LM-79-08 TEST REPORT

for

GREEN CREATIVE LTD

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

LED Lamp

Model: 10PAR30SNDIM/830FL40/N

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.: HZ19070039e

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

Review by: April Zou

Engineer: April Zou
Aug. 01, 2019

Approved by: Jim Zhang

Manager: Jim Zhang
Aug. 01, 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: **10PAR30SNDIM/830FL40/N**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
103.7	983.2	9.48	0.7250

CCT (K)	CRI	Stabilization Time (Light & Power)
2983	82.8	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 : Jul. 25, 2019

Date of Test : Jul. 31, 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	: 10PAR30SNDIM/830FL40/N
Electrical Ratings	: 120V, 60Hz, 10W
Product Description	: 3000K
Manufacturer	: GREEN CREATIVE LTD
Address	: 756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai

TEST RESULTS

Test ambient temperature was 26.0 ℃.

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)	0.109
Power Factor	0.7250
Test Power (W)	9.48
THD A%	68.39
Luminous Efficacy (lm/W)	103.7
Total Luminous Flux (lm)	983.2
Color Rendering Index (CRI)	82.8
R9	5.8
Correlated Color Temperature (CCT)(K)	2983
Chromaticity Chroma x	0.4386
Chromaticity Chroma y	0.4056
Chromaticity Chroma u	0.2510
Chromaticity Chroma v	0.3482
Duv	0.0004
Chromaticity Chroma u ’	0.2510
Chromaticity Chroma v’	0.5222

Special Color Rendering Indices	
R1	81.6
R2	92.7
R3	94
R4	80.4
R5	82.3
R6	92.1
R7	81.4
R8	57.5
R9	5.8
R10	84.1
R11	80.4
R12	76.6
R13	84.4
R14	97.2

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)	0.108
Power Factor	0.7317
Power (W)	9.45
Luminous Efficacy (lm/W)	105.5
Total Luminous Flux (lm)	996.9
Beam Angle (°)	37.7 (0^o-180^o) / 38.2 (90^o-270^o)
Center Beam Candle Power (cd)	1596
Maximum Beam Candle Power (cd)	1596 (At: C=0.0, Gamma=0.0)
Spacing Criteria	0.64 (0^o-180^o) / 0.61 (90^o-270^o)
Zonal Lumens in the 0 °-60 °Zone	95.06%
Zonal Lumens in the 60 °-90 °Zone	4.73%
Zonal Lumens in the 90 °-120 °Zone	0.09%
Zonal Lumens in the 120 °-180 °Zone	0.12%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

