LM-79-08 TEST REPORT

for

GREEN CREATIVE LTD

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

LED Lamp

Model: 7MR16DIM/940FL35

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.: HZ19040047p

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

Review by: April Zou

Engineer: April Zou
May 10, 2019

Approved by: Jim Zhang

Manager: Jim Zhang
May 10, 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: **7MR16DIM/940FL35**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
88.0	582.0	6.61	0.9276

CCT (K)	CRI	Stabilization Time (Light & Power)
4038	95.4	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 : Apr. 26, 2019

Date of Test : Apr. 30, 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

TABLE OF CONTENT

SAMPLE PHOTO

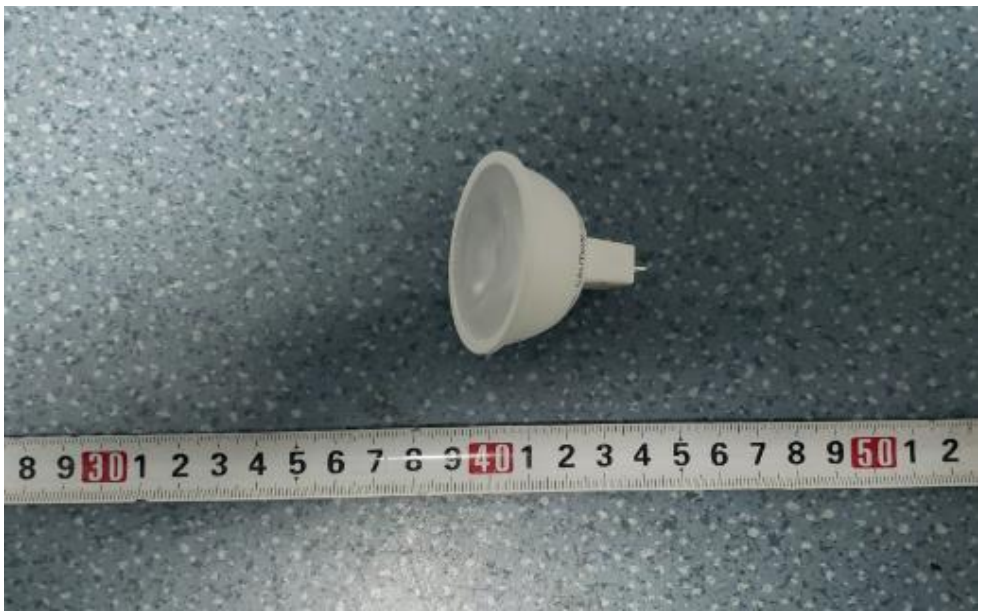


Figure 1- Overview of the sample

Equipment Under Test(EUT)	
Name	: LED Lamp
Model	: 7MR16DIM/940FL35
Electrical Ratings	: 12V, 60Hz, 7W
Product Description	: 4000K
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)	12.0
Voltage frequency (Hz)	60
Test Current (A)	0.595
Power Factor	0.9276
Test Power (W)	6.61
THD A%	20.33
Luminous Efficacy (lm/W)	88.0
Total Luminous Flux (lm)	582.0
Color Rendering Index (CRI)	95.4
R9	82.4
Correlated Color Temperature (CCT)(K)	4038
Chromaticity Chroma x	0.3787
Chromaticity Chroma y	0.3757
Chromaticity Chroma u	0.2244
Chromaticity Chroma v	0.3339
Duv	0.0006
Chromaticity Chroma u ’	0.2244
Chromaticity Chroma v’	0.5009

Special Color Rendering Indices	
R1	96.8
R2	99.7
R3	98.8
R4	92.6
R5	94.3
R6	96.1
R7	93.8
R8	91.1
R9	82.4
R10	96.8
R11	93.3
R12	74.5
R13	98.3
R14	99.2

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)	12.0
Voltage frequency (Hz)	60
Test Current (A)	0.599
Power Factor	0.9298
Power (W)	6.66
Luminous Efficacy (lm/W)	88.9
Total Luminous Flux (lm)	591.9
Beam Angle (°)	36.4（0^o-180^o）/ 35.6（90^o-270^o）
Center Beam Candle Power (cd)	1398
Maximum Beam Candle Power (cd)	1398 (At: C=0.0, Gamma=0.0)
Spacing Criteria	0.58（0^o-180^o）/0.57 (90^o-270^o)
Zonal Lumens in the 0 °-60 °Zone	96.82%
Zonal Lumens in the 60 °-90 °Zone	2.95%
Zonal Lumens in the 90 °-120 °Zone	0.21%
Zonal Lumens in the 120 °-180 °Zone	0.03%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

