

LM-79-08 TEST REPORT

for

GREEN CREATIVE LTD

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

LED Lamp

Model: 6MR16DIM/830FL35/R

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ190400471

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

Review by:



Engineer: April Zou
May 10, 2019

Approved by:



Manager: Jim Zhang
May 10, 2019

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: 6MR16DIM/830FL35/R

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
109.1	632.6	5.80	0.9211
CCT (K)	CRI	Stabilization Time (Light & Power)	
3003	83.1	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	: Apr. 26, 2019
Date of Test	: Apr. 29, 2019
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

LM-79-08 TEST REPORT	1
TEST SUMMARY	2
SAMPLE PHOTO	4
TEST RESULTS	5
Sphere-Spectroradiometer Method.....	5
Goniophotometer Method	6
Spectral Power Distribution - Sphere Spectroradiometer Method	7
Chromaticity Diagram - Sphere Spectroradiometer Method.....	8
Nominal CCT Quadrangles – Sphere Spectroradiometer Method	9
Color Rendition Report – Sphere Spectroradiometer Method	10
Zonal Lumen Tabulation- Goniophotometer Method	11
Illuminance Plots- Goniophotometer Method	12
Luminous Intensity Distribution Plots- Goniophotometer Method.....	13
Luminous Intensity Data- Goniophotometer Method	14
EQUIPMENT LIST	16
TEST METHODS	16
Seasoning of SSL Product.....	16
Sphere-Spectroradiometer Method- Photometric and Electrical Measurements.....	16
Goniophotometer Method	17
Photometric and Electrical Measurements	17
Color Characteristics Measurements.....	17
Color Spatial Uniformity	17

SAMPLE PHOTO



Figure 1- Overview of the sample

Equipment Under Test(EUT)

Name	: LED Lamp
Model	: 6MR16DIM/830FL35/R
Electrical Ratings	: 12V, 60Hz, 6W
Product Description	: 3000K
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 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)	0.523
Power Factor	0.9211
Test Power (W)	5.80
THD A%	22.91
Luminous Efficacy (lm/W)	109.1
Total Luminous Flux (lm)	632.6
Color Rendering Index (CRI)	83.1
R9	9.7
Correlated Color Temperature (CCT)(K)	3003
Chromaticity Chroma x	0.4330
Chromaticity Chroma y	0.3967
Chromaticity Chroma u	0.2513
Chromaticity Chroma v	0.3452
Duv	0.0026
Chromaticity Chroma u'	0.2513
Chromaticity Chroma v'	0.5178

Special Color Rendering Indices	
R1	81.7
R2	91.6
R3	95.8
R4	81.2
R5	82.4
R6	90
R7	82.3
R8	59.6
R9	9.7
R10	81.2
R11	81
R12	77.5
R13	84.1
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 24.7°C.

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)	0.529
Power Factor	0.9248
Power (W)	5.85
Luminous Efficacy (lm/W)	109.5
Total Luminous Flux (lm)	640.4
Beam Angle (°)	34.8 (0°-180°) / 34.1 (90°-270°)
Center Beam Candle Power (cd)	1652
Maximum Beam Candle Power (cd)	1652 (At: C=0.0, Gamma=0.0)
Spacing Criteria	0.55 (0°-180°) / 0.54 (90°-270°)
Zonal Lumens in the 0°-60° Zone	96.96%
Zonal Lumens in the 60°-90° Zone	2.85%
Zonal Lumens in the 90°-120° Zone	0.16%
Zonal Lumens in the 120°-180° Zone	0.03%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