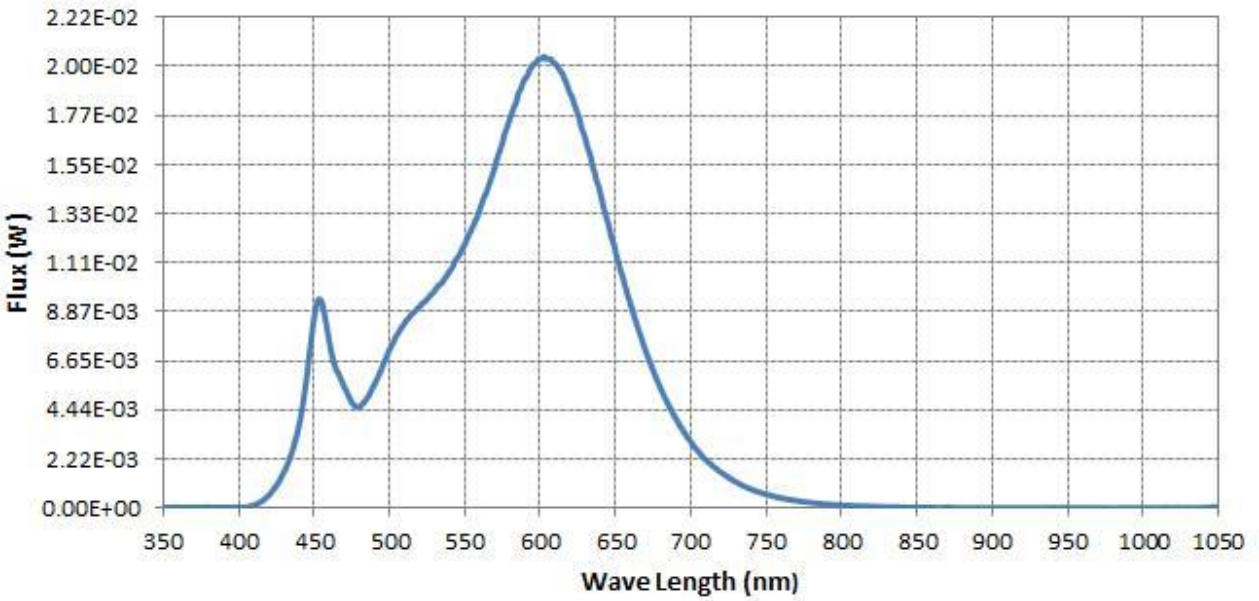
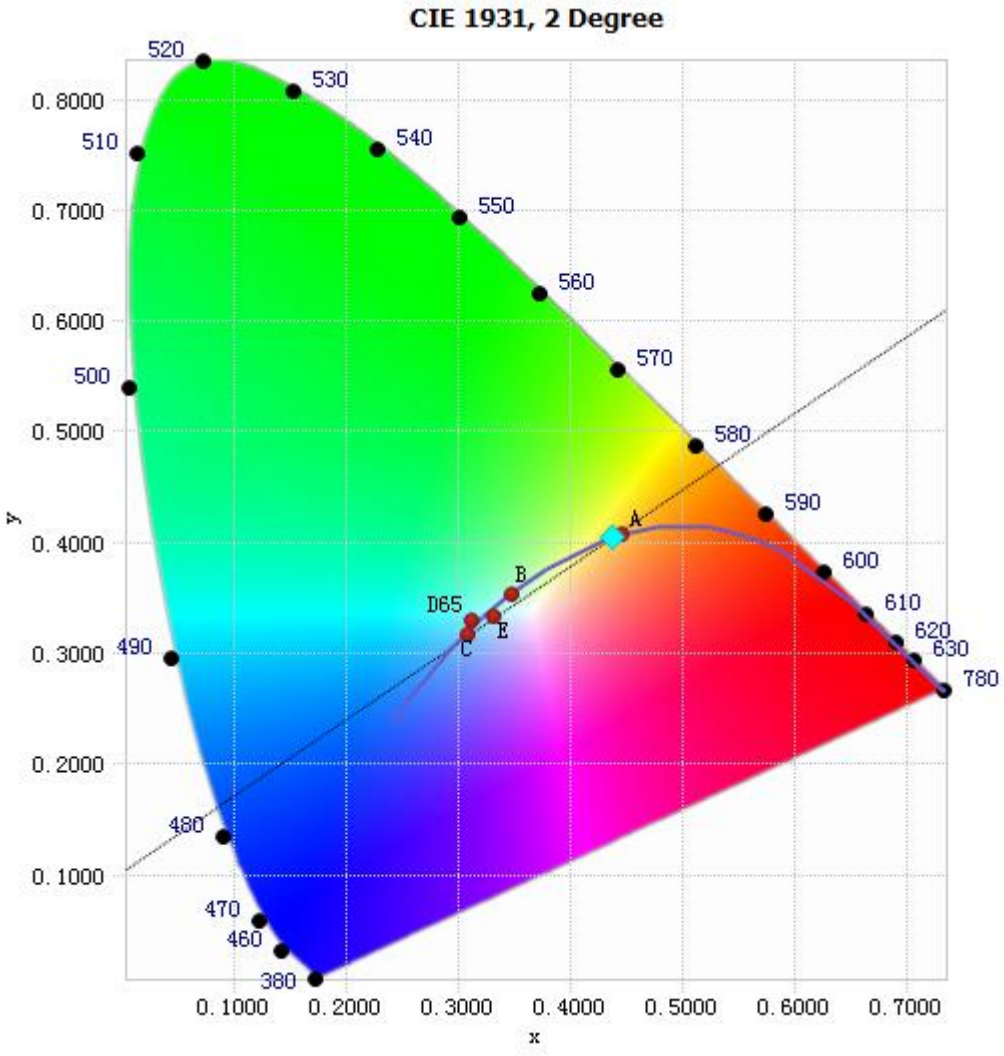


