

## LM-79-08 TEST REPORT

for

### GREEN CREATIVE LTD

Room 3603, Level 36, Tower 1, Enterprise Square Five, 38 Wang Chiu Road, Kowloon Bay, KL,  
Hong Kong

### LED Lamp

**Model: 7.5MR16DIM/927FL35/R**

### 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](http://www.ledtestlab.com)

Report No.: HZ20060049g

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

Review by:



Engineer: April Zou  
Oct. 15, 2020

Approved by:



Manager: Jim Zhang  
Oct. 15, 2020

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: 7.5MR16DIM/927FL35/R

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
83.8	552.2	6.59	0.9121
CCT (K)	CRI	Stabilization Time (Light & Power)	
2722	97.3	60	

Table 1: Executive Data Summary

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

### Test specifications:

<b>Date of Receipt</b>	: Jun. 25, 2020
<b>Date of Test</b>	: Jun. 25, 2020
<b>Test item</b>	: Total Luminous Flux, Luminous Distribution Intensity, Luminous Efficacy, Correlated Color Temperature, Color Rendering Index, Chromaticity Coordinate, Electrical parameters
<b>Reference Standard</b>	: 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

LM-79-08 TEST REPORT .....	1
TEST SUMMARY .....	2
SAMPLE PHOTO .....	4
TEST RESULTS .....	5
Sphere-Spectroradiometer Method.....	5
Goniophotometer Method .....	6
Spectral Power Distribution - Sphere Spectroradiometer Method .....	7
Chromaticity Diagram - Sphere Spectroradiometer Method.....	8
Nominal CCT Quadrangles – Sphere Spectroradiometer Method .....	9
Color Rendition Report – Sphere Spectroradiometer Method .....	10
Zonal Lumen Tabulation- Goniophotometer Method .....	11
Illuminance Plots- Goniophotometer Method .....	12
Luminous Intensity Distribution Plots- Goniophotometer Method.....	13
Luminous Intensity Data- Goniophotometer Method .....	14
EQUIPMENT LIST .....	16
TEST METHODS .....	16
Seasoning of SSL Product.....	16
Sphere-Spectroradiometer Method- Photometric and Electrical Measurements.....	16
Goniophotometer Method .....	17
Photometric and Electrical Measurements .....	17
Color Characteristics Measurements.....	17
Color Spatial Uniformity .....	17

## SAMPLE PHOTO



Figure 1- Overview of the sample

### Equipment Under Test(EUT)

<b>Name</b>	: LED Lamp
<b>Model</b>	: 7.5MR16DIM/927FL35/R
<b>Electrical Ratings</b>	: 12Vac, 50/60Hz, 7.5W
<b>Product Description</b>	: 2700K
<b>Manufacturer</b>	: GREEN CREATIVE LTD
<b>Address</b>	: Room 3603, Level 36, Tower 1, Enterprise Square Five, 38 Wang Chiu Road, Kowloon Bay, KL, Hong Kong

## TEST RESULTS

Test ambient temperature was 26.0 °C.

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)	0.600
Power Factor	0.9121
Test Power (W)	6.59
THD A%	24.50
Luminous Efficacy (lm/W)	83.8
Total Luminous Flux (lm)	552.2
Color Rendering Index (CRI)	97.3
R9	82.6
Correlated Color Temperature (CCT)(K)	2722
Chromaticity Chroma x	0.4580
Chromaticity Chroma y	0.4103
Chromaticity Chroma u	0.2614
Chromaticity Chroma v	0.3513
Duv	0.0002
Chromaticity Chroma u'	0.2614
Chromaticity Chroma v'	0.5270

Special Color Rendering Indices	
R1	98.8
R2	99.5
R3	97.9
R4	98.5
R5	98.1
R6	97.9
R7	95.9
R8	92.1
R9	82.6
R10	96.9
R11	99
R12	87.2
R13	99.4
R14	97.6

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 25.0 °C.

