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/927NF25/R

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ20060049q

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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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/927NF25/R**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
83.5	545.4	6.53	0.9182

CCT (K)	CRI	Stabilization Time (Light & Power)
2738	97.7	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	: 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

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SAMPLE PHOTO

Figure 1- Overview of the sample

Equipment Under Test(EUT)	
Name	: LED Lamp
Model	: 7.5MR16DIM/927NF25/R
Electrical Ratings	: 12Vac, 50/60Hz, 7.5W
Product Description	: 2700K
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)	0.589
Power Factor	0.9182
Test Power (W)	6.53
THD A%	30.77
Luminous Efficacy (lm/W)	83.5
Total Luminous Flux (lm)	545.4
Color Rendering Index (CRI)	97.7
R9	84.7
Correlated Color Temperature (CCT)(K)	2738
Chromaticity Chroma x	0.4563
Chromaticity Chroma y	0.4093
Chromaticity Chroma u	0.2608
Chromaticity Chroma v	0.3509
Duv	-0.0002
Chromaticity Chroma u ’	0.2608
Chromaticity Chroma v’	0.5263

Special Color Rendering Indices	
R1	99.2
R2	99.6
R3	97.6
R4	99.1
R5	98.6
R6	97.8
R7	96.4
R8	93.2
R9	84.7
R10	97.2
R11	98.4
R12	87.4
R13	99.8
R14	97.5

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)	0.592
Power Factor	0.9196
Power (W)	6.53
Luminous Efficacy (lm/W)	85.9
Total Luminous Flux (lm)	561.1
Beam Angle (°)	21.1 (0^o-180^o) / 21.0 (90^o-270^o)
Center Beam Candle Power (cd)	3239
Maximum Beam Candle Power (cd)	3239 (At: C=0.0, Gamma=0.0)
Spacing Criteria	0.35 (0^o-180^o) / 0.35 (90^o-270^o)
Zonal Lumens in the 0 °-60 °Zone	96.85%
Zonal Lumens in the 60 °-90 °Zone	1.44%
Zonal Lumens in the 90 °-120 °Zone	0.20%
Zonal Lumens in the 120 °-180 °Zone	1.50%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

