



## LM-79-08 Test Report

for

### GREEN CREATIVE LTD

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

### LED LAMP

**Model: 13PAR30DIM/940FL40**

### Laboratory: Leading Testing Laboratories

**NVLAP CODE: 200960-0**

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Report No.: HZ17020041k

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

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Mar. 07, 2017

Approved by:



*Jim Zhang*

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Mar. 07, 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: 13PAR30DIM/940FL40

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
93.2	1186.0	12.72	0.9477
CCT (K)	CRI	Stabilization Time (Light & Power)	
3827	93.1	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** : Feb. 27, 2017

**Date of Test** : Mar. 02, 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

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## Sample Photos



Figure 1- Overview of the sample

### Equipment Under Test (EUT)

<b>Name</b>	: LED LAMP
<b>Model</b>	: 13PAR30DIM/940FL40
<b>Electrical Ratings</b>	: 120Vac, 60Hz, 13W
<b>Product Description</b>	: E26 base, 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 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 70 minutes.

### Sphere-Spectroradiometer Method

Parameter	Result
Test Voltage (V)	120.0
Voltage frequency (Hz)	60
Test Current (A)	0.112
Power Factor	0.9477
Test Power (W)	12.72
THD A%	28.16
Luminous Efficacy (lm/W)	93.2
Total Luminous Flux (lm)	1186.0
Color Rendering Index (CRI)	93.1
R9	65.4
Correlated Color Temperature (CCT)(K)	3827
Chromaticity Chroma x	0.3898
Chromaticity Chroma y	0.3864
Chromaticity Chroma u	0.2274
Chromaticity Chroma v	0.3381
Duv	0.0016
Chromaticity Chroma u'	0.2274
Chromaticity Chroma v'	0.5071

Special Color Rendering Indices	
R1	93.1
R2	96.6
R3	98.1
R4	91.4
R5	91.8
R6	94.2
R7	93.7
R8	85.6
R9	65.4
R10	90.5
R11	91.5
R12	73.6
R13	94.2
R14	98.7
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)	0.113
Power Factor	0.9466
Test Power (W)	12.85
Luminous Efficacy (lm/W)	94.1
Total Luminous Flux (lm)	1208.6
Beam Angle (°)	34.6
Center Beam Candle Power (cd)	2720
Spacing Criteria	0.56 (0°-180°)/ 0.53(90°-270°)
Zonal Lumens in the 0°-60°Zone	94.88%
Zonal Lumens in the 60°-90°Zone	5.02%
Zonal Lumens in the 90°-120°Zone	0.01%
Zonal Lumens in the 120°-180°Zone	0.09%