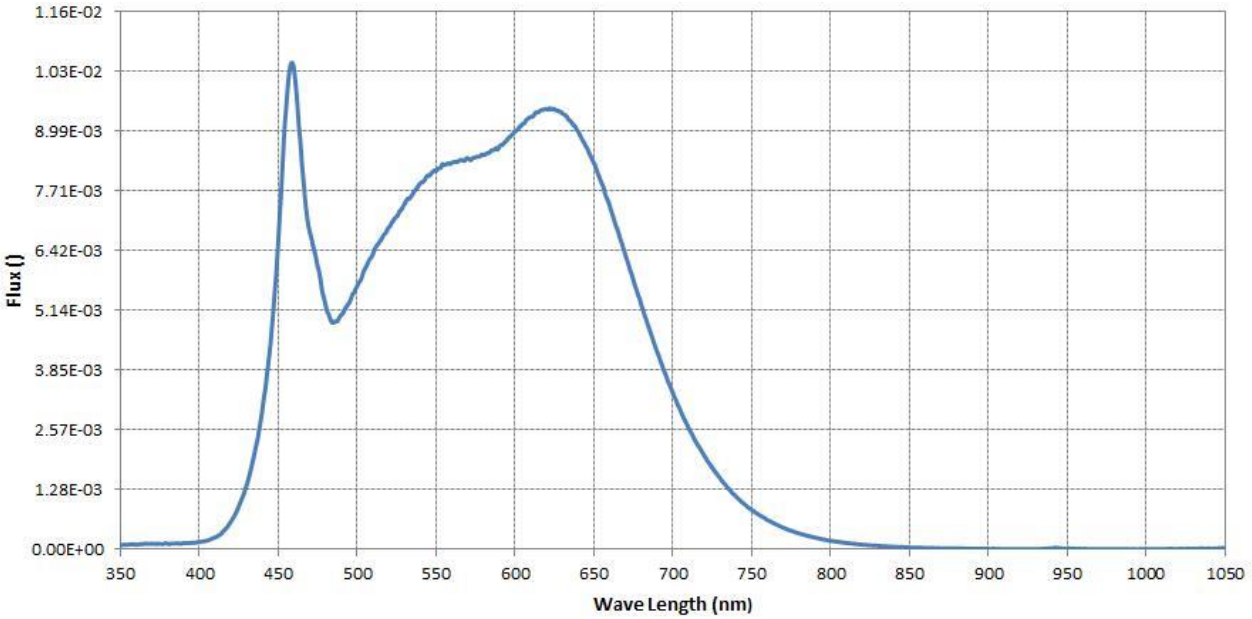
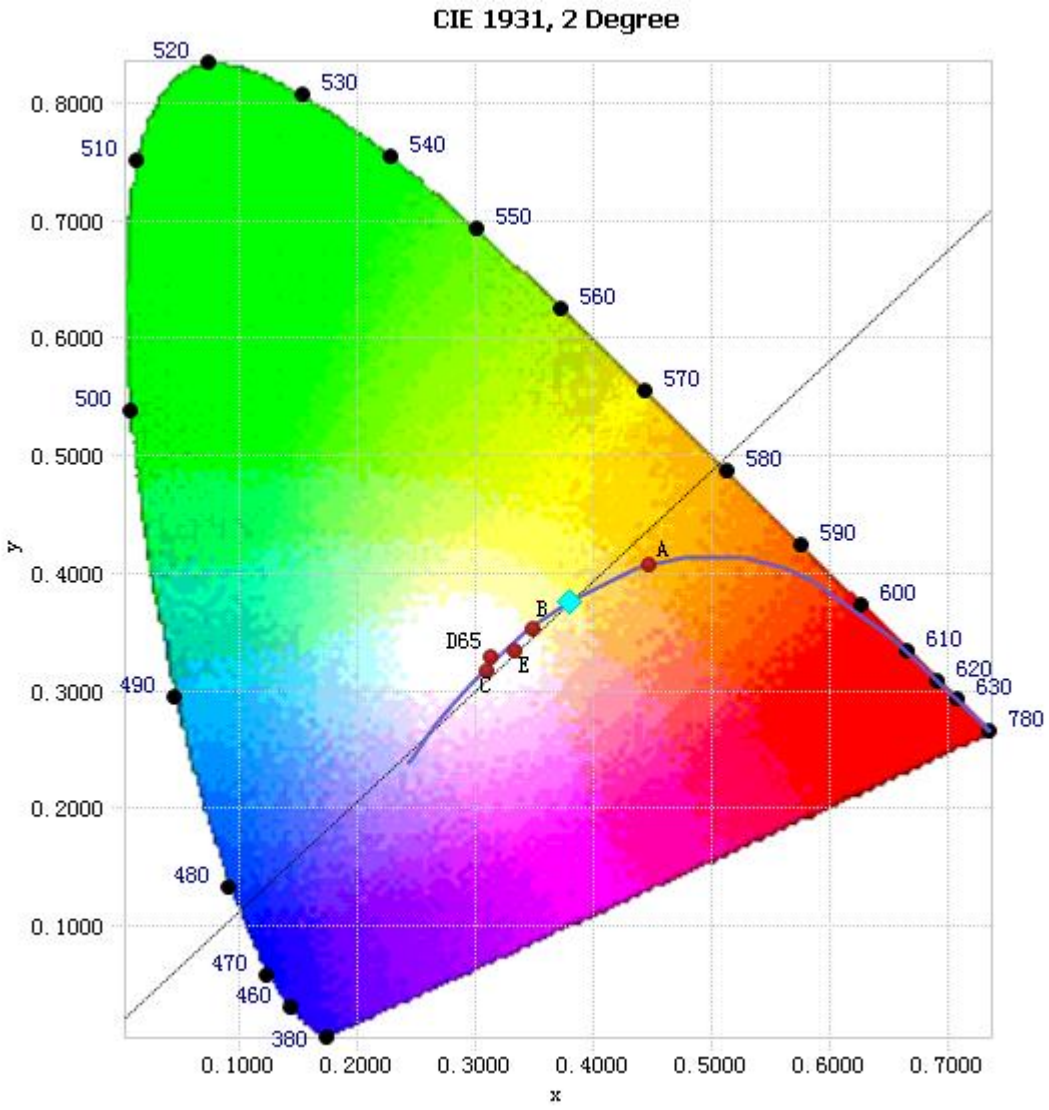