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	4.89E-05	485	4.95E-03	590	1.94E-02	695	3.48E-03
385	4.36E-05	490	5.56E-03	595	2.00E-02	700	2.98E-03
390	4.22E-05	495	6.31E-03	600	2.03E-02	705	2.55E-03
395	3.08E-05	500	7.16E-03	605	2.03E-02	710	2.17E-03
400	2.95E-05	505	7.82E-03	610	2.01E-02	715	1.87E-03
405	5.23E-05	510	8.34E-03	615	1.96E-02	720	1.61E-03
410	1.21E-04	515	8.78E-03	620	1.87E-02	725	1.38E-03
415	2.96E-04	520	9.10E-03	625	1.78E-02	730	1.19E-03
420	5.69E-04	525	9.44E-03	630	1.67E-02	735	9.95E-04
425	1.01E-03	530	9.81E-03	635	1.54E-02	740	8.53E-04
430	1.63E-03	535	1.02E-02	640	1.42E-02	745	7.23E-04
435	2.45E-03	540	1.07E-02	645	1.29E-02	750	6.26E-04
440	3.71E-03	545	1.13E-02	650	1.16E-02	755	5.32E-04
445	5.81E-03	550	1.19E-02	655	1.04E-02	760	4.55E-04
450	8.54E-03	555	1.27E-02	660	9.20E-03	765	3.86E-04
455	9.35E-03	560	1.35E-02	665	8.11E-03	770	3.34E-04
460	7.59E-03	565	1.44E-02	670	7.10E-03	775	2.85E-04
465	6.21E-03	570	1.54E-02	675	6.22E-03	780	2.45E-04
470	5.49E-03	575	1.65E-02	680	5.40E-03		
475	4.77E-03	580	1.76E-02	685	4.68E-03		
480	4.56E-03	585	1.86E-02	690	4.05E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4386, 0.4056)

