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: 7MR16DIM/927NF25/R

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ20060049u

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: **7MR16DIM/927NF25/R**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
85.1	517.7	6.08	0.9183

CCT (K)	CRI	Stabilization Time (Light & Power)
2737	97.8	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	: 7MR16DIM/927NF25/R
Electrical Ratings	: 12Vac, 50/60Hz, 7W
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)	0.548
Power Factor	0.9183
Test Power (W)	6.08
THD A%	31.24
Luminous Efficacy (lm/W)	85.1
Total Luminous Flux (lm)	517.7
Color Rendering Index (CRI)	97.8
R9	85.5
Correlated Color Temperature (CCT)(K)	2737
Chromaticity Chroma x	0.4563
Chromaticity Chroma y	0.4092
Chromaticity Chroma u	0.2608
Chromaticity Chroma v	0.3508
Duv	-0.0002
Chromaticity Chroma u ’	0.2608
Chromaticity Chroma v’	0.5263

Special Color Rendering Indices	
R1	99.3
R2	99.6
R3	97.3
R4	99.3
R5	98.7
R6	97.8
R7	96.6
R8	93.6
R9	85.5
R10	97.1
R11	98.1
R12	87.5
R13	99.8
R14	97.3

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 2.47 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)	0.552
Power Factor	0.9170
Power (W)	6.05
Luminous Efficacy (lm/W)	86.9
Total Luminous Flux (lm)	525.9
Beam Angle (°)	21.5 (0^o-180^o) / 21.7 (90^o-270^o)
Center Beam Candle Power (cd)	2937
Maximum Beam Candle Power (cd)	2937 (At: C=0.0, Gamma=0.0)
Spacing Criteria	0.36 (0^o-180^o) / 0.36 (90^o-270^o)
Zonal Lumens in the 0 °-60 °Zone	98.17%
Zonal Lumens in the 60 °-90 °Zone	1.46%
Zonal Lumens in the 90 °-120 °Zone	0.21%
Zonal Lumens in the 120 °-180 °Zone	0.16%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

