

## **LM-79-08 Test Report**

for

### **GREEN CREATIVE LTD**

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

### **Downlight**

**Model: 18DL6DIM/940**

### **Laboratory: Leading Testing Laboratories**

**NVLAP CODE: 200960-0**

3rd Floor, Bld. 2, NO. 96 Longchuanwu Rd Qianjiang Economy Dev. Zone, Yuhang Dist,  
Hangzhou, Zhejiang Province, China 311100


Tel: +86 571 86376106

[www.ledtestlab.com](http://www.ledtestlab.com)

Report No.: HZ17080054i

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

Review by:



Engineer: April Zou  
Sep. 01, 2017

Approved by:



Manager: Jim Zhang  
Sep. 01, 2017

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: 18DL6DIM/940

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
96.6	1704.0	17.64	0.9153
CCT (K)	CRI	Stabilization Time (Light & Power)	
3847	92.2	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** : Aug. 29, 2017

**Date of Test** : Aug. 30, 2017

**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

## TABLE OF CONTENT

LM-79-08 Test Report.....	1
Test Summary.....	2
Sample Photos.....	4
TEST RESULTS .....	5
Goniophotometer Method .....	6
Spectral Power Distribution - Sphere Spectroradiometer Method .....	7
Chromaticity Diagram - Sphere Spectroradiometer Method.....	8
Nominal CCT Quadrangles – Sphere Spectroradiometer Method .....	9
Zonal Lumen Tabulation- Goniophotometer Method .....	10
Luminous Intensity Distribution Plots- Goniophotometer Method.....	12
Luminous Intensity Data- Goniophotometer Method.....	13
EQUIPMENT LIST .....	15
TEST METHODS .....	15
Seasoning of SSL Product.....	15
Sphere-Spectroradiometer Method- Photometric and Electrical Measurements.....	15
Goniophotometer Method .....	16
Photometric and Electrical Measurements.....	16
Color Characteristics Measurements.....	16
Color Spatial Uniformity .....	16

## Sample Photos



Figure 1- Overview of the sample

### Equipment Under Test (EUT)

<b>Name</b>	: Downlight
<b>Model</b>	: 18DL6DIM/940
<b>Electrical Ratings</b>	: 120V, 60Hz, 18W
<b>Product Description</b>	: 4000K
<b>Manufacturer</b>	: GREEN CREATIVE LTD
<b>Address</b>	: 756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai

## TEST RESULTS

Test ambient temperature was 25.0°C.

Base orientation was light down. 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 70 minutes.

### Sphere-Spectroradiometer Method

Parameter	Result
Test Voltage (V)	120.0
Voltage frequency (Hz)	60
Test Current (A)	0.161
Power Factor	0.9153
Test Power (W)	17.64
THD A%	36.72
Luminous Efficacy (lm/W)	96.6
Total Luminous Flux (lm)	1704.0
Color Rendering Index (CRI)	92.2
R9	58.3
Correlated Color Temperature (CCT)(K)	3847
Chromaticity Chroma x	0.3881
Chromaticity Chroma y	0.3837
Chromaticity Chroma u	0.2274
Chromaticity Chroma v	0.3372
Duv	0.0009
Chromaticity Chroma u'	0.2274
Chromaticity Chroma v'	0.5057

Special Color Rendering Indices	
R1	92.2
R2	96.4
R3	98.2
R4	90.8
R5	91.3
R6	93.9
R7	92.4
R8	82.6
R9	58.3
R10	90.2
R11	91
R12	72.9
R13	93.6
R14	99
Rf	89
Rg	97

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 24.6°C.

The photometric distance is 2.47m.

Luminous data was taken at 0.5°vertical intervals and 10°horizontal intervals.

