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: 45CDLA9.5/835/277V

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

No.1805, DongLiu road, BinJiang District, Hangzhou, China

Tel: +86-571-56680806

www.ledtestlab.com

Report No.: HZ16020003g/R1

This report is replaced the old report No. HZ16020003g 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: **45CDLA9.5/835/277V**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
89.6	3948.0	44.08	0.9929

CCT (K)	CRI	Stabilization Time (Light & Power)
3378	83.2	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 downlight
Model	: 45CDLA9.5/835/277V
Electrical Ratings	: 120-277VAC, 60Hz, 45W
Product Description	: 3500K, 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 25.2℃.

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)	0.370	0.173
Power Factor	0.9929	0.9254
Test Power (W)	44.08	44.31
THD A%	9.63	17.87
Luminous Efficacy (lm/W)	89.6	90.2
Total Luminous Flux (lm)	3948.0	4048.0
Color Rendering Index (CRI)	83.2	
R9	7.6	
Correlated Color Temperature (CCT)(K)	3378	
Chromaticity Chroma x	0.4141	
Chromaticity Chroma y	0.3987	
Chromaticity Chroma u	0.2381	
Chromaticity Chroma v	0.3439	
Duv	0.0011	
Chromaticity Chroma u ’	0.2381	
Chromaticity Chroma v’	0.5158	

Special Color Rendering Indices	
R1	81.3
R2	90.8
R3	96.7
R4	81.1
R5	81.5
R6	88.4
R7	84.4
R8	61.2
R9	7.6
R10	78.8
R11	80.2
R12	68.9
R13	83.6
R14	98.7

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 24.2℃.

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)	0.375
Power Factor	0.9927
Test Power (W)	44.69
Luminous Efficacy (lm/W)	91.2
Total Luminous Flux (lm)	4074.1
Beam Angle (°)	102.0
Center Beam Candle Power (cd)	1657
Spacing Criteria	1.18(0°-180°)/1.18(90°-270°)
Zonal Lumens in the 0°-60°Zone	83.55%
Zonal Lumens in the 60°-90°Zone	16.38%
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