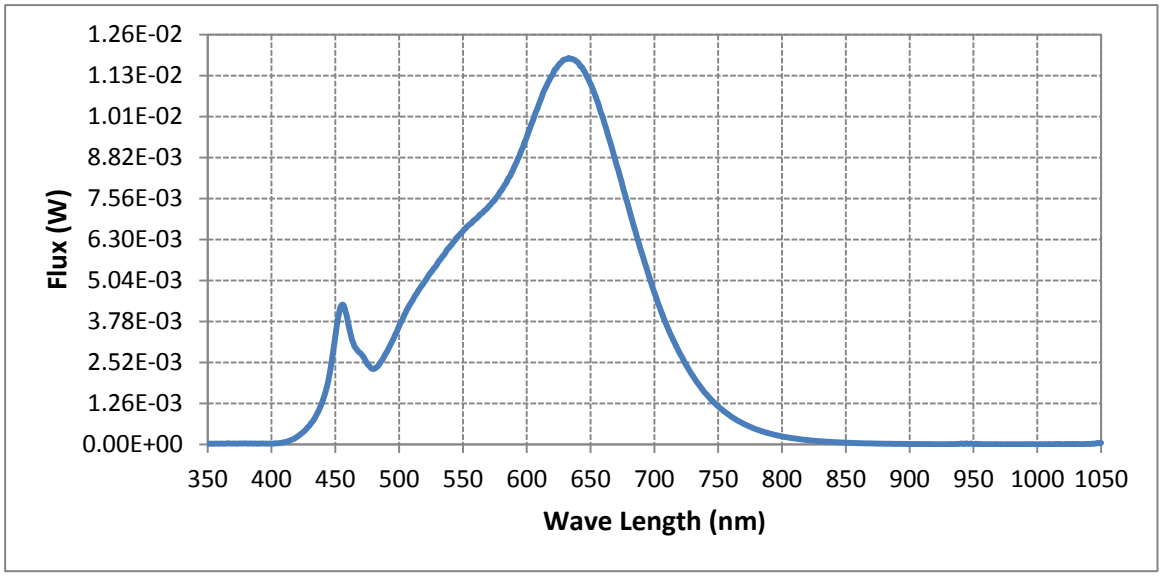
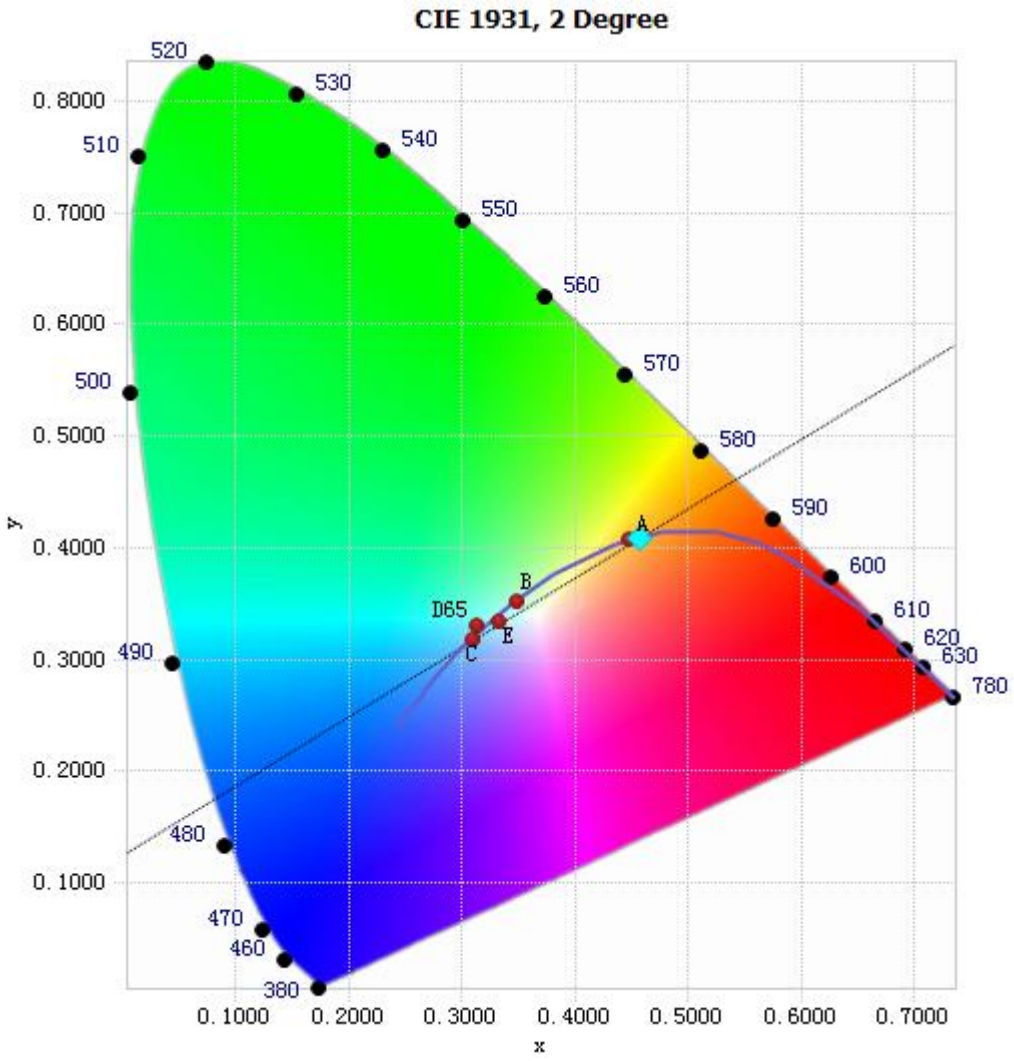


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	3.37E-05	485	2.50E-03	590	8.52E-03	695	5.27E-03
385	2.61E-05	490	2.82E-03	595	8.96E-03	700	4.68E-03
390	2.70E-05	495	3.20E-03	600	9.45E-03	705	4.12E-03
395	2.56E-05	500	3.64E-03	605	9.98E-03	710	3.63E-03
400	2.83E-05	505	4.05E-03	610	1.05E-02	715	3.19E-03
405	3.72E-05	510	4.40E-03	615	1.10E-02	720	2.80E-03
410	6.83E-05	515	4.73E-03	620	1.14E-02	725	2.44E-03
415	1.32E-04	520	5.01E-03	625	1.17E-02	730	2.12E-03
420	2.34E-04	525	5.29E-03	630	1.18E-02	735	1.83E-03
425	3.88E-04	530	5.56E-03	635	1.19E-02	740	1.58E-03
430	5.94E-04	535	5.82E-03	640	1.18E-02	745	1.36E-03
435	8.91E-04	540	6.10E-03	645	1.15E-02	750	1.17E-03
440	1.33E-03	545	6.36E-03	650	1.11E-02	755	1.01E-03
445	2.06E-03	550	6.56E-03	655	1.06E-02	760	8.63E-04
450	3.32E-03	555	6.76E-03	660	1.00E-02	765	7.39E-04
455	4.28E-03	560	6.93E-03	665	9.35E-03	770	6.36E-04
460	3.75E-03	565	7.11E-03	670	8.65E-03	775	5.44E-04
465	3.02E-03	570	7.31E-03	675	7.96E-03	780	4.64E-04
470	2.79E-03	575	7.53E-03	680	7.27E-03		
475	2.48E-03	580	7.80E-03	685	6.57E-03		
480	2.32E-03	585	8.14E-03	690	5.90E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4563, 0.4092)

