Quality Assured

NVLAP LAB CODE 200960-0

LM-79-08 Test Report

For

GREEN CREATIVE LTD

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

LED commercial downlight

Model: 45CDLA9.5/830/277V

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ16020003f/R1

This report is replaced the old report No. HZ16020003f dated Mar. 25, 2016

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

Reviewed by:

Engineer: April Zou

Mar. 31, 2016

Approved by:

Manager: Jim Zhang

Mar. 31, 2016

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: **45CDLA9.5/830/277V**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
88.1	3812.0	43.26	0.9928

CCT (K)	CRI	Stabilization Time (Light & Power)
3121	83.3	65

Table 1: Executive Data Summary

Note: The above results are recorded/ derived from measurements made using an Integrating Sphere.

Test specifications:

Date of Receipt : Mar. 16, 2016

Date of Test : Mar. 23, 2016

Test item : Total Luminous Flux, Luminous Distribution Intensity, Luminous Efficacy, Correlated Color Temperature, Color Rendering Index, Chromaticity Coordinate, Electrical parameters, Color Uniformity

Reference Standard : IESNA LM-79-2008 Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products

TABLE OF CONTENT

Sample Photos

Sample view

Equipment Under Test (EUT)	
Name	: LED commercial downlight
Model	: 45CDLA9.5/830/277V
Electrical Ratings	: 120-277VAC, 60Hz, 45W
Product Description	: 3000K, Non-dimmable, CRI80 Manufacturer of LED light source: Lextar Electronics Corp Model of LED light source: PC35H11
Manufacturer	: GREEN CREATIVE LTD
Address	: 756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai

TEST RESULTS

Test ambient temperature was 25.1℃.

Test orientation was Light down. Test was conducted without a dimmer in the circuit.

The stabilization time of the sample was 65 minutes, and the total operating time including stabilization was 70 minutes.

Sphere-Spectroradiometer Method

Parameter	Result	
Test Voltage (V)	120.0	277.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.363	0.170
Power Factor	0.9928	0.9250
Test Power (W)	43.26	43.56
THD A%	9.71	17.86
Luminous Efficacy (lm/W)	88.1	90.2
Total Luminous Flux (lm)	3812.0	3904.0
Color Rendering Index (CRI)	83.3	
R9	9.9	
Correlated Color Temperature (CCT)(K)	3121	
Chromaticity Chroma x	0.4256	
Chromaticity Chroma y	0.3948	
Chromaticity Chroma u	0.2472	
Chromaticity Chroma v	0.3440	
Duv	0.0025	
Chromaticity Chroma u ’	0.2472	
Chromaticity Chroma v’	0.5160	

Special Color Rendering Indices	
R1	82.3
R2	92.5
R3	95.1
R4	81
R5	82.8
R6	90.7
R7	82.3
R8	59.9
R9	9.9
R10	82.8
R11	80.5
R12	74.9
R13	85
R14	98.1

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 24.1℃.

The photometric distance is 2.475m.

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)	0.369
Power Factor	0.9927
Test Power (W)	43.91
Luminous Efficacy (lm/W)	89.6
Total Luminous Flux (lm)	3932.2
Beam Angle (°)	102.5
Center Beam Candle Power (cd)	1591
Spacing Criteria	1.19(0°-180°)/1.19(90°-270°)
Zonal Lumens in the 0°-60°Zone	83.48%
Zonal Lumens in the 60°-90°Zone	16.45%
Zonal Lumens in the 90°-120°Zone	0.02%
Zonal Lumens in the 120°-180°Zone	0.05%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