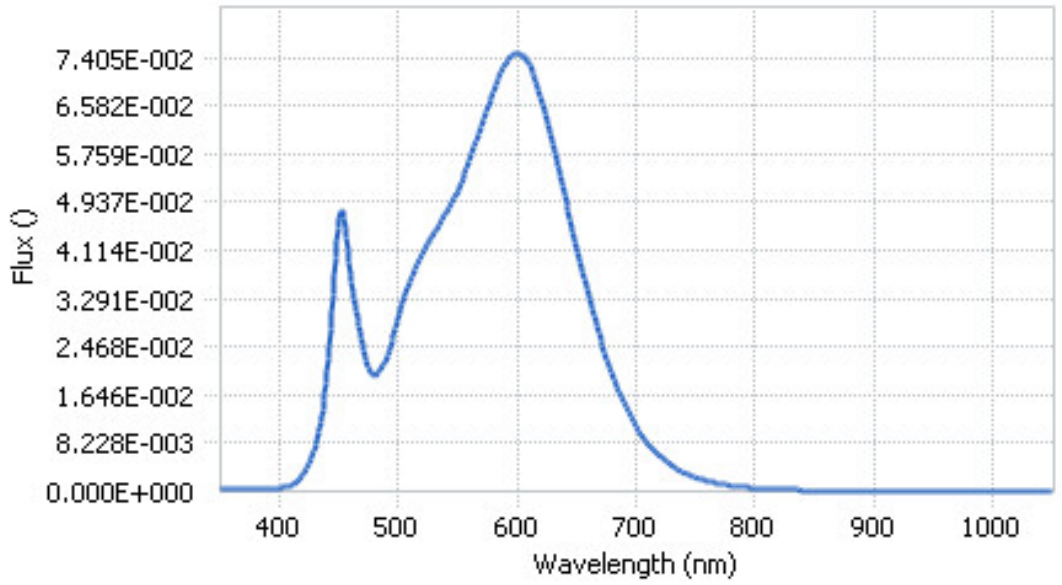
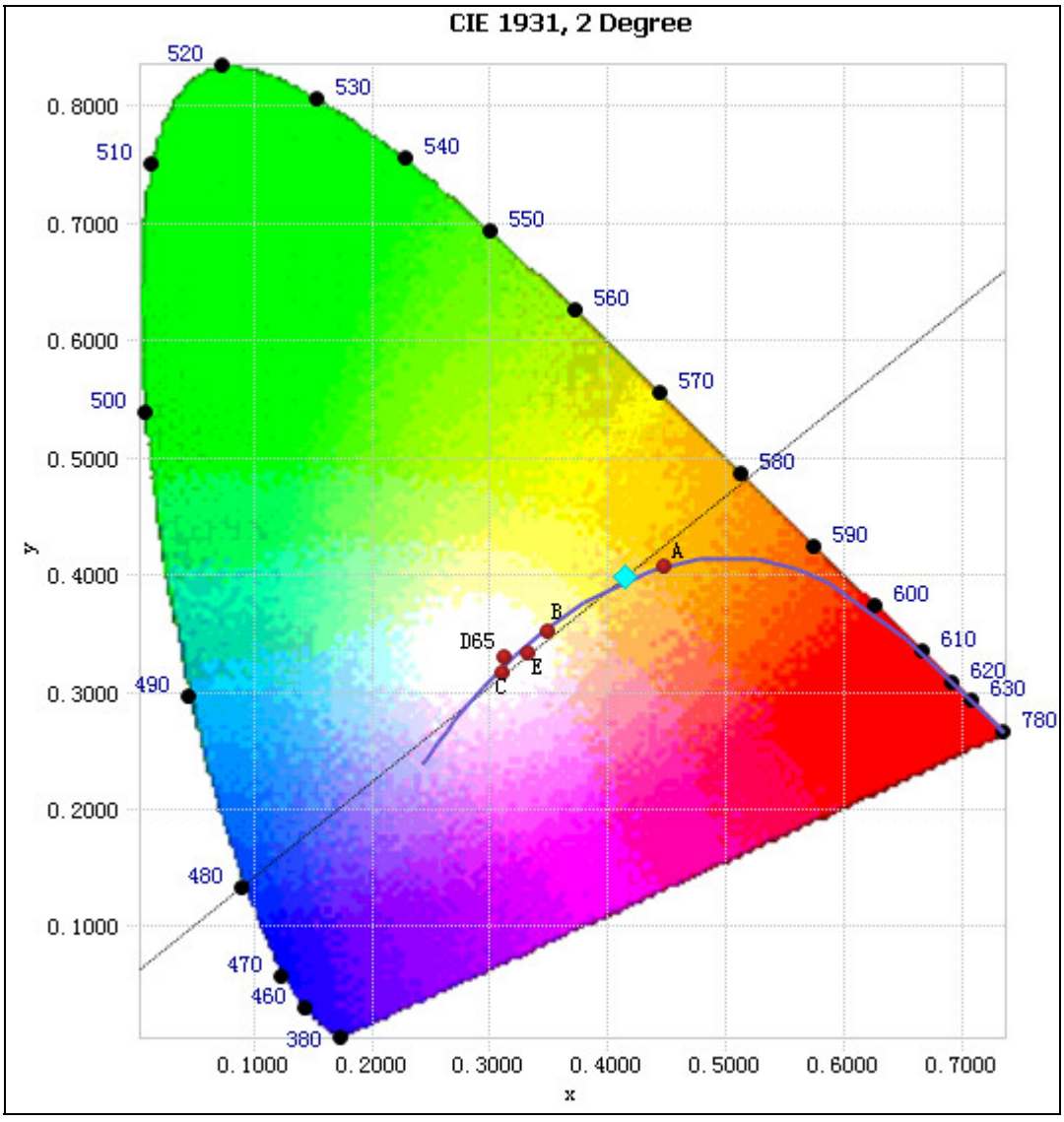