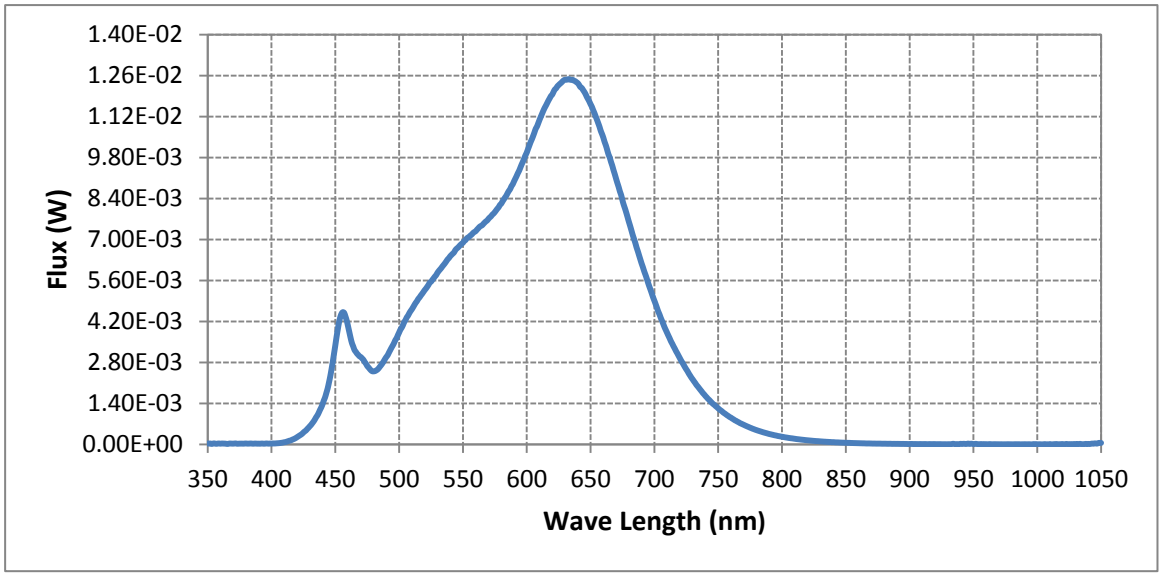
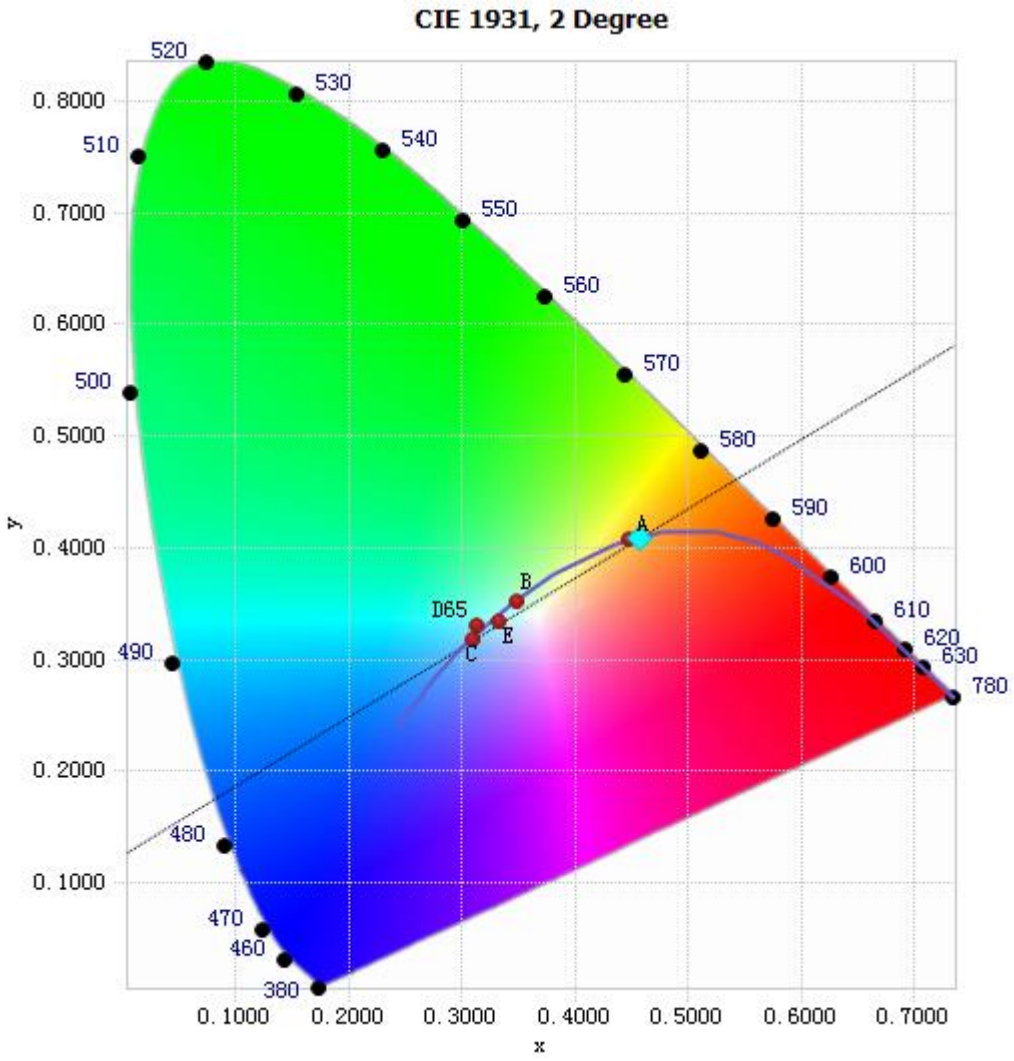


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	3.39E-05	485	2.66E-03	590	8.99E-03	695	5.53E-03
385	2.79E-05	490	2.99E-03	595	9.46E-03	700	4.91E-03
390	2.81E-05	495	3.38E-03	600	9.97E-03	705	4.32E-03
395	2.94E-05	500	3.83E-03	605	1.05E-02	710	3.81E-03
400	2.87E-05	505	4.25E-03	610	1.11E-02	715	3.35E-03
405	4.26E-05	510	4.62E-03	615	1.16E-02	720	2.95E-03
410	7.67E-05	515	4.97E-03	620	1.20E-02	725	2.57E-03
415	1.38E-04	520	5.27E-03	625	1.23E-02	730	2.22E-03
420	2.49E-04	525	5.56E-03	630	1.25E-02	735	1.93E-03
425	4.09E-04	530	5.86E-03	635	1.25E-02	740	1.66E-03
430	6.22E-04	535	6.14E-03	640	1.23E-02	745	1.43E-03
435	9.33E-04	540	6.43E-03	645	1.21E-02	750	1.24E-03
440	1.38E-03	545	6.69E-03	650	1.16E-02	755	1.06E-03
445	2.11E-03	550	6.89E-03	655	1.11E-02	760	9.16E-04
450	3.38E-03	555	7.10E-03	660	1.05E-02	765	7.81E-04
455	4.48E-03	560	7.29E-03	665	9.81E-03	770	6.73E-04
460	4.03E-03	565	7.49E-03	670	9.08E-03	775	5.74E-04
465	3.23E-03	570	7.71E-03	675	8.34E-03	780	4.91E-04
470	2.99E-03	575	7.94E-03	680	7.61E-03		
475	2.68E-03	580	8.23E-03	685	6.89E-03		
480	2.50E-03	585	8.59E-03	690	6.18E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4563, 0.4093)