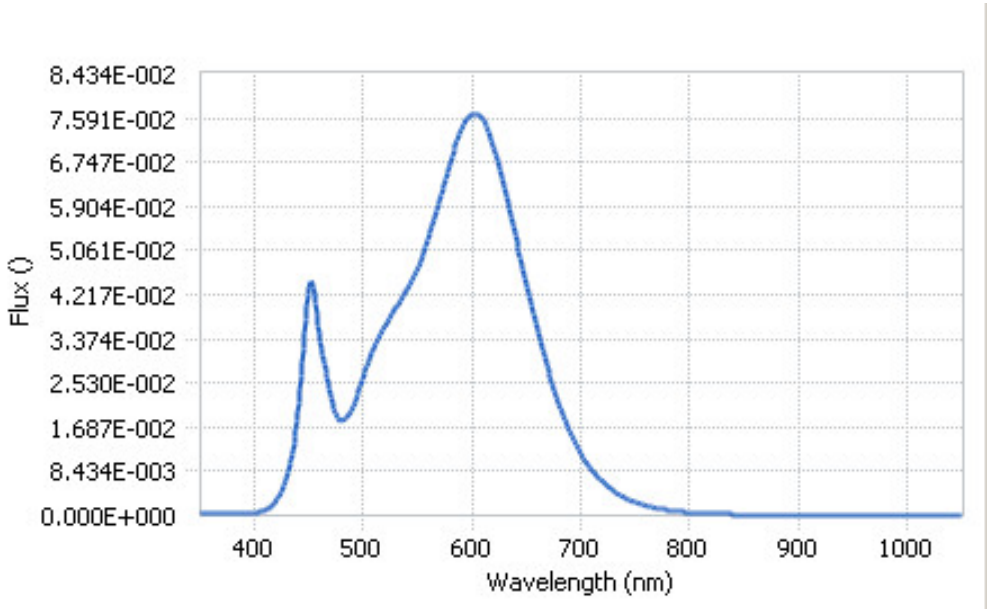
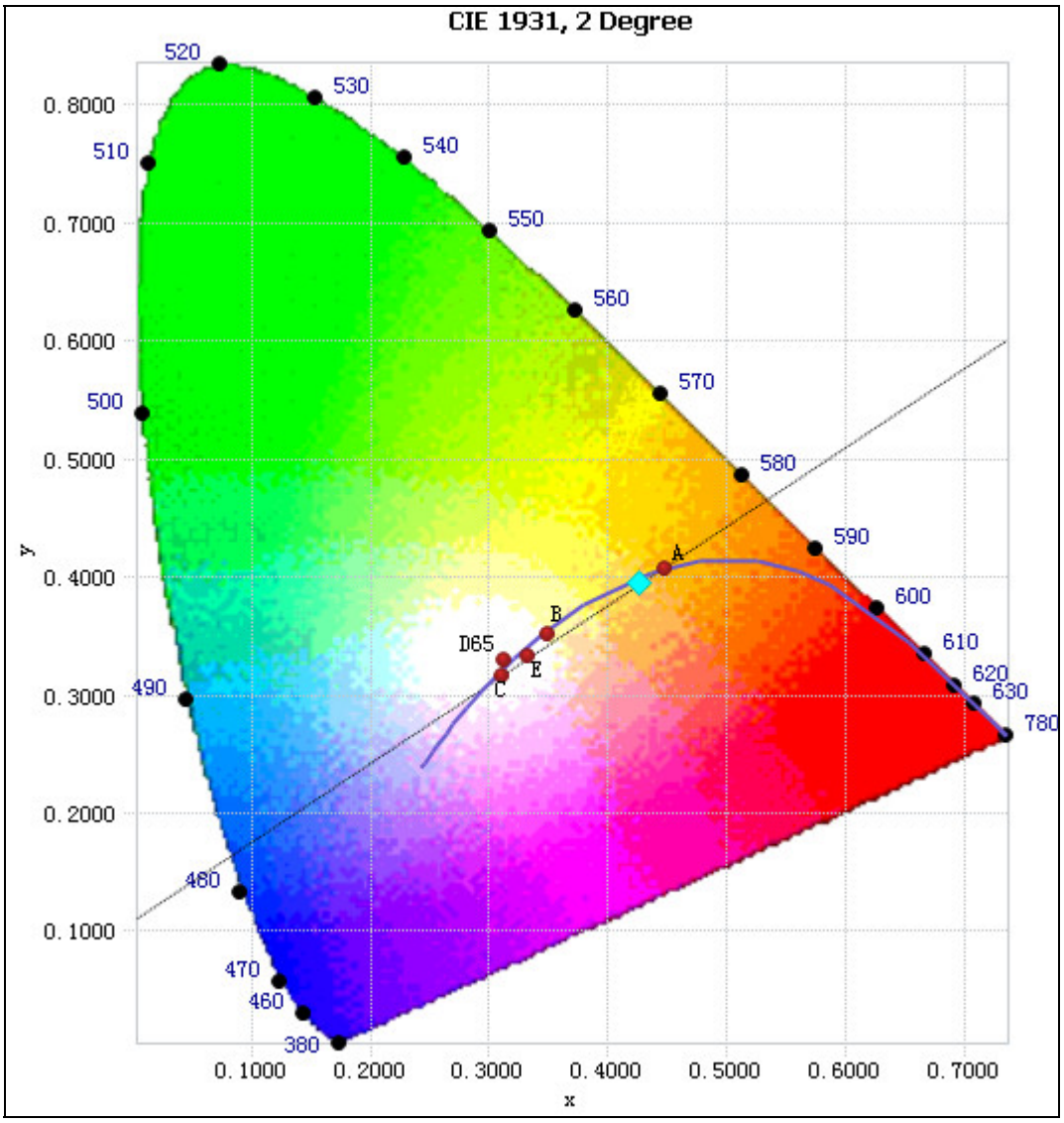


