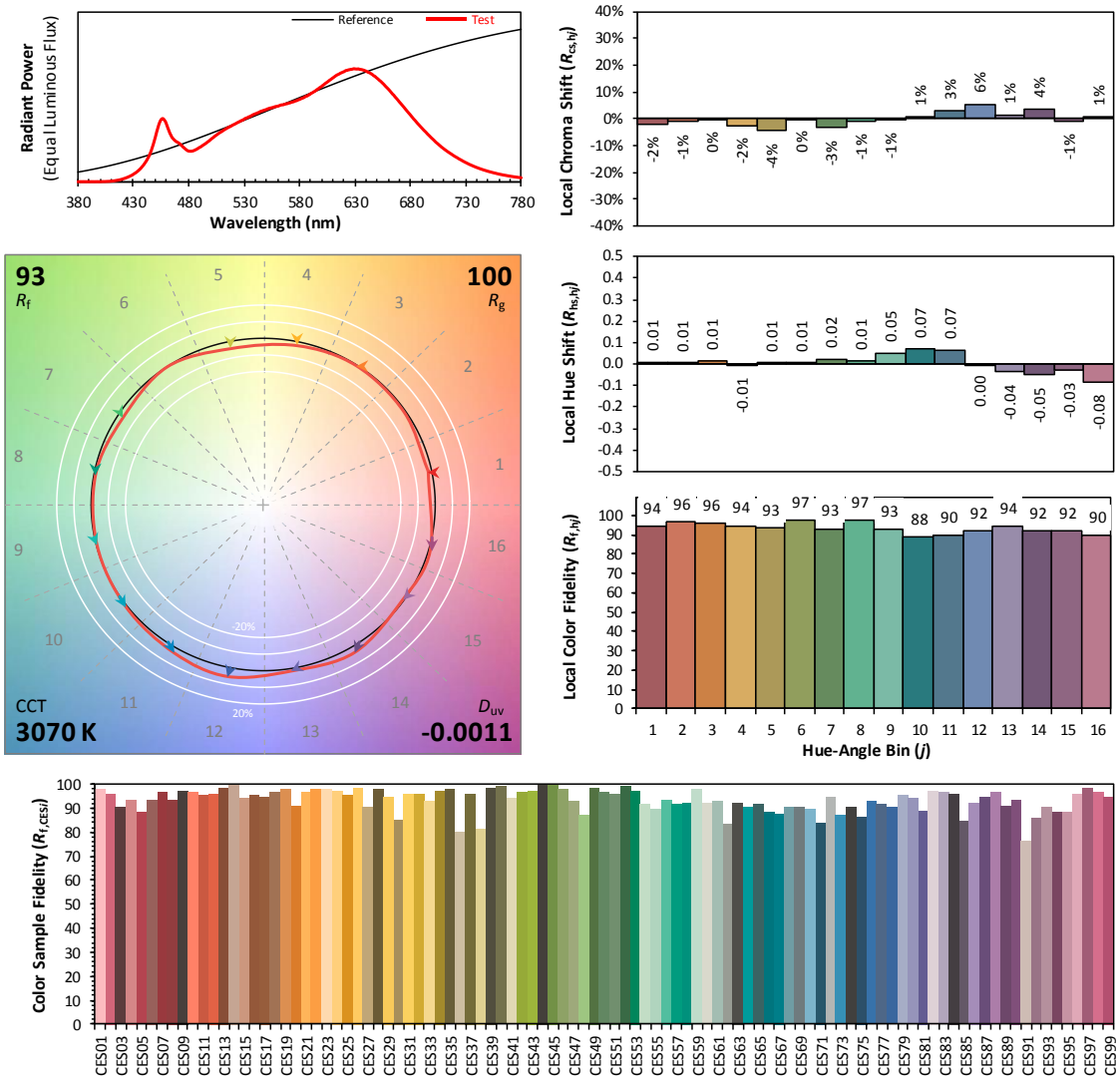
Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

ANSI/IES TM-30-18 Color Rendition Report

Source: LED **Manufacturer:** GREEN CREATIVE LTD

Date: 2020/06/26 **Model:** 7.5MR16DIM/930SP15/R



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

x	0.4306
y	0.3992
u'	0.2486
v'	0.5185

CIE 13.3-1995 (CRI)

R_a	97
R_9	86

Colors are for visual orientation purposes only. Created with the ANSI/IES TM-30-18 Calculator Version 2.00.