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	4.95E-04	485	2.08E-02	590	7.30E-02	695	1.30E-02
385	4.99E-04	490	2.30E-02	595	7.42E-02	700	1.11E-02
390	5.47E-04	495	2.61E-02	600	7.46E-02	705	9.52E-03
395	5.32E-04	500	2.97E-02	605	7.42E-02	710	8.14E-03
400	6.03E-04	505	3.32E-02	610	7.28E-02	715	7.04E-03
405	7.36E-04	510	3.62E-02	615	7.05E-02	720	6.05E-03
410	1.02E-03	515	3.88E-02	620	6.71E-02	725	5.19E-03
415	1.72E-03	520	4.07E-02	625	6.35E-02	730	4.43E-03
420	3.01E-03	525	4.25E-02	630	5.92E-02	735	3.78E-03
425	5.04E-03	530	4.40E-02	635	5.49E-02	740	3.23E-03
430	8.15E-03	535	4.56E-02	640	5.04E-02	745	2.75E-03
435	1.30E-02	540	4.75E-02	645	4.62E-02	750	2.35E-03
440	2.04E-02	545	4.94E-02	650	4.17E-02	755	2.05E-03
445	3.36E-02	550	5.13E-02	655	3.75E-02	760	1.75E-03
450	4.64E-02	555	5.40E-02	660	3.34E-02	765	1.51E-03
455	4.51E-02	560	5.66E-02	665	2.96E-02	770	1.29E-03
460	3.55E-02	565	5.96E-02	670	2.61E-02	775	1.11E-03
465	2.99E-02	570	6.26E-02	675	2.28E-02	780	9.66E-04
470	2.51E-02	575	6.57E-02	680	1.99E-02		
475	2.09E-02	580	6.83E-02	685	1.73E-02		
480	1.99E-02	585	7.11E-02	690	1.50E-02		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y) : (0.4141,0.3987)