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	4.88E-04	485	1.88E-02	590	7.35E-02	695	1.39E-02
385	5.06E-04	490	2.06E-02	595	7.56E-02	700	1.19E-02
390	5.28E-04	495	2.33E-02	600	7.65E-02	705	1.02E-02
395	5.09E-04	500	2.64E-02	605	7.66E-02	710	8.72E-03
400	5.92E-04	505	2.95E-02	610	7.56E-02	715	7.51E-03
405	6.96E-04	510	3.22E-02	615	7.35E-02	720	6.47E-03
410	1.00E-03	515	3.45E-02	620	7.02E-02	725	5.53E-03
415	1.67E-03	520	3.63E-02	625	6.68E-02	730	4.73E-03
420	2.92E-03	525	3.82E-02	630	6.24E-02	735	4.04E-03
425	4.93E-03	530	3.96E-02	635	5.79E-02	740	3.43E-03
430	7.99E-03	535	4.13E-02	640	5.34E-02	745	2.94E-03
435	1.26E-02	540	4.32E-02	645	4.89E-02	750	2.54E-03
440	1.97E-02	545	4.52E-02	650	4.43E-02	755	2.17E-03
445	3.19E-02	550	4.72E-02	655	3.98E-02	760	1.86E-03
450	4.35E-02	555	5.02E-02	660	3.55E-02	765	1.61E-03
455	4.20E-02	560	5.30E-02	665	3.15E-02	770	1.37E-03
460	3.32E-02	565	5.65E-02	670	2.78E-02	775	1.19E-03
465	2.79E-02	570	6.02E-02	675	2.43E-02	780	1.01E-03
470	2.34E-02	575	6.40E-02	680	2.13E-02		
475	1.93E-02	580	6.74E-02	685	1.85E-02		
480	1.81E-02	585	7.09E-02	690	1.61E-02		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y) : (0.4256,0.3948)