Table 3: Test data per Goniophotometer Method

## Spectral Power Distribution - Sphere Spectroradiometer Method

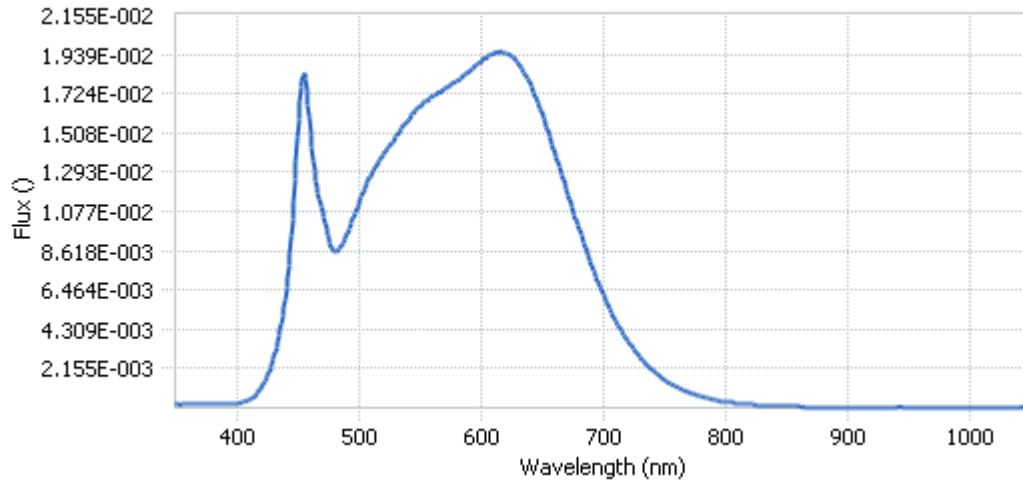


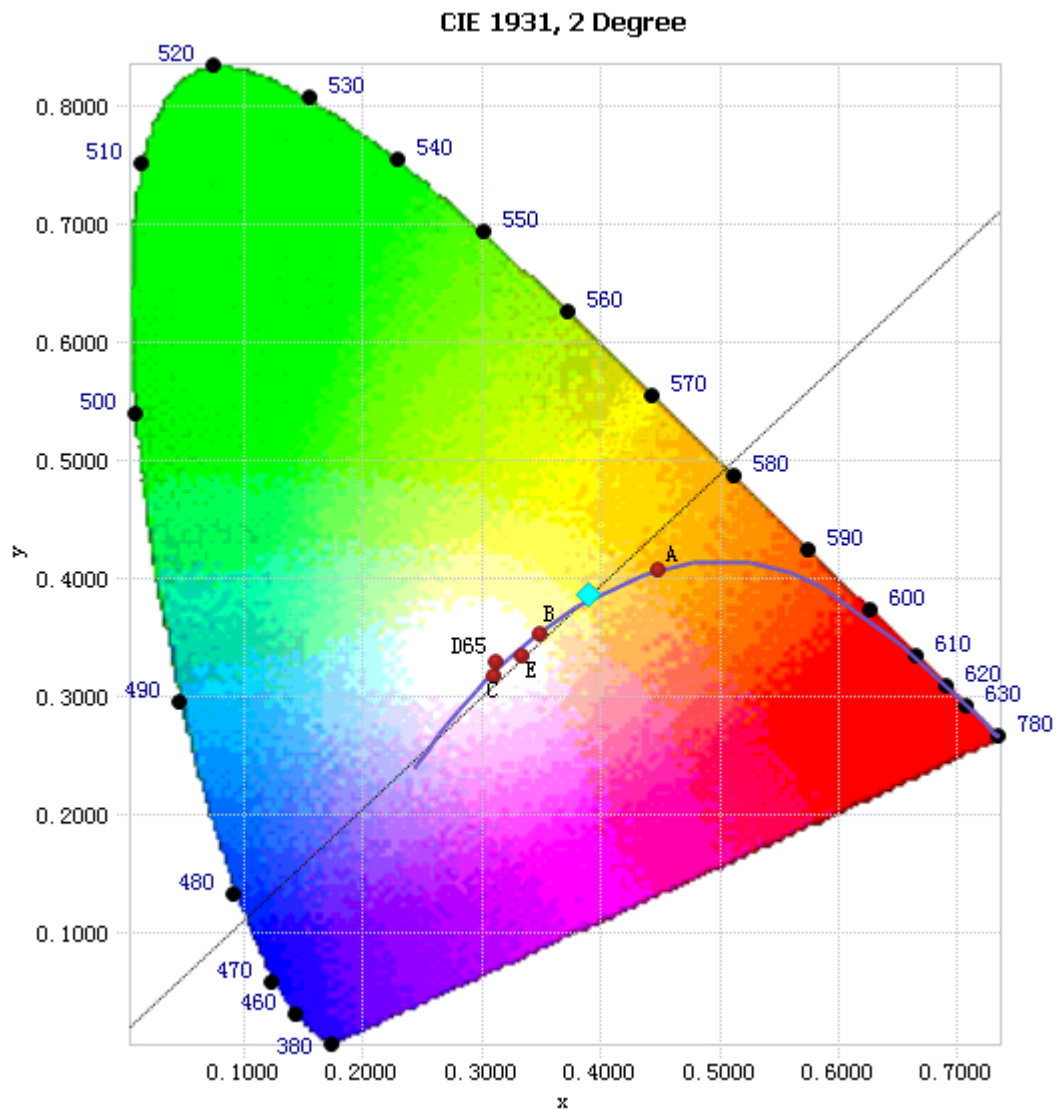
Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.04E-04	485	8.80E-03	590	1.84E-02	695	7.12E-03
385	1.87E-04	490	9.45E-03	595	1.87E-02	700	6.32E-03
390	2.01E-04	495	1.03E-02	600	1.90E-02	705	5.55E-03
395	2.28E-04	500	1.11E-02	605	1.93E-02	710	4.89E-03
400	2.38E-04	505	1.20E-02	610	1.94E-02	715	4.29E-03
405	2.91E-04	510	1.27E-02	615	1.95E-02	720	3.77E-03
410	4.14E-04	515	1.34E-02	620	1.95E-02	725	3.29E-03
415	6.52E-04	520	1.38E-02	625	1.93E-02	730	2.84E-03
420	1.05E-03	525	1.43E-02	630	1.90E-02	735	2.44E-03
425	1.70E-03	530	1.48E-02	635	1.85E-02	740	2.12E-03
430	2.61E-03	535	1.52E-02	640	1.79E-02	745	1.82E-03
435	3.96E-03	540	1.58E-02	645	1.71E-02	750	1.57E-03
440	5.98E-03	545	1.62E-02	650	1.62E-02	755	1.36E-03
445	9.44E-03	550	1.65E-02	655	1.53E-02	760	1.17E-03
450	1.48E-02	555	1.68E-02	660	1.42E-02	765	1.01E-03
455	1.83E-02	560	1.70E-02	665	1.31E-02	770	8.67E-04
460	1.59E-02	565	1.72E-02	670	1.20E-02	775	7.42E-04
465	1.24E-02	570	1.74E-02	675	1.10E-02	780	6.45E-04
470	1.10E-02	575	1.77E-02	680	9.99E-03		
475	9.51E-03	580	1.79E-02	685	8.98E-03		
480	8.59E-03	585	1.82E-02	690	8.02E-03		