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.27E-04	485	4.88E-03	590	8.65E-03	695	3.80E-03
385	1.29E-04	490	5.04E-03	595	8.81E-03	700	3.37E-03
390	1.42E-04	495	5.31E-03	600	8.99E-03	705	2.98E-03
395	1.51E-04	500	5.66E-03	605	9.16E-03	710	2.62E-03
400	1.63E-04	505	6.04E-03	610	9.30E-03	715	2.29E-03
405	1.94E-04	510	6.35E-03	615	9.41E-03	720	2.02E-03
410	2.62E-04	515	6.66E-03	620	9.47E-03	725	1.76E-03
415	3.83E-04	520	6.93E-03	625	9.47E-03	730	1.53E-03
420	5.96E-04	525	7.16E-03	630	9.38E-03	735	1.32E-03
425	9.22E-04	530	7.43E-03	635	9.22E-03	740	1.14E-03
430	1.38E-03	535	7.63E-03	640	8.99E-03	745	9.89E-04
435	2.06E-03	540	7.88E-03	645	8.66E-03	750	8.54E-04
440	3.01E-03	545	8.05E-03	650	8.31E-03	755	7.37E-04
445	4.37E-03	550	8.14E-03	655	7.87E-03	760	6.34E-04
450	6.60E-03	555	8.27E-03	660	7.40E-03	765	5.49E-04
455	9.48E-03	560	8.32E-03	665	6.87E-03	770	4.70E-04
460	1.03E-02	565	8.36E-03	670	6.33E-03	775	4.04E-04
465	8.32E-03	570	8.41E-03	675	5.80E-03	780	3.47E-04
470	6.83E-03	575	8.43E-03	680	5.26E-03		
475	6.09E-03	580	8.49E-03	685	4.75E-03		
480	5.26E-03	585	8.58E-03	690	4.26E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3787, 0.3757)