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

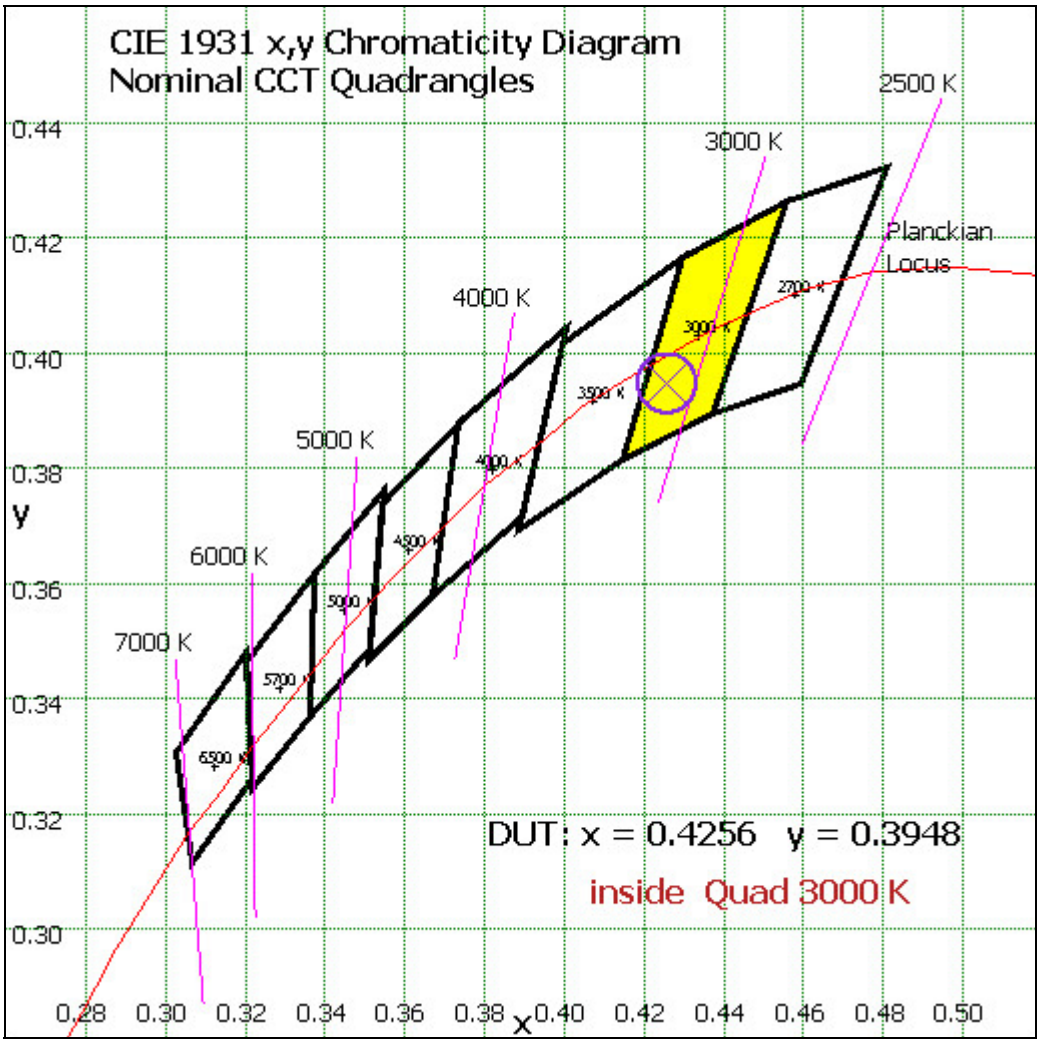


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Zonal Lumen Tabulation- Goniophotometer Method

γ(°)	Lumens	% Total
0- 10	150.058	3.82%
10- 20	424.14	10.79%
20- 30	626.493	15.93%
30- 40	728.74	18.53%
40- 50	726.742	18.48%
50- 60	626.429	15.93%
60- 70	430.717	10.95%
70- 80	191.172	4.86%
80- 90	24.894	0.63%
90-100	0.169	0.00%
100-110	0.236	0.01%
110-120	0.322	0.01%
120-130	0.405	0.01%
130-140	0.488	0.01%
140-150	0.48	0.01%
150-160	0.366	0.01%
160-170	0.233	0.01%
170-180	0.084	0.00%
Total	3932.2	100%

γ(°)	Lumens	% Total
0- 60	3282.602	83.48%
60- 90	646.783	16.45%
0-90	3929.385	99.93%
90- 180	2.783	0.07%
0- 180	3932.2	100%