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

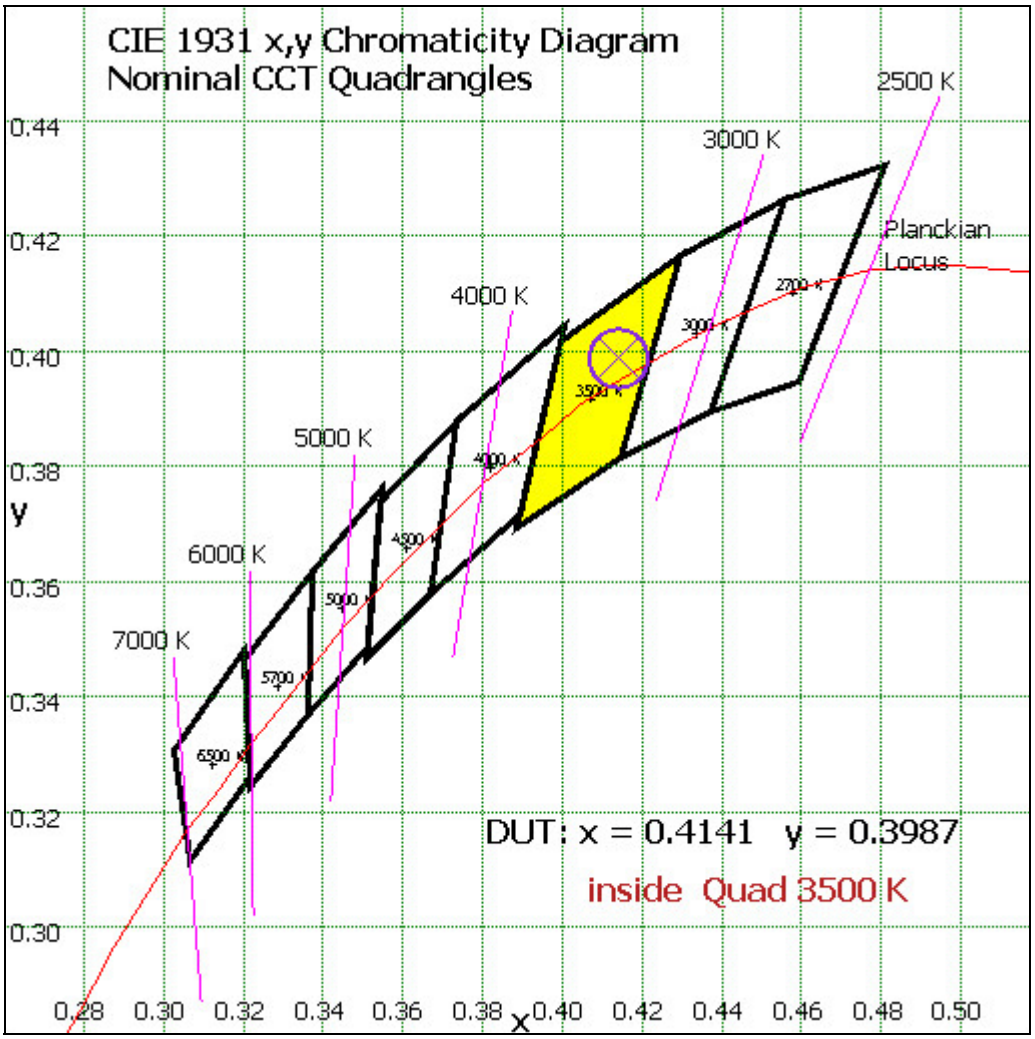


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Zonal Lumen Tabulation- Goniophotometer Method

γ(°)	Lumens	% Total
0- 10	156.267	3.84%
10- 20	441.39	10.83%
20- 30	651.103	15.98%
30- 40	756.025	18.56%
40- 50	752.137	18.46%
50- 60	646.902	15.88%
60- 70	443.989	10.90%
70- 80	197.629	4.85%
80- 90	25.789	0.63%
90-100	0.16	0.00%
100-110	0.243	0.01%
110-120	0.332	0.01%
120-130	0.415	0.01%
130-140	0.506	0.01%
140-150	0.499	0.01%
150-160	0.38	0.01%
160-170	0.242	0.01%
170-180	0.087	0.00%
Total	4074.1	100%

γ(°)	Lumens	% Total
0- 60	3403.824	83.55%
60- 90	667.407	16.38%
0-90	4071.231	99.93%
90- 180	2.864	0.07%
0- 180	4074.1	100%