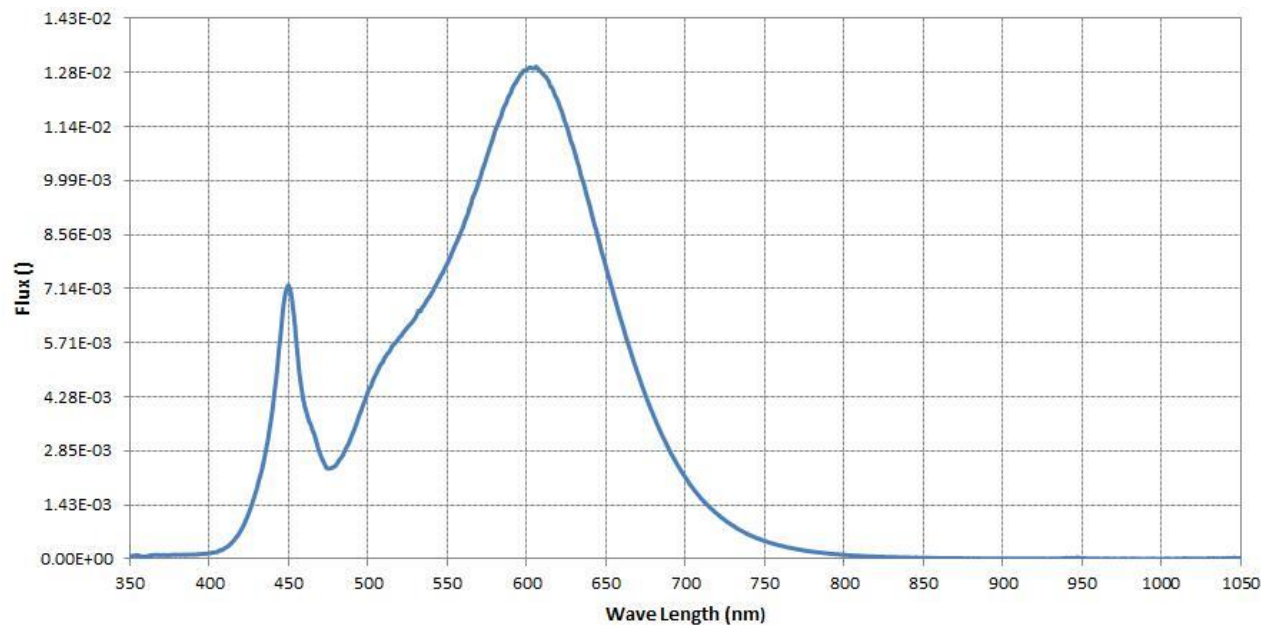
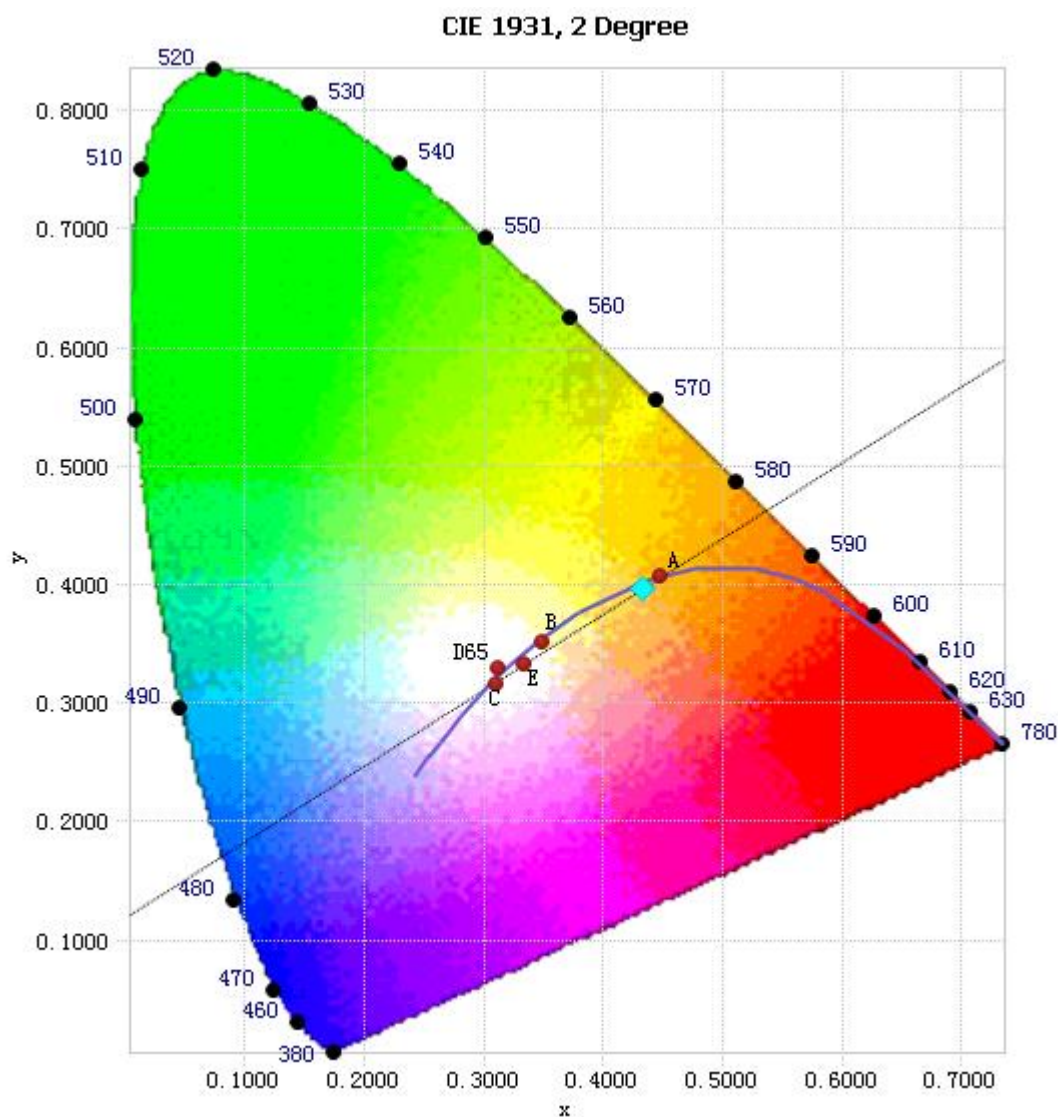


