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/940FL35/R

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ20060049i

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

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Oct. 15, 2020

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Manager: Jim Zhang

Oct. 15, 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/940FL35/R**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
91.7	595.3	6.49	0.9109

CCT (K)	CRI	Stabilization Time (Light & Power)
3948	97.1	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. 25, 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/940FL35/R
Electrical Ratings	: 12Vac, 50/60Hz, 7.5W
Product Description	: 4000K
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 25.0 ℃.

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)	0.592
Power Factor	0.9109
Test Power (W)	6.49
THD A%	24.82
Luminous Efficacy (lm/W)	91.7
Total Luminous Flux (lm)	595.3
Color Rendering Index (CRI)	97.1
R9	94.3
Correlated Color Temperature (CCT)(K)	3948
Chromaticity Chroma x	0.3835
Chromaticity Chroma y	0.3813
Chromaticity Chroma u	0.2253
Chromaticity Chroma v	0.3360
Duv	0.0012
Chromaticity Chroma u ’	0.2253
Chromaticity Chroma v’	0.5040

Special Color Rendering Indices	
R1	98.6
R2	99.3
R3	98.4
R4	95.9
R5	96.4
R6	97
R7	95.7
R8	95.5
R9	94.3
R10	98.5
R11	98.3
R12	74.7
R13	98.7
R14	98.3

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)	0.598
Power Factor	0.9141
Power (W)	6.58
Luminous Efficacy (lm/W)	93.3
Total Luminous Flux (lm)	613.7
Beam Angle (°)	31.7 (0^o-180^o) / 31.7 (90^o-270^o)
Center Beam Candle Power (cd)	1814
Maximum Beam Candle Power (cd)	1814 (At: C=0.0, Gamma=0.0)
Spacing Criteria	0.52 (0^o-180^o) / 0.56 (90^o-270^o)
Zonal Lumens in the 0 °-60 °Zone	97.71%
Zonal Lumens in the 60 °-90 °Zone	1.69%
Zonal Lumens in the 90 °-120 °Zone	0.33%
Zonal Lumens in the 120 °-180 °Zone	0.27%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