Table 4: Zonal Lumen Data

Illuminance Plots- Goniophotometer Method

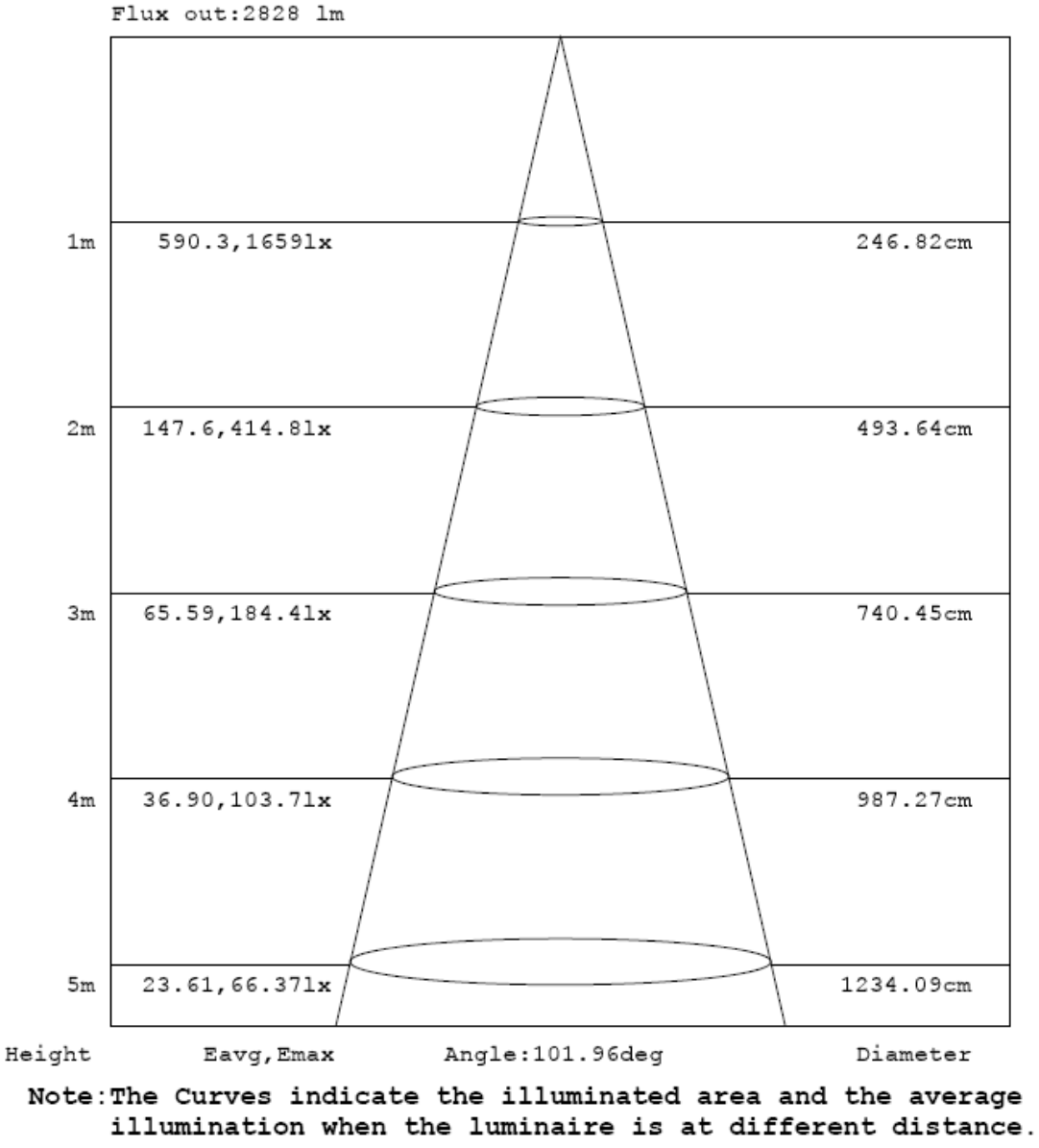


Chart 4: Beam Angle

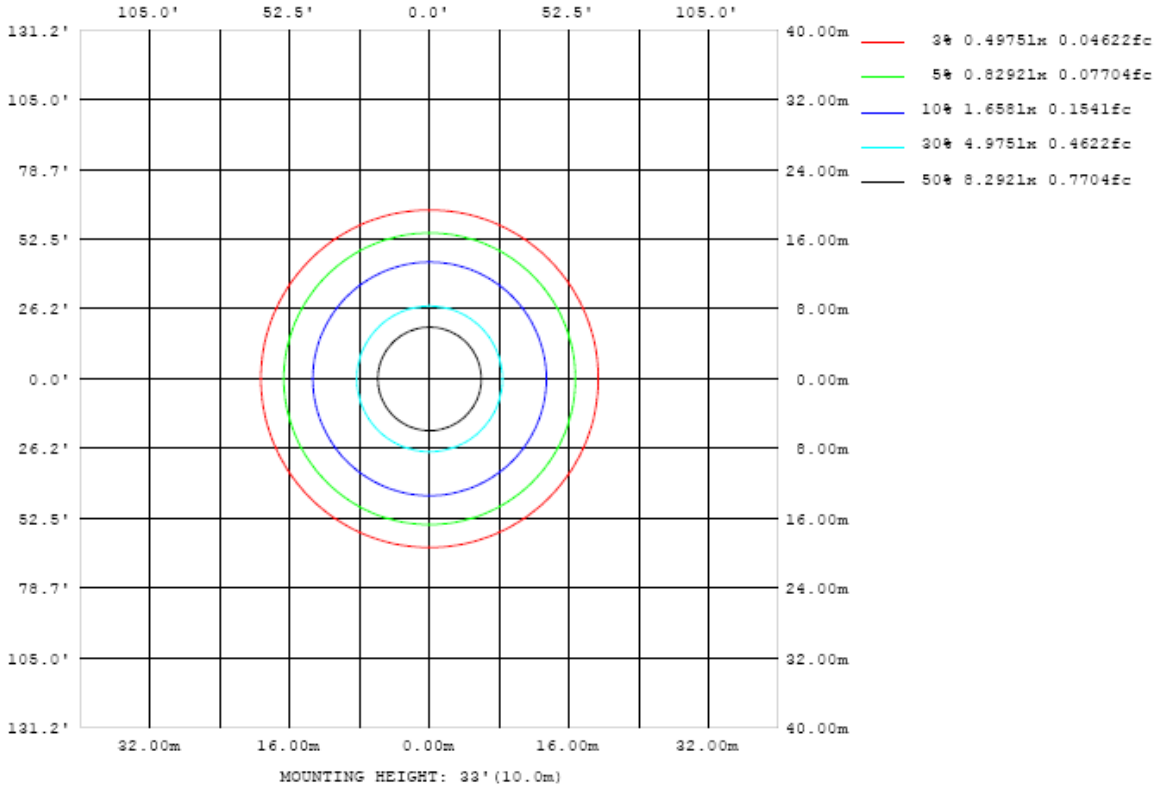


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

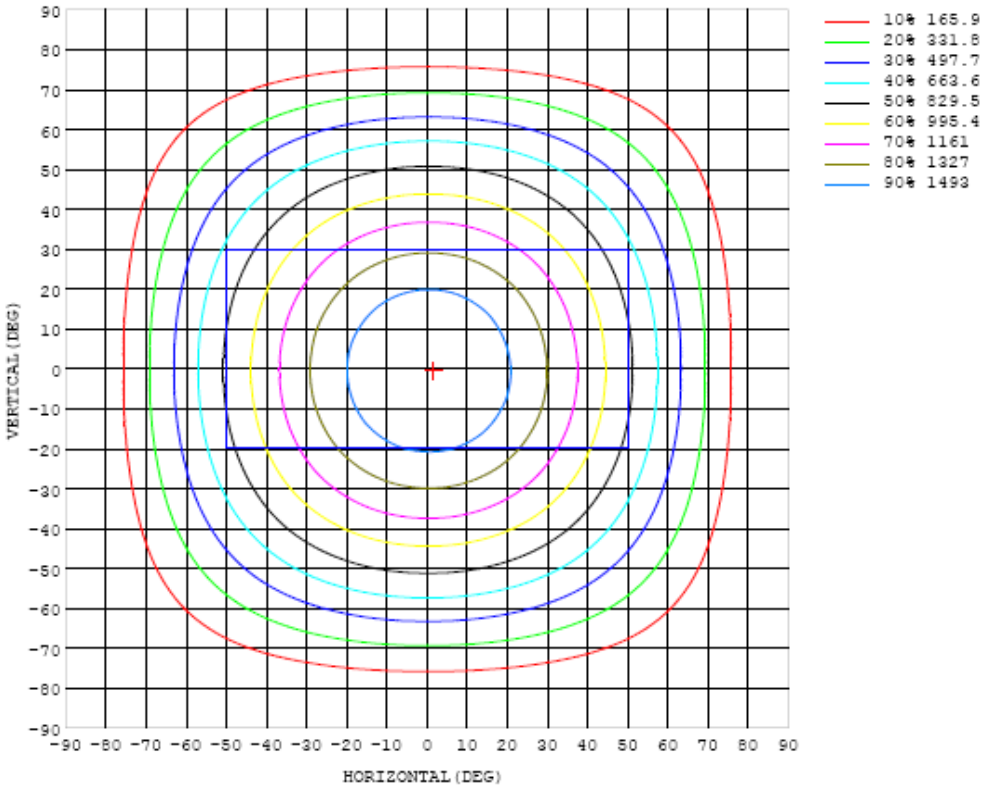


Chart 6: Isocandela Plot

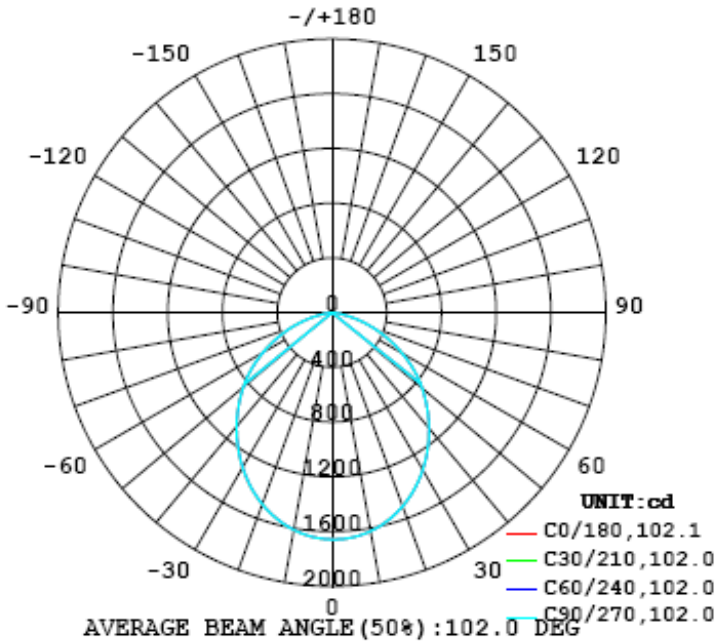


Chart 7: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1 UNIT: cd

γ (DEG) \ C (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	1657	1657	1657	1657	1657	1657	1657	1657	1657	1657	1657	1657	1657	1657	1657	1657	1657	1657	1657
5	1649	1649	1650	1650	1650	1650	1650	1650	1650	1649	1649	1648	1649	1647	1647	1647	1646	1646	1645
10	1620	1621	1622	1622	1622	1623	1621	1621	1621	1621	1620	1619	1619	1618	1617	1616	1615	1614	1613
15	1571	1573	1573	1574	1574	1574	1574	1573	1573	1572	1571	1570	1570	1568	1567	1565	1564	1562	1561
20	1505	1506	1507	1507	1508	1508	1507	1506	1506	1505	1504	1503	1502	1501	1499	1498	1496	1494	1492
25	1422	1423	1424	1424	1424	1424	1424	1423	1422	1422	1421	1420	1418	1417	1415	1413	1411	1409	1408
30	1325	1326	1327	1327	1327	1327	1327	1326	1326	1325	1324	1322	1321	1320	1317	1316	1314	1312	1310