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)	0.603
Power Factor	0.9169
Power (W)	6.63
Luminous Efficacy (lm/W)	84.9
Total Luminous Flux (lm)	563.1
Beam Angle ( ° )	32.0 (0°-180°) / 31.8 (90°-270°)
Center Beam Candle Power (cd)	1696
Maximum Beam Candle Power (cd)	1696 (At: C=0.0, Gamma=0.0)
Spacing Criteria	0.52 (0°-180°) / 0.52 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	97.51%
Zonal Lumens in the 60 °-90 °Zone	1.89%
Zonal Lumens in the 90 °-120 °Zone	0.34%
Zonal Lumens in the 120 °-180 °Zone	0.26%

Table 3: Test data per Goniophotometer Method

### Spectral Power Distribution - Sphere Spectroradiometer Method

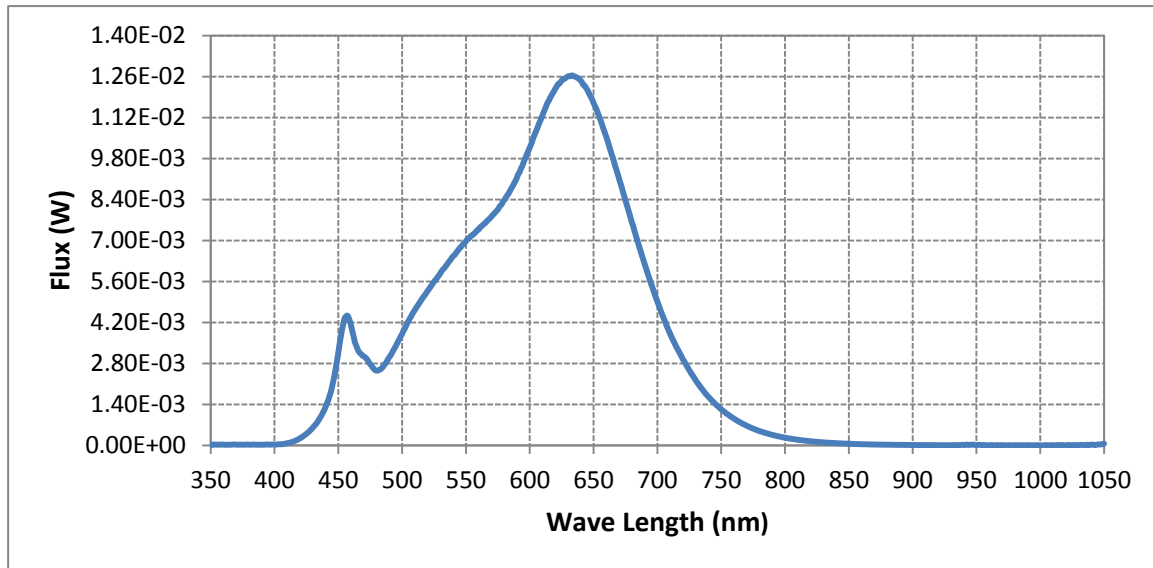
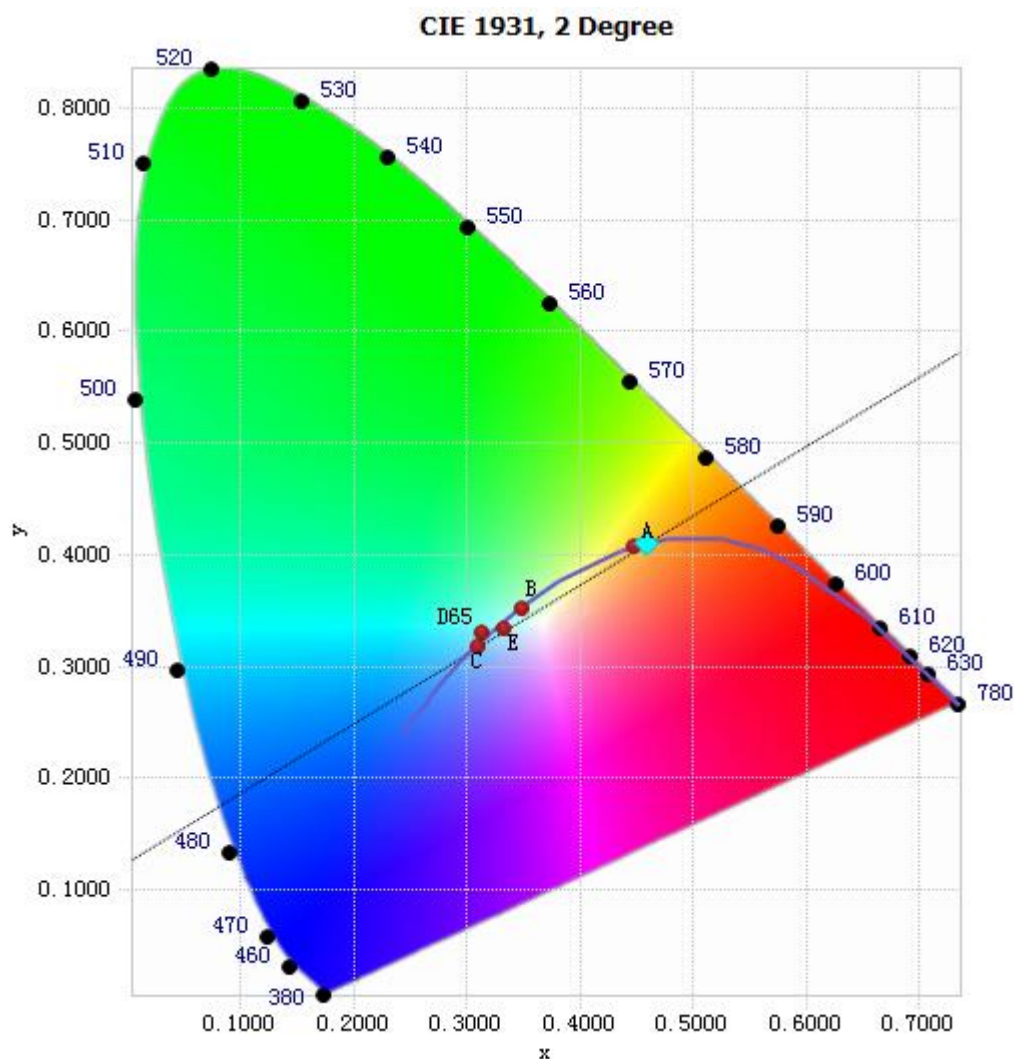