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

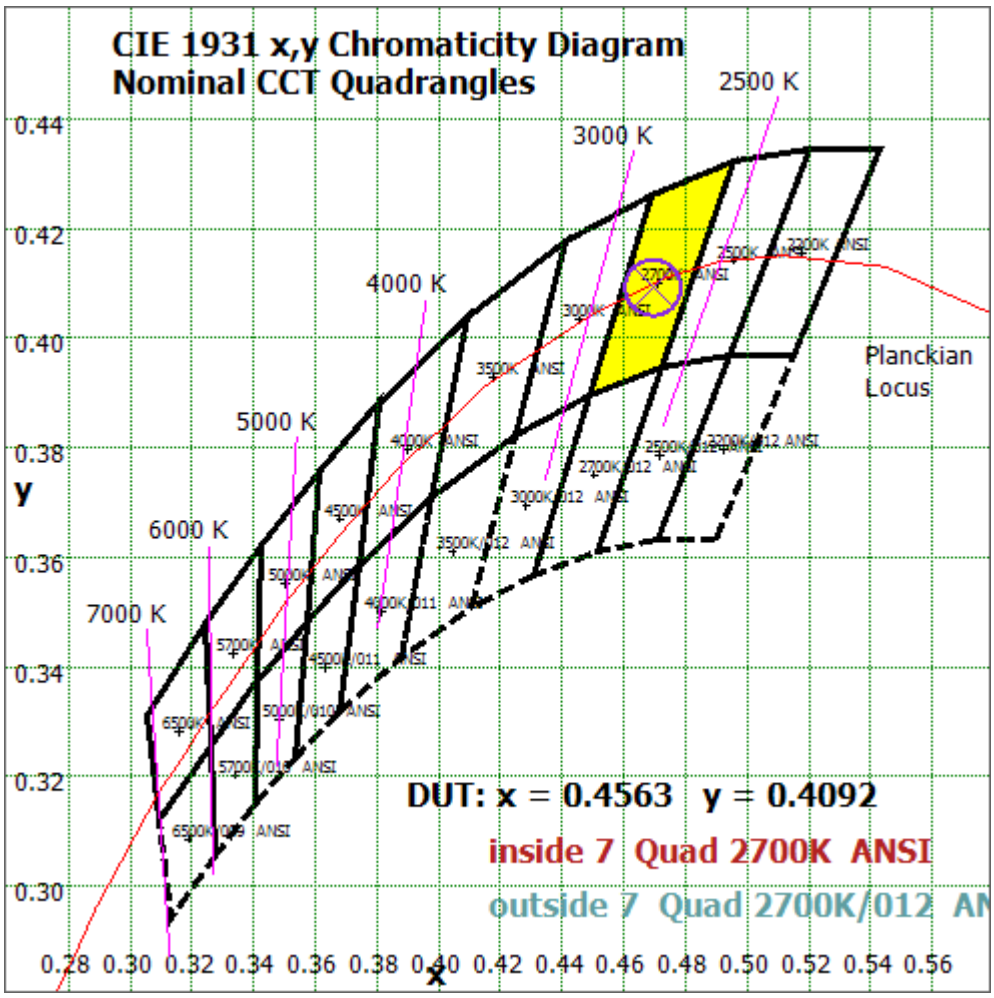


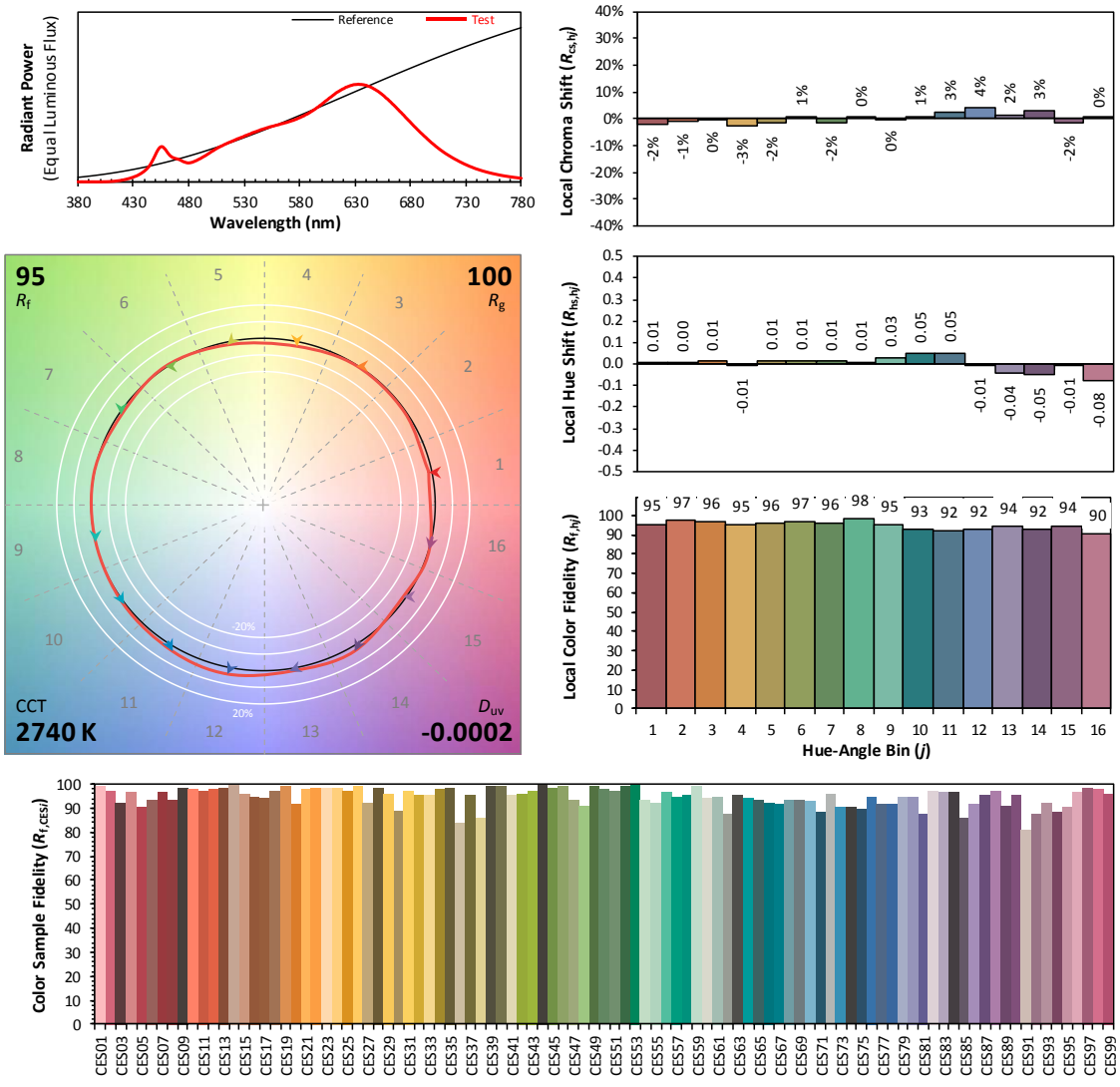
Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

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:** 7MR16DIM/927NF25/R



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

x	0.4563
y	0.4092
u'	0.2608
v'	0.5263

CIE 13.3-1995 (CRI)

R_a	98
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	210.217	39.97%
10- 20	194.593	37.00%
20- 30	66.401	12.63%
30- 40	26.098	4.96%
40- 50	12.415	2.36%
50- 60	6.559	1.25%
60- 70	4.204	0.80%
70- 80	2.534	0.48%
80- 90	0.95	0.18%
90-100	0.329	0.06%
100-110	0.365	0.07%
110-120	0.417	0.08%
120-130	0.441	0.08%
130-140	0.066	0.01%
140-150	0.09	0.02%
150-160	0.111	0.02%
160-170	0.094	0.02%
170-180	0.033	0.01%
Total	525.9	100%

γ(°)	Lumens	% Total
0- 60	516.283	98.17%
60- 90	7.688	1.46%
0-90	523.971	99.63%
90- 180	1.946	0.37%
0- 180	525.9	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