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

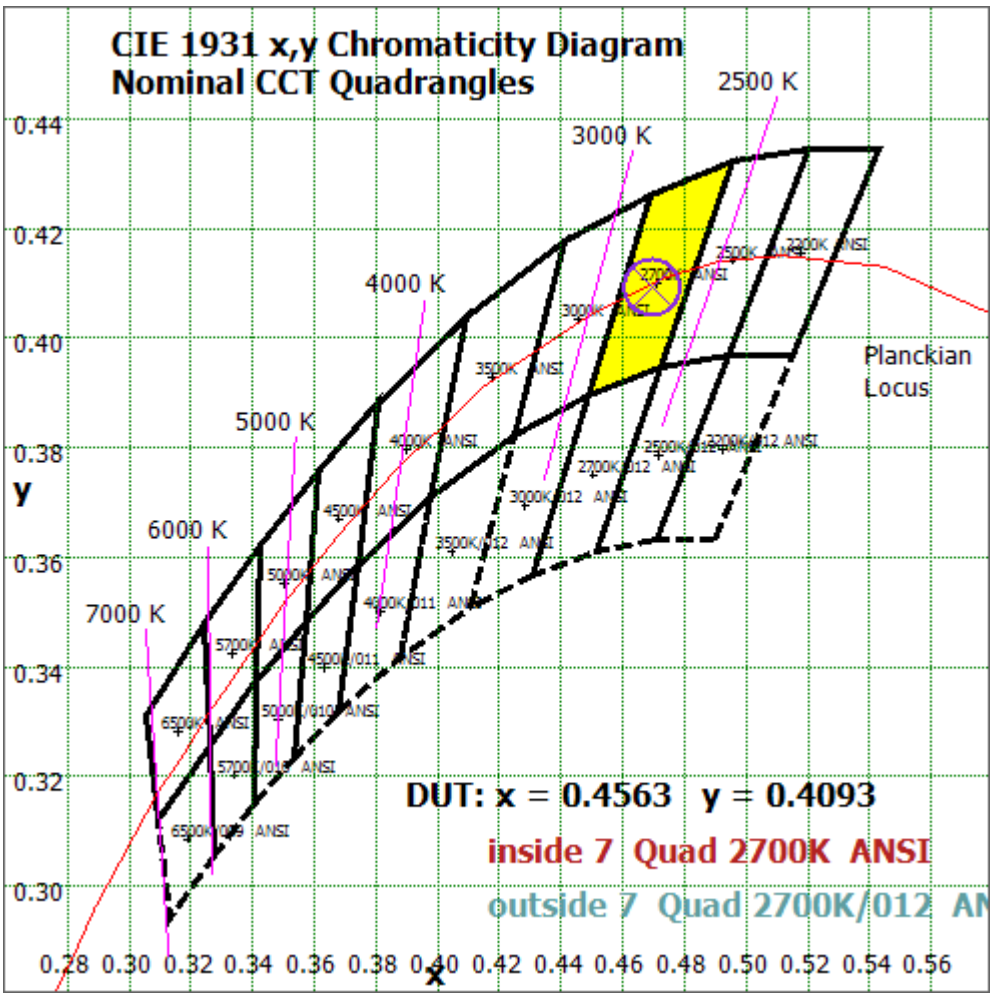


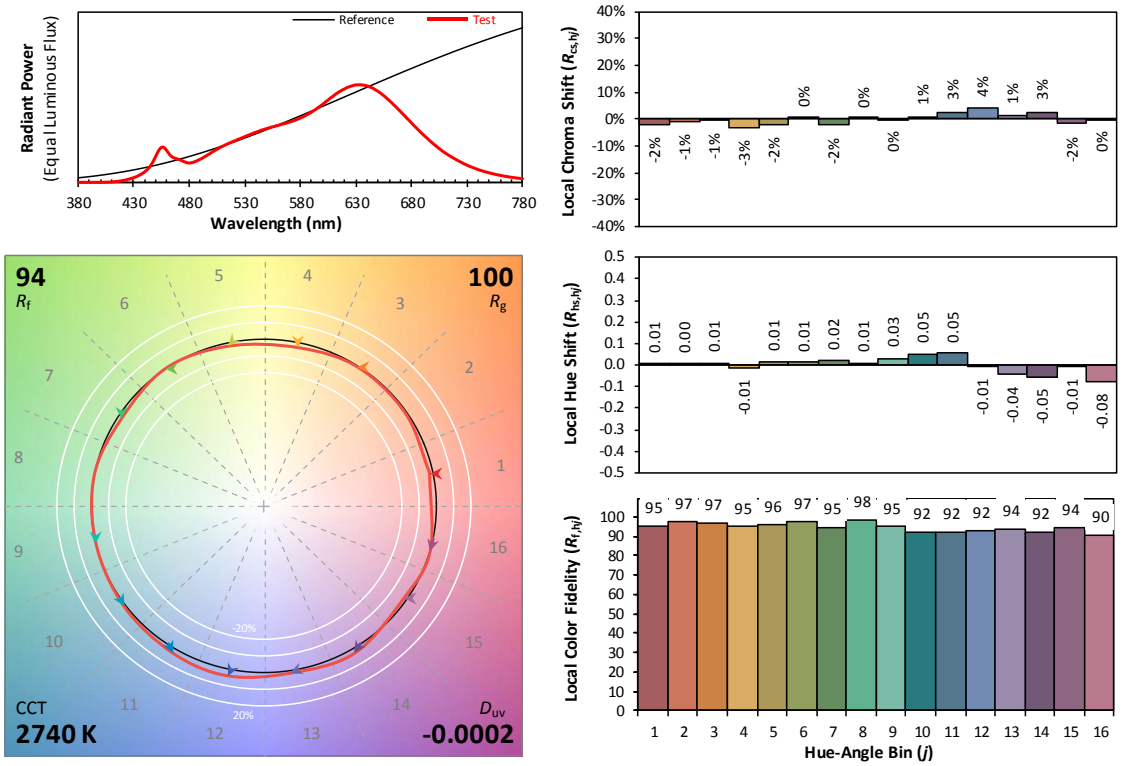
Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

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/927NF25/R



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

x	0.4563
y	0.4093
u'	0.2608
v'	0.5263

CIE 13.3-1995 (CRI)

R_a	98
R_9	85

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	226.222	40.32%
10- 20	203.186	36.21%
20- 30	68.52	12.21%
30- 40	26.078	4.65%
40- 50	12.679	2.26%
50- 60	6.735	1.20%
60- 70	4.428	0.79%
70- 80	2.679	0.48%
80- 90	0.98	0.17%
90-100	0.344	0.06%
100-110	0.362	0.06%
110-120	0.433	0.08%
120-130	1.031	0.18%
130-140	1.394	0.25%
140-150	1.813	0.32%
150-160	1.883	0.34%
160-170	1.538	0.27%
170-180	0.764	0.14%
Total	561.1	100%

γ(°)	Lumens	% Total
0- 60	543.42	96.85%
60- 90	8.087	1.44%
0-90	551.507	98.30%
90- 180	9.562	1.70%
0- 180	561.1	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