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	288.293	47.50%
10- 20	172.262	28.38%
20- 30	78.742	12.97%
30- 40	35.739	5.89%
40- 50	13.022	2.15%
50- 60	7.255	1.20%
60- 70	5.17	0.85%
70- 80	3.151	0.52%
80- 90	1.189	0.20%
90-100	0.398	0.07%
100-110	0.532	0.09%
110-120	0.45	0.07%
120-130	0.26	0.04%
130-140	0.08	0.01%
140-150	0.106	0.02%
150-160	0.131	0.02%
160-170	0.108	0.02%
170-180	0.038	0.01%
Total	606.9	100%

γ(°)	Lumens	% Total
0- 60	595.313	98.09%
60- 90	9.51	1.57%
0-90	604.823	99.65%
90- 180	2.103	0.35%
0- 180	606.9	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

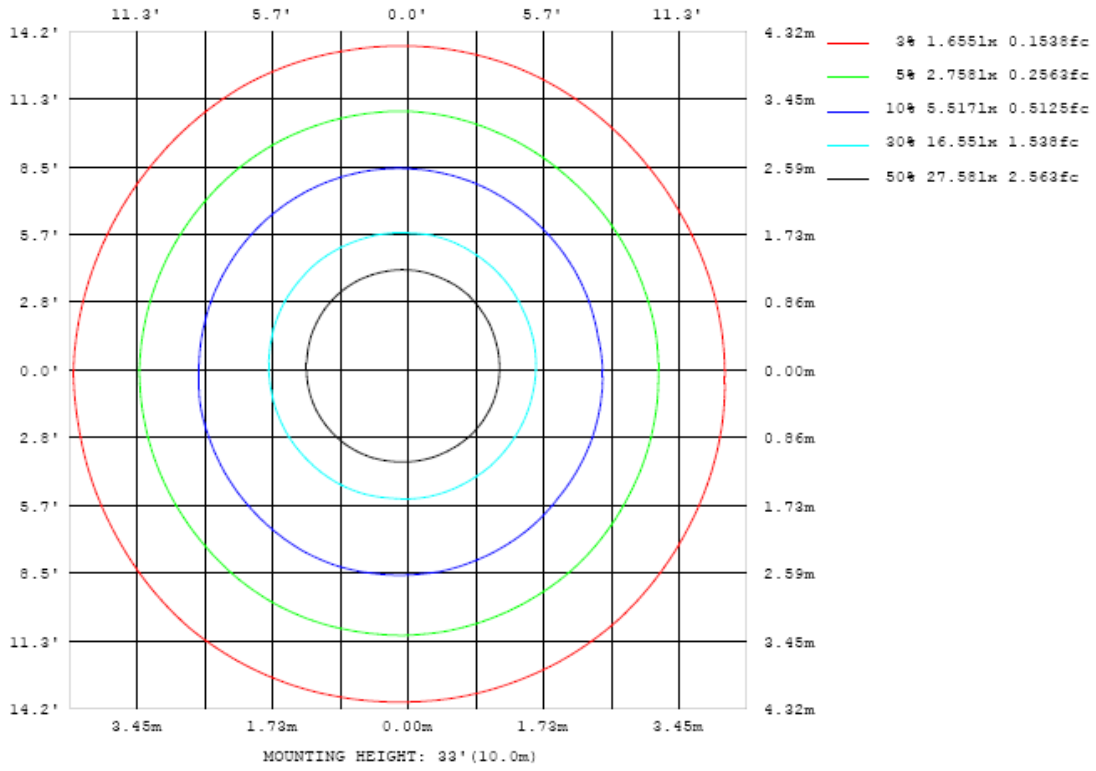


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

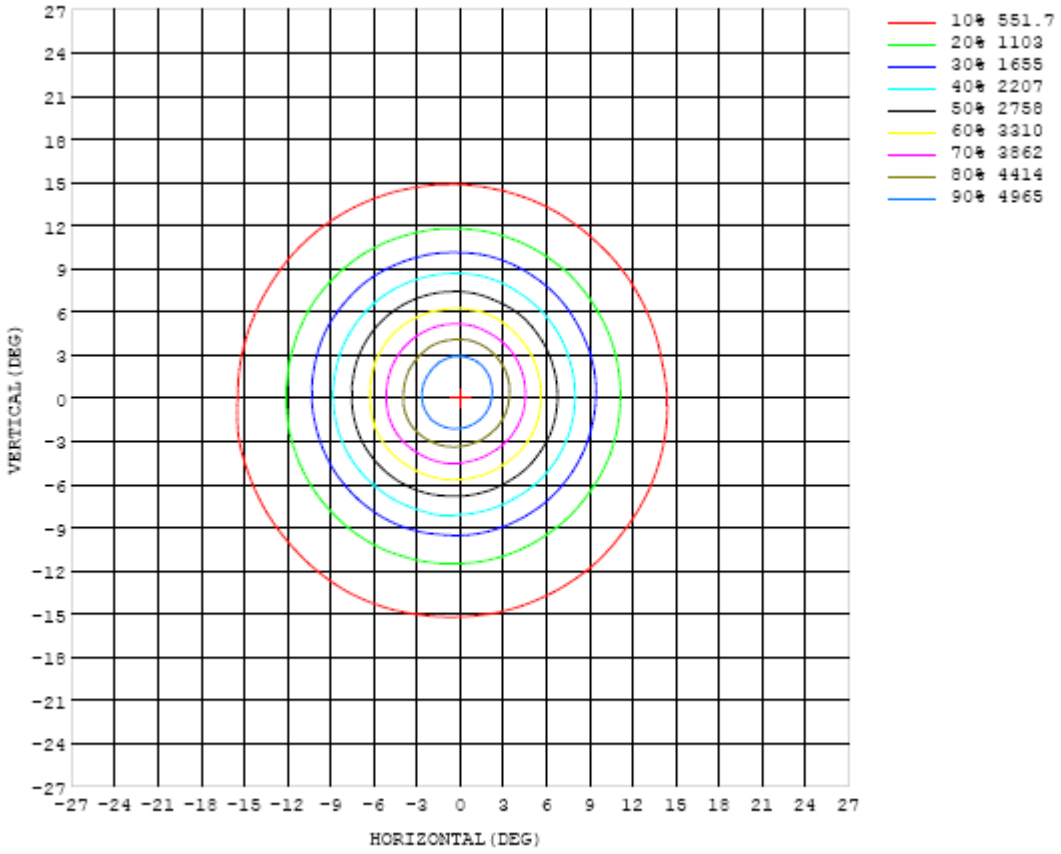


Chart 6: Isocandela Plot

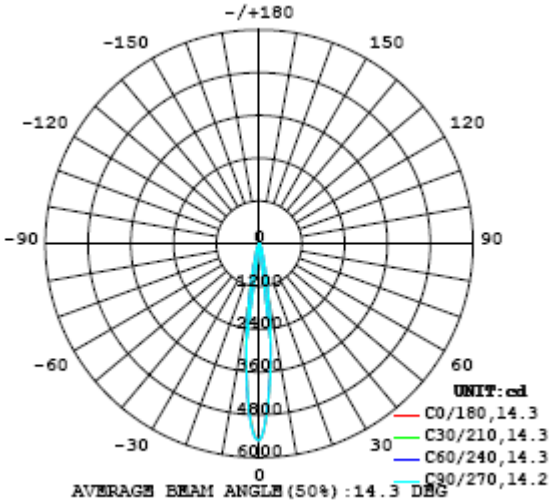


Chart 7: Polar Candela Distribution

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	5517	5517	5517	5517	5517	5517	5517	5517	5517	5517	5517	5517	5517	5517	5517	5517	5517	5517	5517
5	3609	3611	3599	3576	3582	3556	3548	3571	3595	3625	3668	3700	3748	3790	3839	3887	3919	3928	3931
10	1454	1427	1419	1419	1424	1430	1437	1446	1475	1495	1535	1568	1598	1629	1658	1690	1715	1738	1767
15	485	492	500	505	512	530	539	551	564	572	583	599	607	608	610	613	615	620	606
20	250	252	255	257	261	266	270	274	279	280	283	287	291	291	289	288	287	286	287
25	157	160	163	165	168	171	172	172	175	177	178	180	183	183	183	181	181	180	179
30	91.9	95.5	98.0	98.9	102	103	105	106	107	108	109	110	111	113	113	111	110	109	111