Parameter	Result
Test Voltage (V)	120.0
Voltage frequency (Hz)	60
Test Current (A)	0.160
Power Factor	0.9225
Test Power (W)	17.71
Luminous Efficacy (lm/W)	97.8
Total Luminous Flux (lm)	1731.7
Beam Angle (°)	98.5
Center Beam Candle Power (cd)	738
Spacing Criteria	1.18 (0°-180°)/ 1.20 (90°-270°)
Zonal Lumens in the 0°-60°Zone	86.05%
Zonal Lumens in the 60°-90°Zone	13.85%
Zonal Lumens in the 90°-120°Zone	0.02%
Zonal Lumens in the 120°-180°Zone	0.08%

Table 3: Test data per Goniophotometer Method

## Spectral Power Distribution - Sphere Spectroradiometer Method

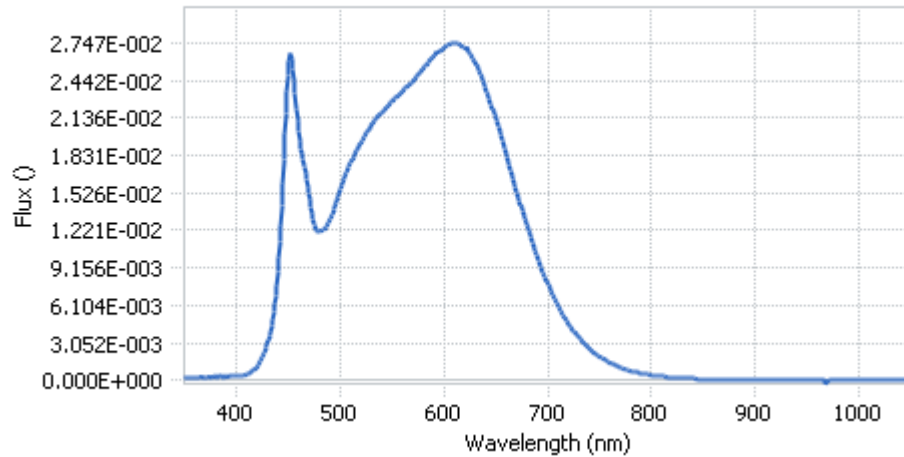


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	3.14E-04	485	1.23E-02	590	2.63E-02	695	8.93E-03
385	3.01E-04	490	1.31E-02	595	2.68E-02	700	7.89E-03
390	3.23E-04	495	1.42E-02	600	2.71E-02	705	6.90E-03
395	3.20E-04	500	1.55E-02	605	2.73E-02	710	6.05E-03
400	3.59E-04	505	1.66E-02	610	2.74E-02	715	5.30E-03
405	3.93E-04	510	1.76E-02	615	2.74E-02	720	4.64E-03
410	5.01E-04	515	1.86E-02	620	2.71E-02	725	4.01E-03
415	7.06E-04	520	1.94E-02	625	2.66E-02	730	3.50E-03
420	1.09E-03	525	2.00E-02	630	2.59E-02	735	3.02E-03
425	1.78E-03	530	2.07E-02	635	2.50E-02	740	2.58E-03
430	2.90E-03	535	2.13E-02	640	2.39E-02	745	2.23E-03
435	4.98E-03	540	2.18E-02	645	2.26E-02	750	1.92E-03
440	8.84E-03	545	2.23E-02	650	2.14E-02	755	1.66E-03
445	1.61E-02	550	2.27E-02	655	1.99E-02	760	1.42E-03
450	2.49E-02	555	2.31E-02	660	1.85E-02	765	1.23E-03
455	2.53E-02	560	2.35E-02	665	1.69E-02	770	1.05E-03
460	2.03E-02	565	2.39E-02	670	1.54E-02	775	9.09E-04
465	1.75E-02	570	2.44E-02	675	1.40E-02	780	7.72E-04
470	1.52E-02	575	2.48E-02	680	1.26E-02		
475	1.27E-02	580	2.54E-02	685	1.13E-02		
480	1.21E-02	585	2.58E-02	690	1.01E-02		