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.13E-04	485	2.81E-03	590	1.23E-02	695	2.49E-03
385	1.04E-04	490	3.27E-03	595	1.27E-02	700	2.16E-03
390	1.15E-04	495	3.84E-03	600	1.29E-02	705	1.85E-03
395	1.31E-04	500	4.41E-03	605	1.29E-02	710	1.59E-03
400	1.51E-04	505	4.87E-03	610	1.28E-02	715	1.38E-03
405	1.88E-04	510	5.26E-03	615	1.25E-02	720	1.19E-03
410	2.93E-04	515	5.60E-03	620	1.21E-02	725	1.03E-03
415	4.65E-04	520	5.86E-03	625	1.15E-02	730	8.80E-04
420	7.54E-04	525	6.11E-03	630	1.08E-02	735	7.51E-04
425	1.22E-03	530	6.37E-03	635	1.00E-02	740	6.48E-04
430	1.85E-03	535	6.68E-03	640	9.29E-03	745	5.51E-04
435	2.70E-03	540	7.02E-03	645	8.48E-03	750	4.76E-04
440	3.96E-03	545	7.39E-03	650	7.70E-03	755	4.10E-04
445	5.90E-03	550	7.79E-03	655	6.95E-03	760	3.53E-04
450	7.23E-03	555	8.28E-03	660	6.24E-03	765	3.03E-04
455	5.69E-03	560	8.77E-03	665	5.55E-03	770	2.62E-04
460	4.07E-03	565	9.37E-03	670	4.90E-03	775	2.25E-04
465	3.42E-03	570	9.99E-03	675	4.30E-03	780	1.94E-04
470	2.76E-03	575	1.06E-02	680	3.78E-03		
475	2.39E-03	580	1.13E-02	685	3.30E-03		
480	2.49E-03	585	1.19E-02	690	2.87E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4330, 0.3967)