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

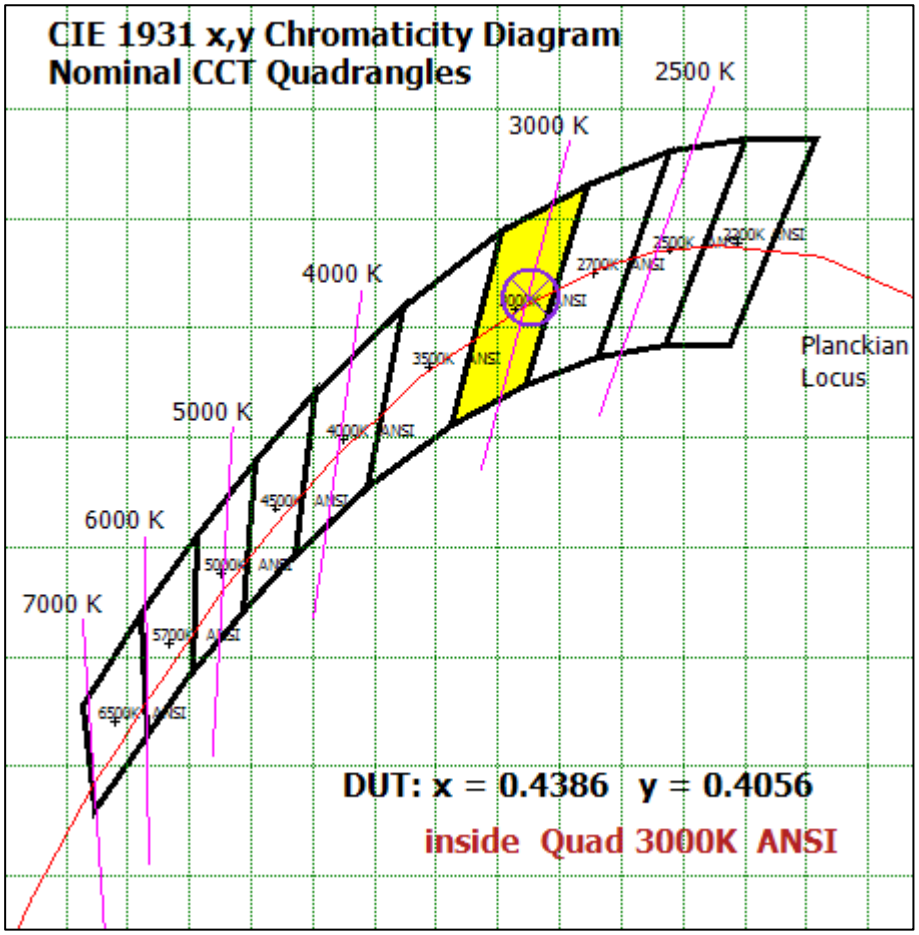
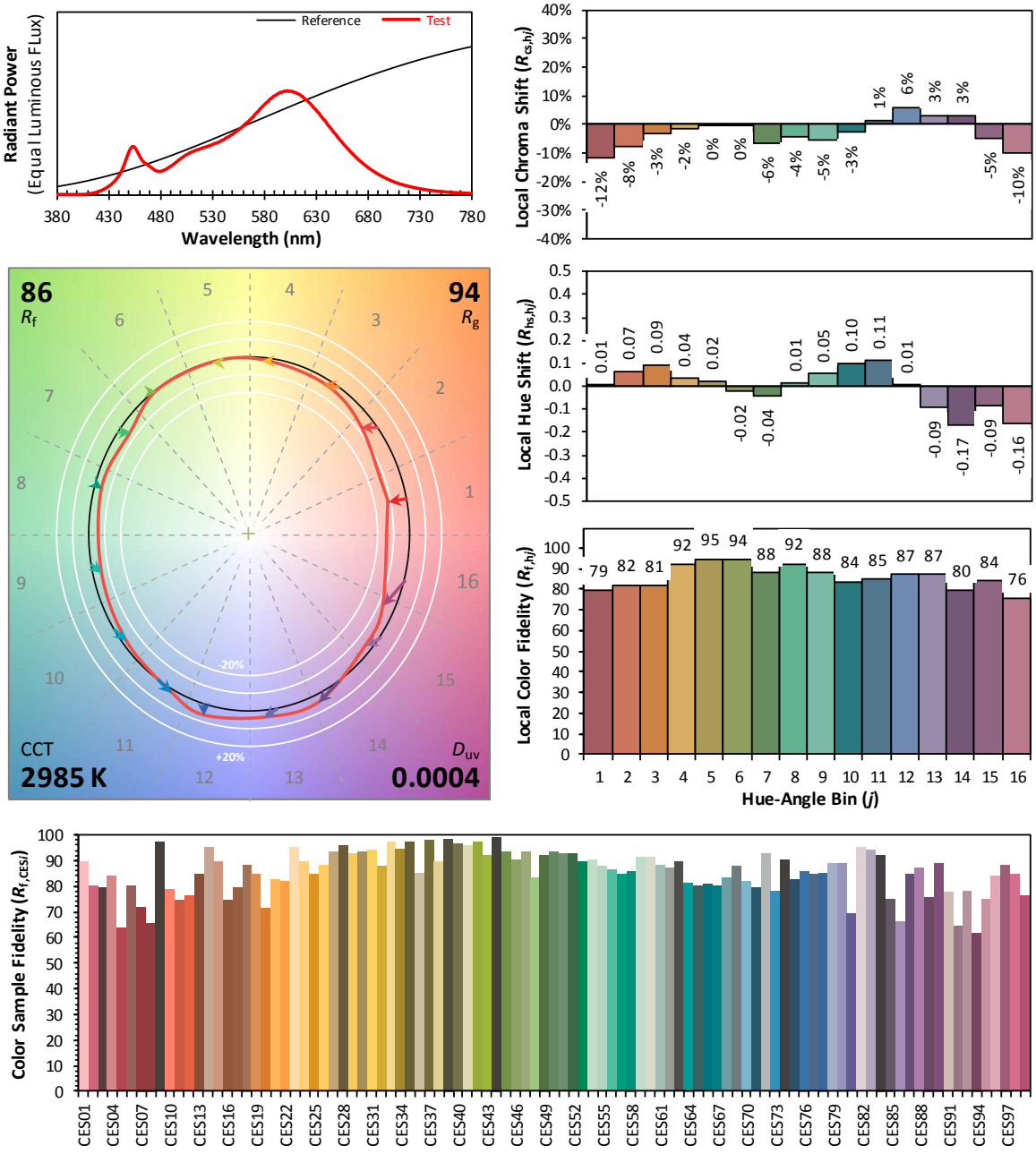


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method



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

x	0.4386
y	0.4056
u'	0.2510
v'	0.5222

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	140.297	14.07%
10- 20	285.793	28.67%
20- 30	233.907	23.46%
30- 40	151.76	15.22%
40- 50	87.233	8.75%
50- 60	48.65	4.88%
60- 70	27.379	2.75%
70- 80	14.317	1.44%
80- 90	5.454	0.55%
90-100	0.809	0.08%
100-110	0.022	0.00%
110-120	0.034	0.00%
120-130	0.078	0.01%
130-140	0.178	0.02%
140-150	0.292	0.03%
150-160	0.327	0.03%
160-170	0.246	0.02%
170-180	0.083	0.01%
Total	996.9	100%

