LM-79-08 TEST REPORT

for

GREEN CREATIVE LTD

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

LED Lamp

Model: 15.5PAR38DIM/930FL40/GU24

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

3rd Floor, Bld. 2, NO. 96 Longchuanwu Rd Qianjiang Economy Dev. Zone, YuhangDist,
Hangzhou, Zhejiang Province, China 311100
Tel: +86571 86376106
www.ledtestlab.com

Report No.: HZ19050046av

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

Review by: April Zou

Engineer: April Zou
Jul. 11, 2019

Approved by: Jim Zhang

Manager: Jim Zhang
Jul. 11, 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: **15.5PAR38DIM/930FL40/GU24**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
91.4	1402.4	15.34	0.9273

CCT (K)	CRI	Stabilization Time (Light & Power)
3110	97.8	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 : May 29, 2019

Date of Test : Jul. 02, 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

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SAMPLE PHOTO

Figure 1- Overview of the sample

Equipment Under Test(EUT)	
Name	: LED Lamp
Model	: 15.5PAR38DIM/930FL40/GU24
Electrical Ratings	: 120V, 60Hz, 15.5W
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 ℃.

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)	120.0
Voltage frequency (Hz)	60
Test Current (A)	0.138
Power Factor	0.9273
Test Power (W)	15.34
THD A%	35.55
Luminous Efficacy (lm/W)	91.4
Total Luminous Flux (lm)	1402.4
Color Rendering Index (CRI)	97.8
R9	88.8
Correlated Color Temperature (CCT)(K)	3110
Chromaticity Chroma x	0.4283
Chromaticity Chroma y	0.3994
Chromaticity Chroma u	0.2470
Chromaticity Chroma v	0.3455
Duv	-0.0007
Chromaticity Chroma u ’	0.2470
Chromaticity Chroma v’	0.5182

Special Color Rendering Indices	
R1	99.2
R2	99.8
R3	97.9
R4	98.5
R5	98.1
R6	97.5
R7	96.8
R8	94.8
R9	88.8
R10	97.8
R11	98.8
R12	84
R13	99.8
R14	97.9

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 24.9 ℃.

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)	120.0
Voltage frequency (Hz)	60
Test Current (A)	0.138
Power Factor	0.9318
Power (W)	15.44
Luminous Efficacy (lm/W)	92.1
Total Luminous Flux (lm)	1422.1
Beam Angle (°)	38.4 (0^o-180^o) /38.0(90^o-270^o)
Center Beam Candle Power (cd)	2737
Maximum Beam Candle Power (cd)	2786(At: C=270.0, Gamma=2.5)
Spacing Criteria	0.62 (0^o-180^o) / 0.63 (90^o-270^o)
Zonal Lumens in the 0 °-60 °Zone	96.93%
Zonal Lumens in the 60 °-90 °Zone	2.93%
Zonal Lumens in the 90 °-120 °Zone	0.01%
Zonal Lumens in the 120 °-180 °Zone	0.13%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