35	46.5	48.6	50.0	51.5	53.6	55.0	56.2	57.2	58.4	59.0	59.7	59.8	60.4	62.1	62.3	62.2	61.7	60.6	59.2
40	22.7	23.1	23.6	24.7	25.9	26.8	27.3	28.0	28.4	28.8	29.1	29.7	30.5	31.3	31.6	31.0	30.2	29.4	28.8
45	13.5	13.5	13.5	14.0	14.9	15.6	16.6	16.9	16.9	16.7	16.7	16.8	17.3	17.7	17.9	17.8	17.3	16.9	17.3
50	10.2	10.1	10.1	10.3	10.8	11.4	11.7	11.8	11.6	11.3	11.1	11.1	11.5	11.7	11.8	11.4	11.2	11.1	11.1
55	7.21	7.26	7.32	7.43	7.50	7.68	7.85	8.00	8.15	8.07	8.14	8.09	8.32	8.36	8.36	8.27	8.26	8.37	8.41
60	6.08	6.10	6.15	6.16	6.14	6.22	6.28	6.39	6.50	6.47	6.55	6.50	6.65	6.62	6.63	6.61	6.54	6.61	6.67
65	5.05	5.04	5.13	5.15	5.09	5.13	5.19	5.25	5.33	5.34	5.39	5.32	5.45	5.42	5.43	5.46	5.42	5.46	5.54
70	4.17	3.90	3.95	4.26	3.95	3.99	4.23	4.05	4.08	4.32	4.17	4.11	4.50	4.16	4.15	4.46	4.22	4.22	4.46
75	2.88	2.83	2.86	2.91	2.85	2.87	2.92	2.89	2.92	2.98	2.96	2.94	3.05	3.00	3.02	3.28	3.06	3.05	3.19
80	1.81	1.81	1.84	1.86	1.85	1.84	1.86	1.86	1.86	1.88	1.89	1.88	1.94	1.95	1.93	1.98	1.96	1.95	1.99
85	1.05	0.95	0.94	1.05	0.95	0.95	1.05	0.95	0.96	1.07	1.00	0.98	1.11	1.04	1.01	1.18	1.08	1.02	1.19
90	0.54	0.45	0.43	0.64	0.44	0.44	0.66	0.44	0.43	0.78	0.48	0.44	0.65	0.47	0.49	0.78	0.48	0.46	0.59
95	0.31	0.27	0.27	0.32	0.30	0.28	0.33	0.29	0.27	0.32	0.30	0.29	0.33	0.33	0.30	0.33	0.31	0.29	0.32
100	0.72	0.58	0.26	0.97	0.56	0.29	0.88	0.61	0.26	0.35	0.43	0.29	0.84	0.51	0.26	0.58	0.59	0.25	0.34