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

## Chromaticity Diagram - Sphere Spectroradiometer Method

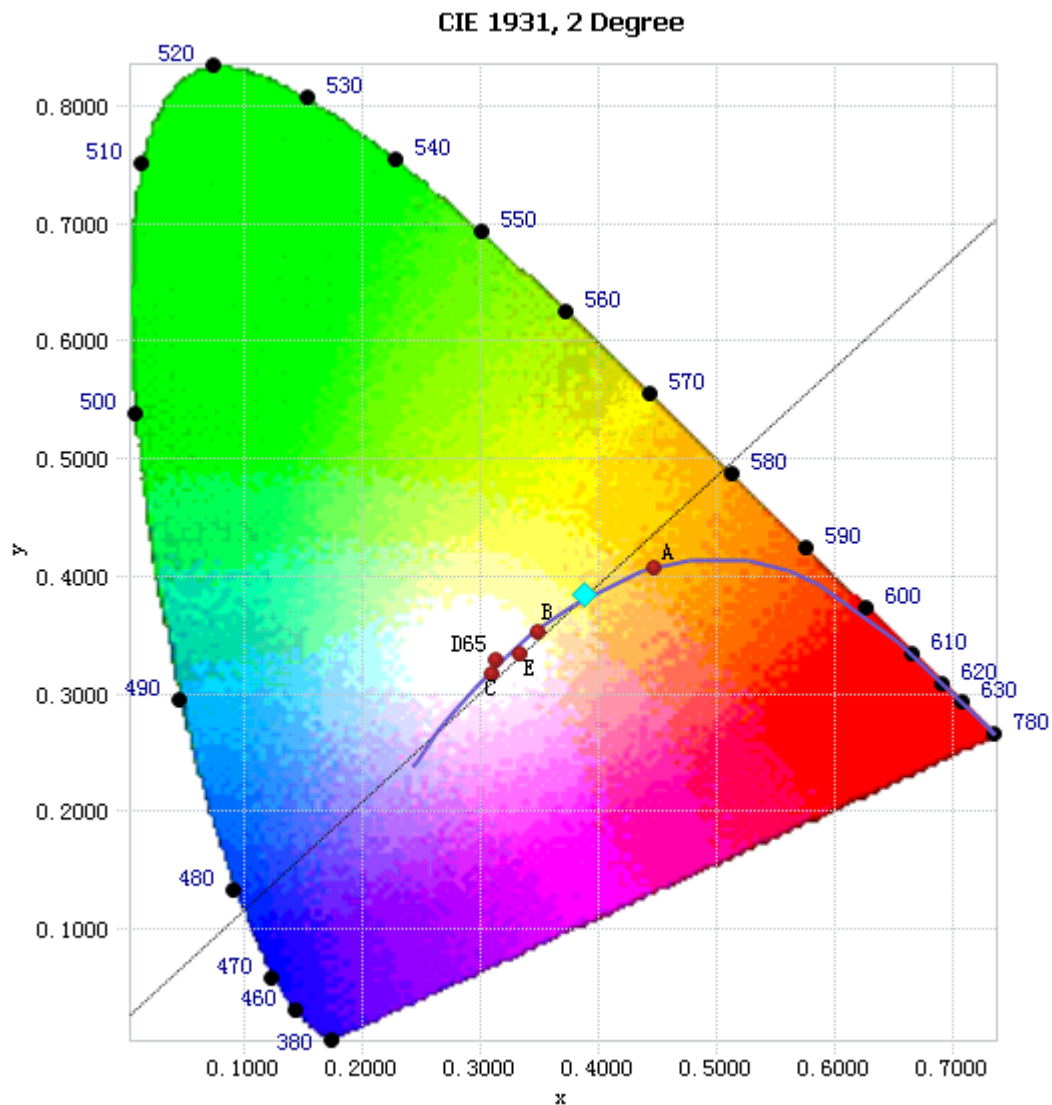


Chart 2: Chromaticity Diagram per Sphere - Spectroradiometer Method

Note: The location on the diagram of the tristimulus coordinates are indicated by the blue diamond.