γ(°)	Lumens	% Total
0- 60	947.64	95.06%
60- 90	47.15	4.73%
0-90	994.79	99.79%
90- 180	2.069	0.21%
0- 180	996.9	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

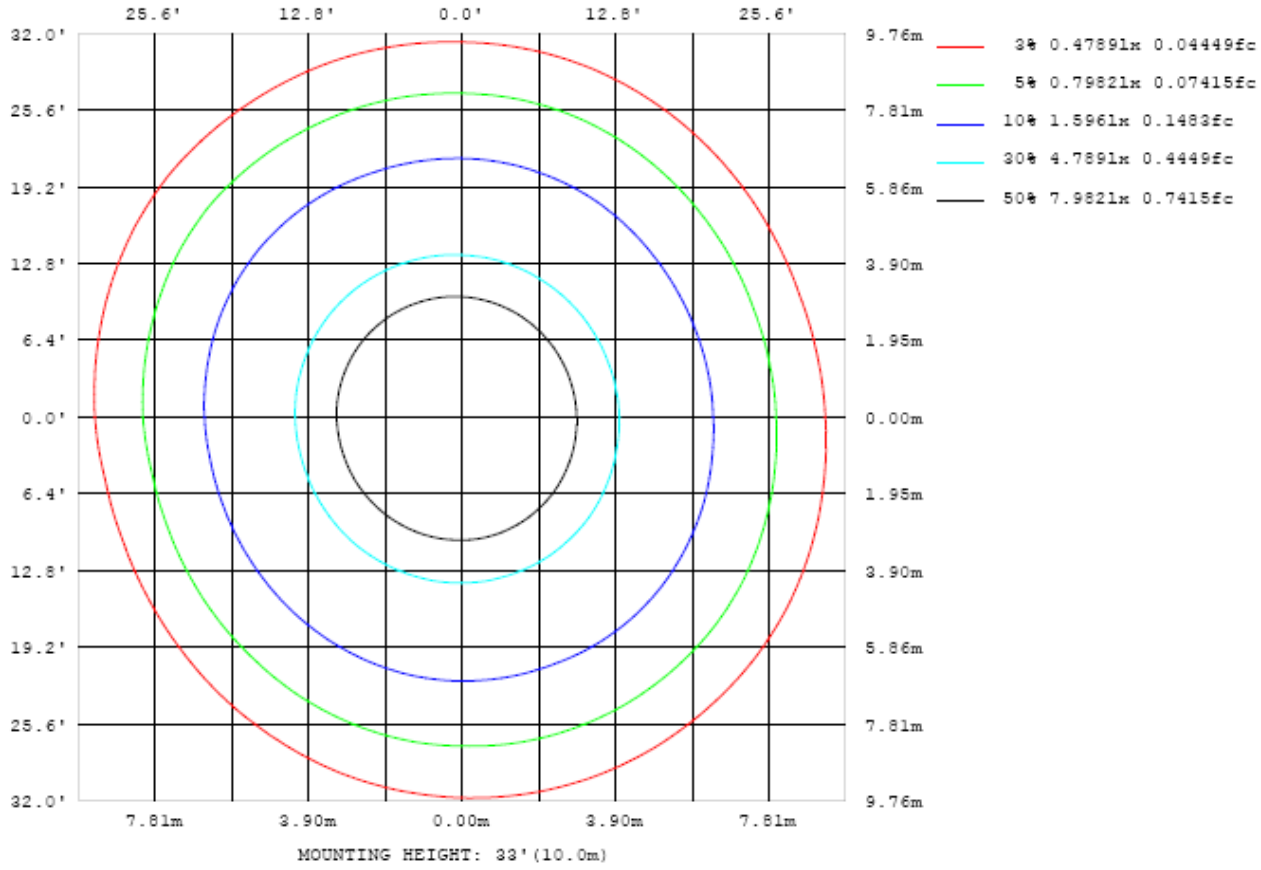


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

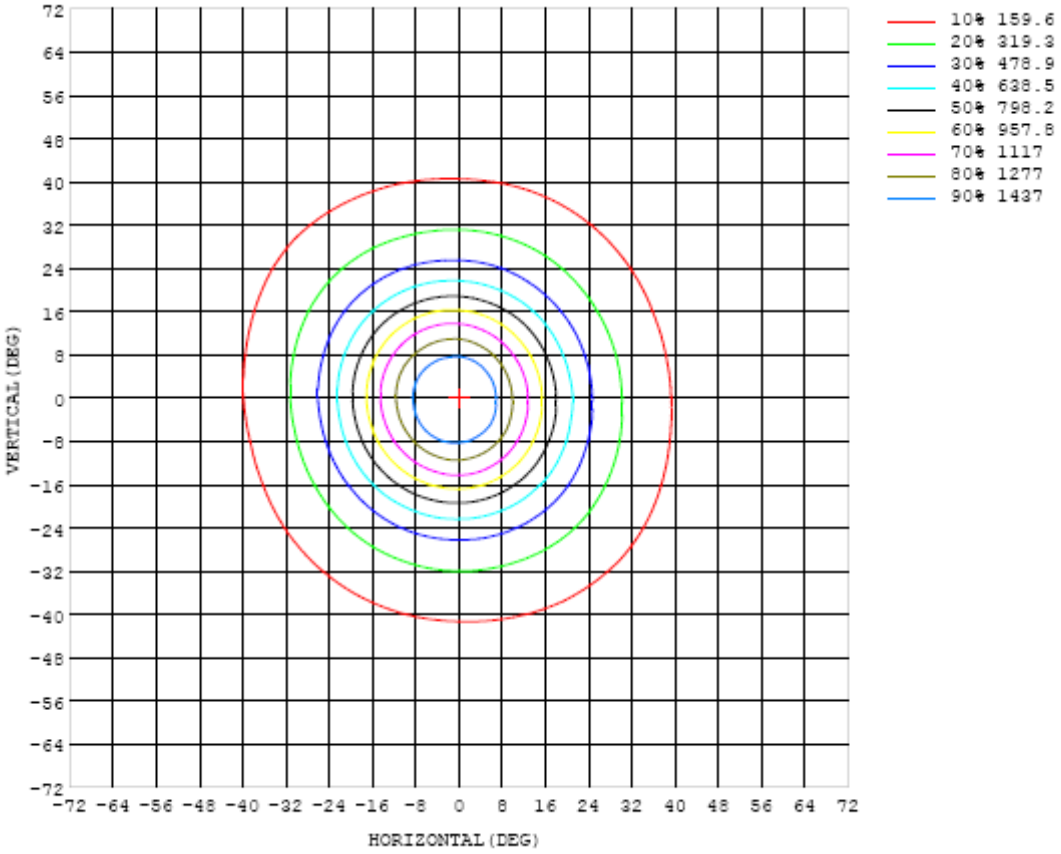


Chart 6: Isocandela Plot

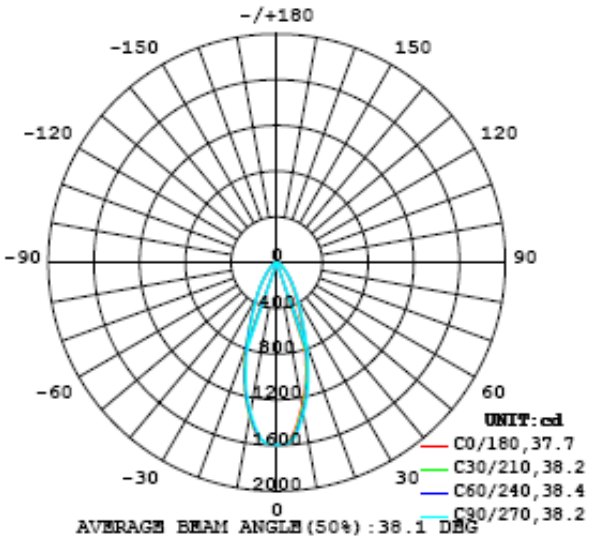


Chart 7: Polar Candela Distribution

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	1596	1596	1596	1596	1596	1596	1596	1596	1596	1596	1596	1596	1596	1596	1596	1596	1596	1596	1596
5	1525	1533	1538	1544	1548	1551	1553	1558	1561	1560	1561	1558	1559	1559	1559	1559	1558	1556	1557
10	1269	1276	1286	1298	1311	1316	1325	1335	1342	1348	1354	1356	1359	1360	1359	1358	1360	1358	1362
15	980	988	997	1008	1021	1035	1046	1057	1068	1073	1073	1073	1076	1076	1079	1080	1082	1086	1093
20	685	690	704	714	730	734	742	751	757	764	766	768	771	769	770	772	772	776	783
25	467	476	482	493	503	509	514	518	523	522	523	522	520	516	513	512	512	516	524
30	323	331	339	347	356	360	364	365	367	366	365	360	357	351	346	343	343	346	353
35	221	229	237	245	252	256	257	257	257	256	255	250	245	238	233	230	229	230	237
40	150	156	163	169	174	176	179	179	178	176	174	170	165	159	155	152	150	151	158