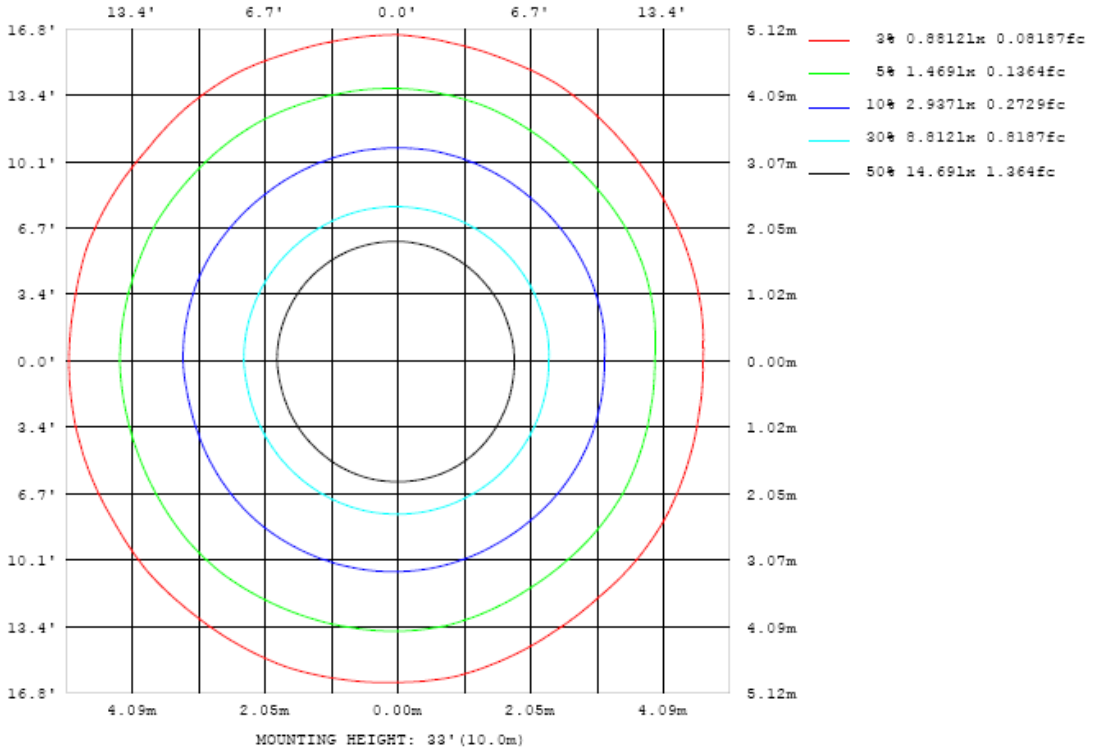


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

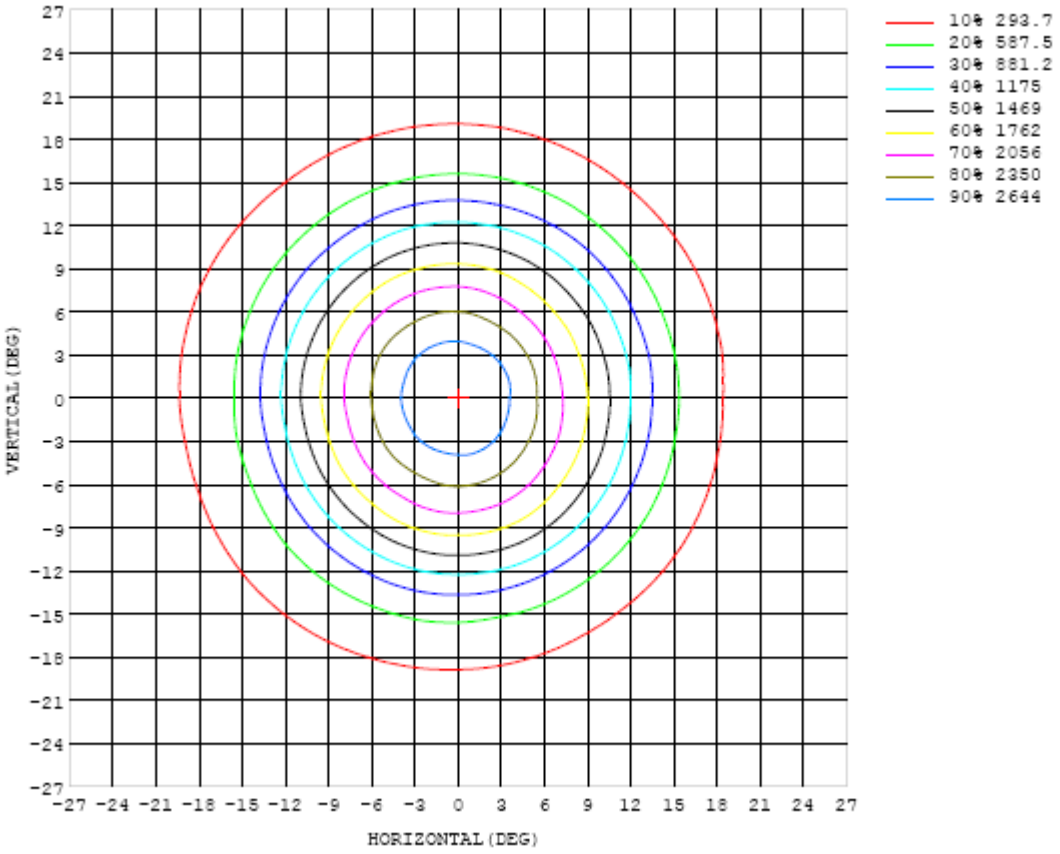


Chart 6: Isocandela Plot

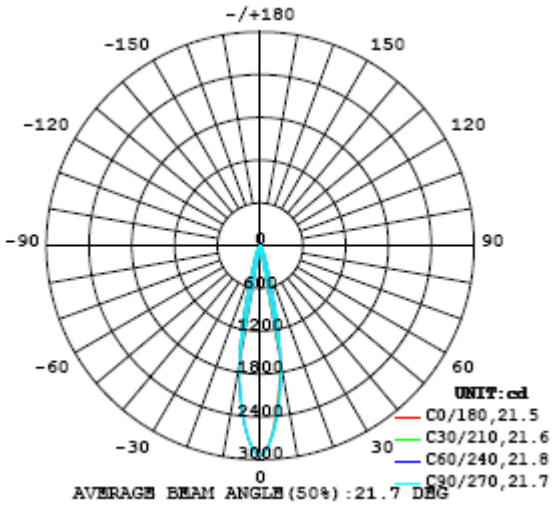


Chart 7: Polar Candela Distribution

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	2937	2937	2937	2937	2937	2937	2937	2937	2937	2937	2937	2937	2937	2937	2937	2937	2937	2937	2937
5	2431	2437	2450	2457	2476	2490	2495	2503	2508	2511	2502	2494	2496	2507	2507	2501	2497	2497	2502
10	1575	1576	1592	1606	1621	1644	1663	1665	1666	1665	1669	1667	1660	1653	1652	1648	1643	1649	1667
15	636	629	635	642	643	647	650	652	647	665	672	664	670	671	671	665	655	666	671
20	227	227	230	232	233	233	236	242	247	250	252	257	260	264	266	264	262	264	270
25	122	122	125	128	129	128	131	137	143	144	145	147	149	151	152	152	153	156	156
30	69.7	64.1	63.4	65.2	64.9	67.7	70.3	71.4	75.0	76.3	78.2	81.6	80.3	80.3	82.4	81.0	82.5	85.7	84.9
35	36.1	35.6	35.2	35.6	34.9	35.3	35.4	35.5	36.7	37.3	38.1	39.3	39.7	39.9	41.4	40.9	41.0	39.7	41.5
40	23.9	24.0	23.9	24.4	24.2	24.1	23.7	23.2	22.6	22.5	22.5	22.3	22.4	23.1	23.4	22.9	23.3	22.6	22.6
45	15.3	15.8	16.1	16.6	17.0	17.3	17.6	17.5	16.8	16.1	15.3	14.8	14.6	15.0	15.0	14.9	14.8	14.7	14.8