## Nominal CCT Quadrangles – Sphere Spectroradiometer Method

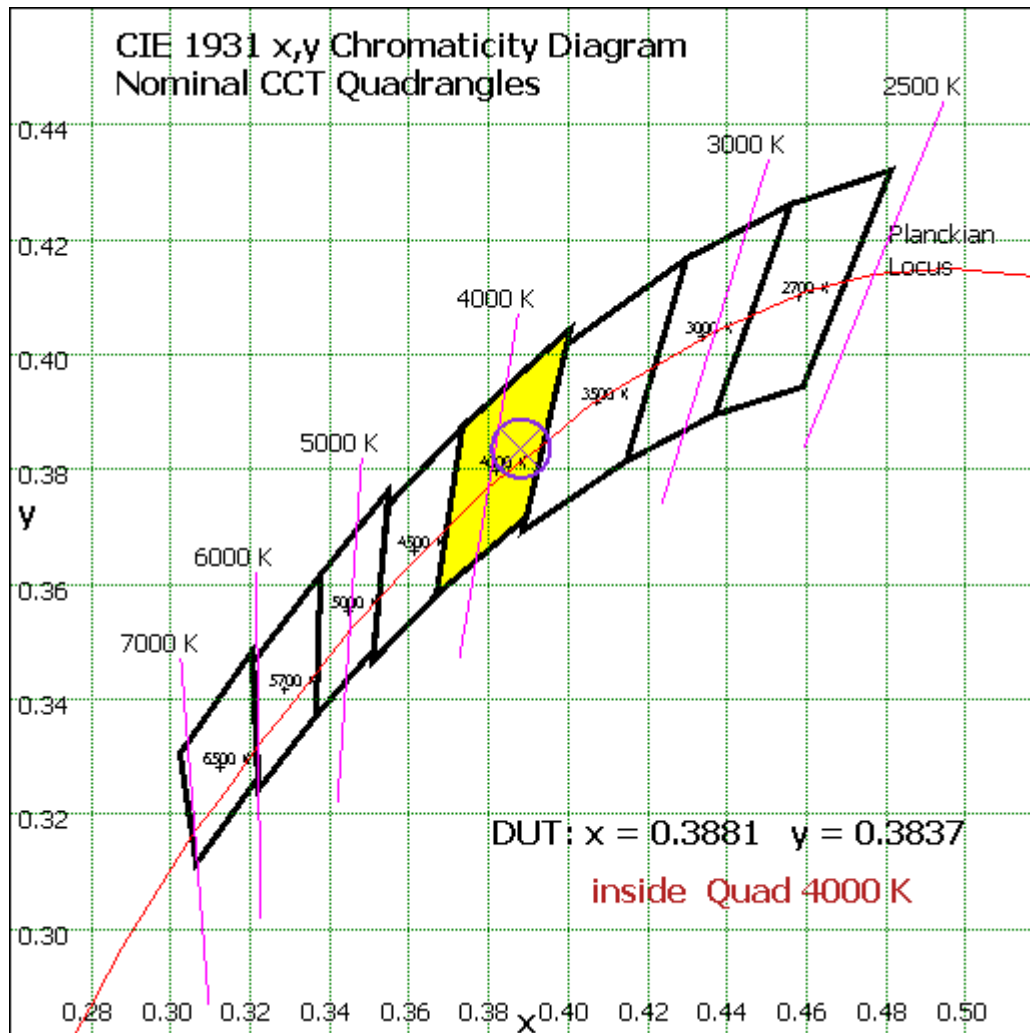


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

### Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	69.83	4.03%
10- 20	197.439	11.40%
20- 30	291.919	16.86%
30- 40	339.024	19.58%
40- 50	328.965	19.00%
50- 60	262.914	15.18%
60- 70	164.378	9.49%
70- 80	64.156	3.70%
80- 90	11.299	0.65%
90-100	0.072	0.00%
100-110	0.098	0.01%
110-120	0.164	0.01%
120-130	0.234	0.01%
130-140	0.315	0.02%
140-150	0.347	0.02%
150-160	0.297	0.02%
160-170	0.197	0.01%
170-180	0.069	0.00%
Total	1731.7	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	1490.091	86.05%
60- 90	239.833	13.85%
0-90	1729.924	99.90%
90- 180	1.793	0.10%
0- 180	1731.7	100%