Table 4: Zonal Lumen Data

Illuminance Plots- Goniophotometer Method

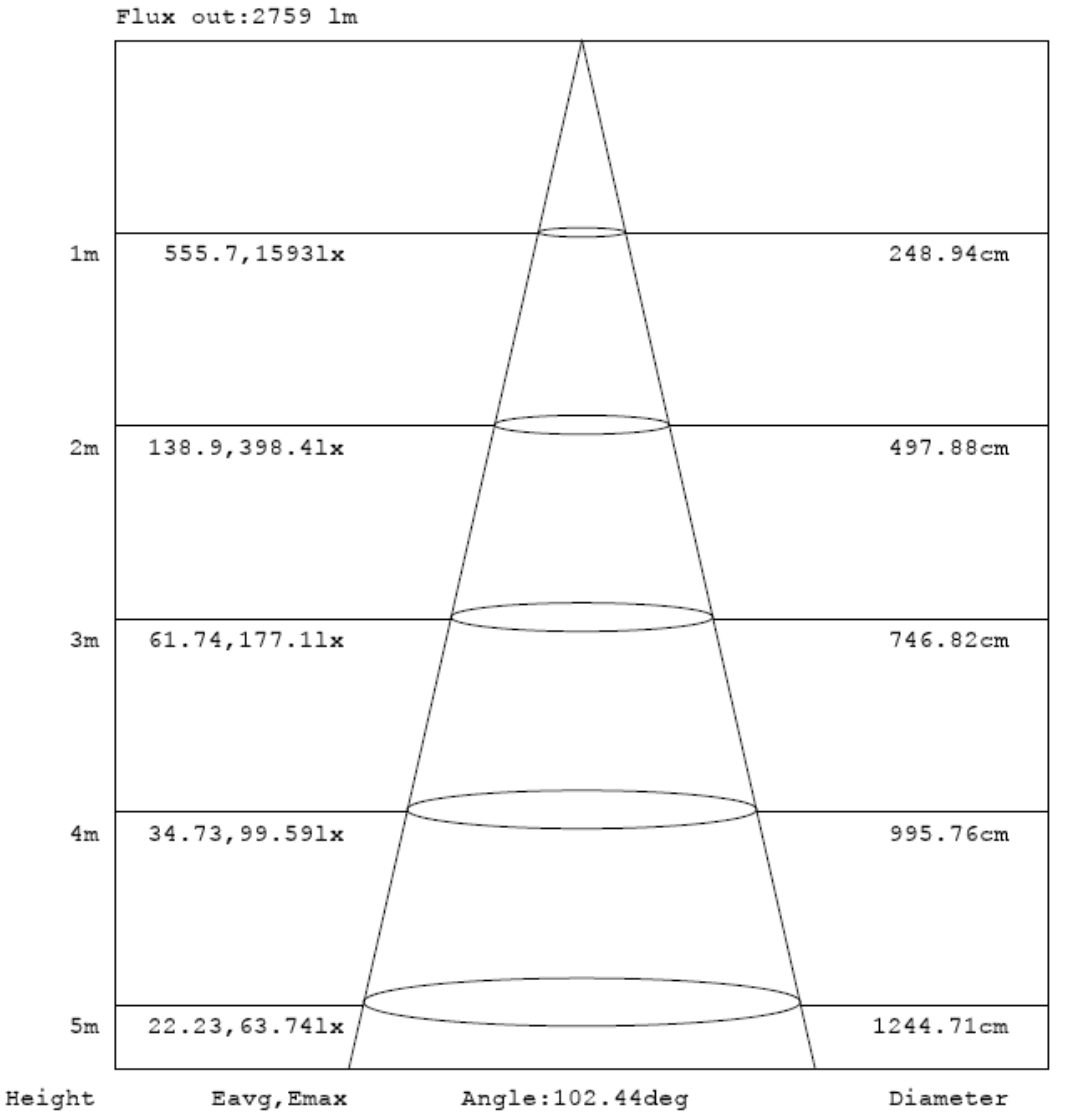


Chart 4: Beam Angle

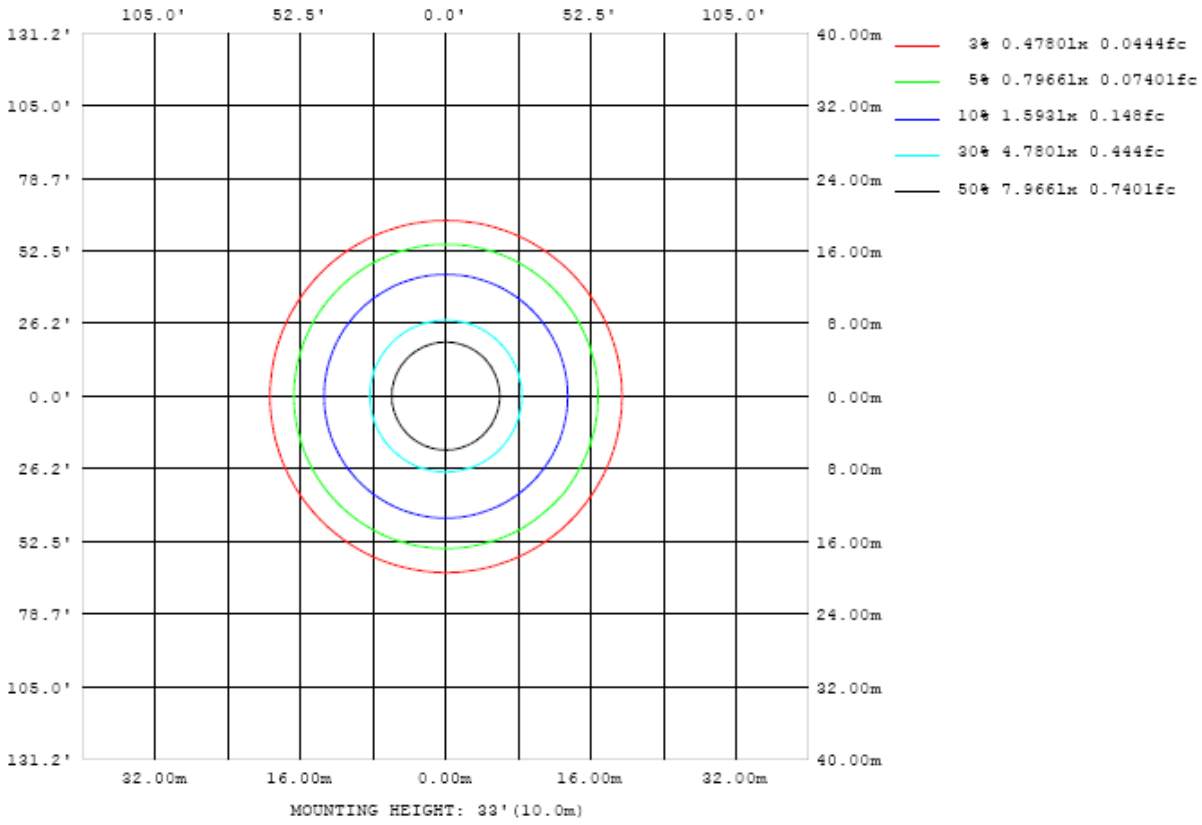


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

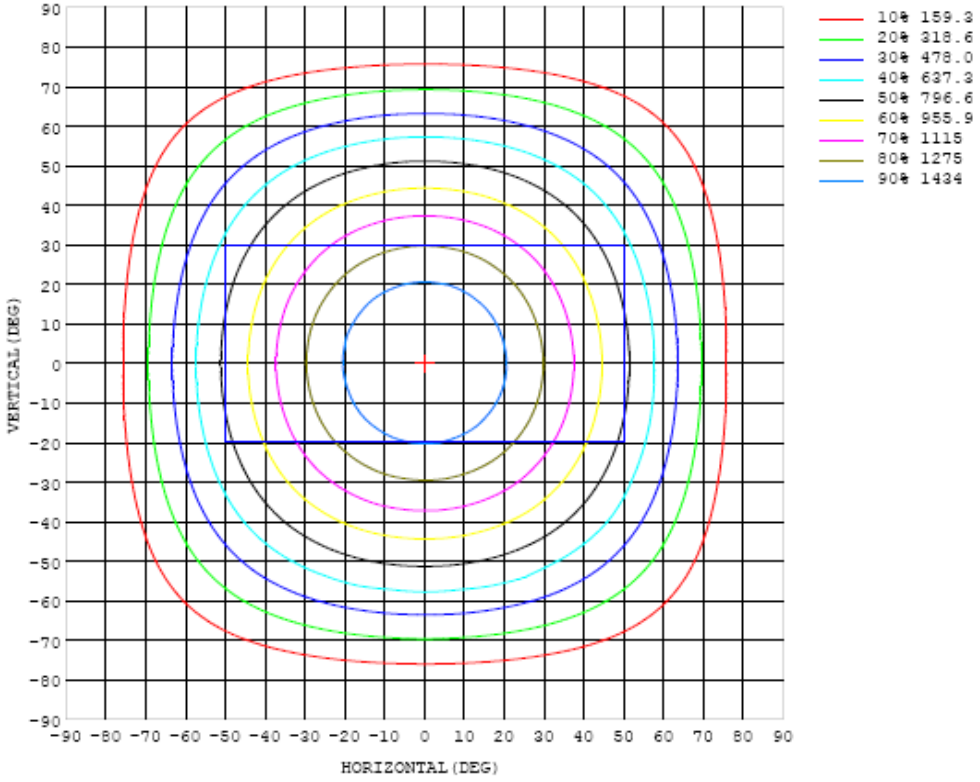


Chart 6: Isocandela Plot

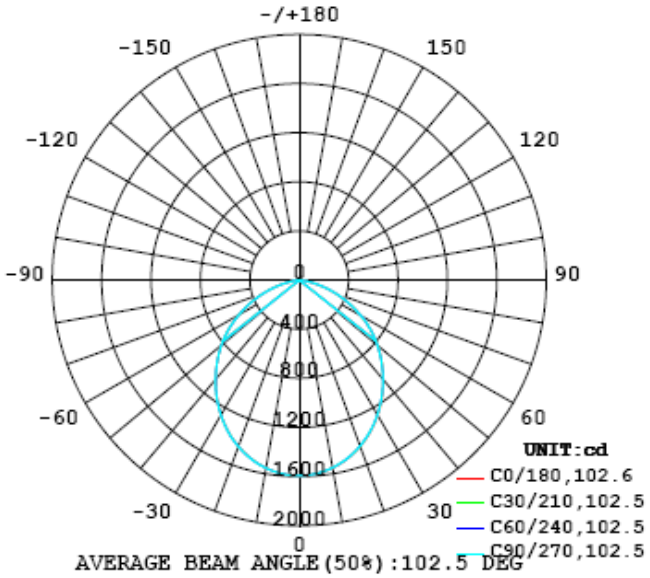


Chart 7: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1 UNIT: cd

C (DEG) / γ (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	1591	1591	1591	1591	1591	1591	1591	1591	1591	1591	1591	1591	1591	1591	1591	1591	1591	1591	1591
5	1582	1581	1581	1581	1581	1581	1581	1580	1581	1581	1581	1580	1581	1581	1581	1581	1581	1582	1582
10	1553	1552	1551	1551	1551	1551	1551	1550	1551	1551	1551	1551	1551	1551	1552	1552	1552	1553	1552
15	1506	1505	1503	1504	1504	1503	1503	1502	1503	1502	1503	1503	1503	1503	1504	1504	1505	1506	1505
20	1441	1441	1440	1440	1439	1438	1437	1437	1438	1438	1438	1437	1438	1439	1440	1440	1440	1442	1441
25	1362	1362	1360	1360	1359	1358	1358	1357	1358	1357	1358	1358	1358	1359	1360	1360	1360	1361	1361
30	1270	1270	1268	1267	1267	1266	1265	1265	1265	1266	1265	1266	1266	1267	1268	1267	1268	1268	1268