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



## Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3898, 0.3864)

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

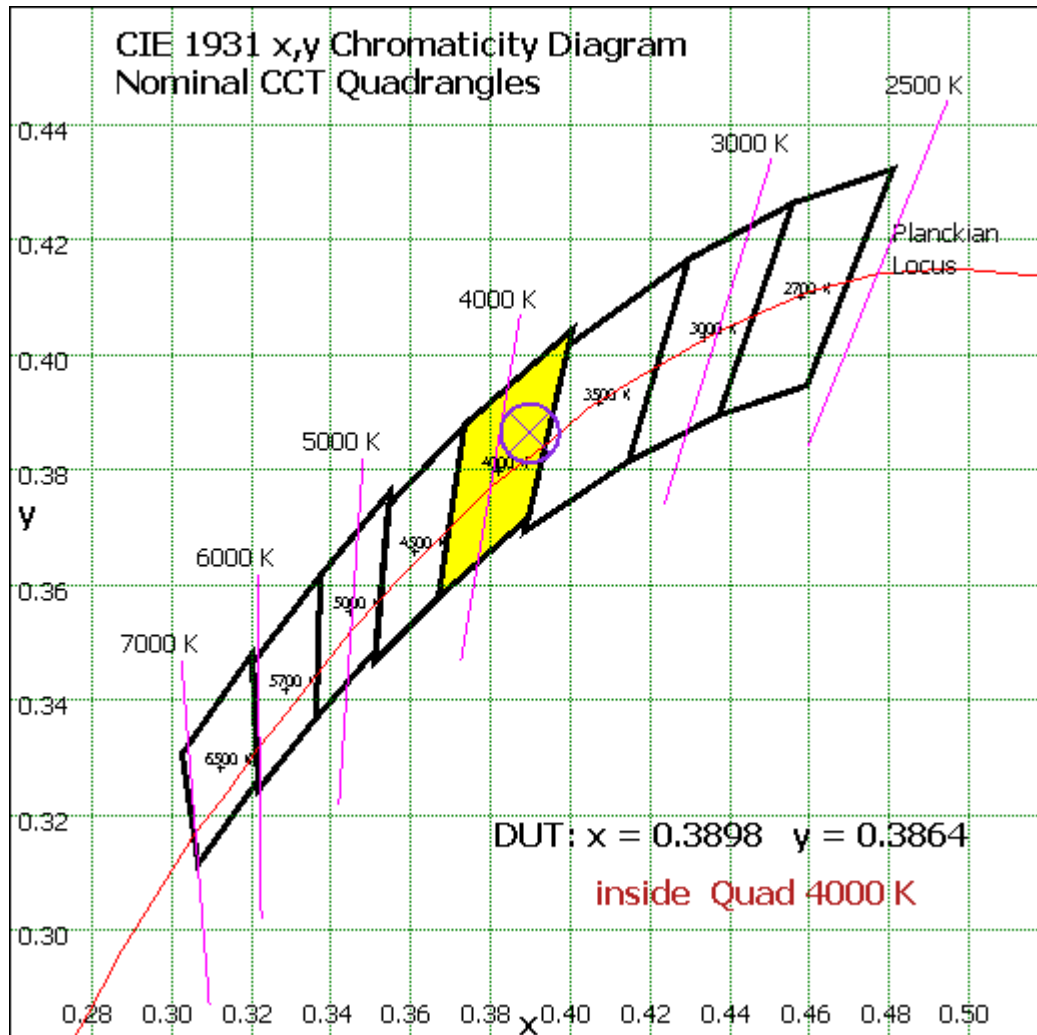


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

### Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	243.476	20.15%
10- 20	455.051	37.65%
20- 30	221.668	18.34%
30- 40	104.699	8.66%
40- 50	71.103	5.88%
50- 60	50.681	4.19%
60- 70	34.825	2.88%
70- 80	20.001	1.65%
80- 90	5.903	0.49%
90-100	0.071	0.01%
100-110	0.01	0.00%
110-120	0.022	0.00%
120-130	0.048	0.00%
130-140	0.144	0.01%
140-150	0.272	0.02%
150-160	0.311	0.03%
160-170	0.225	0.02%
170-180	0.07	0.01%
Total	1208.6	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	1146.678	94.88%
60- 90	60.729	5.02%
0-90	1207.407	99.90%
90- 180	1.173	0.10%
0- 180	1208.6	100%