Table 5: Zonal Lumen Data

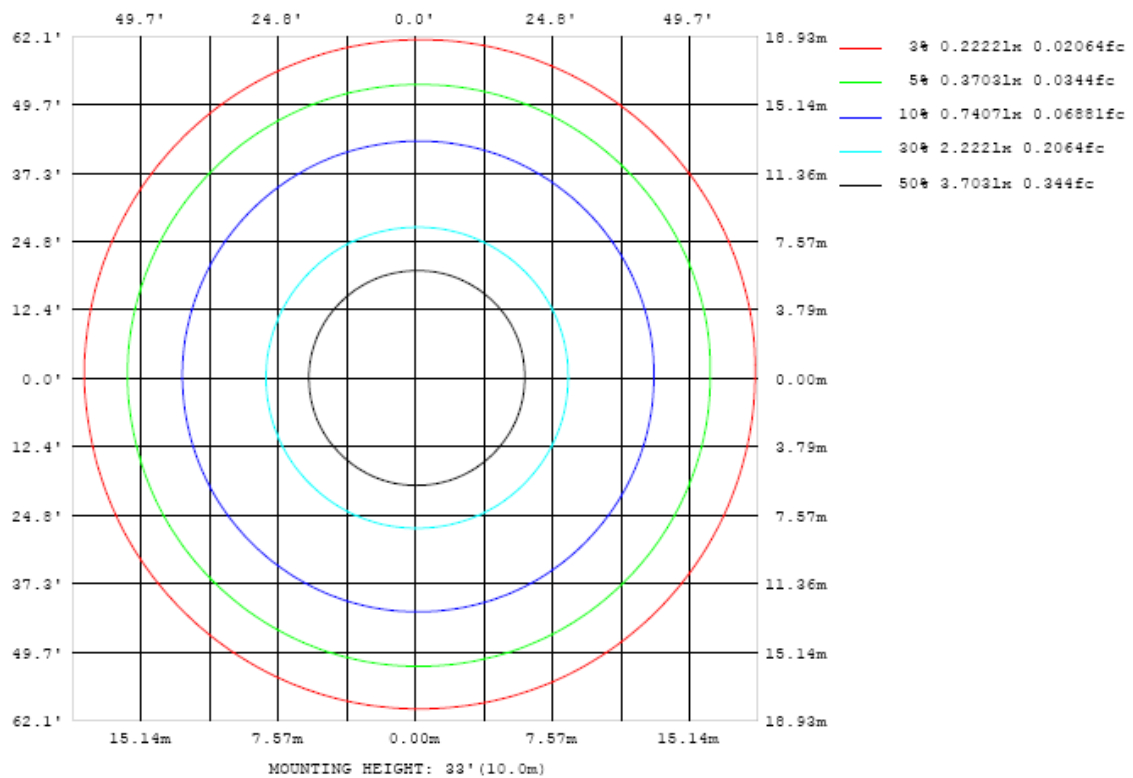


Chart 4: Illuminance Plot (Footcandles)