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

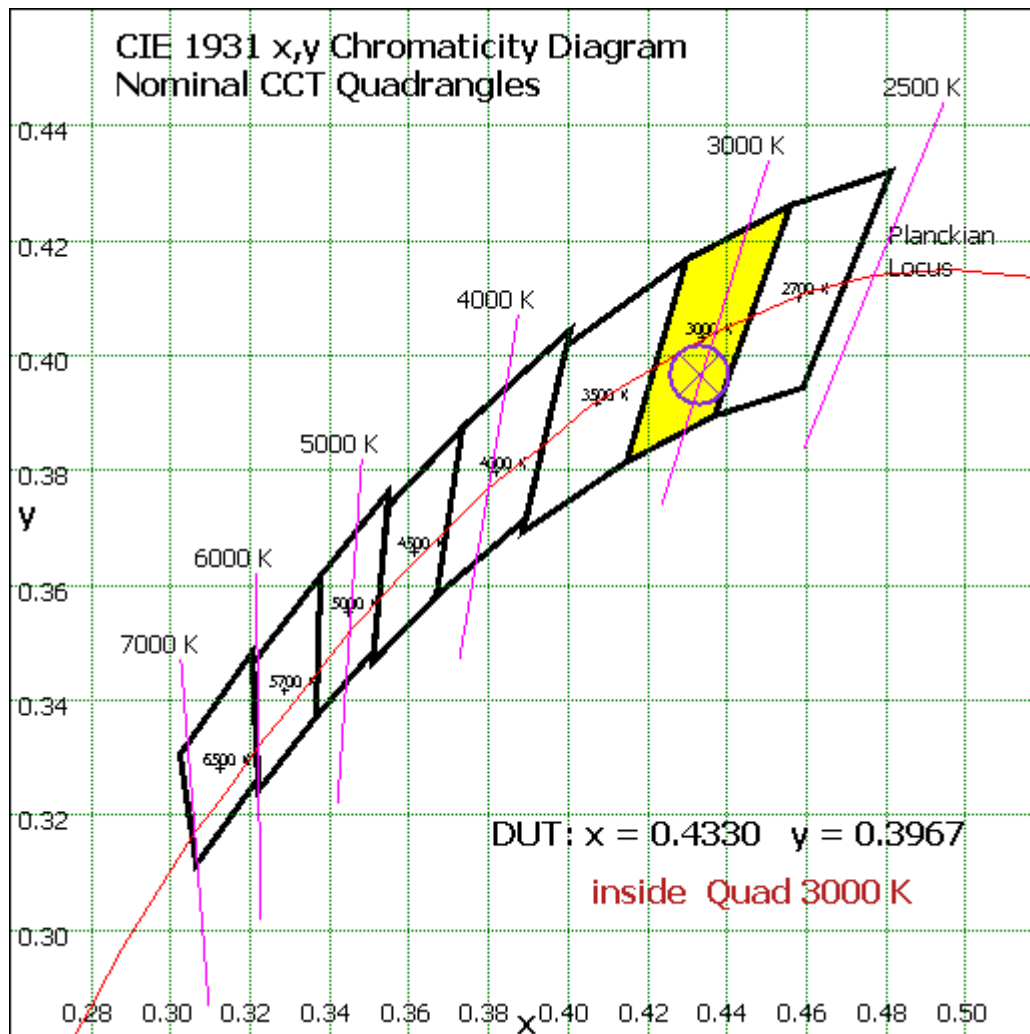
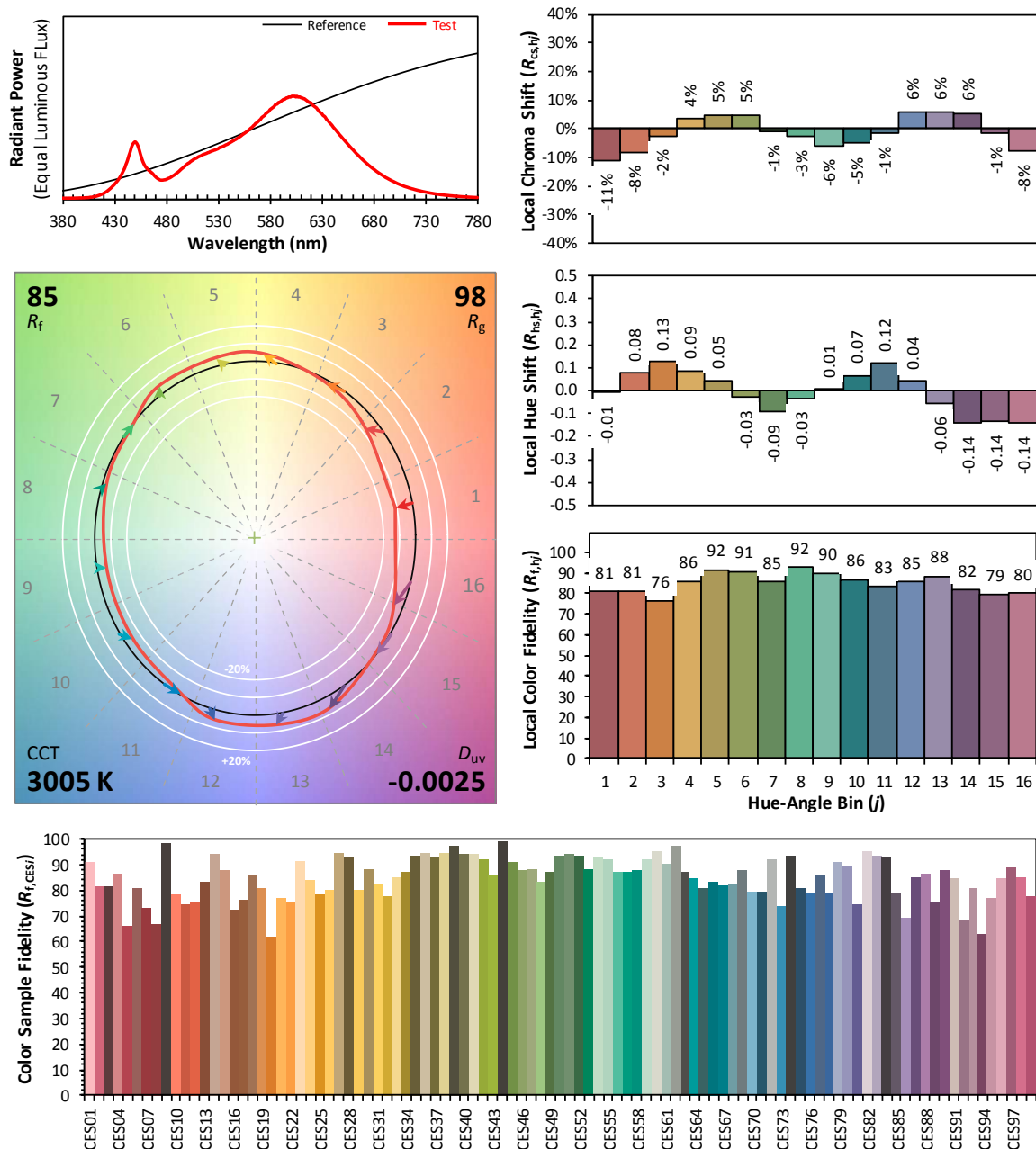