105	0.71	0.34	0.29	0.72	0.36	0.35	0.60	0.35	0.33	0.61	0.35	0.32	0.72	0.46	0.37	0.77	0.66	0.33	0.60
110	0.44	0.40	0.26	0.54	0.36	0.27	0.52	0.36	0.27	0.49	0.36	0.28	0.57	0.37	0.32	0.49	0.45	0.34	0.36
115	0.22	0.24	0.20	0.25	0.34	0.24	0.26	0.33	0.21	0.21	0.21	0.22	0.26	0.28	0.29	0.24	0.24	0.25	0.22
120	1.62	0.62	0.20	1.86	0.62	0.20	1.13	0.30	0.17	0.84	0.26	0.18	1.63	0.42	0.18	0.87	0.42	0.22	1.00
125	0.21	0.15	0.15	0.20	0.17	0.16	0.23	0.17	0.14	0.19	0.14	0.15	0.27	0.21	0.15	0.23	0.18	0.16	0.25
130	0.10	0.10	0.10	0.10	0.11	0.10	0.11	0.10	0.10	0.10	0.10	0.10	0.12	0.12	0.11	0.12	0.10	0.11	0.11
135	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.09	0.10	0.09	0.10	0.10	0.10	0.10	0.10	0.10	0.09
140	0.12	0.12	0.12	0.12	0.12	0.13	0.12	0.13	0.12	0.12	0.12	0.13	0.12	0.12	0.13	0.12	0.12	0.12	0.11
145	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.16
150	0.23	0.23	0.23	0.23	0.23	0.24	0.24	0.23	0.24	0.23	0.23	0.23	0.23	0.23	0.22	0.22	0.22	0.22	0.23
155	0.28	0.28	0.28	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.28	0.28	0.28	0.29
160	0.34	0.34	0.34	0.35	0.35	0.35	0.35	0.35	0.35	0.36	0.35	0.35	0.35	0.35	0.35	0.34	0.34	0.34	0.34
165	0.40	0.40	0.40	0.41	0.41	0.41	0.41	0.41	0.42	0.42	0.42	0.41	0.42	0.41	0.41	0.41	0.41	0.41	0.39
170	0.44	0.44	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.46	0.45	0.45	0.45	0.45	0.45	0.44	0.44	0.44	0.42
175	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.42	0.42	0.42	0.42	0.42
180	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28