## Luminous Intensity Distribution Plots- Goniophotometer Method

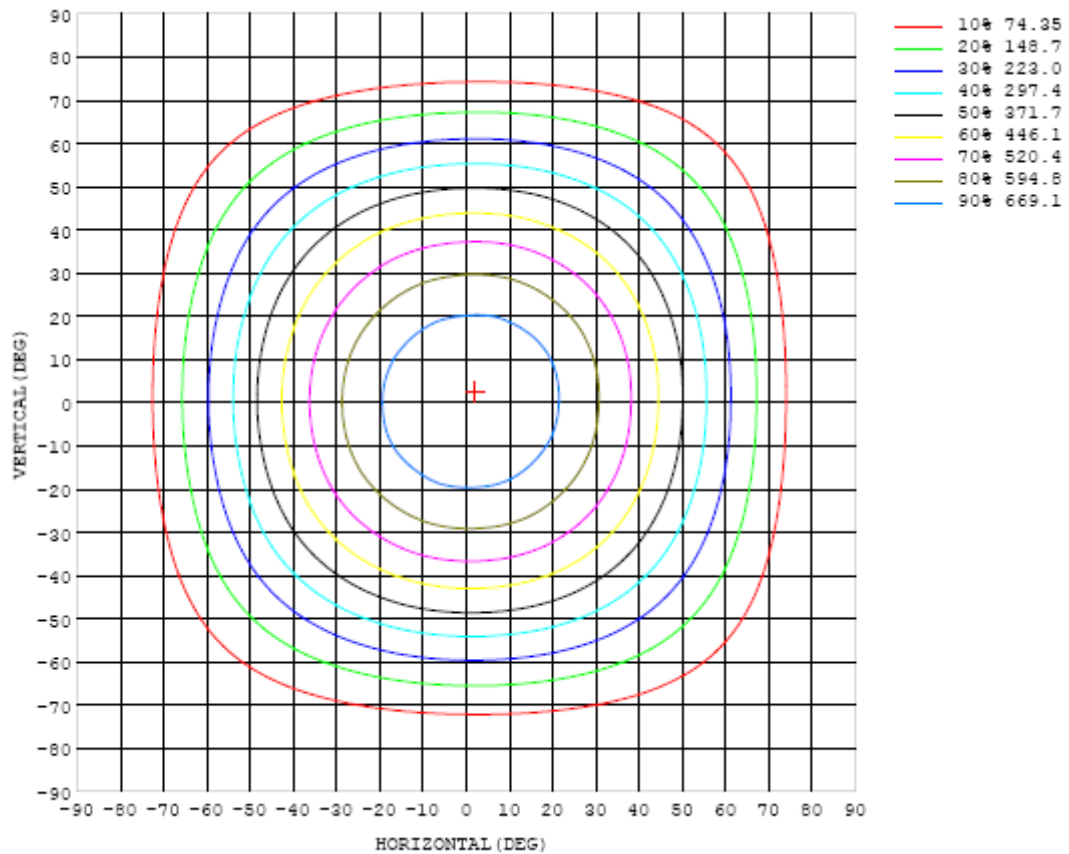


Chart 5: Isocandela Plot

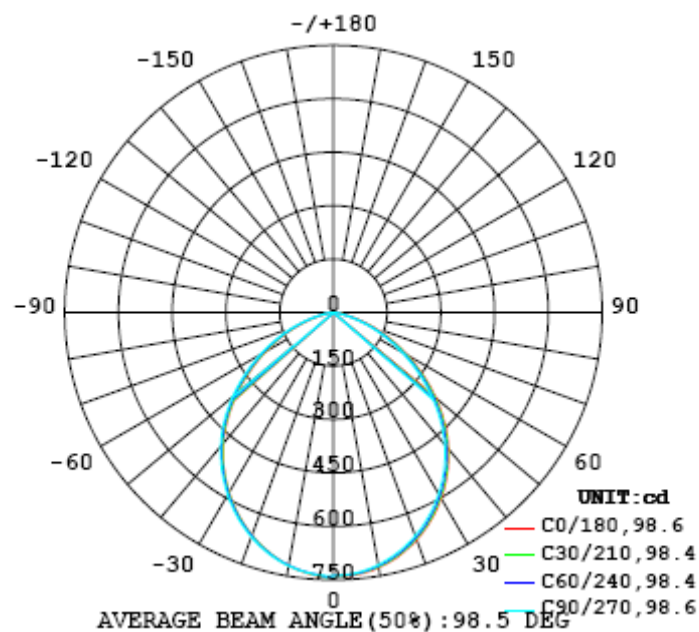


Chart 6: Polar Candela Distribution

## 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	738	738	738	738	738	738	738	738	738	738	738	738	738	738	738	738	738	738	738
5	738	737	736	735	736	735	734	733	732	733	734	735	735	735	735	736	737	738	737
10	726	726	725	724	723	722	722	720	719	718	719	720	720	720	720	721	722	721	721
15	706	706	705	703	702	701	700	699	697	696	697	697	697	697	696	697	698	698	697
20	679	678	677	675	673	672	671	670	667	667	667	667	666	665	666	666	666	665	665
25	643	642	641	640	638	636	635	633	631	630	630	629	628	628	628	628	628	627	627
30	601	601	600	598	596	594	593	591	588	587	586	586	584	583	584	584	583	583	583
35	553	552	552	550	548	546	545	542	540	538	537	536	535	534	534	534	533	533	533
40	500	499	498	496	493	492	490	487	485	483	481	480	479	478	478	478	478	477	479
45	439	438	436	434	432	430	427	425	422	420	419	417	416	414	414	415	414	415	416
50	373	372	370	368	365	363	361	358	355	353	352	350	348	347	347	347	347	348	350
55	305	304	302	300	297	295	292	289	287	285	283	282	280	280	280	280	280	281	283
60	239	237	235	233	230	228	225	223	220	218	217	215	214	214	214	214	214	215	218
65	175	173	171	169	166	164	161	159	156	155	153	152	151	151	151	152	152	153	157
70	116	114	112	110	107	105	103	100	98.1	96.5	95.4	94.5	93.9	93.9	94.3	95.0	95.8	96.9	100
75	65.8	63.4	61.5	59.1	57.1	55.1	53.6	51.1	49.5	48.2	47.4	46.8	46.5	46.6	47.1	47.8	48.8	49.9	52.5
80	27.5	26.2	24.9	23.6	22.3	21.2	20.2	19.3	18.6	18.2	18.0	17.9	17.9	18.2	18.5	18.9	19.5	20.1	21.3
85	11.6	10.9	10.2	9.46	8.76	8.09	7.46	7.00	6.52	6.14	5.97	5.76	5.70	5.73	6.04	6.34	6.69	7.16	8.08