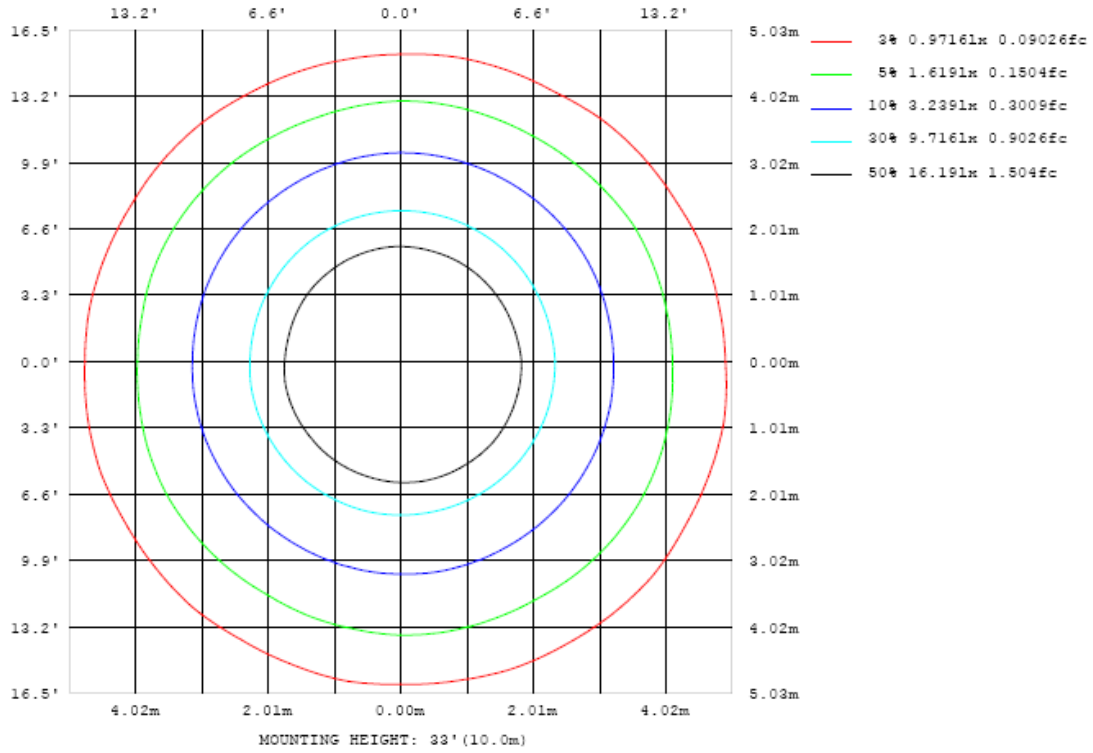


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

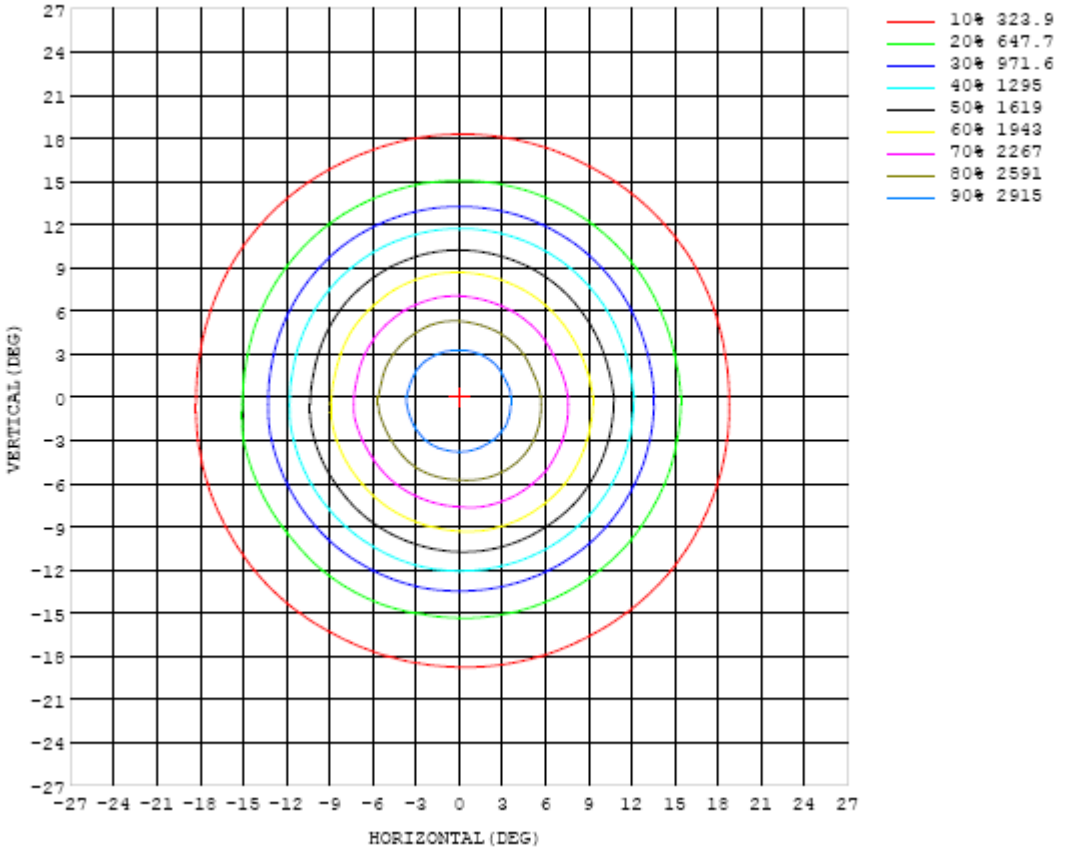


Chart 6: Isocandela Plot

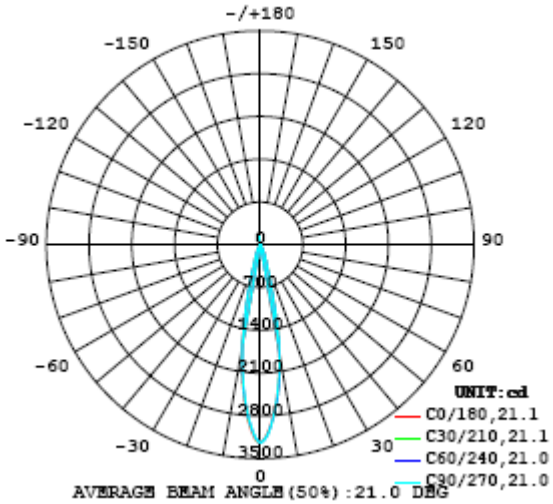


Chart 7: Polar Candela Distribution

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	3239	3239	3239	3239	3239	3239	3239	3239	3239	3239	3239	3239	3239	3239	3239	3239	3239	3239	3239
5	2694	2713	2727	2746	2754	2750	2742	2733	2722	2714	2716	2718	2722	2718	2705	2702	2696	2706	2706
10	1787	1795	1804	1815	1830	1823	1818	1819	1815	1796	1778	1766	1757	1749	1733	1735	1732	1733	1700
15	703	702	710	707	707	706	699	700	694	691	682	690	689	685	670	675	679	684	657
20	271	275	279	281	280	277	274	275	275	273	269	266	261	263	262	263	259	255	250
25	155	160	161	161	163	161	158	156	155	153	153	151	150	151	150	148	148	146	143
30	84.8	88.6	86.8	86.1	88.2	87.3	84.6	84.9	82.3	80.2	81.7	80.1	79.5	81.8	80.2	78.7	80.7	80.0	77.5
35	41.4	42.4	41.4	41.2	41.0	41.1	40.4	40.5	39.7	39.6	40.2	40.9	41.1	42.0	41.6	41.8	41.7	41.8	39.8
40	23.4	23.6	23.6	23.7	23.7	24.3	24.0	24.0	24.0	24.2	24.8	25.9	25.7	25.6	25.4	26.0	25.6	26.4	25.8
45	15.9	15.8	16.0	16.0	16.3	16.9	17.2	17.3	17.3	17.0	17.0	17.0	16.5	16.1	16.0	16.6	16.9	17.8	18.4