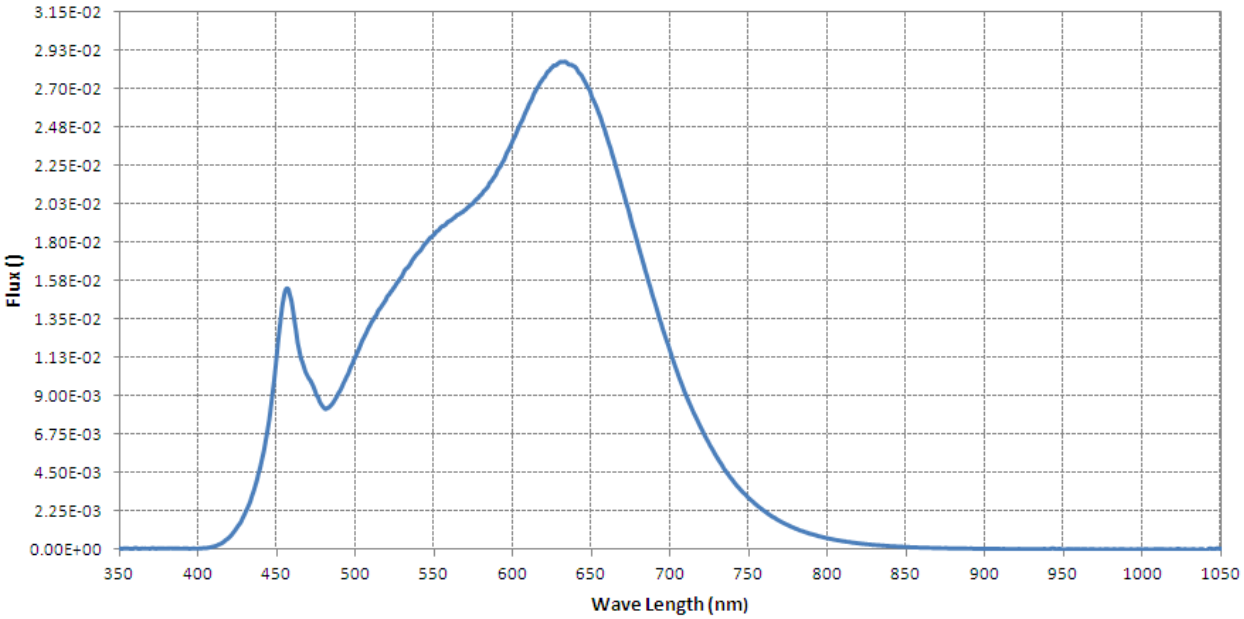
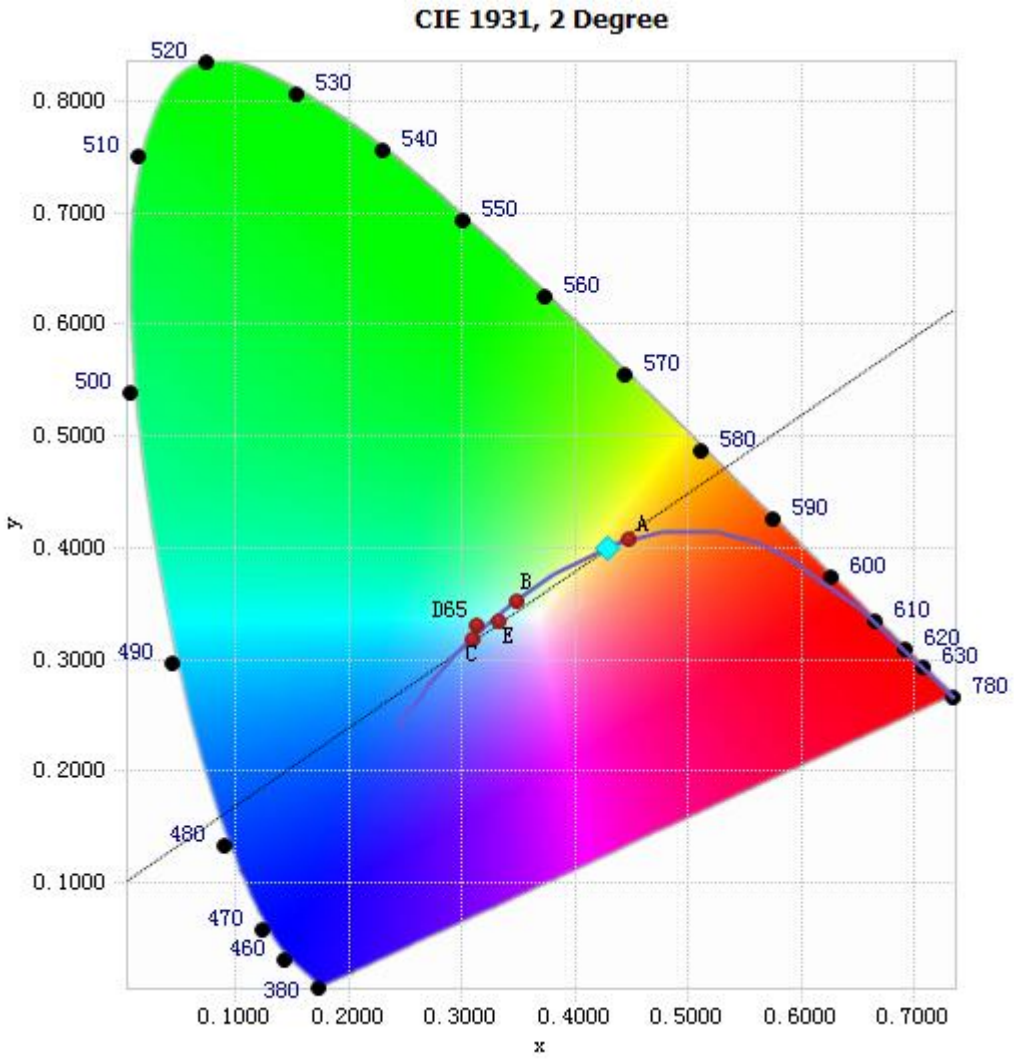