90	0.45	0.20	0.07	0.01	0.01	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
95	0.03	0.03	0.03	0.03	0.03	0.03	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
100	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.07
105	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.11
110	0.11	0.11	0.11	0.11	0.11	0.11	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.15
115	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.18
120	0.19	0.19	0.19	0.19	0.19	0.20	0.20	0.20	0.20	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.22
125	0.24	0.24	0.24	0.24	0.24	0.24	0.25	0.25	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.28
130	0.30	0.30	0.30	0.30	0.30	0.30	0.31	0.31	0.31	0.31	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.36
135	0.37	0.36	0.36	0.36	0.37	0.37	0.37	0.37	0.38	0.38	0.38	0.38	0.38	0.38	0.39	0.38	0.38	0.39	0.47
140	0.44	0.42	0.43	0.43	0.43	0.43	0.43	0.43	0.44	0.44	0.44	0.44	0.45	0.45	0.45	0.45	0.44	0.46	0.56
145	0.51	0.47	0.47	0.47	0.47	0.47	0.47	0.48	0.48	0.48	0.48	0.48	0.48	0.49	0.49	0.49	0.48	0.52	0.65
150	0.56	0.50	0.50	0.50	0.50	0.51	0.51	0.51	0.51	0.51	0.51	0.52	0.52	0.52	0.52	0.52	0.51	0.56	0.71
155	0.61	0.54	0.54	0.54	0.54	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.56	0.56	0.56	0.55	0.61	0.75
160	0.66	0.57	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.59	0.59	0.59	0.59	0.58	0.65	0.77
165	0.71	0.61	0.62	0.63	0.63	0.63	0.63	0.63	0.63	0.64	0.64	0.64	0.64	0.64	0.64	0.63	0.62	0.70	0.76
170	0.74	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.67	0.67	0.67	0.66	0.66	0.73	0.75
175	0.74	0.74	0.72	0.72	0.72	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.74
180	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73