Table 5: Zonal Lumen Data

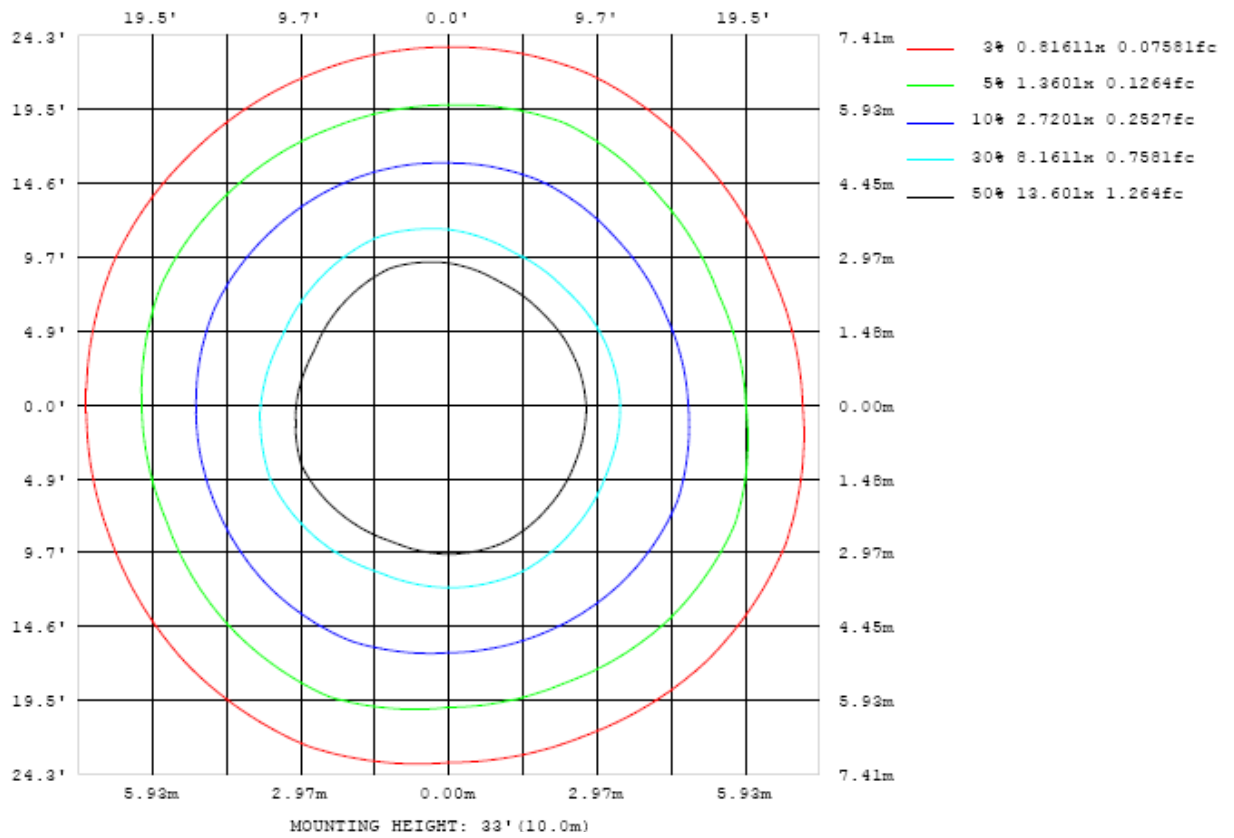


Chart 4: Illuminance Plot (Footcandles)