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

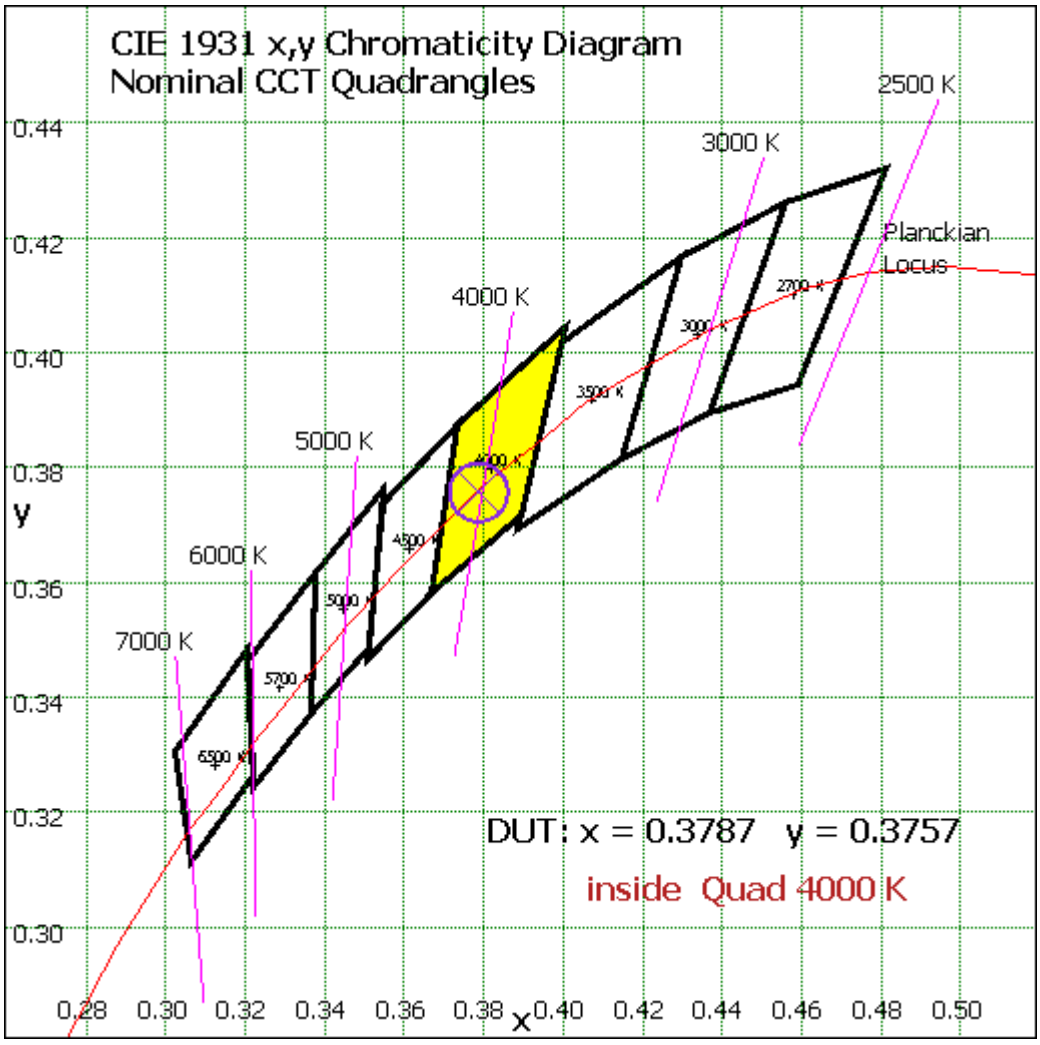
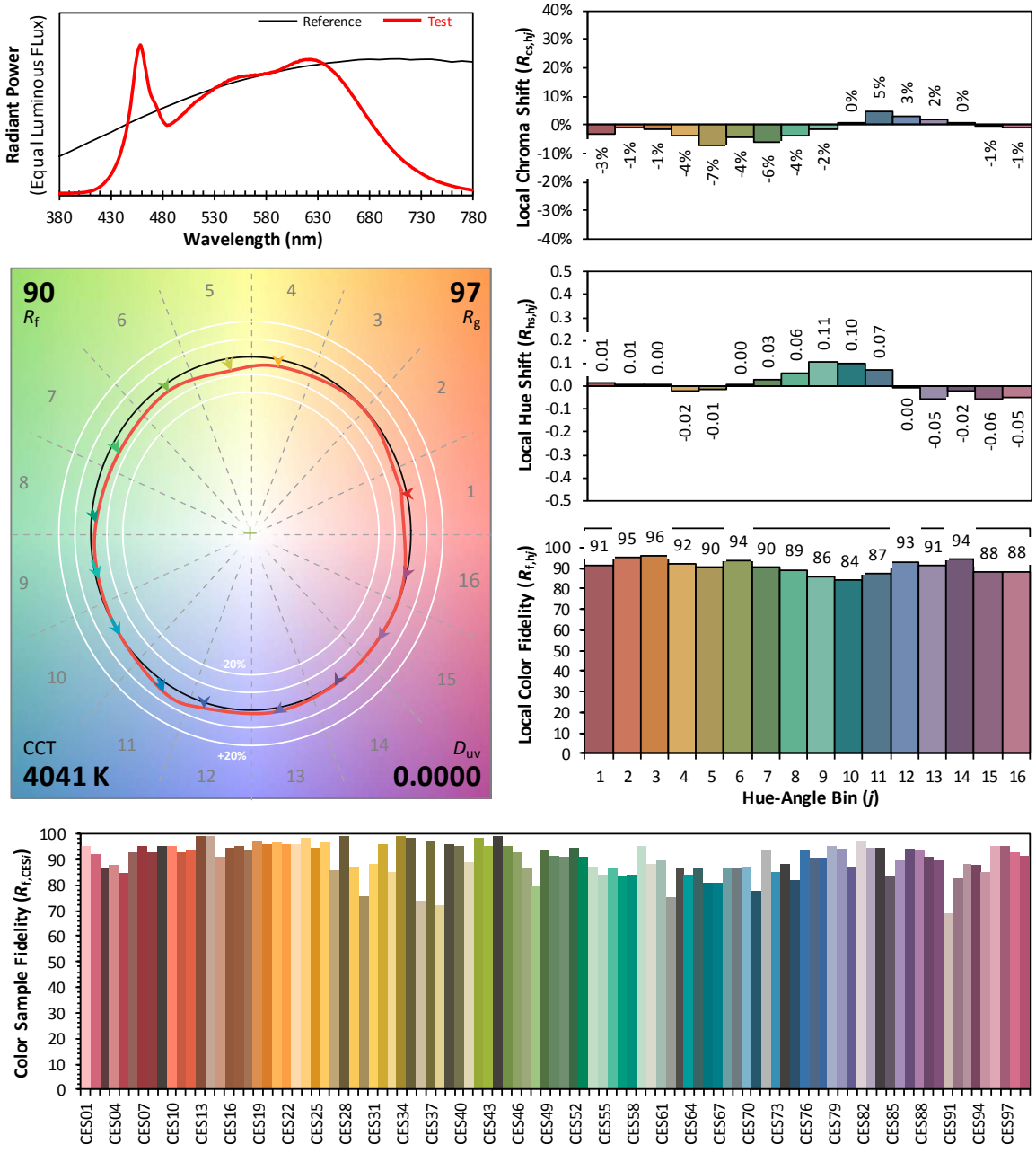