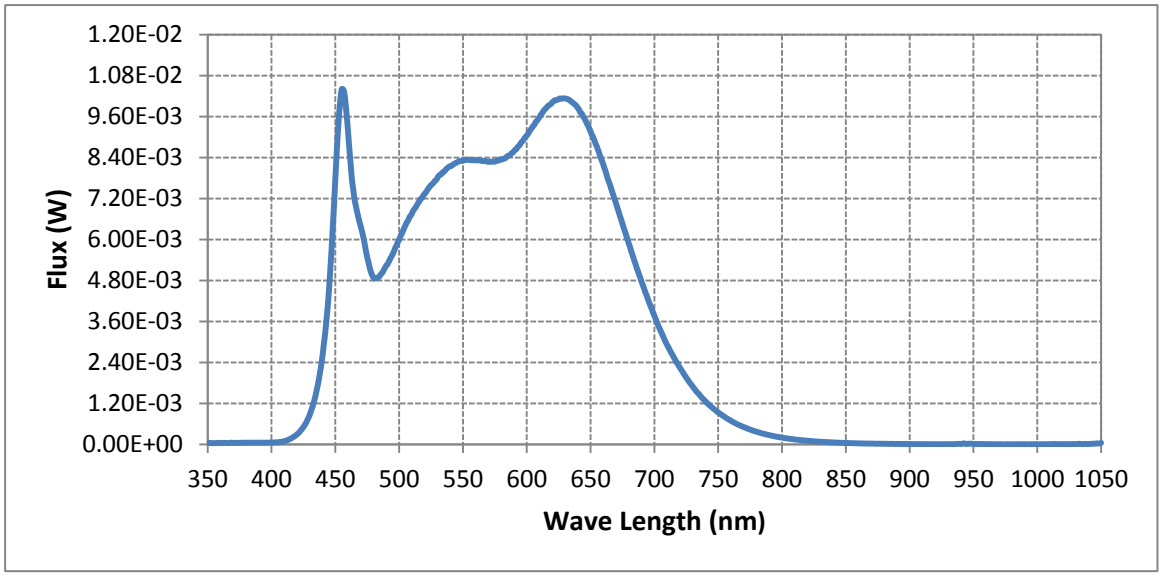
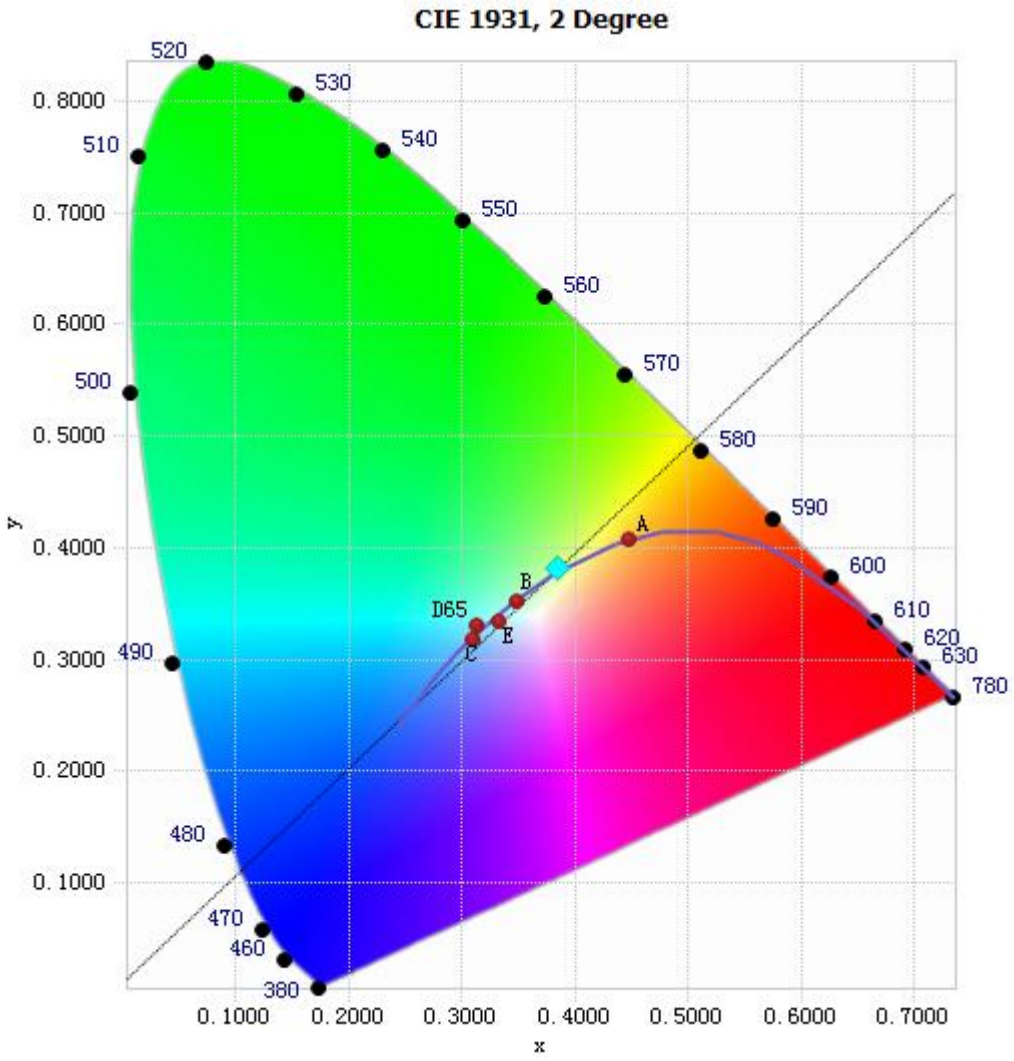


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	5.08E-05	485	4.95E-03	590	8.59E-03	695	4.25E-03
385	5.05E-05	490	5.24E-03	595	8.80E-03	700	3.77E-03
390	5.41E-05	495	5.58E-03	600	9.05E-03	705	3.32E-03
395	4.91E-05	500	5.99E-03	605	9.33E-03	710	2.91E-03
400	5.66E-05	505	6.42E-03	610	9.59E-03	715	2.56E-03
405	6.46E-05	510	6.76E-03	615	9.84E-03	720	2.25E-03
410	9.78E-05	515	7.08E-03	620	1.00E-02	725	1.96E-03
415	1.70E-04	520	7.34E-03	625	1.01E-02	730	1.70E-03
420	2.97E-04	525	7.60E-03	630	1.01E-02	735	1.47E-03
425	5.11E-04	530	7.81E-03	635	1.00E-02	740	1.26E-03
430	8.74E-04	535	7.98E-03	640	9.85E-03	745	1.09E-03
435	1.52E-03	540	8.15E-03	645	9.56E-03	750	9.41E-04
440	2.61E-03	545	8.25E-03	650	9.16E-03	755	8.09E-04
445	4.51E-03	550	8.31E-03	655	8.72E-03	760	6.93E-04
450	7.75E-03	555	8.33E-03	660	8.19E-03	765	5.93E-04
455	1.04E-02	560	8.31E-03	665	7.63E-03	770	5.11E-04
460	9.15E-03	565	8.30E-03	670	7.05E-03	775	4.36E-04
465	7.19E-03	570	8.28E-03	675	6.46E-03	780	3.73E-04
470	6.38E-03	575	8.28E-03	680	5.88E-03		
475	5.48E-03	580	8.35E-03	685	5.31E-03		
480	4.88E-03	585	8.45E-03	690	4.76E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3835, 0.3813)