45	101	106	111	116	119	121	123	123	122	120	118	114	110	106	102	99.1	97.7	99.6	105
50	70.4	74.5	77.1	80.1	81.9	83.5	84.4	84.4	83.8	82.2	80.0	77.5	75.1	71.9	69.3	67.8	67.3	68.9	71.5
55	49.2	51.5	54.0	55.9	57.2	58.2	58.9	59.0	58.4	57.3	55.8	54.2	52.6	50.7	48.9	48.0	47.6	48.2	50.4
60	35.4	36.7	38.1	39.1	39.9	40.5	40.9	40.9	40.5	39.8	38.8	37.8	37.0	35.8	34.8	34.3	34.1	34.6	35.8
65	25.9	26.7	27.5	28.0	28.3	28.6	28.8	28.7	28.5	28.1	27.6	27.1	26.8	26.2	25.6	25.3	25.3	25.6	26.3
70	18.7	19.1	19.5	19.8	19.9	20.1	20.2	20.3	20.1	19.9	19.8	19.5	19.4	19.2	18.9	18.8	18.7	18.9	19.3
75	12.5	12.7	13.0	13.2	13.3	13.4	13.6	13.7	13.7	13.6	13.7	13.6	13.6	13.6	13.5	13.5	13.4	13.5	13.6
80	7.62	7.75	7.84	8.01	8.14	8.21	8.35	8.48	8.45	8.49	8.68	8.68	8.67	8.79	8.79	8.81	8.78	8.78	8.70
85	4.33	4.40	4.49	4.58	4.71	4.79	4.92	5.02	5.03	5.06	5.21	5.20	5.20	5.32	5.36	5.37	5.36	5.36	5.37
90	1.59	1.63	1.67	1.71	1.77	1.83	1.90	1.96	2.01	2.08	2.15	2.20	2.24	2.31	2.33	2.34	2.34	2.33	2.38
95	0.43	0.45	0.47	0.49	0.51	0.54	0.57	0.60	0.62	0.65	0.67	0.69	0.70	0.72	0.72	0.72	0.73	0.73	0.74
100	0.03	0.04	0.04	0.05	0.06	0.06	0.07	0.07	0.07	0.08	0.08	0.09	0.09	0.09	0.10	0.10	0.10	0.10	0.11
105	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
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	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.05
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	0.06	0.07	0.07	0.09
130	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	0.10	0.10	0.10	0.10	0.10	0.15
135	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.17	0.17	0.17	0.17	0.17	0.16	0.16	0.17	0.16	0.26
140	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.25	0.25	0.25	0.25	0.25	0.24	0.24	0.24	0.24	0.40
145	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.34	0.34	0.34	0.33	0.33	0.33	0.33	0.33	0.55
150	0.45	0.45	0.45	0.45	0.45	0.45	0.44	0.44	0.44	0.44	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.42	0.70
155	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.54	0.54	0.54	0.54	0.54	0.53	0.53	0.54	0.53	0.83
160	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.63	0.93
165	0.73	0.73	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.71	0.98
170	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.75	0.96
175	0.81	0.81	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.81	0.81	0.81	0.81	0.80	0.86
180	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87