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method



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

x 0.4331
 y 0.3967
 u' 0.2513
 v' 0.5178

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

$\gamma(^{\circ})$	Lumens	% Total
0- 10	145.173	22.67%
10- 20	272.024	42.48%
20- 30	139.573	21.79%
30- 40	40.552	6.33%
40- 50	14.371	2.24%
50- 60	9.227	1.44%
60- 70	8.371	1.31%
70- 80	6.458	1.01%
80- 90	3.443	0.54%
90-100	0.914	0.14%
100-110	0.107	0.02%
110-120	0	0.00%
120-130	0.005	0.00%
130-140	0.013	0.00%
140-150	0.03	0.00%
150-160	0.061	0.01%
160-170	0.069	0.01%
170-180	0.026	0.00%
Total	640.4	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	620.92	96.96%
60- 90	18.272	2.85%
0-90	639.192	99.81%
90- 180	1.225	0.19%
0- 180	640.4	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

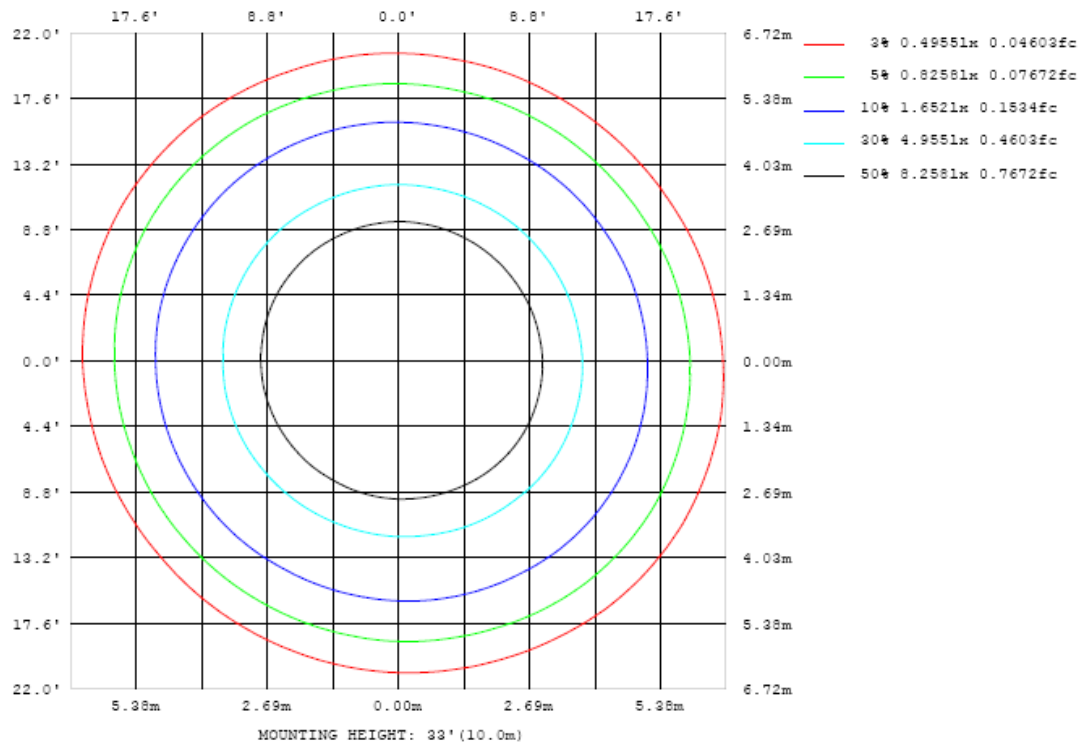


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

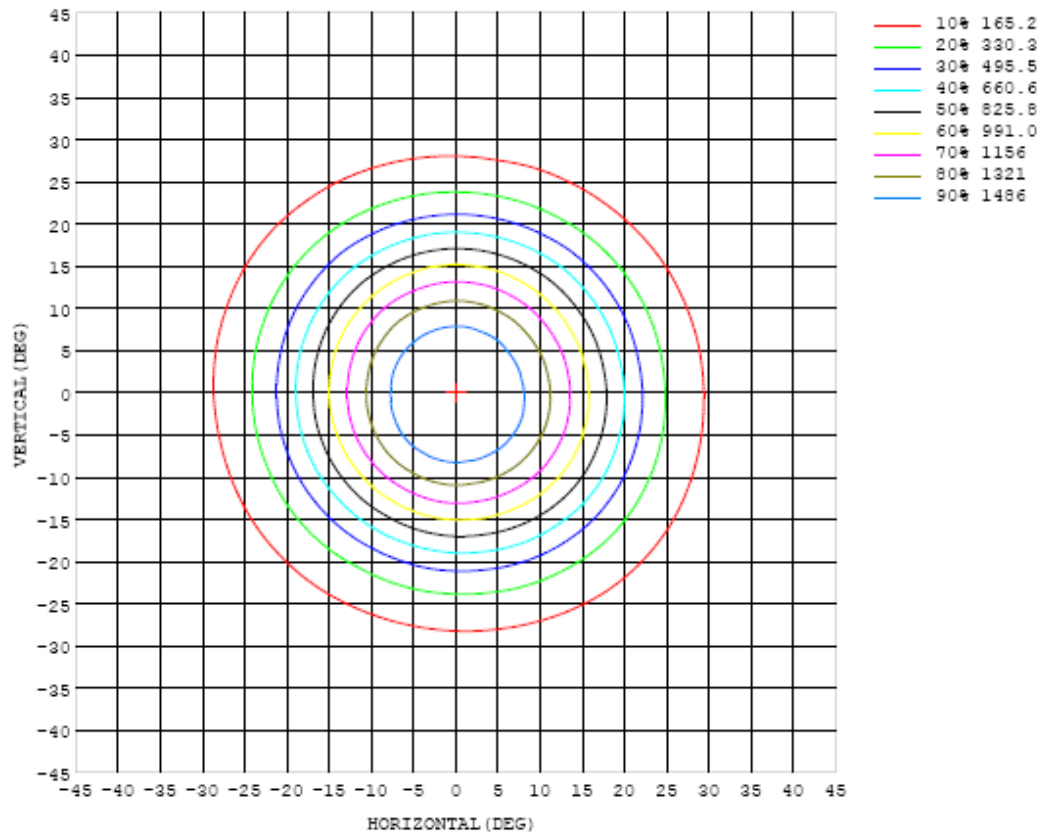


Chart 6: Isocandela Plot

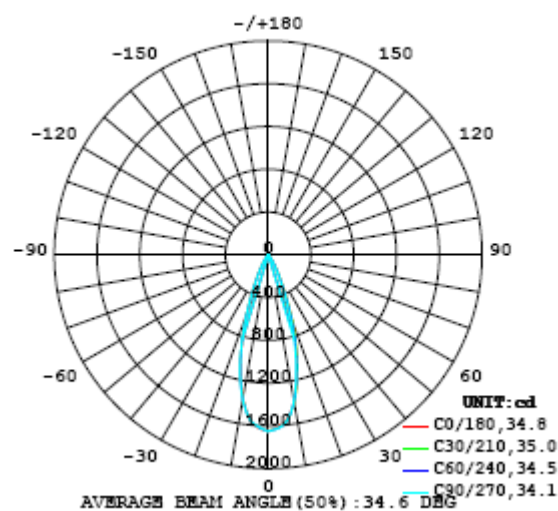


Chart 7: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1

UNIT: cd

C (DEG) y (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	1652	1652	1652	1652	1652	1652	1652	1652	1652	1652	1652	1652	1652	1652	1652	1652	1652	1652	1652
5	1582	1582	1586	1591	1598	1602	1601	1602	1596	1601	1603	1600	1600	1602	1599	1594	1594	1591	1589
10	1395	1398	1402	1400	1401	1399	1394	1390	1382	1387	1383	1379	1373	1377	1373	1369	1365	1364	1361