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method



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

x	0.3787
y	0.3758
u'	0.2244
v'	0.5009

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	124.787	21.08%
10- 20	245.719	41.51%
20- 30	135.943	22.97%
30- 40	43.015	7.27%
40- 50	14.745	2.49%
50- 60	8.834	1.49%
60- 70	7.869	1.33%
70- 80	6.178	1.04%
80- 90	3.404	0.58%
90-100	1.039	0.18%
100-110	0.177	0.03%
110-120	0.003	0.00%
120-130	0.004	0.00%
130-140	0.012	0.00%
140-150	0.028	0.00%
150-160	0.055	0.01%
160-170	0.06	0.01%
170-180	0.022	0.00%
Total	591.9	100%

γ(°)	Lumens	% Total
0- 60	573.043	96.82%
60- 90	17.451	2.95%
0-90	590.494	99.76%
90- 180	1.4	0.24%
0- 180	591.9	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

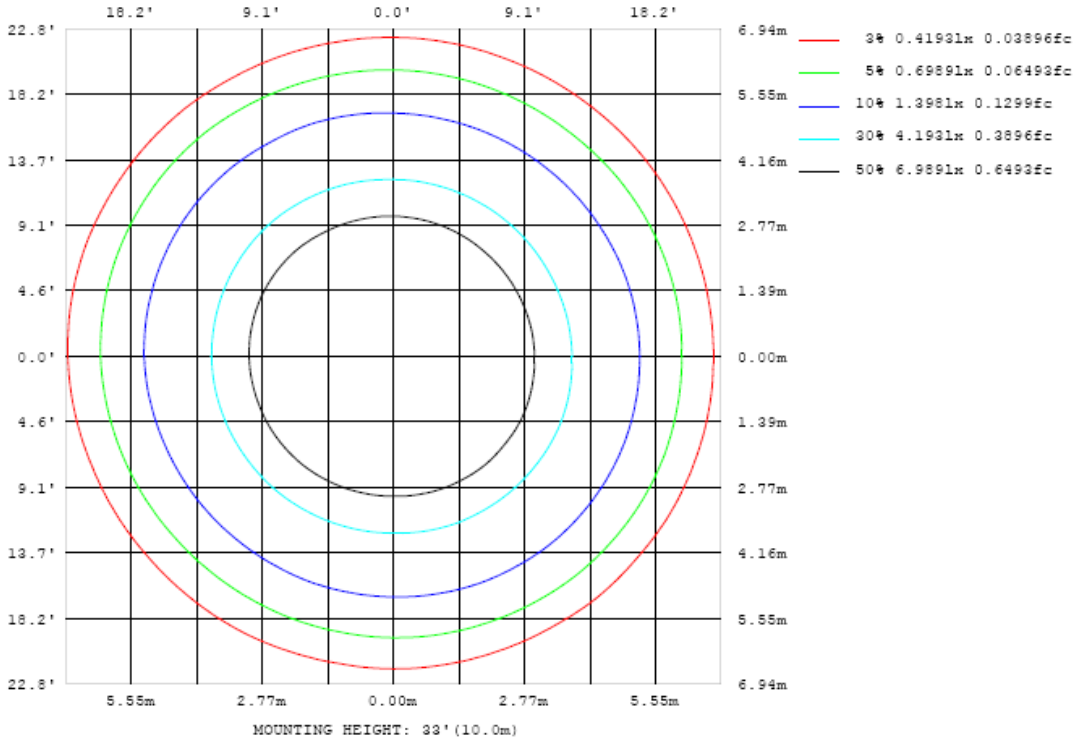


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

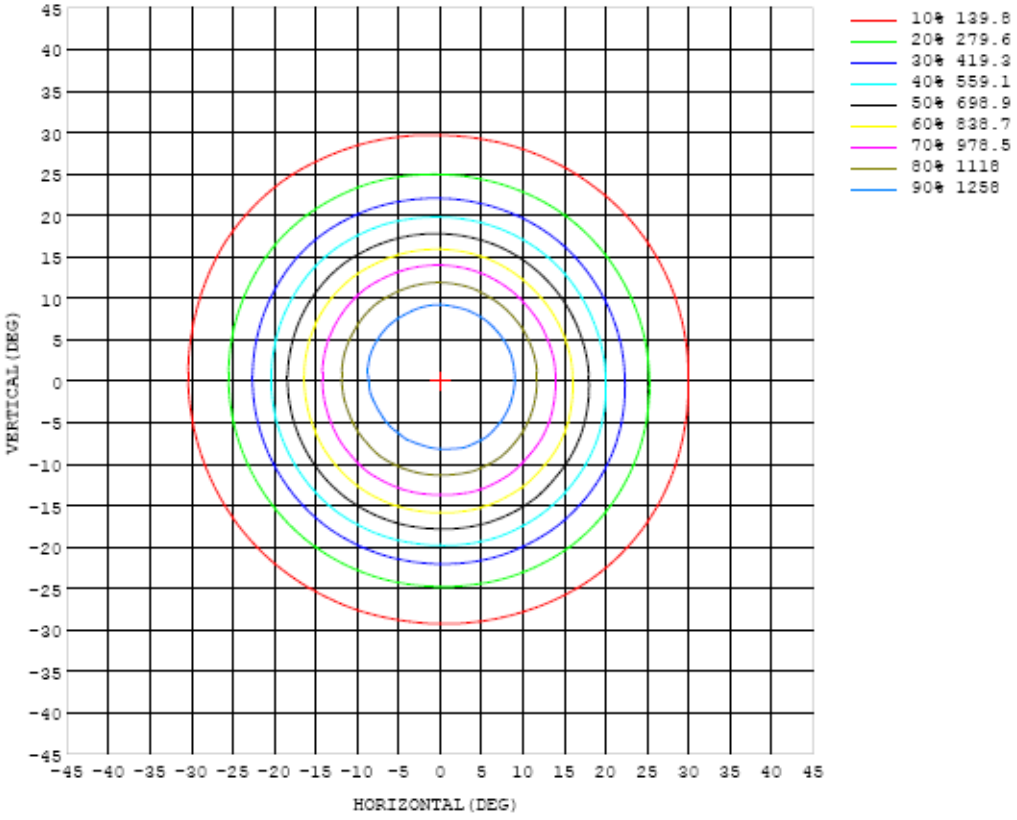


Chart 6: Isocandela Plot

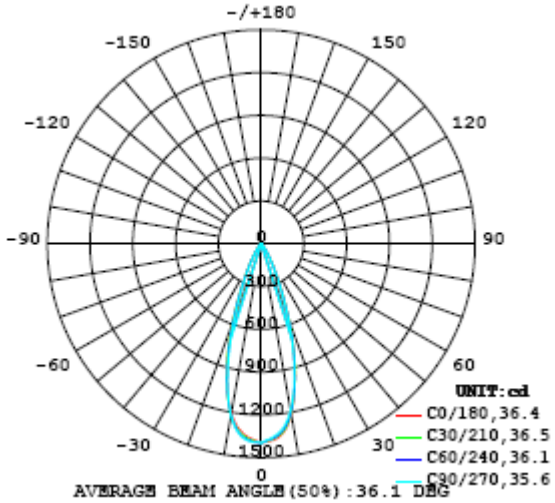


Chart 7: Polar Candela Distribution

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	1398	1398	1398	1398	1398	1398	1398	1398	1398	1398	1398	1398	1398	1398	1398	1398	1398	1398	1398
5	1365	1363	1358	1353	1348	1355	1347	1339	1339	1337	1333	1333	1328	1329	1327	1332	1335	1339	1345
10	1212	1210	1208	1207	1202	1208	1201	1199	1188	1185	1183	1184	1188	1191	1190	1196	1199	1202	1206
15	909	913	919	918	911	913	908	907	902	896	897	900	905	911	911	918	921	925	930
20	557	565	570	568	564	565	560	559	552	546	545	549	551	559	563	568	575	583	587
25	289	293	293	292	289	287	282	278	273	270	269	270	271	273	277	281	289	297	303
30	139	140	140	139	136	134	130	128	126	125	124	124	124	126	129	134	138	144	150
35	64.9	65.2	64.3	63.1	61.6	60.6	58.9	58.3	57.9	58.2	57.8	59.3	60.9	61.6	63.1	64.8	66.8	69.3	70.6
40	31.4	31.0	30.5	30.0	29.8	29.4	28.6	28.6	28.5	28.6	29.4	30.3	31.4	32.2	33.1	33.3	33.9	34.5	35.3
45	17.2	17.2	17.0	17.2	17.3	17.2	16.8	16.7	16.7	16.8	17.1	17.6	17.9	18.3	18.7	19.0	19.3	19.2	19.1
50	12.3	12.2	12.1	12.1	12.0	12.1	11.8	11.8	11.6	11.6	11.6	11.8	12.1	12.1	12.3	12.3	12.5	12.4	12.5
55	10.0	10.1	9.96	9.82	9.76	9.75	9.65	9.46	9.32	9.21	9.18	9.26	9.39	9.42	9.35	9.39	9.49	9.62	9.57