35	1167	1167	1166	1165	1165	1164	1163	1162	1163	1163	1164	1164	1164	1165	1165	1165	1166	1165	1165
40	1058	1058	1056	1056	1056	1055	1054	1054	1054	1055	1055	1054	1055	1055	1055	1055	1055	1056	1055
45	944	944	944	943	942	942	942	941	941	941	942	941	941	942	942	941	942	942	941
50	829	829	828	828	828	827	827	827	826	827	827	826	826	827	827	826	826	826	825
55	705	705	705	705	705	704	705	704	704	704	704	704	703	703	703	702	702	701	700
60	572	572	572	571	578	572	572	572	572	572	571	571	570	570	570	569	568	567	568
65	438	439	439	439	439	439	439	439	439	439	439	438	438	438	437	436	435	434	434
70	306	306	306	307	307	307	307	308	307	307	307	307	306	306	304	304	303	302	303
75	180	180	181	181	182	182	182	182	182	182	182	181	180	180	179	178	178	177	178
80	72.3	72.7	73.1	73.4	73.8	73.8	74.0	74.2	74.1	73.8	73.6	73.4	72.9	72.4	72.0	71.6	71.0	70.7	71.8
85	16.5	16.6	16.8	16.8	16.9	17.0	17.0	17.0	17.0	17.0	16.9	16.7	16.6	16.4	16.2	16.0	15.9	15.8	16.7
90	0.18	0.21	0.22	0.23	0.23	0.24	0.24	0.25	0.22	0.22	0.22	0.20	0.18	0.22	0.16	0.15	0.14	0.13	0.19
95	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.20
100	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.22
105	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	0.17	0.17	0.17	0.17	0.17	0.28
110	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	0.34
115	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.39
120	0.32	0.32	0.32	0.32	0.32	0.31	0.31	0.31	0.31	0.31	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.45
125	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.52
130	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.60
135	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.72
140	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.83
145	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.90
150	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.94
155	0.62	0.63	0.62	0.63	0.63	0.63	0.63	0.63	0.62	0.62	0.63	0.62	0.62	0.63	0.62	0.62	0.63	0.63	0.94
160	0.65	0.66	0.65	0.65	0.66	0.66	0.66	0.66	0.66	0.65	0.65	0.65	0.65	0.66	0.65	0.65	0.65	0.65	0.93
165	0.71	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.71	0.71	0.72	0.72	0.72	0.72	0.71	0.92
170	0.77	0.77	0.77	0.77	0.78	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.94
175	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.88	0.87	0.87	0.88	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.94
180	0.89	0.89	0.89	0.89	0.87	0.86	0.86	0.86	0.87	0.88	0.88	0.87	0.88	0.88	0.87	0.89	0.90	0.90	0.88