15	1049	1051	1053	1050	1047	1038	1024	1014	1002	996	988	982	975	979	977	981	982	989	990
20	658	663	663	662	653	634	622	607	590	580	571	562	560	562	564	572	577	582	581
25	322	328	328	326	321	312	300	292	282	275	269	266	264	269	273	277	281	287	290
30	150	153	154	154	151	147	140	133	127	124	121	119	118	119	121	124	126	130	133
35	70.0	72.8	73.7	73.0	70.8	68.2	63.5	61.8	59.7	57.9	55.7	54.5	54.0	53.8	54.5	55.3	57.5	59.8	60.8
40	36.3	37.8	37.9	37.3	35.7	33.7	31.9	30.6	29.2	28.4	27.6	27.0	26.5	26.3	26.2	26.8	27.9	29.1	30.1
45	20.9	21.4	21.3	21.0	20.4	19.4	18.5	17.7	17.0	16.6	16.3	16.0	15.8	15.6	15.5	15.8	16.4	16.9	17.4
50	14.1	14.8	14.7	14.5	14.0	13.6	13.1	12.8	12.4	12.1	11.9	11.7	11.8	11.8	11.8	11.7	11.8	12.1	12.4
55	11.1	11.4	11.5	11.4	11.0	10.7	10.6	10.5	10.4	10.2	9.99	9.84	9.79	9.91	9.97	10.00	10.1	10.2	10.2
60	9.53	9.80	9.84	9.74	9.54	9.47	9.38	9.49	9.56	9.27	9.02	8.91	8.96	8.97	9.16	9.20	9.27	9.36	9.40
65	8.87	9.19	9.18	9.06	9.03	9.01	8.85	8.72	8.70	8.51	8.63	8.61	8.62	8.59	8.77	8.71	8.52	8.51	8.68
70	7.73	7.82	7.74	7.89	7.86	7.72	7.66	7.51	7.44	7.28	7.45	7.37	7.41	7.42	7.29	7.39	7.26	7.38	7.35
75	6.20	6.38	6.23	6.39	6.33	6.22	6.30	6.18	6.13	6.00	6.12	6.00	6.10	6.02	5.97	6.05	6.00	6.09	5.94
80	5.00	4.94	4.84	5.06	5.08	5.03	4.98	4.80	4.86	4.65	4.71	4.57	4.68	4.67	4.59	4.65	4.58	4.57	4.60
85	3.48	3.45	3.48	3.49	3.36	3.33	3.30	3.20	3.09	3.15	3.00	3.01	2.97	3.06	3.07	3.02	2.98	2.94	3.01
90	1.65	1.63	1.67	1.61	1.75	1.57	1.53	1.55	1.58	1.38	1.42	1.38	1.49	1.47	1.42	1.44	1.39	1.40	1.40
95	0.78	0.84	0.84	0.84	0.86	0.92	0.78	0.81	0.82	0.74	0.76	0.76	0.76	0.79	0.74	0.65	0.71	0.71	0.71
100	0.34	0.31	0.31	0.32	0.32	0.30	0.30	0.28	0.26	0.29	0.27	0.28	0.24	0.26	0.24	0.25	0.26	0.25	0.26
105	0.10	0.10	0.10	0.09	0.09	0.09	0.09	0.08	0.08	0.08	0.08	0.07	0.07	0.07	0.07	0.07	0.08	0.07	0.07
110	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
115	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
120	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
125	0.00	0.01	0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.00
130	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
135	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
140	0.03	0.03	0.03	0.02	0.02	0.03	0.03	0.02	0.02	0.03	0.03	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03
145	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.05
150	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.09
155	0.12	0.11	0.11	0.12	0.12	0.12	0.12	0.12	0.11	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.15
160	0.18	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.21
165	0.24	0.23	0.23	0.23	0.23	0.24	0.24	0.24	0.23	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.25	0.27
170	0.27	0.27	0.27	0.27	0.27	0.27	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.29	0.30
175	0.25	0.24	0.24	0.24	0.24	0.24	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.26	0.26	0.26	0.27
180	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21