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	1596	1596	1596	1596	1596	1596	1596	1596	1596	1596	1596	1596	1596	1596	1596	1596	1596		
5	1556	1554	1554	1554	1554	1554	1554	1554	1553	1553	1541	1535	1532	1532	1528	1523	1522		
10	1362	1363	1362	1356	1348	1343	1335	1329	1323	1317	1303	1294	1285	1276	1271	1268	1267		
15	1095	1095	1093	1090	1084	1076	1065	1054	1041	1027	1013	1003	991	983	980	977	979		
20	785	785	783	780	773	763	753	742	730	719	710	701	694	687	681	679	681		
25	527	530	531	530	525	519	512	504	497	491	484	476	469	464	463	461	464		
30	358	363	366	367	363	359	354	350	347	342	337	332	325	320	317	318	320		
35	243	249	254	256	254	250	246	244	242	239	235	230	224	219	216	215	218		
40	163	169	174	177	175	173	171	169	167	165	162	158	153	149	146	144	147		
45	109	114	118	120	119	118	118	116	114	112	110	108	104	101	98.3	96.9	98.3		
50	74.8	77.9	80.6	82.0	82.1	82.3	81.9	80.6	79.2	77.8	76.3	74.3	72.1	69.8	68.2	67.5	68.4		
55	52.4	54.5	56.1	57.1	57.4	57.5	57.0	56.0	54.9	54.0	53.2	51.8	50.2	48.7	47.7	47.4	48.0		
60	37.1	38.3	39.3	39.9	40.1	40.4	40.1	39.5	38.9	38.5	37.9	37.3	36.2	35.2	34.7	34.5	34.8		
65	27.0	27.7	28.2	28.5	28.7	28.8	28.7	28.3	28.0	27.7	27.5	27.2	26.6	26.1	25.7	25.5	25.6		
70	19.6	20.0	20.3	20.4	20.5	20.5	20.4	20.2	19.9	19.7	19.6	19.5	19.2	18.8	18.7	18.5	18.6		
75	13.8	14.0	14.1	14.2	14.2	14.1	13.9	13.7	13.5	13.2	13.1	12.9	12.6	12.4	12.4	12.4	12.4		
80	8.80	8.89	8.93	8.97	8.90	8.81	8.65	8.51	8.34	8.16	8.02	7.89	7.65	7.56	7.62	7.62	7.60		
85	5.39	5.45	5.45	5.43	5.39	5.31	5.20	5.10	4.96	4.82	4.71	4.60	4.44	4.37	4.39	4.38	4.37		
90	2.35	2.33	2.27	2.23	2.16	2.11	2.05	1.99	1.92	1.85	1.79	1.73	1.67	1.63	1.62	1.61	1.61		
95	0.73	0.72	0.71	0.69	0.68	0.65	0.63	0.60	0.57	0.54	0.51	0.49	0.47	0.45	0.44	0.44	0.44		
100	0.11	0.11	0.10	0.10	0.10	0.09	0.08	0.07	0.06	0.05	0.04	0.04	0.04	0.03	0.03	0.03	0.04		
105	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	0.02	0.02		
110	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02		
115	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	0.04	0.03	0.04	0.04		
120	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	0.06	0.06	0.06	0.06		
125	0.09	0.09	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.09	0.09	0.09	0.09		
130	0.16	0.16	0.16	0.17	0.17	0.17	0.18	0.18	0.18	0.18	0.17	0.17	0.17	0.17	0.17	0.17	0.17		
135	0.27	0.27	0.28	0.28	0.29	0.29	0.29	0.30	0.30	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.28		
140	0.41	0.42	0.42	0.43	0.43	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44		
145	0.58	0.58	0.58	0.59	0.59	0.60	0.60	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.60		
150	0.74	0.74	0.74	0.75	0.75	0.76	0.76	0.76	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.78	0.76		
155	0.87	0.87	0.88	0.88	0.88	0.89	0.89	0.89	0.89	0.90	0.90	0.90	0.90	0.90	0.91	0.91	0.88		
160	0.99	0.98	0.98	0.98	0.99	0.99	0.99	0.99	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.01	0.98		
165	1.05	1.04	1.04	1.04	1.04	1.04	1.04	1.05	1.04	1.05	1.05	1.05	1.05	1.05	1.05	1.06	1.01		
170	1.04	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.02	1.03	1.02	1.03	1.03	1.03	1.03	1.04	0.98		
175	0.95	0.94	0.94	0.93	0.93	0.93	0.93	0.93	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.87		
180	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87		

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

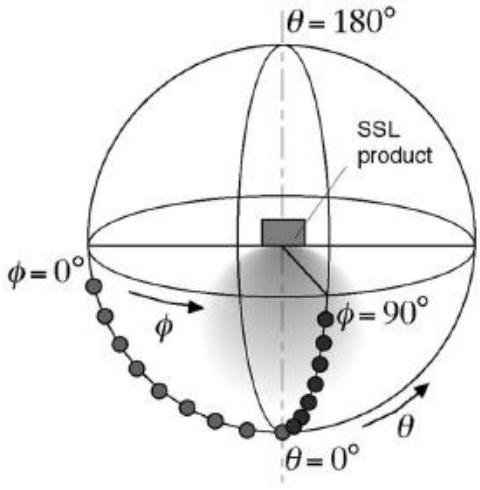
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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

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