50	9.89	9.90	10.1	9.99	10.00	10.3	10.1	9.96	10.0	10.1	10.1	10.3	10.4	10.5	10.4	10.4	10.3	10.5	10.4
55	7.73	7.67	7.60	7.49	7.46	7.71	7.83	7.77	7.83	7.79	7.94	8.00	7.99	7.96	7.98	8.00	7.88	7.93	7.72
60	5.67	5.61	5.67	5.67	5.72	5.77	5.78	5.72	5.70	5.65	5.62	5.57	5.50	5.42	5.34	5.28	5.39	5.41	5.43
65	4.58	4.64	4.70	4.79	4.81	4.80	4.80	4.75	4.70	4.70	4.70	4.64	4.59	4.52	4.38	4.37	4.57	4.40	4.43
70	3.68	3.63	3.64	3.88	3.77	3.66	3.78	3.70	3.62	3.70	3.64	3.53	3.69	3.56	3.42	3.54	3.60	3.39	3.55
75	2.59	2.60	2.61	2.67	2.65	2.60	2.66	2.61	2.56	2.62	2.57	2.50	2.58	2.52	2.45	2.55	2.55	2.45	2.68
80	1.59	1.61	1.61	1.64	1.63	1.60	1.62	1.61	1.58	1.60	1.61	1.56	1.58	1.59	1.54	1.57	1.61	1.55	1.62
85	0.93	0.86	0.82	0.91	0.85	0.81	0.88	0.85	0.80	0.87	0.85	0.80	0.88	0.85	0.80	0.90	0.87	0.82	0.96
90	0.45	0.42	0.38	0.42	0.41	0.38	0.42	0.40	0.37	0.41	0.39	0.36	0.38	0.38	0.36	0.40	0.41	0.39	0.45
95	0.37	0.31	0.26	0.34	0.31	0.26	0.34	0.29	0.25	0.31	0.29	0.25	0.30	0.28	0.26	0.35	0.31	0.28	0.34
100	0.44	0.32	0.20	0.33	0.33	0.20	0.25	0.25	0.20	0.37	0.31	0.20	0.24	0.23	0.21	0.33	0.26	0.22	0.27
105	0.54	0.36	0.22	0.45	0.33	0.23	0.51	0.35	0.22	0.49	0.35	0.21	0.41	0.28	0.22	0.53	0.29	0.24	0.65
110	0.38	0.33	0.22	0.34	0.27	0.21	0.49	0.35	0.21	0.44	0.32	0.21	0.38	0.28	0.21	0.38	0.34	0.24	0.70