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	5517	5517	5517	5517	5517	5517	5517	5517	5517	5517	5517	5517	5517	5517	5517	5517	5517		
5	3940	3970	3976	3989	3998	3996	3997	3976	3947	3915	3854	3813	3794	3756	3717	3679	3644		
10	1782	1798	1806	1797	1800	1775	1748	1732	1699	1687	1655	1612	1588	1553	1513	1499	1481		
15	603	600	592	587	579	569	557	545	535	522	510	502	488	482	479	477	478		
20	282	280	276	273	273	272	269	265	263	259	256	252	249	247	246	246	248		
25	177	175	173	172	172	172	171	170	169	166	164	161	157	156	154	154	156		
30	110	108	106	105	105	106	106	105	102	99.5	98.1	95.7	93.0	92.0	91.1	90.3	90.3		
35	58.3	57.9	57.5	57.2	56.8	56.8	57.1	56.4	55.4	53.4	52.0	50.8	49.4	48.2	47.3	46.5	46.5		
40	28.5	28.3	28.5	28.9	28.9	28.7	28.8	27.8	27.5	26.7	26.1	25.6	25.0	24.0	23.3	22.8	22.8		
45	17.6	18.1	18.5	18.7	18.2	17.6	17.0	16.4	15.7	15.4	15.3	15.4	15.1	14.7	14.0	13.6	13.5		
50	11.4	11.7	11.7	11.6	11.3	11.0	10.8	10.4	10.1	9.99	10.1	10.4	10.4	10.4	10.1	9.96	9.97		
55	8.44	8.48	8.34	8.33	8.32	8.36	8.20	8.08	7.75	7.53	7.45	7.55	7.39	7.22	7.03	7.04	7.05		
60	6.66	6.61	6.44	6.38	6.38	6.42	6.32	6.26	6.14	6.08	6.05	6.06	5.97	5.87	5.75	5.79	5.87		
65	5.54	5.50	5.43	5.37	5.31	5.29	5.18	5.18	5.09	5.09	5.08	5.09	5.00	4.88	4.83	4.89	4.94		
70	4.24	4.22	4.53	4.23	4.12	4.28	4.05	4.04	4.17	3.96	3.92	4.27	3.84	3.73	3.95	3.79	3.82		
75	3.08	3.06	3.22	3.08	3.00	3.26	2.95	2.92	3.22	2.90	2.85	2.94	2.78	2.72	2.76	2.75	2.78		
80	1.99	1.98	2.01	2.01	1.94	1.96	1.91	1.90	1.91	1.90	1.87	1.85	1.83	1.79	1.76	1.77	1.78		
85	1.09	1.06	1.20	1.10	1.04	1.14	1.06	1.02	1.12	1.05	1.02	1.12	1.00	0.97	1.05	0.96	0.95		
90	0.51	0.47	0.59	0.48	0.50	0.63	0.46	0.45	0.55	0.50	0.47	0.57	0.46	0.46	0.61	0.43	0.42		
95	0.31	0.29	0.31	0.31	0.30	0.32	0.30	0.29	0.30	0.30	0.30	0.32	0.31	0.30	0.32	0.28	0.27		
100	0.48	0.26	0.35	0.41	0.24	0.31	0.40	0.24	0.30	0.34	0.31	0.34	0.50	0.32	0.77	0.68	0.31		
105	0.46	0.30	0.73	0.44	0.31	0.85	0.43	0.31	0.83	0.46	0.32	0.66	0.44	0.33	0.84	0.41	0.32		
110	0.46	0.34	0.37	0.44	0.39	0.38	0.45	0.34	0.38	0.58	0.33	0.41	0.47	0.31	0.42	0.40	0.28		
115	0.22	0.28	0.22	0.22	0.24	0.22	0.22	0.22	0.24	0.22	0.22	0.23	0.25	0.24	0.25	0.32	0.21		
120	0.48	0.22	1.59	1.30	0.26	2.19	0.79	0.26	1.44	1.09	0.35	1.96	1.67	0.29	2.36	0.88	0.21		
125	0.17	0.17	0.24	0.20	0.15	0.27	0.22	0.16	0.29	0.21	0.16	0.23	0.22	0.15	0.23	0.18	0.14		
130	0.10	0.10	0.11	0.11	0.10	0.13	0.13	0.11	0.14	0.12	0.11	0.12	0.12	0.10	0.10	0.10	0.09		
135	0.09	0.09	0.09	0.09	0.09	0.10	0.10	0.10	0.10	0.10	0.09	0.10	0.10	0.10	0.10	0.10	0.09		
140	0.11	0.11	0.11	0.11	0.12	0.11	0.12	0.12	0.11	0.12	0.12	0.12	0.12	0.13	0.12	0.13	0.13		
145	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	0.17	0.17		
150	0.22	0.22	0.22	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.24	0.24	0.24	0.24		
155	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29		
160	0.34	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.34		
165	0.37	0.37	0.37	0.37	0.37	0.37	0.36	0.37	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.37		
170	0.38	0.38	0.38	0.38	0.38	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.39		
175	0.35	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.35	0.35	0.36	0.36	0.36	0.36	0.37	0.37	0.40		
180	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28		