35	1217	1217	1219	1219	1219	1219	1218	1217	1218	1217	1216	1215	1214	1212	1210	1209	1207	1204	1203
40	1101	1102	1103	1103	1103	1103	1103	1102	1102	1101	1100	1099	1098	1097	1095	1093	1092	1090	1088
45	982	982	982	983	983	983	982	982	982	981	980	979	978	977	976	974	973	971	969
50	859	860	861	860	861	861	860	860	859	859	858	858	856	856	854	854	852	851	849
55	730	730	730	730	730	730	729	729	729	729	728	728	727	727	726	725	724	722	722
60	590	590	590	590	589	590	589	589	589	589	588	588	588	587	586	585	585	584	584
65	451	451	450	450	450	450	450	449	449	449	449	449	449	449	448	447	447	446	447
70	314	315	314	315	315	314	314	314	314	314	314	314	313	313	313	313	312	312	313
75	185	185	185	186	186	186	186	185	185	185	186	185	185	185	185	184	184	183	185
80	75.0	75.4	75.6	75.8	75.8	75.9	75.8	75.7	75.3	75.5	75.5	75.1	75.0	74.8	74.7	74.4	74.3	74.0	75.3
85	16.4	16.4	16.4	16.4	16.4	16.4	16.5	16.5	16.5	16.5	16.5	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.8
90	0.14	0.15	0.14	0.15	0.14	0.15	0.16	0.15	0.16	0.23	0.19	0.20	0.19	0.17	0.17	0.15	0.14	0.15	0.18
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	0.18
100	0.14	0.14	0.14	0.14	0.14	0.13	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	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	0.29
110	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	0.22	0.35
115	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.40
120	0.33	0.33	0.32	0.33	0.33	0.32	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.46
125	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	0.39	0.53
130	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.48	0.47	0.48	0.48	0.48	0.48	0.48	0.48	0.63
135	0.57	0.57	0.57	0.57	0.56	0.56	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.76
140	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	0.86
145	0.66	0.66	0.66	0.66	0.66	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	0.94
150	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.66	0.66	0.98
155	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.98
160	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.96
165	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.75	0.75	0.74	0.74	0.74	0.75	0.74	0.75	0.75	0.74	0.96
170	0.80	0.80	0.80	0.80	0.81	0.80	0.80	0.80	0.80	0.80	0.81	0.80	0.80	0.80	0.80	0.81	0.81	0.81	0.98
175	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.97
180	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93	0.92	0.93	0.93	0.93	0.92	0.92	0.93	0.91