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	5.45E-05	485	8.54E-03	590	2.22E-02	695	1.29E-02
385	5.72E-05	490	9.31E-03	595	2.31E-02	700	1.16E-02
390	4.83E-05	495	1.03E-02	600	2.40E-02	705	1.02E-02
395	4.49E-05	500	1.14E-02	605	2.51E-02	710	9.01E-03
400	4.68E-05	505	1.24E-02	610	2.61E-02	715	7.95E-03
405	7.49E-05	510	1.33E-02	615	2.70E-02	720	7.01E-03
410	1.74E-04	515	1.41E-02	620	2.77E-02	725	6.12E-03
415	3.74E-04	520	1.49E-02	625	2.83E-02	730	5.34E-03
420	7.47E-04	525	1.55E-02	630	2.86E-02	735	4.60E-03
425	1.36E-03	530	1.62E-02	635	2.85E-02	740	3.98E-03
430	2.20E-03	535	1.68E-02	640	2.82E-02	745	3.45E-03
435	3.40E-03	540	1.74E-02	645	2.75E-02	750	2.99E-03
440	5.15E-03	545	1.80E-02	650	2.65E-02	755	2.58E-03
445	7.65E-03	550	1.85E-02	655	2.55E-02	760	2.22E-03
450	1.16E-02	555	1.90E-02	660	2.41E-02	765	1.90E-03
455	1.51E-02	560	1.93E-02	665	2.25E-02	770	1.63E-03
460	1.41E-02	565	1.96E-02	670	2.09E-02	775	1.41E-03
465	1.12E-02	570	2.00E-02	675	1.93E-02	780	1.20E-03
470	1.00E-02	575	2.04E-02	680	1.77E-02		
475	9.05E-03	580	2.08E-02	685	1.61E-02		
480	8.28E-03	585	2.15E-02	690	1.45E-02		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4283, 0.3994)