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

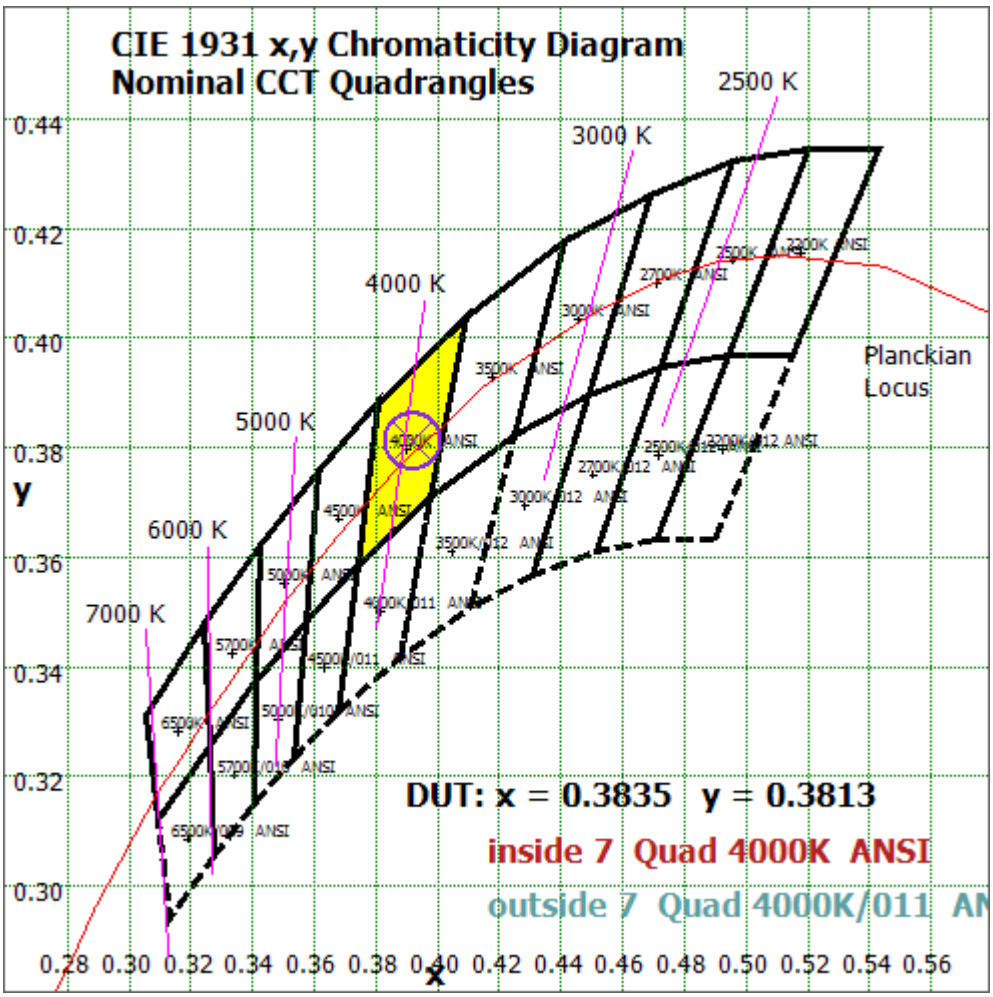


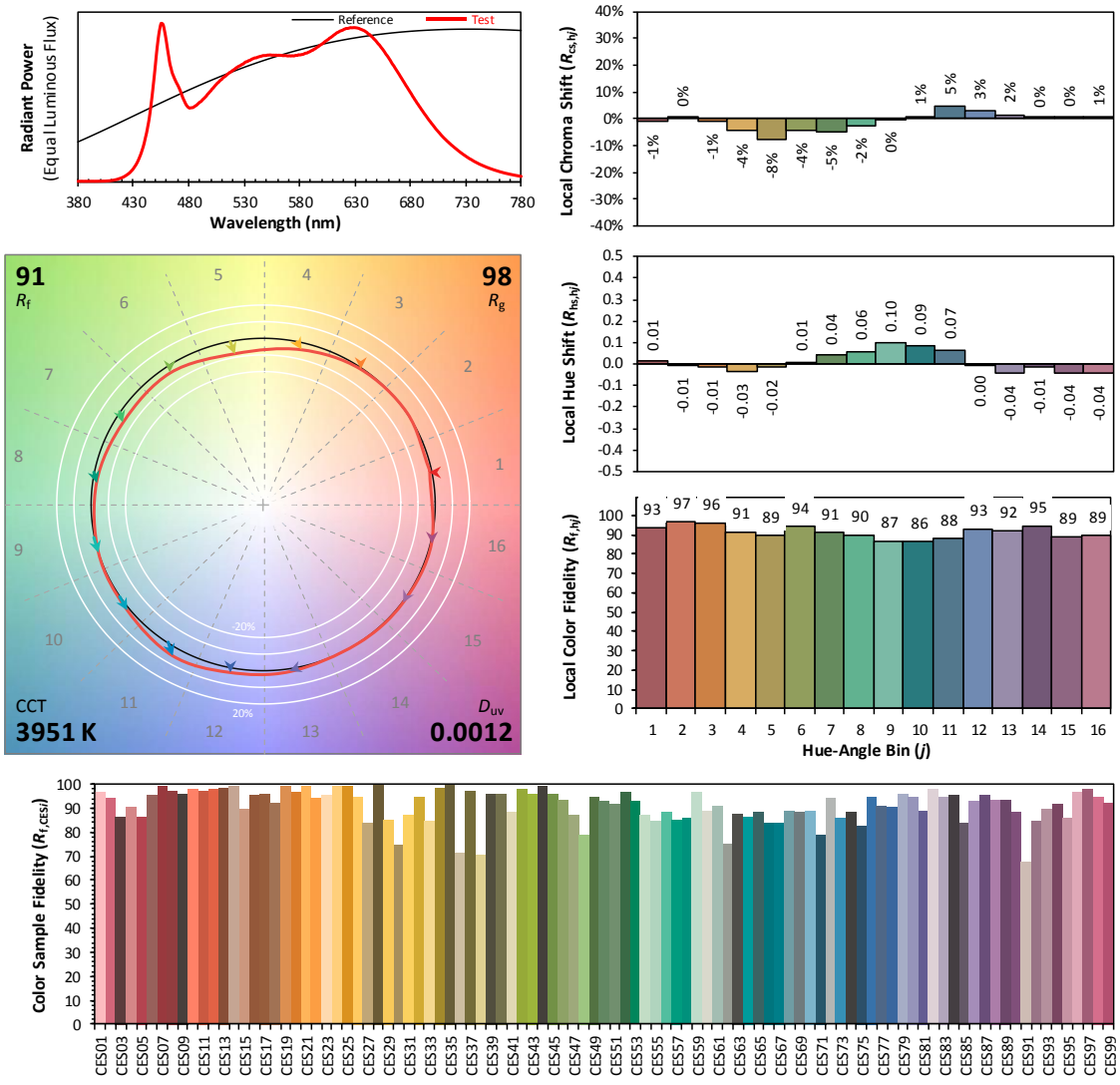
Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

ANSI/IES TM-30-18 Color Rendition Report

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

Date: 2020/06/25 **Model:** 7.5MR16DIM/940FL35/R



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

x	0.3835
y	0.3813
u'	0.2253
v'	0.5040

CIE 13.3-1995 (CRI)

R_a	97
R_9	95

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	151.082	24.62%
10- 20	262.87	42.83%
20- 30	128.822	20.99%
30- 40	35.558	5.79%
40- 50	13.554	2.21%
50- 60	7.766	1.27%
60- 70	5.64	0.92%
70- 80	3.279	0.53%
80- 90	1.468	0.24%
90-100	0.584	0.10%
100-110	0.696	0.11%
110-120	0.75	0.12%
120-130	1.169	0.19%
130-140	0.102	0.02%
140-150	0.111	0.02%
150-160	0.123	0.02%
160-170	0.103	0.02%
170-180	0.039	0.01%
Total	613.7	100%

γ(°)	Lumens	% Total
0- 60	599.652	97.71%
60- 90	10.387	1.69%
0-90	610.039	99.40%
90- 180	3.677	0.60%
0- 180	613.7	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