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	1591	1591	1591	1591	1591	1591	1591	1591	1591	1591	1591	1591	1591	1591	1591	1591	1591		
5	1582	1582	1582	1582	1583	1582	1583	1583	1583	1583	1583	1583	1583	1583	1582	1582	1582		
10	1553	1553	1554	1554	1554	1554	1554	1555	1554	1555	1554	1555	1555	1555	1554	1553	1554		
15	1506	1506	1505	1506	1506	1507	1507	1507	1508	1508	1507	1507	1508	1508	1507	1507	1506		
20	1441	1442	1441	1442	1442	1442	1442	1442	1443	1444	1443	1443	1443	1444	1443	1443	1442		
25	1362	1362	1362	1361	1362	1363	1363	1363	1364	1364	1362	1364	1365	1365	1364	1363	1363		
30	1268	1268	1268	1268	1268	1269	1269	1270	1270	1271	1271	1271	1271	1272	1271	1271	1271		
35	1165	1165	1165	1165	1165	1166	1166	1166	1167	1167	1167	1168	1169	1169	1169	1169	1168		
40	1055	1054	1054	1054	1055	1055	1055	1055	1057	1057	1057	1058	1059	1059	1059	1059	1059		
45	941	940	940	940	940	940	940	941	942	942	942	943	944	945	945	945	945		
50	824	824	824	824	824	824	824	824	825	825	826	827	828	828	829	829	829		
55	700	699	698	698	697	698	698	698	699	700	700	702	703	704	705	705	705		
60	566	566	565	564	564	564	564	564	565	566	566	568	569	570	571	572	573		
65	433	432	431	430	430	430	430	430	431	432	432	434	435	436	437	438	439		
70	301	301	300	299	299	299	299	299	300	300	301	302	303	304	305	306	307		
75	177	176	176	176	175	175	175	175	176	176	176	177	178	179	179	180	181		
80	71.3	70.9	70.6	70.2	70.1	70.1	69.8	70.1	70.1	70.1	70.5	70.7	71.1	71.7	72.2	72.9	73.3		
85	16.7	16.6	16.6	16.5	16.4	16.4	16.4	16.3	16.3	16.3	16.4	16.5	16.6	16.7	16.9	17.1	17.4		
90	0.19	0.18	0.18	0.18	0.18	0.17	0.17	0.17	0.17	0.17	0.18	0.18	0.18	0.20	0.21	0.23	0.24		
95	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.19		
100	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22		
105	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	0.28	0.28	0.28	0.28		
110	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34		
115	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		
120	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45		
125	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52		
130	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60		
135	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		
140	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83		
145	0.90	0.91	0.90	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.90	0.91	0.91		
150	0.94	0.94	0.94	0.95	0.95	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.95	0.95		
155	0.95	0.95	0.96	0.96	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.96	0.95		
160	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94		
165	0.93	0.93	0.93	0.93	0.93	0.93	0.92	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93		
170	0.94	0.94	0.95	0.94	0.95	0.95	0.95	0.94	0.94	0.95	0.94	0.95	0.95	0.94	0.95	0.95	0.95		
175	0.94	0.94	0.94	0.94	0.94	0.95	0.94	0.95	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94		
180	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.89	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88		

Table 7: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Jul. 17, 2015	Jul. 16, 2016
Digital Power Meter	PF2010A	HZTE028-01	Jul. 17, 2015	Jul. 16, 2016
AC Power Supply	PCR 500L	HZTE001-08	Jul. 17, 2015	Jul. 16, 2016
DC Power Supply	WY12010	HZTE004-03	Jul. 17, 2015	Jul. 16, 2016
Temperature Meter	TES1310	HZTE017-01	Jul. 17, 2015	Jul. 16, 2016
Standard source	D908	HZTE012-01	Jul. 23, 2015	Jul. 22, 2016
Integrate Sphere system	2M	HZTE015-01	Jul. 16, 2015	Jul. 15, 2016
Digital Power Meter	WT210	HZTE008-01	Jul. 17, 2015	Jul. 16, 2016
AC Power Supply	PCR 500L	HZTE001-07	Jul. 17, 2015	Jul. 16, 2016
DC Power Supply	6154	HZTE004-04	Jul. 17, 2015	Jul. 16, 2016
Temperature and humidity recorder	JR900	HZTE018-01	Jul. 21, 2015	Jul. 20, 2016
Standard source	SCL-1400	HZTE012-02	Oct. 21, 2015	Oct. 20, 2016

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 BR30s) 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 expended uncertainty is 1.39% 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 BR30s) 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 1.8% with a coverage factor k=2.

Color Characteristics Measurements

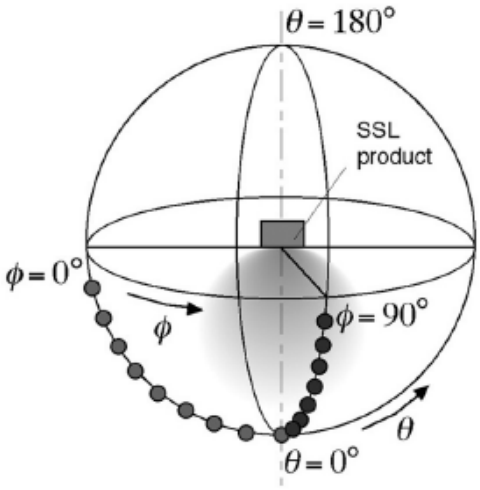
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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