60	9.18	9.26	9.14	9.14	9.15	9.00	8.93	8.74	8.49	8.26	8.12	8.19	8.28	8.17	8.09	8.01	8.12	8.10	8.20
65	8.65	8.69	8.48	8.51	8.57	8.57	8.29	8.09	7.80	7.63	7.44	7.42	7.55	7.52	7.46	7.49	7.52	7.62	7.63
70	7.67	7.69	7.55	7.57	7.53	7.66	7.45	7.23	6.93	6.77	6.58	6.54	6.51	6.51	6.67	6.63	6.75	6.78	6.94
75	5.99	6.09	6.03	6.09	5.99	6.22	5.98	6.01	5.75	5.65	5.52	5.52	5.51	5.43	5.54	5.47	5.61	5.59	5.83
80	4.76	4.85	4.75	4.83	4.81	4.96	4.78	4.77	4.63	4.54	4.57	4.60	4.47	4.37	4.38	4.31	4.46	4.45	4.52
85	3.27	3.33	3.32	3.25	3.31	3.29	3.41	3.41	3.29	3.27	3.27	3.27	3.25	3.27	3.18	3.14	3.05	3.06	3.11
90	1.72	1.67	1.70	1.77	1.66	1.82	1.87	1.79	1.70	1.66	1.59	1.59	1.62	1.74	1.60	1.57	1.54	1.52	1.56
95	0.97	0.98	0.96	1.01	1.05	1.12	1.04	1.06	1.02	0.98	0.92	0.92	0.91	0.90	0.91	0.88	0.90	0.85	0.79
100	0.49	0.50	0.47	0.51	0.49	0.51	0.50	0.49	0.48	0.47	0.41	0.41	0.40	0.39	0.38	0.39	0.38	0.35	0.37
105	0.17	0.18	0.17	0.18	0.18	0.19	0.18	0.18	0.17	0.16	0.16	0.15	0.14	0.14	0.13	0.12	0.12	0.11	0.10
110	0.04	0.04	0.04	0.04	0.05	0.04	0.05	0.05	0.04	0.04	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.00
115	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
120	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
125	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
130	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
135	0.01	0.01	0.01	0.02	0.01	0.02	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01
140	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
145	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	0.04
150	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.06	0.06	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.08
155	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.10	0.10	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.12
160	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.17
165	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	0.21
170	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.24	0.24	0.24	0.24	0.24
175	0.24	0.24	0.24	0.24	0.24	0.25	0.25	0.25	0.25	0.24	0.24	0.24	0.24	0.23	0.23	0.22	0.21	0.21	0.21
180	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	0.20	0.20	0.20