## Luminous Intensity Distribution Plots- Goniophotometer Method

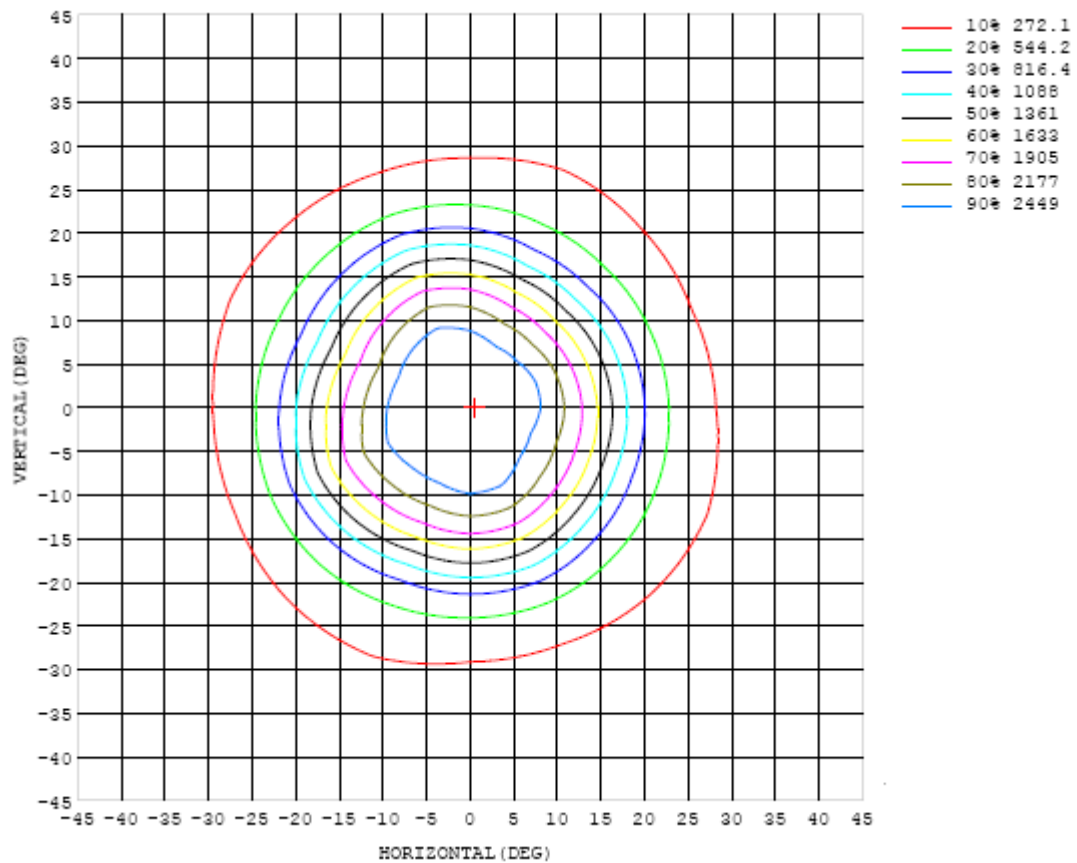


Chart 5: Isocandela Plot

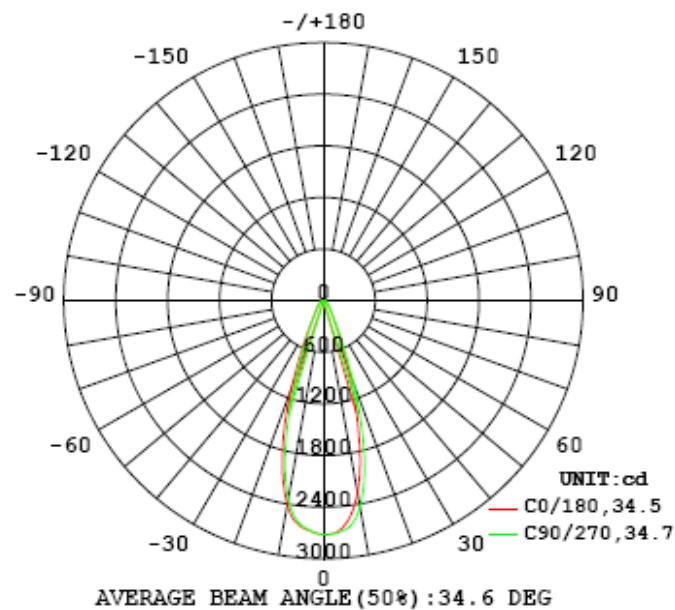


Chart 6: Polar Candela Distribution

## Luminous Intensity Data- Goniophotometer Method

Table--1 UNIT: cd

C (DEG) Y (DEG)	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5			
0	2720	2720	2720	2720	2720	2720	2720	2720	2720	2720	2720	2720	2720	2720	2720	2720			
5	2639	2617	2628	2668	2679	2654	2634	2641	2654	2661	2678	2672	2639	2616	2624	2649			
10	2269	2238	2293	2415	2436	2393	2418	2469	2407	2344	2393	2436	2341	2217	2194	2245			
15	1571	1602	1682	1796	1820	1793	1874	1969	1840	1716	1762	1811	1676	1497	1453	1509			
20	822	831	897	1002	1010	984	1090	1193	1085	952	964	998	885	755	731	778			
25	399	440	449	462	470	496	522	537	513	483	458	448	422	410	381	374			
30	228	262	256	243	248	285	273	254	257	272	252	239	237	250	227	216			
35	153	168	167	160	160	178	174	165	165	169	163	160	159	162	152	147			
40	111	119	119	116	116	123	125	121	117	118	116	117	117	116	112	109			
45	86.9	91.2	92.2	90.7	90.1	94.6	96.2	93.7	89.8	92.4	92.1	94.0	91.8	91.1	88.6	85.7			
50	68.3	71.1	71.4	71.7	72.4	75.3	78.4	76.4	72.0	74.2	72.9	73.4	72.8	70.7	68.7	66.8			
55	53.5	54.1	55.0	55.8	57.4	58.2	60.0	58.3	56.8	56.8	55.8	55.9	56.4	54.8	54.1	52.8			
60	42.8	43.0	43.5	44.5	45.7	45.7	46.3	45.5	44.7	44.9	44.2	44.3	44.7	43.8	43.0	42.4			
65	33.7	33.8	34.4	35.4	36.2	36.5	36.7	36.1	35.6	35.5	35.1	35.2	35.0	34.5	33.9	33.4			
70	25.4	25.5	26.1	27.0	27.6	28.2	28.3	27.9	27.7	27.2	26.9	26.7	26.3	25.9	25.4	25.0			
75	17.6	17.7	18.3	19.2	19.7	20.3	20.4	20.2	20.1	19.4	19.2	18.9	18.3	17.8	17.4	17.2			
80	10.3	10.6	11.3	12.0	12.5	13.0	13.2	13.0	12.9	12.3	12.0	11.5	11.0	10.5	10.1	9.98			
85	4.01	4.38	4.85	5.42	5.98	6.30	6.48	6.45	6.35	5.84	5.41	4.95	4.49	4.08	3.83	3.78			
90	0.15	0.22	0.28	0.41	0.66	0.95	1.08	1.05	0.90	0.65	0.37	0.26	0.22	0.23	0.20	0.17			
95	0.00	0.00	0.02	0.03	0.02	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00			
100	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01			
105	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.02			
110	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02			
115	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.02	0.03	0.03	0.03	0.03	0.03			