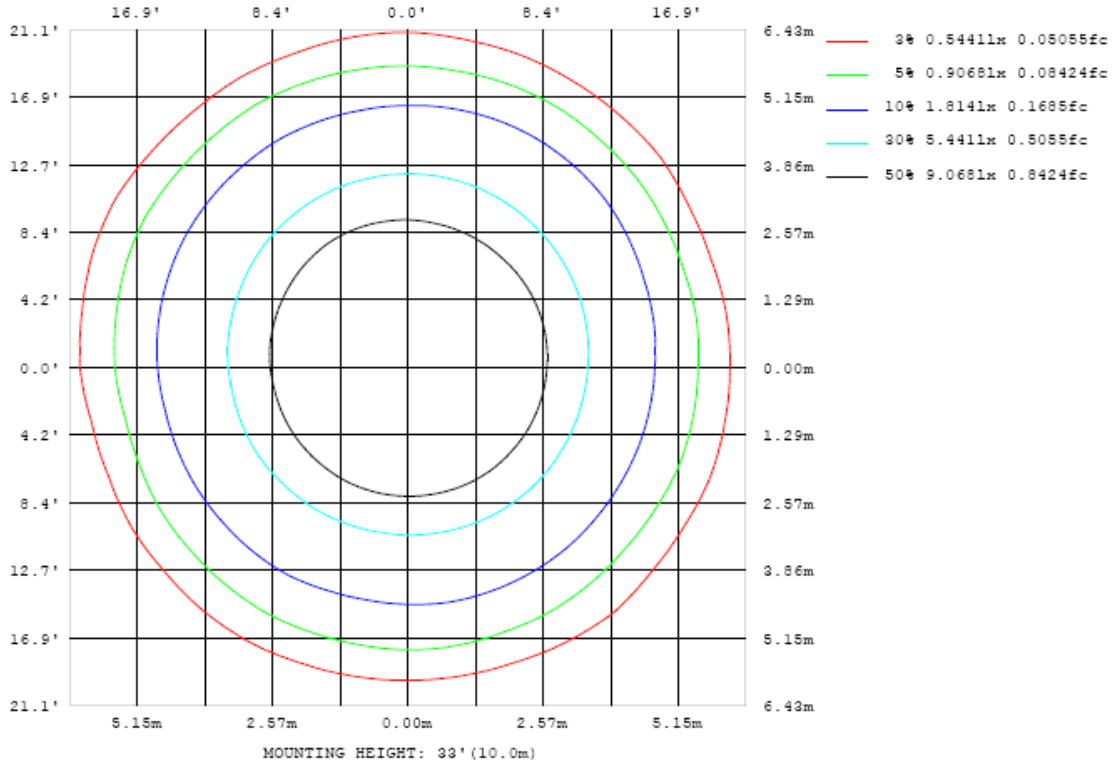


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

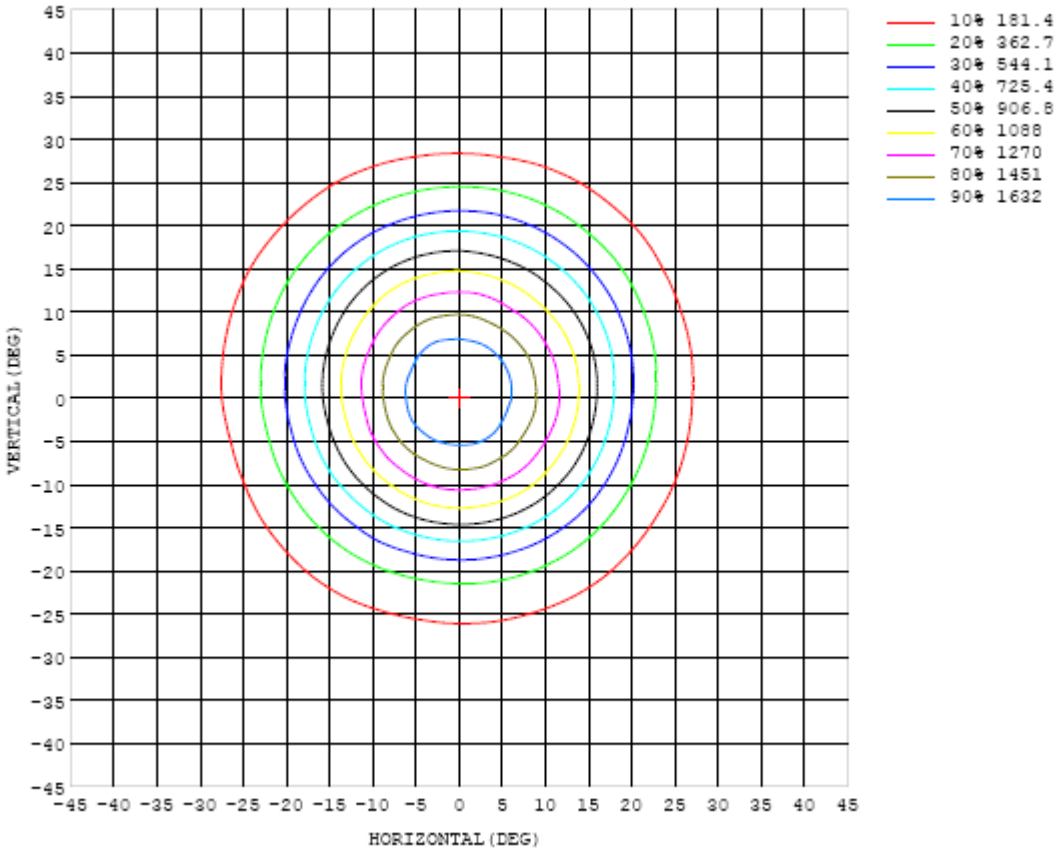


Chart 6: Isocandela Plot

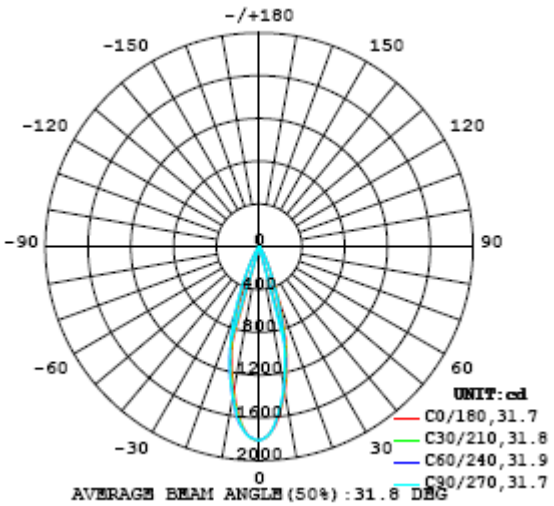


Chart 7: Polar Candela Distribution

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	1814	1814	1814	1814	1814	1814	1814	1814	1814	1814	1814	1814	1814	1814	1814	1814	1814	1814	1814
5	1685	1676	1669	1668	1673	1671	1671	1666	1661	1660	1662	1667	1671	1677	1683	1687	1692	1695	1699
10	1381	1375	1362	1349	1346	1340	1331	1332	1321	1320	1321	1322	1320	1324	1335	1338	1348	1348	1358
15	989	973	959	942	923	910	895	883	875	870	870	875	883	891	905	921	933	950	977
20	553	531	517	505	491	481	468	459	454	453	455	456	466	472	484	499	516	530	557
25	251	245	238	231	227	226	220	218	219	215	211	215	224	228	231	237	242	249	264
30	112	112	112	107	103	104	103	99.9	99.6	97.7	97.3	99.7	104	103	101	104	104	108	117
35	52.2	51.7	53.1	49.8	46.6	46.4	45.0	43.7	44.2	44.3	45.2	45.1	46.6	46.6	46.5	49.1	47.6	48.9	52.7
40	27.2	27.4	27.5	26.6	25.6	24.5	22.9	22.3	22.3	22.4	23.2	23.2	24.3	24.9	25.5	25.6	25.4	25.9	27.3
45	18.9	18.4	17.2	16.2	15.6	15.1	14.4	13.3	12.7	12.6	12.6	12.9	13.5	13.8	14.0	14.2	14.4	14.8	15.8