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

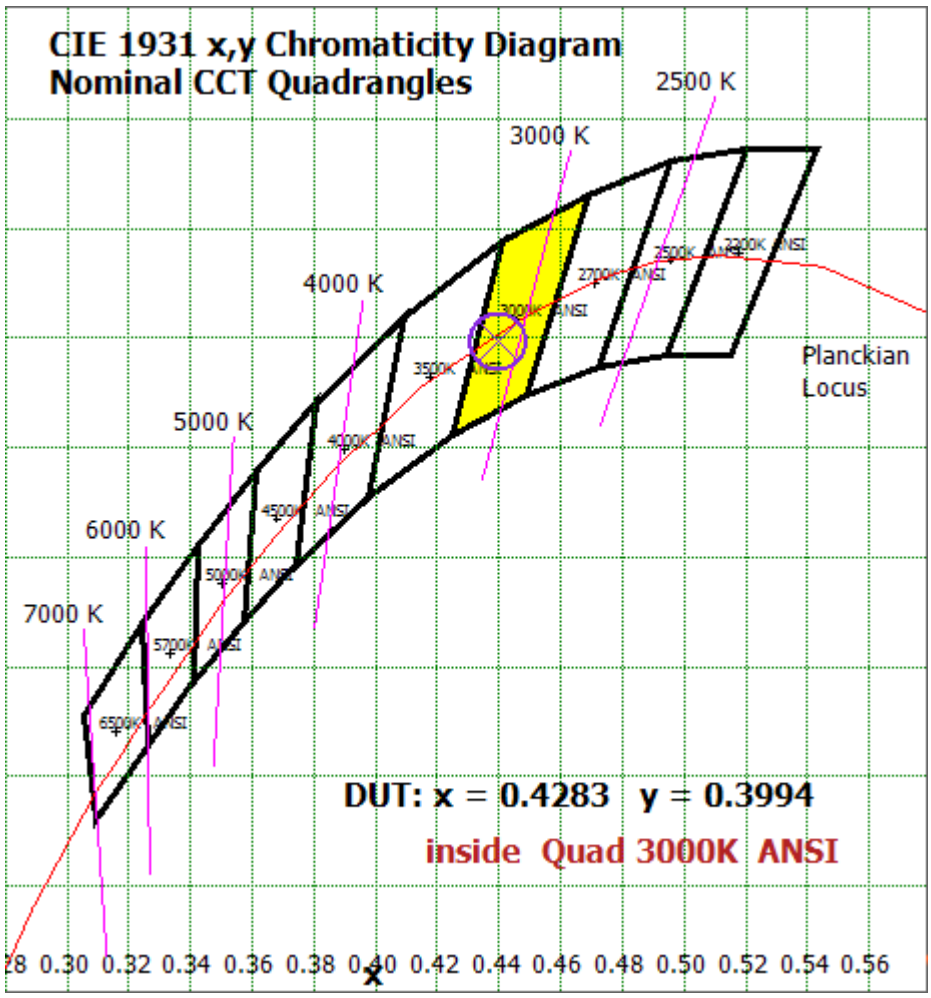
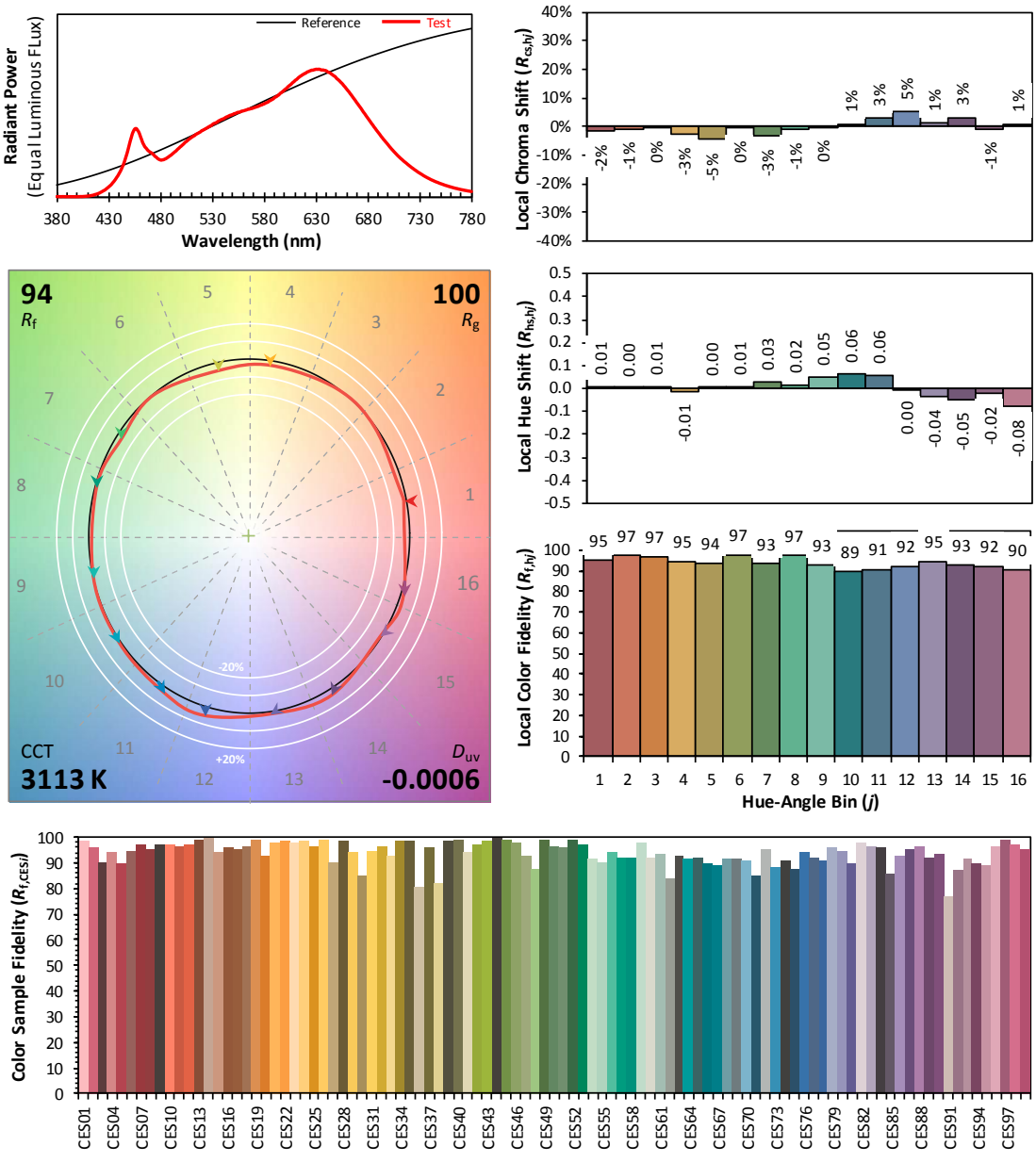


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method



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

x	0.4283
y	0.3994
u'	0.2470
v'	0.5182

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

γ(°)	Lumens	% Total
0- 10	243.923	17.15%
10- 20	507.856	35.71%
20- 30	359.52	25.28%
30- 40	159.905	11.24%
40- 50	68.596	4.82%
50- 60	38.667	2.72%
60- 70	25.201	1.77%
70- 80	13.193	0.93%
80- 90	3.327	0.23%
90-100	0.039	0.00%
100-110	0.016	0.00%
110-120	0.032	0.00%
120-130	0.084	0.01%
130-140	0.241	0.02%
140-150	0.442	0.03%
150-160	0.521	0.04%
160-170	0.404	0.03%
170-180	0.136	0.01%
Total	1422.1	100%