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.96E-05	485	2.69E-03	590	9.15E-03	695	5.53E-03
385	2.71E-05	490	3.02E-03	595	9.65E-03	700	4.92E-03
390	2.47E-05	495	3.40E-03	600	1.02E-02	705	4.34E-03
395	3.35E-05	500	3.81E-03	605	1.07E-02	710	3.81E-03
400	3.20E-05	505	4.26E-03	610	1.13E-02	715	3.36E-03
405	4.46E-05	510	4.63E-03	615	1.18E-02	720	2.95E-03
410	7.76E-05	515	4.97E-03	620	1.22E-02	725	2.57E-03
415	1.41E-04	520	5.28E-03	625	1.25E-02	730	2.23E-03
420	2.47E-04	525	5.59E-03	630	1.26E-02	735	1.93E-03
425	3.99E-04	530	5.89E-03	635	1.26E-02	740	1.66E-03
430	6.07E-04	535	6.18E-03	640	1.25E-02	745	1.44E-03
435	8.99E-04	540	6.47E-03	645	1.22E-02	750	1.24E-03
440	1.32E-03	545	6.74E-03	650	1.17E-02	755	1.07E-03
445	1.98E-03	550	6.98E-03	655	1.12E-02	760	9.18E-04
450	3.17E-03	555	7.18E-03	660	1.05E-02	765	7.87E-04
455	4.35E-03	560	7.38E-03	665	9.85E-03	770	6.75E-04
460	4.09E-03	565	7.59E-03	670	9.11E-03	775	5.77E-04
465	3.30E-03	570	7.82E-03	675	8.37E-03	780	4.91E-04
470	3.04E-03	575	8.06E-03	680	7.62E-03		
475	2.77E-03	580	8.38E-03	685	6.90E-03		
480	2.56E-03	585	8.74E-03	690	6.20E-03		