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	1398	1398	1398	1398	1398	1398	1398	1398	1398	1398	1398	1398	1398	1398	1398	1398	1398		
5	1348	1349	1356	1363	1370	1369	1369	1371	1371	1369	1365	1369	1368	1371	1369	1369	1371		
10	1215	1218	1219	1222	1224	1221	1221	1223	1224	1219	1220	1218	1218	1216	1217	1217	1215		
15	937	940	937	937	936	922	916	911	908	903	900	895	894	894	899	902	909		
20	589	590	585	583	579	567	561	551	545	542	540	538	540	541	543	547	554		
25	306	307	306	305	300	293	290	282	277	273	272	272	273	275	278	282	287		
30	152	152	153	151	148	143	140	136	133	132	131	130	131	133	136	139	140		
35	72.0	72.4	71.0	69.7	68.3	65.8	64.8	64.1	63.8	63.4	63.1	63.3	63.7	64.4	64.6	64.6	64.4		
40	35.3	35.1	34.6	33.8	32.9	32.0	32.1	32.1	31.8	32.1	32.1	32.8	33.1	33.1	32.5	32.1	31.8		
45	19.1	19.3	19.3	19.0	18.6	17.9	17.6	17.5	17.6	17.8	17.8	18.0	18.1	18.2	18.2	17.9	17.6		
50	12.5	12.8	12.9	12.7	12.6	12.2	12.1	11.9	12.0	12.1	12.1	12.2	12.2	12.4	12.4	12.4	12.3		
55	9.73	9.82	9.84	9.82	9.89	9.70	9.65	9.58	9.61	9.62	9.66	9.66	9.77	9.86	9.84	9.82	9.89		
60	8.43	8.52	8.45	8.42	8.60	8.51	8.53	8.59	8.58	8.56	8.55	8.54	8.74	8.86	8.62	8.66	8.84		
65	7.88	7.91	7.82	7.80	8.03	8.01	7.92	7.71	7.71	7.75	7.79	7.89	8.08	8.16	8.20	8.29	8.28		
70	6.98	6.89	7.10	7.06	7.28	7.19	7.18	6.92	6.93	6.90	6.89	7.12	7.15	7.41	7.37	7.47	7.51		
75	5.70	5.66	5.84	5.70	6.00	5.85	5.92	5.73	5.70	5.63	5.63	5.89	5.76	5.98	5.92	6.04	6.01		
80	4.47	4.48	4.54	4.50	4.62	4.47	4.61	4.41	4.40	4.46	4.38	4.54	4.52	4.60	4.60	4.76	4.74		
85	3.06	3.18	3.07	3.16	3.14	3.10	3.10	3.07	3.04	3.14	3.10	3.03	3.11	3.14	3.24	3.27	3.34		
90	1.54	1.52	1.45	1.48	1.56	1.58	1.53	1.51	1.56	1.58	1.57	1.60	1.62	1.64	1.74	1.67	1.69		
95	0.84	0.81	0.82	0.82	0.83	0.82	0.88	0.88	0.81	0.88	0.89	0.88	0.93	0.98	0.93	0.98	1.01		
100	0.34	0.34	0.35	0.35	0.35	0.36	0.36	0.35	0.35	0.37	0.37	0.39	0.42	0.43	0.47	0.48	0.46		
105	0.10	0.10	0.10	0.10	0.10	0.10	0.11	0.11	0.12	0.12	0.13	0.14	0.15	0.15	0.16	0.17	0.18		
110	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.02	0.03	0.03	0.03	0.04	0.04		
115	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
120	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
125	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00		
130	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		
135	0.01	0.01	0.01	0.02	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		
140	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		
145	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		
150	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.08	0.08	0.09	0.09	0.08	0.08	0.09	0.09	0.08		
155	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.14	0.14	0.14	0.14	0.13		
160	0.19	0.19	0.19	0.19	0.19	0.19	0.18	0.18	0.18	0.18	0.19	0.19	0.19	0.19	0.19	0.19	0.18		
165	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.24	0.24	0.22		
170	0.25	0.25	0.25	0.25	0.24	0.24	0.24	0.24	0.25	0.25	0.25	0.26	0.26	0.26	0.26	0.26	0.24		
175	0.20	0.20	0.19	0.19	0.20	0.20	0.20	0.20	0.20	0.21	0.21	0.22	0.22	0.23	0.23	0.23	0.23		
180	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	0.20		

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

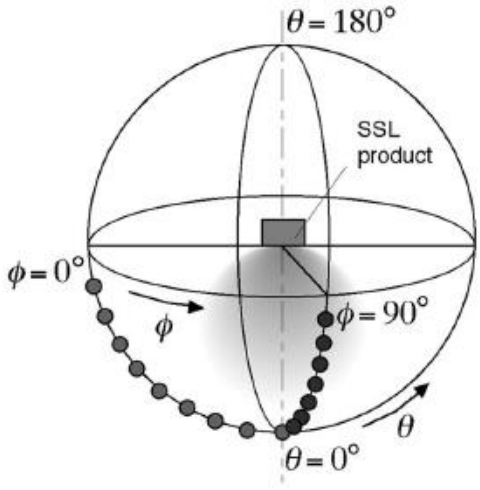
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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

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