γ(°)	Lumens	% Total
0- 60	1378.467	96.93%
60- 90	41.721	2.93%
0-90	1420.188	99.87%
90- 180	1.915	0.13%
0- 180	1422.1	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

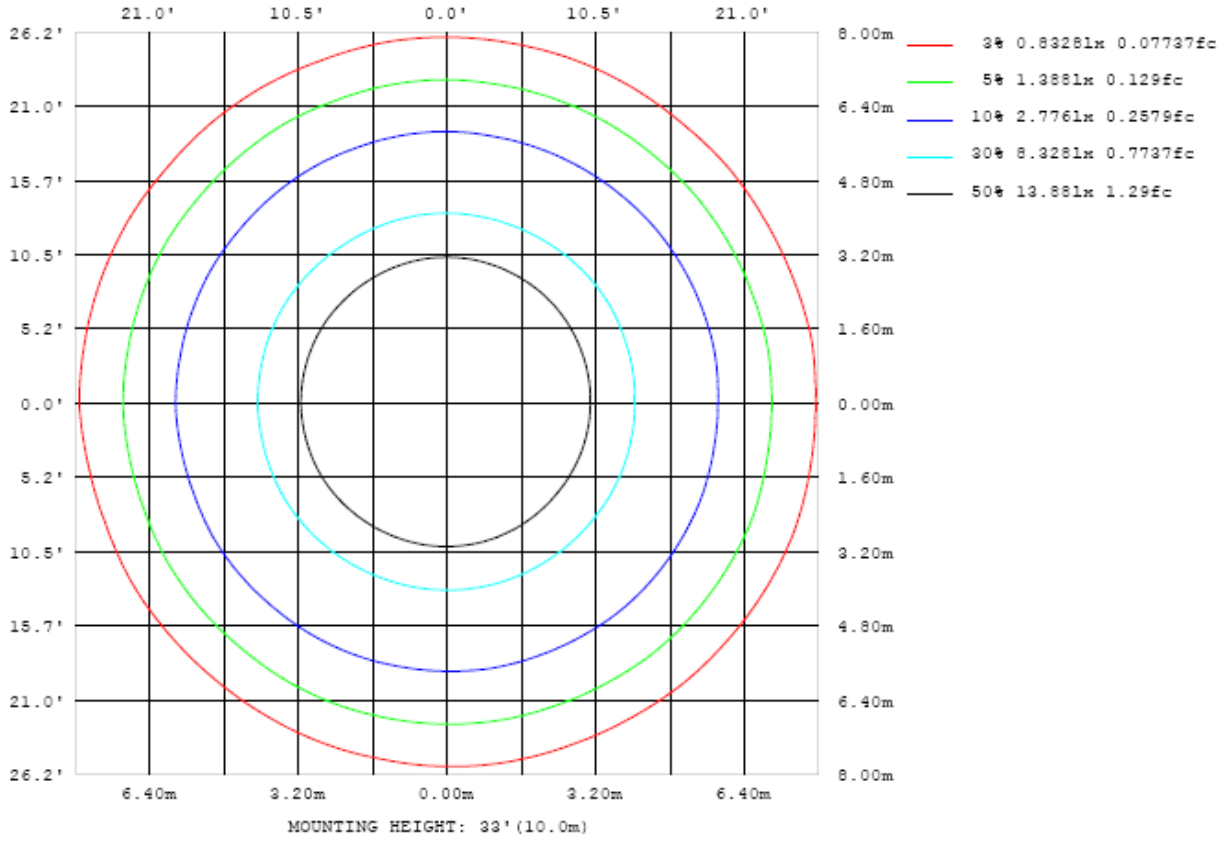


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

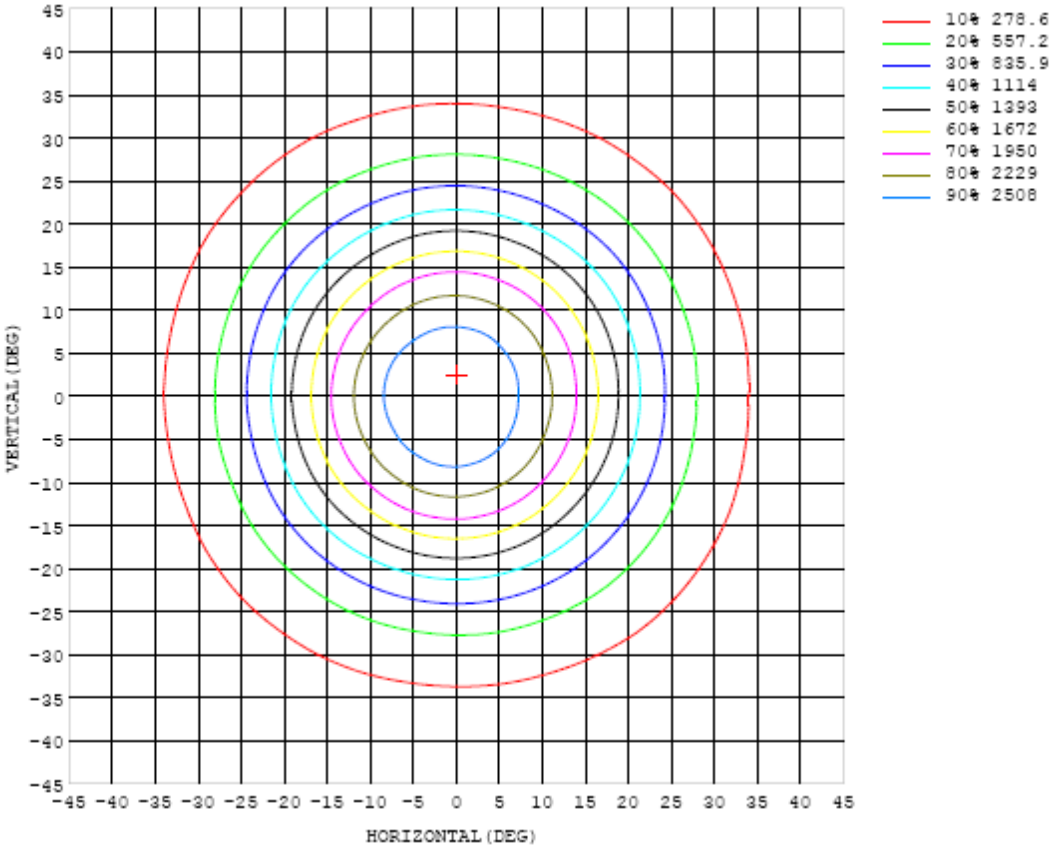


Chart 6: Isocandela Plot

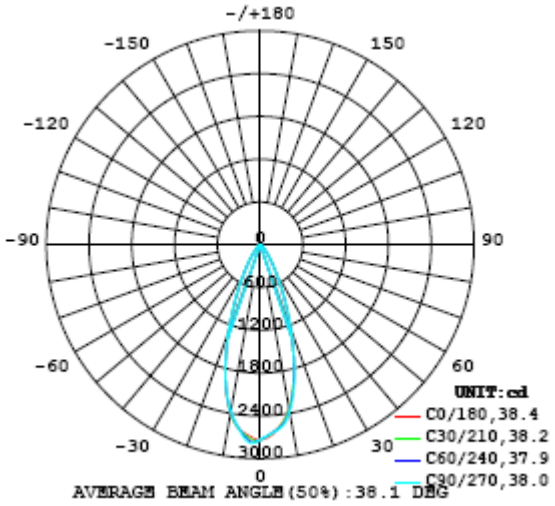


Chart 7: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1 UNIT: cd

γ (DEG) \ C (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	2737	2737	2737	2737	2737	2737	2737	2737	2737	2737	2737	2737	2737	2737	2737	2737	2737	2737	2737
5	2616	2609	2607	2606	2606	2608	2608	2613	2617	2620	2620	2623	2624	2625	2626	2627	2633	2641	2647
10	2326	2328	2331	2339	2347	2356	2365	2371	2376	2378	2382	2385	2388	2388	2391	2389	2394	2399	2402
15	1836	1836	1834	1831	1834	1840	1848	1853	1856	1861	1863	1865	1866	1874	1883	1889	1892	1897	1901
20	1259	1255	1252	1245	1239	1240	1245	1251	1253	1254	1252	1251	1255	1263	1274	1280	1280	1281	1290
25	773	770	771	767	762	762	755	757	758	758	756	757	760	763	768	771	771	775	786
30	443	441	445	443	441	440	433	430	431	428	425	427	429	428	432	436	432	437	447
35	249	250	255	252	250	249	243	240	241	240	238	240	238	237	239	241	240	243	249
40	146	147	149	147	144	143	140	138	139	138	135	134	133	132	133	135	135	138	143
45	88.1	88.3	88.8	88.3	87.6	87.4	86.3	85.1	84.2	83.3	82.8	82.9	81.5	81.6	81.3	81.4	82.4	84.6	86.4
50	58.4	58.7	58.6	59.0	58.4	58.0	57.4	56.7	56.0	55.6	55.5	55.4	55.2	55.3	55.1	55.3	56.1	57.1	57.9
55	42.5	42.7	42.6	42.6	42.7	42.6	42.4	42.3	42.2	41.8	41.4	41.5	41.6	41.7	41.8	42.1	42.3	42.6	43.1
60	32.5	32.5	32.5	32.5	32.3	32.2	32.3	32.5	32.6	32.5	32.4	32.3	32.4	32.5	32.6	32.6	32.5	32.6	32.9
65	25.0	25.1	25.4	25.4	25.1	25.0	25.0	25.1	25.3	25.4	25.3	25.2	25.3	25.4	25.6	25.7	25.5	25.3	25.5
70	18.5	18.5	18.7	18.7	18.5	18.5	18.4	18.5	18.6	18.6	18.6	18.5	18.5	18.5	18.6	18.7	18.6	18.6	18.8