115	0.18	0.22	0.16	0.15	0.19	0.16	0.18	0.19	0.16	0.18	0.19	0.15	0.16	0.16	0.16	0.18	0.18	0.17	0.25
120	2.22	2.95	0.21	1.93	1.74	0.15	1.79	1.32	0.11	2.56	1.73	0.14	2.03	1.80	0.14	3.47	2.83	0.21	3.87
125	0.19	0.24	0.13	0.14	0.14	0.10	0.17	0.17	0.11	0.19	0.19	0.10	0.24	0.19	0.12	0.32	0.24	0.15	0.58
130	0.09	0.12	0.10	0.08	0.09	0.07	0.10	0.11	0.08	0.10	0.11	0.08	0.09	0.09	0.08	0.10	0.10	0.10	0.16
135	0.07	0.08	0.07	0.07	0.07	0.07	0.08	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.09	0.09
140	0.09	0.10	0.10	0.10	0.09	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.11	0.11	0.11
145	0.12	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	0.15	0.15	0.15	0.15
150	0.15	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.20	0.20	0.21
155	0.17	0.25	0.25	0.25	0.24	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.26
160	0.19	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
165	0.18	0.37	0.37	0.36	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.35
170	0.09	0.39	0.39	0.39	0.39	0.39	0.40	0.39	0.39	0.40	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.38	0.36
175	0.00	0.39	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.36	0.36	0.36	0.36	0.36	0.32	0.38
180	148	148	148	148	148	148	148	148	148	148	148	148	148	148	148	148	148	148	148