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	738	738	738	738	738	738	738	738	738	738	738	738	738	738	738	738	738		
5	736	735	735	735	733	733	734	734	734	737	738	739	741	742	741	739	739		
10	720	720	720	720	719	719	720	721	721	724	726	726	728	730	730	729	727		
15	697	696	697	696	696	698	699	699	700	703	705	706	707	709	710	709	708		
20	665	665	666	665	666	667	669	669	670	673	676	677	678	681	682	681	680		
25	627	627	628	628	628	630	632	632	634	637	639	641	643	645	647	646	645		
30	583	584	584	584	585	587	589	589	591	594	597	599	601	603	605	604	603		
35	534	535	535	535	536	539	540	541	543	546	549	551	553	555	556	556	555		
40	479	481	481	482	483	486	487	489	491	494	497	499	500	502	504	503	503		
45	418	419	420	422	423	425	428	430	432	435	438	440	441	443	444	444	442		
50	352	354	355	357	358	361	363	365	368	370	373	375	376	378	379	378	377		
55	285	286	289	290	292	295	297	300	302	304	307	308	309	310	311	311	310		
60	220	221	224	225	228	230	233	234	237	239	241	243	244	244	245	244	242		
65	159	161	163	164	166	169	171	173	175	177	179	180	181	181	181	181	179		
70	102	104	106	108	110	112	114	116	118	120	121	122	123	123	123	122	120		
75	54.0	55.8	57.4	59.0	60.9	62.9	64.5	66.2	67.6	68.9	70.1	70.8	71.1	71.1	70.6	69.8	68.2		
80	22.3	23.2	24.2	25.2	26.3	27.4	28.4	29.4	30.2	31.0	31.6	31.9	31.9	31.7	31.3	30.5	29.4		
85	8.69	9.37	10.1	10.7	11.4	12.0	12.6	13.0	13.4	13.7	13.8	13.9	13.9	13.7	13.4	13.0	12.4		
90	0.02	0.01	0.00	0.06	0.24	0.54	0.93	1.29	1.56	1.77	1.96	2.06	2.01	1.87	1.71	1.41	1.06		
95	0.05	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		
100	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.07		
105	0.11	0.11	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.09	0.09	0.10	0.10	0.10	0.10	0.10		
110	0.15	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13		
115	0.18	0.18	0.18	0.18	0.18	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17		
120	0.22	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		
125	0.28	0.28	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	0.26	0.26		
130	0.36	0.36	0.35	0.35	0.35	0.35	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.35		
135	0.46	0.46	0.45	0.45	0.44	0.44	0.44	0.43	0.43	0.43	0.43	0.43	0.43	0.44	0.44	0.44	0.45		
140	0.56	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.53	0.53	0.53	0.53	0.53	0.53	0.54	0.54	0.55		
145	0.65	0.64	0.64	0.64	0.63	0.63	0.63	0.63	0.62	0.62	0.62	0.62	0.62	0.63	0.63	0.63	0.64		
150	0.71	0.71	0.70	0.70	0.70	0.70	0.70	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.71		
155	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.75		
160	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.75	0.75	0.75	0.76	0.76	0.76	0.76	0.76	0.76	0.77		
165	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.77		
170	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76		
175	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74		
180	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73		

Table 7: Luminous Intensity Data

## EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Aug. 23, 2017	Aug. 22, 2018
Digital Power Meter	PF2010A	HZTE028-01	Aug. 10, 2017	Aug. 09, 2018
AC Power Supply	DPS1060	HZTE001-06	Aug. 10, 2017	Aug. 09, 2018
DC Power Supply	WY12010	HZTE004-03	Aug. 10, 2017	Aug. 09, 2018
Temperature Meter	TES1310	HZTE017-01	Aug. 17, 2017	Aug. 16, 2018
Standard source	D908	HZTE012-01	Aug. 15, 2017	Aug. 14, 2018
Integrate Sphere system	2M	HZTE015-01	Aug. 23, 2017	Aug. 22, 2018
Digital Power Meter	WT210	HZTE008-01	Aug. 10, 2017	Aug. 09, 2018
AC Power Supply	PCR 500L	HZTE001-07	Aug. 10, 2017	Aug. 09, 2018
DC Power Supply	IT6154	HZTE004-04	Aug. 10, 2017	Aug. 09, 2018
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 16, 2017	Aug. 15, 2018
Standard source	SCL-1400	HZTE012-02	Aug. 15, 2017	Aug. 14, 2018

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  $4\pi$ . 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 FA19 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 FA19 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**

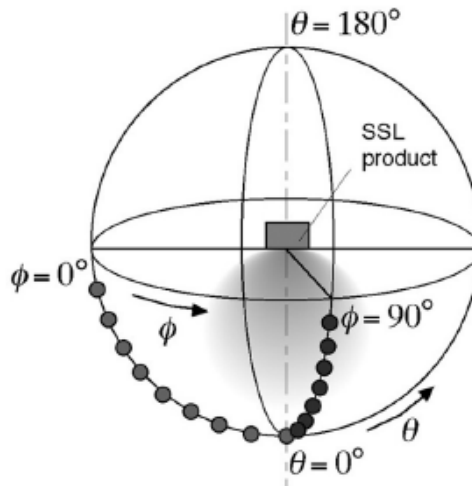
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as 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  $10^\circ$  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 \*\*\*

This report is considered invalidated without the Special Seal for Inspection of the LTL. This report shall not be altered, increased or deleted. The results shown in this test report refer only to the sample(s) tested. Without written approval of LTL, this test report shall not be copied except in full and published as advertisement.