Table 7: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Aug. 02, 2019	Aug. 01, 2020
Digital Power Meter	PF2010A	HZTE028-01	Aug. 02, 2019	Aug. 01, 2020
AC Power Supply	DPS1060	HZTE001-06	Aug. 02, 2019	Aug. 01, 2020
DC Power Supply	WY12010	HZTE004-03	Aug. 02, 2019	Aug. 01, 2020
Temperature recorder	JM624U	HZTE018-08	Aug. 02, 2019	Aug. 01, 2020
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 02, 2019	Aug. 01, 2020
Standard source	D908	HZTE012-01	Aug. 02, 2019	Aug. 01, 2020
Integrate Sphere system	3M	HZTE015-04	Aug. 02, 2019	Aug. 01, 2020
Digital Power Meter	WT210	HZTE008-01	Aug. 02, 2019	Aug. 01, 2020
AC Power Supply	PCR 500L	HZTE001-07	Aug. 02, 2019	Aug. 01, 2020
DC Power Supply	IT6154	HZTE004-04	Aug. 02, 2019	Aug. 01, 2020
Standard source	SCL-1400	HZTE012-02	Aug. 02, 2019	Aug. 01, 2020
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 02, 2019	Aug. 01, 2020
Temperature Meter	TES1310	HZTE017-01	Aug. 02, 2019	Aug. 01, 2020

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

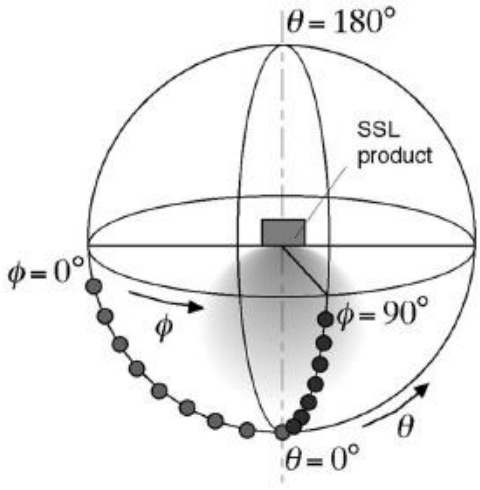
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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