50	11.1	11.3	11.3	11.2	11.1	10.8	10.2	9.61	9.46	9.30	9.29	9.40	9.57	9.65	9.83	9.91	9.94	10.2	11.0
55	8.24	8.19	8.20	8.17	8.02	7.93	7.76	7.71	7.71	7.65	7.70	7.76	7.78	7.84	7.88	7.99	7.97	8.23	8.34
60	6.68	6.72	6.79	6.77	6.73	6.69	6.61	6.50	6.51	6.48	6.49	6.55	6.60	6.64	6.66	6.72	6.68	6.69	6.80
65	5.58	5.60	5.58	5.50	5.38	5.40	5.31	5.16	5.22	5.24	5.16	5.30	5.40	5.34	5.47	5.59	5.51	5.63	5.78
70	4.21	4.14	4.26	4.07	3.88	4.03	3.92	3.72	3.85	3.82	3.68	3.91	4.05	3.90	4.10	4.20	4.03	4.28	4.42
75	2.97	2.91	2.85	2.79	2.74	2.67	2.62	2.58	2.56	2.53	2.54	2.59	2.64	2.70	2.71	2.77	2.85	2.95	3.12
80	1.96	1.93	1.87	1.82	1.75	1.72	1.69	1.63	1.66	1.66	1.60	1.67	1.69	1.67	1.71	1.75	1.79	1.87	2.01
85	1.33	1.24	1.34	1.26	1.09	1.19	1.14	1.00	1.15	1.16	1.00	1.14	1.14	0.99	1.11	1.15	1.06	1.25	1.36
90	0.88	0.79	0.87	0.78	0.64	0.68	0.65	0.56	0.64	0.63	0.56	0.66	0.64	0.55	0.63	0.65	0.57	0.72	0.80
95	0.54	0.45	0.48	0.45	0.40	0.41	0.39	0.38	0.39	0.38	0.38	0.41	0.41	0.37	0.40	0.41	0.39	0.46	0.48
100	0.46	0.42	0.51	0.50	0.43	0.50	0.51	0.42	0.52	0.50	0.44	0.51	0.50	0.40	0.47	0.49	0.38	0.44	0.43
105	1.02	0.42	1.22	1.56	0.48	1.08	0.86	0.47	0.72	0.60	0.49	0.67	0.64	0.45	1.06	1.41	0.42	1.41	1.71
110	0.45	0.54	0.45	0.43	0.54	0.41	0.38	0.48	0.38	0.39	0.48	0.38	0.38	0.46	0.37	0.38	0.47	0.40	0.43