Table 6: Luminous Intensity Data

Table--2

UNIT: cd

C (DEG) Y (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	1652	1652	1652	1652	1652	1652	1652	1652	1652	1652	1652	1652	1652	1652	1652	1652	1652		
5	1587	1586	1587	1590	1593	1586	1583	1582	1583	1577	1575	1575	1575	1576	1579	1580	1580		
10	1360	1365	1369	1372	1378	1373	1373	1375	1379	1376	1380	1378	1378	1381	1384	1384	1384		
15	992	998	1002	1000	1003	1001	1000	1004	1008	1006	1012	1012	1016	1021	1025	1036	1040		
20	586	589	590	590	591	583	580	582	585	583	589	597	608	615	626	638	644		
25	295	295	292	289	285	280	275	274	271	270	271	274	282	291	298	309	314		
30	136	136	136	133	129	125	121	118	117	116	117	119	121	125	131	139	145		
35	61.6	61.8	61.0	59.9	57.6	55.5	54.2	53.4	52.9	52.3	52.7	53.8	55.0	56.9	59.7	63.2	66.4		
40	30.9	30.7	30.2	29.4	28.6	28.0	27.5	27.6	27.6	27.3	27.6	28.1	28.7	29.6	30.8	32.5	34.5		
45	17.7	17.6	17.4	17.1	16.9	16.6	16.4	16.3	16.4	16.5	16.7	16.9	17.2	17.5	18.2	19.1	20.1		
50	12.5	12.4	12.1	11.9	11.6	11.3	11.1	11.2	11.2	11.3	11.3	11.6	11.8	12.0	12.3	12.8	13.6		
55	10.2	10.2	9.82	9.65	9.49	9.37	9.33	9.27	9.29	9.34	9.43	9.53	9.72	9.91	9.93	10.4	10.6		
60	9.43	9.24	8.95	8.57	8.38	8.57	8.59	8.48	8.49	8.45	8.38	8.43	8.61	8.75	8.91	9.12	9.24		
65	8.86	8.84	8.74	8.38	8.29	8.23	8.15	8.09	8.02	7.96	8.00	8.26	8.33	8.31	8.33	8.58	8.71		
70	7.57	7.49	7.60	7.39	7.42	7.28	7.14	7.27	7.13	7.01	7.16	7.39	7.29	7.39	7.47	7.49	7.69		
75	6.18	6.01	6.01	5.99	6.05	6.03	5.82	5.99	5.80	5.91	5.81	5.95	5.85	5.90	6.06	6.01	6.24		
80	4.74	4.66	4.63	4.78	4.80	4.73	4.58	4.74	4.60	4.78	4.89	4.94	4.86	4.99	5.11	5.02	5.14		
85	3.10	3.14	3.16	3.24	3.30	3.09	3.16	3.17	3.25	3.24	3.38	3.43	3.44	3.48	3.50	3.38	3.44		
90	1.44	1.40	1.43	1.43	1.46	1.50	1.46	1.47	1.57	1.56	1.56	1.63	1.64	1.72	1.66	1.63	1.63		
95	0.72	0.79	0.78	0.78	0.79	0.75	0.82	0.84	0.83	0.88	0.83	0.80	0.83	0.88	0.82	0.87	0.85		
100	0.25	0.27	0.26	0.29	0.31	0.29	0.30	0.31	0.32	0.31	0.34	0.34	0.33	0.33	0.33	0.34	0.33		
105	0.08	0.07	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.09	0.09	0.10	0.10	0.10	0.10	0.10	0.10		
110	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
115	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
120	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
125	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		
130	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		
135	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02		
140	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03		
145	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		
150	0.10	0.10	0.10	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09		
155	0.16	0.16	0.16	0.16	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.14	0.14	0.14	0.15	0.15	0.15		
160	0.22	0.22	0.22	0.22	0.22	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21		
165	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.26	0.26	0.26	0.26	0.26	0.26		
170	0.31	0.30	0.31	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	0.29		
175	0.27	0.27	0.27	0.27	0.27	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.25	0.25	0.25		
180	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21		

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	3M	HZTE015-04	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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