50	9.46	9.59	9.67	9.85	9.87	10.0	10.2	10.3	10.2	10.3	9.93	9.40	9.27	9.50	9.33	9.11	8.92	8.79	8.90
55	7.69	7.93	7.99	7.86	7.63	7.34	7.28	7.15	7.04	6.89	7.01	7.06	7.11	7.20	7.20	7.11	6.83	6.59	6.56
60	4.68	4.77	4.93	5.01	5.04	5.11	5.16	5.10	5.08	5.07	5.11	5.15	5.19	5.30	5.35	5.41	5.39	5.40	5.58
65	3.85	3.94	4.07	4.08	4.09	4.15	4.15	4.15	4.16	4.13	4.12	4.16	4.20	4.23	4.31	4.32	4.32	4.34	4.66
70	3.04	3.05	3.18	3.17	3.12	3.30	3.35	3.20	3.27	3.29	3.21	3.32	3.34	3.29	3.51	3.48	3.34	3.45	3.65
75	2.23	2.23	2.28	2.29	2.27	2.32	2.35	2.30	2.33	2.34	2.30	2.35	2.37	2.35	2.41	2.39	2.36	2.41	2.52
80	1.45	1.46	1.49	1.49	1.48	1.51	1.51	1.46	1.48	1.46	1.43	1.46	1.47	1.45	1.49	1.49	1.45	1.48	1.56
85	0.85	0.80	0.87	0.85	0.80	0.86	0.85	0.79	0.83	0.82	0.76	0.82	0.80	0.76	0.83	0.81	0.76	0.83	0.83
90	0.39	0.39	0.40	0.39	0.38	0.39	0.39	0.36	0.38	0.37	0.35	0.37	0.36	0.34	0.38	0.38	0.34	0.38	0.37
95	0.32	0.26	0.35	0.33	0.26	0.31	0.31	0.25	0.28	0.28	0.24	0.28	0.27	0.23	0.30	0.29	0.23	0.28	0.28
100	0.30	0.20	0.34	0.30	0.19	0.33	0.32	0.19	0.24	0.29	0.19	0.29	0.28	0.19	0.28	0.25	0.19	0.23	0.22
105	0.48	0.22	0.53	0.37	0.22	0.51	0.42	0.22	0.40	0.40	0.22	0.38	0.31	0.22	0.38	0.32	0.22	0.41	0.32
110	0.33	0.21	0.33	0.33	0.21	0.34	0.30	0.20	0.29	0.28	0.20	0.36	0.27	0.20	0.30	0.27	0.21	0.30	0.26