75	12.3	12.3	12.3	12.3	12.3	12.3	12.2	12.3	12.4	12.3	12.3	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.3
80	6.98	6.99	6.98	6.97	6.98	6.98	6.95	6.98	7.02	7.01	6.96	6.94	6.92	6.89	6.93	6.95	6.91	6.91	7.05
85	2.76	2.77	2.77	2.78	2.78	2.78	2.77	2.77	2.78	2.76	2.76	2.76	2.75	2.74	2.73	2.73	2.72	2.73	2.86
90	0.32	0.33	0.33	0.33	0.34	0.33	0.33	0.33	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.31	0.31	0.35
95	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
100	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
105	0.01	0.01	0.02	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02
110	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
115	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	0.03	0.03
120	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	0.06
125	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	0.07	0.11
130	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.13	0.13	0.13	0.13	0.13	0.13	0.14	0.14	0.13	0.23
135	0.21	0.21	0.21	0.21	0.22	0.22	0.22	0.22	0.22	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.24	0.23	0.41
140	0.34	0.34	0.34	0.34	0.35	0.35	0.35	0.35	0.36	0.36	0.36	0.36	0.37	0.37	0.37	0.37	0.37	0.35	0.64
145	0.50	0.50	0.50	0.50	0.50	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.49	0.89
150	0.65	0.66	0.66	0.66	0.66	0.67	0.67	0.67	0.67	0.67	0.68	0.68	0.68	0.68	0.69	0.69	0.69	0.65	1.14
155	0.83	0.83	0.84	0.84	0.84	0.85	0.85	0.85	0.86	0.86	0.87	0.87	0.87	0.88	0.88	0.88	0.88	0.84	1.34
160	1.01	1.01	1.02	1.02	1.03	1.03	1.04	1.04	1.05	1.05	1.05	1.06	1.06	1.06	1.06	1.05	1.05	1.00	1.51
165	1.14	1.15	1.16	1.16	1.17	1.17	1.18	1.18	1.19	1.19	1.20	1.21	1.21	1.21	1.21	1.21	1.21	1.16	1.59
170	1.23	1.24	1.25	1.25	1.25	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.25	1.24	1.24	1.20	1.46
175	1.21	1.22	1.22	1.23	1.23	1.23	1.24	1.25	1.25	1.25	1.26	1.27	1.29	1.30	1.31	1.32	1.33	1.33	1.31
180	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38