120	0.04	0.04	0.04	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.04	0.04	0.04	0.04	0.04			
125	0.06	0.06	0.06	0.04	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.07	0.07	0.07	0.07	0.07			
130	0.13	0.12	0.11	0.06	0.06	0.05	0.05	0.06	0.06	0.06	0.07	0.13	0.14	0.14	0.14	0.14			
135	0.26	0.24	0.22	0.12	0.11	0.10	0.10	0.11	0.11	0.11	0.12	0.25	0.26	0.27	0.27	0.27			
140	0.43	0.43	0.40	0.19	0.18	0.17	0.17	0.18	0.18	0.19	0.20	0.40	0.42	0.43	0.44	0.44			
145	0.63	0.63	0.58	0.29	0.27	0.27	0.27	0.26	0.26	0.26	0.26	0.57	0.61	0.62	0.63	0.63			
150	0.82	0.83	0.77	0.36	0.33	0.34	0.34	0.34	0.33	0.33	0.33	0.75	0.80	0.81	0.82	0.82			
155	0.98	1.00	0.92	0.43	0.40	0.40	0.41	0.42	0.42	0.42	0.39	0.88	0.96	0.96	0.97	0.97			
160	1.07	1.09	0.98	0.50	0.48	0.48	0.49	0.49	0.49	0.49	0.45	0.97	1.06	1.07	1.07	1.07			
165	1.10	1.13	0.98	0.53	0.52	0.53	0.54	0.54	0.55	0.56	0.51	0.99	1.11	1.11	1.11	1.10			
170	1.05	1.09	0.90	0.56	0.56	0.57	0.58	0.58	0.57	0.56	0.53	0.84	1.03	1.03	1.04	1.04			
175	0.91	0.89	0.67	0.54	0.55	0.56	0.57	0.57	0.57	0.59	0.61	0.60	0.85	0.86	0.87	0.88			
180	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67			

Table 6: Luminous Intensity Data

## EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Jul. 27, 2016	Jul. 26, 2017
Digital Power Meter	PF2010A	HZTE028-01	Jul. 27, 2016	Jul. 26, 2017
AC Power Supply	PCR 500L	HZTE001-08	Jul. 27, 2016	Jul. 26, 2017
DC Power Supply	WY12010	HZTE004-03	Jul. 27, 2016	Jul. 26, 2017
Temperature Meter	TES1310	HZTE017-01	Jul. 27, 2016	Jul. 26, 2017
Standard source	D908	HZTE012-01	Jul. 27, 2016	Jul. 26, 2017
Integrate Sphere system	2M	HZTE015-01	Jul. 27, 2016	Jul. 26, 2017
Digital Power Meter	WT210	HZTE008-01	Jul. 27, 2016	Jul. 26, 2017
AC Power Supply	PCR 500L	HZTE001-07	Jul. 27, 2016	Jul. 26, 2017
DC Power Supply	6154	HZTE004-04	Jul. 27, 2016	Jul. 26, 2017
Temperature and humidity recorder	JR900	HZTE018-01	Jul. 27, 2016	Jul. 26, 2017
Standard source	SCL-1400	HZTE012-02	Jul. 27, 2016	Jul. 26, 2017

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 1.06% 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 1.94% 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 \*\*\*

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