115	0.36	0.44	0.41	0.42	0.47	0.44	0.43	0.34	0.47	0.50	0.38	0.50	0.56	0.38	0.41	0.41	0.42	0.33	0.37
120	1.97	0.65	3.28	4.42	0.69	3.87	4.43	0.44	3.51	3.90	0.39	3.22	3.86	0.52	3.88	3.87	0.42	2.91	3.10
125	1.47	0.22	0.68	0.54	0.21	0.30	0.25	0.16	0.19	0.17	0.14	0.15	0.17	0.15	0.22	0.25	0.16	0.47	0.78
130	0.13	0.13	0.13	0.12	0.13	0.12	0.12	0.13	0.12	0.11	0.12	0.11	0.11	0.12	0.11	0.11	0.11	0.11	0.10
135	0.14	0.15	0.14	0.14	0.14	0.13	0.13	0.13	0.13	0.12	0.13	0.12	0.12	0.13	0.12	0.12	0.12	0.12	0.12
140	0.15	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	0.14	0.14
145	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	0.17	0.17	0.18	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	0.22	0.22	0.22	0.22	0.22	0.22
155	0.27	0.28	0.28	0.28	0.28	0.28	0.29	0.29	0.29	0.29	0.29	0.29	0.28	0.28	0.28	0.28	0.28	0.27	0.26
160	0.33	0.34	0.34	0.34	0.34	0.34	0.35	0.35	0.35	0.35	0.35	0.34	0.34	0.34	0.34	0.34	0.34	0.33	0.32
165	0.38	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.37
170	0.41	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.40	0.39
175	0.45	0.38	0.38	0.38	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.38	0.38	0.38	0.38	0.38	0.38	0.36	0.35
180	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49