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	1657	1657	1657	1657	1657	1657	1657	1657	1657	1657	1657	1657	1657	1657	1657	1657	1657		
5	1645	1645	1644	1645	1645	1644	1644	1644	1645	1645	1646	1647	1647	1647	1648	1648	1649		
10	1612	1612	1611	1611	1611	1612	1611	1612	1612	1613	1614	1615	1616	1617	1618	1619	1619		
15	1560	1560	1559	1559	1559	1559	1559	1560	1561	1562	1563	1564	1566	1567	1569	1570	1570		
20	1491	1490	1489	1489	1489	1490	1489	1490	1491	1493	1494	1496	1498	1499	1501	1502	1503		
25	1406	1406	1404	1404	1404	1405	1405	1406	1407	1409	1410	1413	1414	1416	1418	1419	1421		
30	1309	1308	1306	1306	1306	1306	1306	1308	1309	1311	1313	1315	1316	1318	1320	1322	1323		
35	1201	1200	1198	1198	1198	1198	1198	1200	1201	1203	1205	1207	1209	1211	1212	1214	1215		
40	1086	1086	1084	1084	1083	1084	1084	1086	1087	1088	1091	1092	1094	1096	1097	1098	1099		
45	968	967	966	965	965	965	966	967	969	970	972	974	975	977	978	979	980		
50	848	847	846	846	846	846	846	848	849	850	852	853	854	855	857	857	858		
55	720	720	719	719	719	719	719	721	721	723	724	725	727	728	728	729	730		
60	583	583	582	582	583	583	583	584	585	586	587	588	589	590	591	591	591		
65	446	446	446	445	446	446	446	447	448	449	449	450	451	451	452	452	452		
70	312	311	311	311	311	311	311	311	312	312	313	314	314	315	315	316	316		
75	184	184	184	183	183	183	183	183	183	184	184	185	185	185	186	186	187		
80	75.0	74.7	74.2	74.1	73.9	73.8	73.9	73.8	74.0	74.1	74.2	74.6	74.9	75.2	75.5	75.9	76.3		
85	16.7	16.7	16.7	16.7	16.6	16.6	16.6	16.6	17.1	16.5	17.1	17.2	17.2	17.4	16.7	17.7	17.9		
90	0.17	0.16	0.16	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.16	0.16	0.16	0.16	0.16		
95	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	0.18	0.18	0.18	0.17		
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	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.28		
110	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35		
115	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40		
120	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	0.45		
125	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.52	0.52		
130	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		
135	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	0.75		
140	0.86	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.86	0.86	0.86	0.86	0.86	0.86		
145	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		
150	0.98	0.98	0.98	0.99	0.99	0.99	0.99	0.99	0.99	0.98	0.99	0.98	0.98	0.98	0.98	0.98	0.98		
155	0.99	0.99	0.99	0.99	1.00	1.00	1.00	0.99	0.99	1.00	0.99	0.99	0.99	0.99	0.99	0.99	0.99		
160	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98		
165	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.97	0.97	0.97	0.96	0.96		
170	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.99	0.98	0.98	0.98	0.98		
175	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98		
180	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92		

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

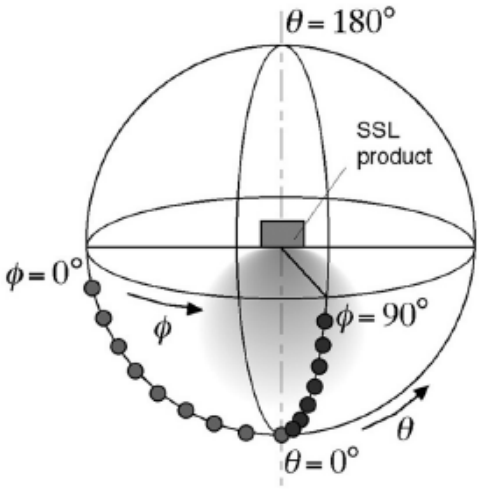
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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