115	0.20	0.17	0.18	0.18	0.17	0.18	0.22	0.16	0.18	0.17	0.15	0.16	0.22	0.15	0.16	0.17	0.15	0.15	0.16
120	4.46	0.16	3.59	4.60	0.30	3.25	4.33	0.34	2.95	3.30	0.30	1.50	1.90	0.18	1.56	2.20	0.17	1.36	1.44
125	0.46	0.13	0.49	0.44	0.13	0.28	0.32	0.13	0.17	0.20	0.10	0.14	0.15	0.10	0.14	0.15	0.10	0.19	0.19
130	0.13	0.09	0.12	0.12	0.10	0.11	0.12	0.09	0.10	0.10	0.08	0.09	0.08	0.07	0.08	0.08	0.07	0.09	0.09
135	0.10	0.09	0.09	0.09	0.09	0.09	0.09	0.08	0.08	0.08	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
140	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
145	0.16	0.15	0.15	0.16	0.15	0.15	0.15	0.15	0.15	0.15	0.14	0.14	0.14	0.14	0.14	0.14	0.13	0.14	0.14
150	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.19	0.19	0.19	0.19	0.19	0.18	0.18	0.18	0.19
155	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.23	0.24
160	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.30	0.30	0.30	0.30	0.30	0.30	0.29	0.29
165	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.35	0.35	0.35	0.35	0.35	0.34
170	0.39	0.38	0.38	0.39	0.39	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.37	0.37	0.37	0.37	0.37	0.36
175	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.35	0.35	0.35	0.35	0.35	0.34	0.34	0.34	0.34	0.31
180	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29