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	1814	1814	1814	1814	1814	1814	1814	1814	1814	1814	1814	1814	1814	1814	1814	1814	1814		
5	1708	1708	1707	1714	1719	1719	1721	1724	1720	1726	1724	1725	1720	1718	1709	1699	1696		
10	1381	1398	1405	1422	1425	1433	1437	1433	1431	1428	1415	1408	1409	1407	1406	1400	1382		
15	998	1011	1028	1045	1062	1071	1073	1070	1069	1061	1054	1048	1037	1038	1031	1022	1006		
20	577	592	613	634	649	662	670	674	677	675	671	661	647	633	616	599	577		
25	278	289	302	309	314	320	325	329	333	336	332	328	317	311	294	277	265		
30	124	133	138	136	136	139	137	136	134	132	132	130	125	123	119	115	115		
35	54.1	57.0	59.1	59.5	60.4	61.4	58.3	57.7	59.1	57.6	58.1	56.4	54.5	55.3	52.7	52.0	52.7		
40	27.6	28.0	28.8	29.2	29.1	28.8	27.9	28.2	28.3	27.8	28.2	27.7	27.1	27.4	27.5	27.3	27.1		
45	16.8	18.2	19.6	20.7	21.1	21.1	21.3	21.2	20.7	19.9	19.3	19.4	19.3	19.4	19.5	19.5	19.4		
50	11.8	12.2	12.7	13.0	13.3	13.7	13.5	13.5	13.5	13.9	13.8	13.6	12.9	12.2	11.8	11.2	10.8		
55	8.52	8.70	9.06	9.28	9.55	9.74	9.71	9.77	9.49	9.25	9.09	9.06	9.08	8.95	8.93	8.52	8.24		
60	6.97	7.02	7.11	7.23	7.29	7.29	7.26	7.30	7.33	7.36	7.31	7.20	7.17	7.16	7.05	6.82	6.67		
65	5.86	5.92	6.01	6.06	6.21	6.28	6.27	6.26	6.23	6.26	6.19	6.15	6.12	6.11	5.96	5.74	5.63		
70	4.38	4.59	4.65	4.64	4.90	4.89	4.86	4.97	4.90	4.85	4.96	4.86	4.79	4.94	4.65	4.40	4.43		
75	3.15	3.29	3.33	3.35	3.56	3.56	3.51	3.73	3.61	3.54	3.78	3.57	3.45	3.53	3.33	3.16	3.08		
80	2.06	2.11	2.18	2.26	2.31	2.37	2.38	2.41	2.41	2.43	2.41	2.39	2.34	2.26	2.20	2.12	2.02		
85	1.32	1.47	1.50	1.42	1.52	1.56	1.48	1.54	1.59	1.54	1.60	1.62	1.50	1.50	1.46	1.32	1.38		
90	0.80	0.95	0.99	0.92	1.02	1.02	0.94	1.03	1.06	1.06	1.22	1.19	1.06	1.09	0.97	0.84	0.93		
95	0.46	0.52	0.55	0.50	0.55	0.54	0.51	0.56	0.55	0.54	0.63	0.62	0.56	0.58	0.55	0.49	0.52		
100	0.37	0.41	0.42	0.37	0.38	0.40	0.37	0.38	0.38	0.39	0.43	0.43	0.42	0.42	0.45	0.42	0.46		
105	0.39	0.45	0.50	0.42	0.50	0.50	0.41	0.47	0.47	0.42	0.53	0.53	0.46	0.53	0.55	0.45	0.53		
110	0.47	0.64	0.57	0.50	1.09	0.82	0.44	1.19	1.24	0.42	1.45	1.19	0.47	0.70	0.50	0.50	0.49		
115	0.47	0.35	0.36	0.38	0.38	0.38	0.41	0.40	0.36	0.39	0.40	0.40	0.44	0.38	0.36	0.36	0.36		
120	1.78	2.11	2.52	1.23	1.46	1.48	0.61	0.60	0.80	0.35	1.01	1.24	0.47	1.50	2.54	0.35	2.99		
125	0.37	1.46	3.08	0.70	4.27	4.45	0.55	4.57	3.95	0.38	4.95	4.87	0.38	4.82	3.67	0.29	2.58		
130	0.10	0.11	0.12	0.13	0.15	0.16	0.14	0.15	0.13	0.14	0.20	0.20	0.15	0.15	0.15	0.14	0.13		
135	0.13	0.12	0.13	0.14	0.12	0.13	0.14	0.13	0.13	0.14	0.13	0.13	0.14	0.13	0.13	0.15	0.14		
140	0.15	0.14	0.15	0.15	0.14	0.15	0.15	0.15	0.15	0.16	0.14	0.15	0.15	0.15	0.15	0.16	0.15		
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	0.18	0.18	0.18	0.18		
150	0.21	0.21	0.21	0.20	0.20	0.20	0.20	0.21	0.21	0.20	0.21	0.21	0.21	0.21	0.21	0.22	0.22		
155	0.26	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.26	0.26	0.26	0.26	0.26		
160	0.31	0.31	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30		
165	0.36	0.36	0.36	0.36	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.34	0.35	0.35	0.35	0.35	0.36		
170	0.39	0.39	0.40	0.40	0.41	0.41	0.40	0.40	0.41	0.41	0.40	0.39	0.39	0.39	0.40	0.40	0.41		
175	0.40	0.43	0.44	0.46	0.48	0.46	0.45	0.46	0.47	0.46	0.43	0.43	0.44	0.44	0.44	0.45	0.46		
180	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49		

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

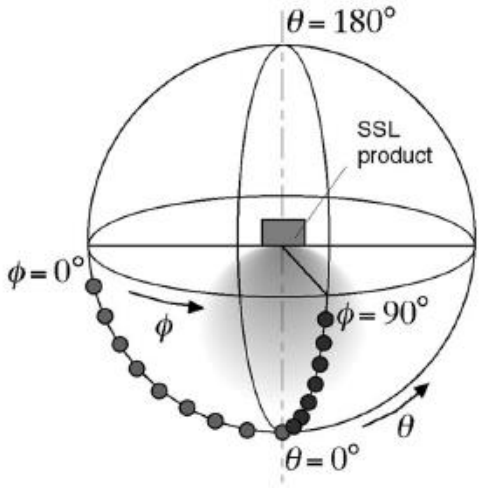
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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