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	2737	2737	2737	2737	2737	2737	2737	2737	2737	2737	2737	2737	2737	2737	2737	2737	2737		
5	2651	2656	2662	2667	2672	2680	2689	2698	2706	2711	2707	2691	2674	2661	2647	2634	2627		
10	2403	2399	2394	2388	2383	2382	2380	2374	2369	2366	2361	2356	2351	2344	2336	2333	2329		
15	1899	1895	1894	1889	1886	1885	1887	1888	1887	1884	1879	1874	1868	1863	1855	1848	1841		
20	1294	1298	1301	1297	1291	1290	1296	1303	1303	1297	1291	1290	1290	1291	1288	1275	1267		
25	784	786	789	784	781	781	783	787	788	783	779	779	784	788	787	781	780		
30	444	444	446	442	444	447	445	448	448	443	443	445	446	450	450	449	451		
35	247	248	248	244	245	247	244	247	247	244	245	245	244	247	248	248	252		
40	143	144	144	142	142	142	141	142	141	141	142	141	140	142	142	143	148		
45	86.5	86.7	86.7	86.4	86.0	85.6	85.5	85.4	85.5	85.4	85.2	84.9	84.4	84.2	84.7	86.3	87.9		
50	58.4	58.5	58.2	58.0	57.9	57.7	57.8	57.5	57.3	57.6	57.4	57.4	57.1	57.0	57.7	58.0	58.2		
55	43.4	43.5	43.4	43.3	43.2	43.1	43.1	43.0	42.7	42.8	42.8	42.7	42.8	42.9	43.0	42.8	42.5		
60	33.0	33.1	33.1	32.8	32.8	32.7	32.9	32.9	32.8	32.7	32.8	32.7	32.9	32.9	33.0	32.8	32.6		
65	25.6	25.7	25.6	25.5	25.4	25.4	25.6	25.6	25.5	25.4	25.4	25.4	25.5	25.6	25.6	25.4	25.2		
70	18.9	19.0	19.0	18.9	18.9	18.8	18.9	19.0	19.0	18.9	18.9	19.0	19.0	19.1	19.0	18.8	18.7		
75	12.4	12.5	12.4	12.3	12.3	12.3	12.4	12.4	12.4	12.4	12.4	12.4	12.5	12.5	12.5	12.4	12.3		
80	7.10	7.12	7.07	7.01	6.97	6.95	6.96	6.97	6.98	6.99	7.01	7.03	7.04	7.06	7.06	7.04	7.03		
85	2.89	2.90	2.85	2.79	2.75	2.73	2.72	2.72	2.71	2.73	2.75	2.76	2.77	2.79	2.81	2.82	2.83		
90	0.35	0.34	0.33	0.31	0.30	0.30	0.29	0.29	0.29	0.30	0.30	0.30	0.31	0.31	0.32	0.33	0.34		
95	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		
100	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		
105	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		
110	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		
115	0.04	0.04	0.04	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		
120	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		
125	0.12	0.12	0.12	0.11	0.11	0.11	0.11	0.11	0.10	0.10	0.10	0.10	0.10	0.09	0.09	0.09	0.09		
130	0.23	0.23	0.23	0.23	0.22	0.22	0.22	0.21	0.21	0.20	0.20	0.20	0.19	0.19	0.19	0.19	0.18		
135	0.42	0.42	0.41	0.41	0.41	0.41	0.40	0.40	0.39	0.39	0.38	0.38	0.37	0.37	0.37	0.37	0.35		
140	0.66	0.66	0.65	0.65	0.65	0.65	0.65	0.64	0.64	0.64	0.63	0.63	0.63	0.62	0.62	0.62	0.60		
145	0.93	0.92	0.92	0.93	0.93	0.93	0.93	0.92	0.92	0.92	0.92	0.92	0.92	0.91	0.91	0.92	0.88		
150	1.19	1.19	1.19	1.19	1.19	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.22	1.15		
155	1.42	1.41	1.42	1.42	1.42	1.43	1.43	1.43	1.43	1.44	1.44	1.45	1.45	1.45	1.45	1.48	1.38		
160	1.62	1.61	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.64	1.52		
165	1.74	1.74	1.74	1.74	1.74	1.74	1.74	1.74	1.74	1.74	1.74	1.74	1.73	1.73	1.73	1.76	1.59		
170	1.69	1.68	1.69	1.69	1.70	1.71	1.72	1.72	1.73	1.74	1.74	1.75	1.75	1.75	1.75	1.78	1.56		
175	1.48	1.49	1.50	1.50	1.50	1.51	1.52	1.53	1.54	1.55	1.56	1.56	1.57	1.58	1.60	1.56	1.31		
180	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38		

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.

3rd Floor, Bld. 2, NO. 96 Longchuanwu Rd Qianjiang Economy Dev. Zone, YuhangDist,
Hangzhou, Zhejiang Province, China 311100
Tel: +86 571 86376106 www.ledtestlab.com

The uncertainty of integrating sphere system reported in this document is expended 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 expended uncertainty is 2.3% with a coverage factor k=2.

Color Characteristics Measurements

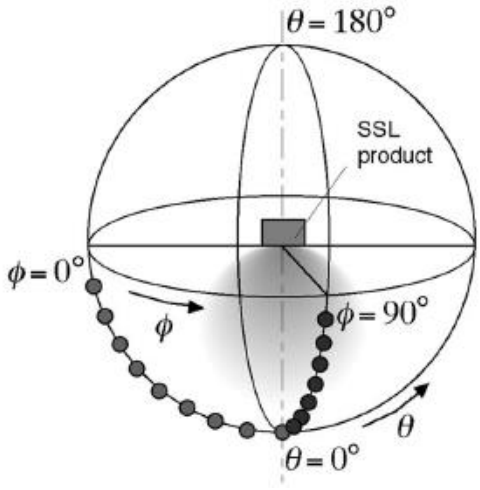
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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