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	3239	3239	3239	3239	3239	3239	3239	3239	3239	3239	3239	3239	3239	3239	3239	3239	3239		
5	2683	2684	2682	2677	2669	2666	2662	2655	2641	2634	2634	2639	2642	2651	2657	2650	2681		
10	1677	1674	1676	1677	1669	1670	1666	1672	1670	1666	1666	1676	1685	1693	1705	1721	1745		
15	645	650	650	648	649	651	652	657	658	658	661	665	668	674	676	678	685		
20	249	249	250	247	244	241	240	243	247	247	247	249	253	260	267	269	270		
25	142	140	137	136	135	132	131	130	130	133	134	134	140	145	148	153	153		
30	76.8	72.8	70.5	70.9	70.5	68.2	68.8	66.5	65.3	68.1	68.6	69.6	74.5	75.0	76.2	81.9	83.3		
35	37.9	36.9	35.5	34.9	34.9	34.0	33.3	32.7	32.2	32.3	33.1	33.6	35.4	35.9	37.1	38.9	40.6		
40	24.4	23.6	23.1	23.4	23.8	23.4	23.0	22.5	22.3	21.8	22.1	21.7	21.5	21.4	21.9	22.3	23.2		
45	18.8	18.9	18.8	18.6	18.2	17.4	16.7	16.5	16.1	15.9	16.3	15.8	15.5	15.0	15.0	15.2	15.6		
50	10.3	10.4	10.4	10.5	10.5	10.2	9.75	9.56	9.32	9.28	9.62	9.56	9.59	9.32	9.11	9.19	9.53		
55	7.60	7.38	7.33	7.38	7.33	7.24	7.13	7.21	7.10	7.20	7.42	7.64	7.53	7.21	6.88	7.05	7.42		
60	5.36	5.25	5.22	5.32	5.28	5.21	5.11	5.26	5.36	5.43	5.46	5.41	5.24	5.19	5.24	5.46	5.55		
65	4.41	4.33	4.34	4.58	4.39	4.31	4.27	4.28	4.30	4.31	4.29	4.32	4.25	4.15	4.16	4.27	4.40		
70	3.42	3.35	3.64	3.58	3.40	3.45	3.36	3.34	3.50	3.38	3.31	3.63	3.36	3.26	3.42	3.36	3.40		
75	2.48	2.43	2.62	2.56	2.49	2.48	2.47	2.45	2.54	2.46	2.41	2.48	2.43	2.37	2.41	2.43	2.46		
80	1.58	1.56	1.61	1.63	1.59	1.57	1.58	1.57	1.58	1.57	1.54	1.56	1.55	1.50	1.50	1.53	1.53		
85	0.86	0.82	0.96	0.87	0.84	0.93	0.84	0.82	0.93	0.84	0.81	0.91	0.84	0.81	0.91	0.84	0.82		
90	0.41	0.41	0.45	0.42	0.40	0.44	0.41	0.38	0.44	0.41	0.39	0.44	0.40	0.38	0.44	0.41	0.38		
95	0.31	0.28	0.36	0.30	0.29	0.38	0.29	0.27	0.35	0.30	0.27	0.37	0.30	0.27	0.35	0.32	0.26		
100	0.23	0.21	0.32	0.28	0.20	0.25	0.22	0.20	0.32	0.31	0.21	0.36	0.29	0.21	0.39	0.31	0.21		
105	0.31	0.24	0.65	0.35	0.24	0.58	0.31	0.23	0.57	0.35	0.24	0.53	0.35	0.23	0.53	0.35	0.23		
110	0.33	0.24	0.56	0.35	0.23	0.51	0.28	0.23	0.45	0.30	0.24	0.49	0.34	0.22	0.40	0.35	0.23		
115	0.23	0.17	0.22	0.22	0.16	0.17	0.17	0.16	0.18	0.19	0.17	0.21	0.22	0.17	0.19	0.21	0.17		
120	2.92	0.26	3.82	4.16	0.24	3.38	3.10	0.25	3.63	4.29	0.17	2.94	2.54	0.18	3.62	3.62	0.17		
125	0.41	0.16	0.63	0.52	0.14	0.58	0.33	0.12	0.53	0.37	0.16	0.68	0.00	0.37	15.7	9.16	0.26		
130	0.16	0.11	0.15	0.14	0.09	0.13	0.12	0.08	0.10	0.00	0.14	0.86	0.00	0.61	27.8	14.8	0.38		
135	0.09	0.09	0.09	0.09	0.08	0.08	0.08	0.07	0.02	0.00	0.12	1.04	0.00	0.93	39.8	20.4	0.57		
140	0.11	0.11	0.11	0.11	0.11	0.11	0.10	0.09	0.00	0.00	0.13	1.22	0.00	1.36	51.9	26.2	0.86		
145	0.16	0.16	0.16	0.15	0.16	0.14	0.11	0.11	0.00	0.00	0.18	1.38	0.00	1.93	64.0	32.1	1.26		
150	0.21	0.21	0.21	0.21	0.20	0.18	0.13	0.12	0.00	0.00	0.25	1.54	0.00	2.72	76.0	38.2	1.81		
155	0.25	0.26	0.25	0.26	0.26	0.20	0.15	0.13	0.00	0.00	0.35	1.69	0.00	3.84	88.1	44.6	2.61		
160	0.30	0.30	0.30	0.30	0.31	0.23	0.17	0.14	0.00	0.00	0.51	1.80	0.00	5.53	100	51.5	3.86		
165	0.34	0.34	0.34	0.34	0.35	0.23	0.20	0.12	0.00	0.00	0.78	1.84	0.00	8.35	112	59.2	6.00		
170	0.37	0.36	0.36	0.37	0.39	0.19	0.25	0.06	0.00	0.00	1.32	1.70	0.00	13.9	124	69.1	10.4		
175	0.40	0.38	0.40	0.44	0.24	0.26	0.12	0.00	0.00	0.20	2.46	0.88	0.00	29.5	136	86.0	23.8		
180	148	148	148	148	148	148	148	148	148	148	148	148	148	148	148	148	148		

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.

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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

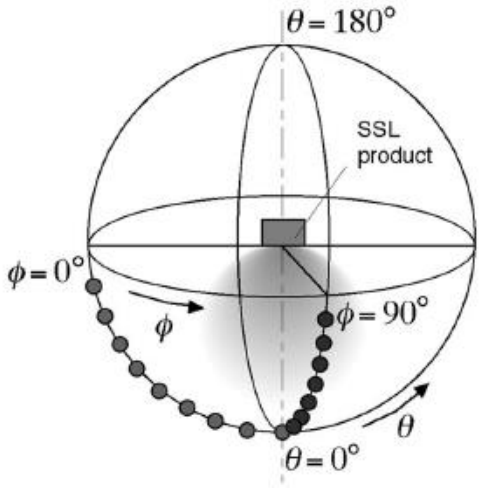
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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