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	2937	2937	2937	2937	2937	2937	2937	2937	2937	2937	2937	2937	2937	2937	2937	2937	2937		
5	2498	2507	2520	2522	2522	2519	2515	2515	2500	2491	2477	2468	2470	2460	2459	2453	2438		
10	1671	1668	1666	1664	1659	1656	1647	1639	1631	1620	1606	1591	1581	1571	1574	1563	1570		
15	676	679	680	676	673	673	673	674	675	668	661	656	647	644	640	633	636		
20	273	273	271	266	261	260	260	259	257	254	249	243	239	239	239	236	234		
25	156	157	157	154	155	155	150	149	149	144	141	139	134	131	130	127	125		
30	84.3	85.9	84.2	82.6	85.2	85.8	82.4	82.1	81.7	78.3	76.0	76.6	72.5	69.4	70.1	65.9	65.6		
35	40.4	41.1	40.2	40.6	40.5	41.4	40.9	41.0	40.4	39.2	38.8	37.8	38.1	37.6	38.4	37.3	37.0		
40	22.9	23.1	23.2	23.7	23.9	24.3	25.0	25.3	25.3	25.4	25.6	25.8	26.6	26.3	26.4	25.3	24.5		
45	14.9	15.0	15.2	15.6	16.0	16.8	16.8	17.0	17.7	18.2	18.0	18.1	18.2	17.7	17.3	16.3	15.9		
50	9.21	9.34	9.55	9.78	9.96	10.1	10.4	10.3	10.5	10.6	10.2	10.1	10.1	9.96	9.95	9.55	9.56		
55	6.60	6.69	6.82	6.83	6.96	7.28	7.46	7.40	7.47	7.58	7.57	7.67	7.90	8.12	8.14	7.77	7.87		
60	5.58	5.64	5.57	5.45	5.42	5.38	5.33	5.27	5.23	5.19	5.22	5.15	5.12	5.11	5.07	4.80	4.76		
65	4.49	4.54	4.53	4.49	4.50	4.60	4.46	4.39	4.31	4.25	4.24	4.21	4.18	4.22	4.18	3.96	3.94		
70	3.50	3.65	3.56	3.44	3.65	3.68	3.43	3.46	3.35	3.25	3.30	3.27	3.22	3.36	3.27	3.06	3.10		
75	2.50	2.62	2.51	2.46	2.58	2.60	2.47	2.49	2.41	2.37	2.39	2.37	2.34	2.39	2.35	2.24	2.27		
80	1.55	1.57	1.55	1.54	1.57	1.60	1.56	1.57	1.54	1.52	1.53	1.53	1.52	1.55	1.54	1.48	1.49		
85	0.80	0.89	0.86	0.79	0.89	0.89	0.81	0.88	0.89	0.81	0.89	0.92	0.83	0.92	0.91	0.83	0.90		
90	0.36	0.39	0.39	0.36	0.39	0.39	0.36	0.39	0.38	0.36	0.39	0.40	0.39	0.40	0.41	0.41	0.41		
95	0.24	0.30	0.29	0.24	0.31	0.28	0.23	0.28	0.27	0.24	0.31	0.29	0.26	0.33	0.32	0.27	0.32		
100	0.20	0.24	0.22	0.19	0.29	0.25	0.18	0.23	0.21	0.18	0.39	0.33	0.19	0.60	0.41	0.19	0.44		
105	0.22	0.42	0.37	0.23	0.53	0.40	0.21	0.54	0.46	0.22	0.69	0.58	0.21	0.71	0.53	0.22	0.68		
110	0.22	0.63	0.50	0.22	0.57	0.50	0.21	0.45	0.37	0.21	0.47	0.42	0.20	0.36	0.35	0.22	0.36		
115	0.15	0.22	0.21	0.15	0.20	0.19	0.15	0.18	0.17	0.15	0.19	0.19	0.16	0.20	0.20	0.17	0.21		
120	0.15	2.01	2.30	0.27	3.96	3.83	0.18	2.30	1.79	0.34	3.37	3.91	0.21	2.76	3.47	0.18	2.61		
125	0.11	0.20	0.19	0.10	0.18	0.22	0.10	0.34	0.35	0.11	0.48	0.55	0.13	0.62	0.50	0.16	0.62		
130	0.08	0.11	0.11	0.07	0.09	0.10	0.07	0.10	0.09	0.08	0.10	0.10	0.08	0.12	0.11	0.10	0.14		
135	0.08	0.08	0.08	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.10		
140	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.09	0.10	0.10	0.10	0.10	0.11	0.11	0.11	0.11	0.11		
145	0.14	0.14	0.14	0.14	0.14	0.14	0.13	0.14	0.14	0.14	0.14	0.14	0.15	0.15	0.15	0.15	0.15		
150	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	0.20	0.20	0.20	0.20		
155	0.24	0.24	0.24	0.24	0.24	0.23	0.23	0.24	0.24	0.24	0.24	0.24	0.24	0.25	0.24	0.25	0.25		
160	0.29	0.29	0.29	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	0.29		
165	0.33	0.33	0.32	0.32	0.32	0.32	0.32	0.32	0.31	0.31	0.31	0.31	0.31	0.32	0.31	0.31	0.32		
170	0.34	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	0.34		
175	0.32	0.30	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.32	0.32	0.31	0.32	0.32	0.33		
180	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29		

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

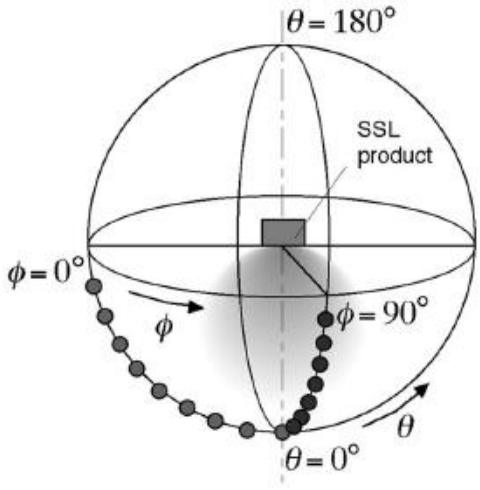
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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