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

## Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4580, 0.4103)

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

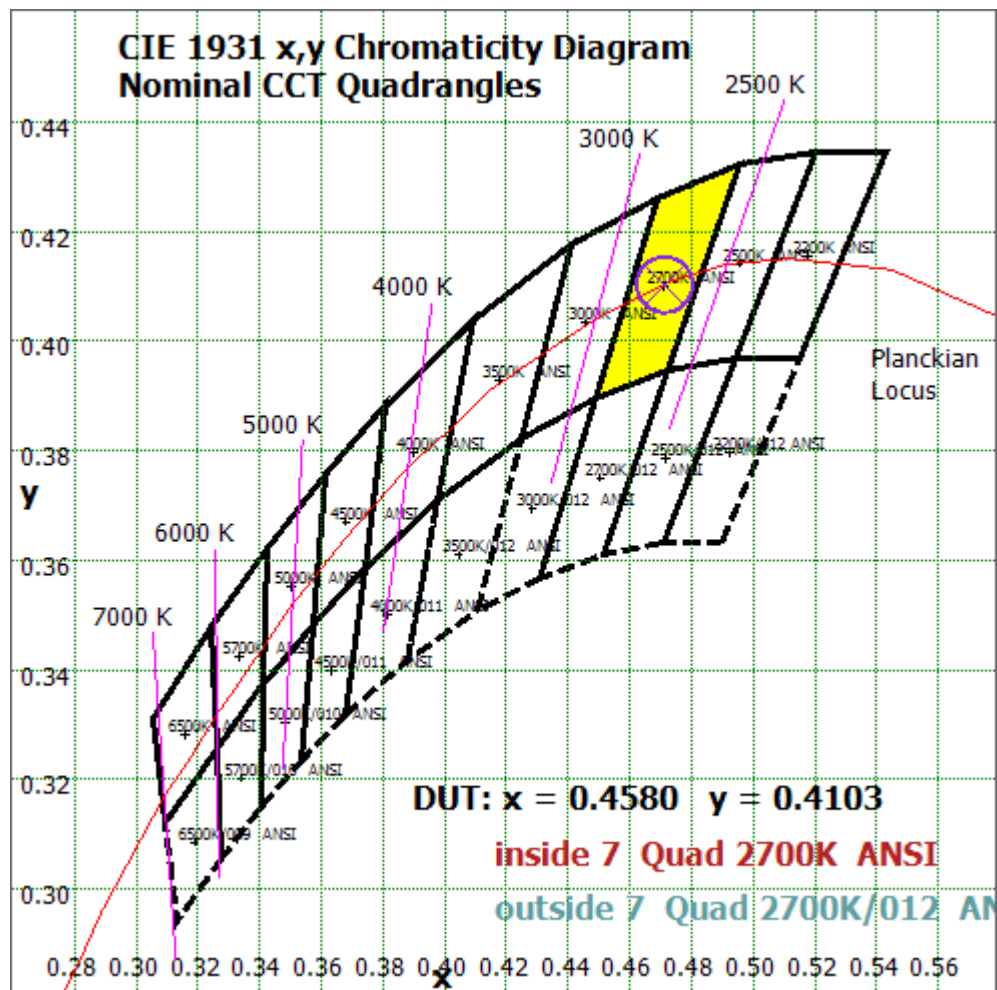


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

# Color Rendition Report – Sphere Spectroradiometer Method

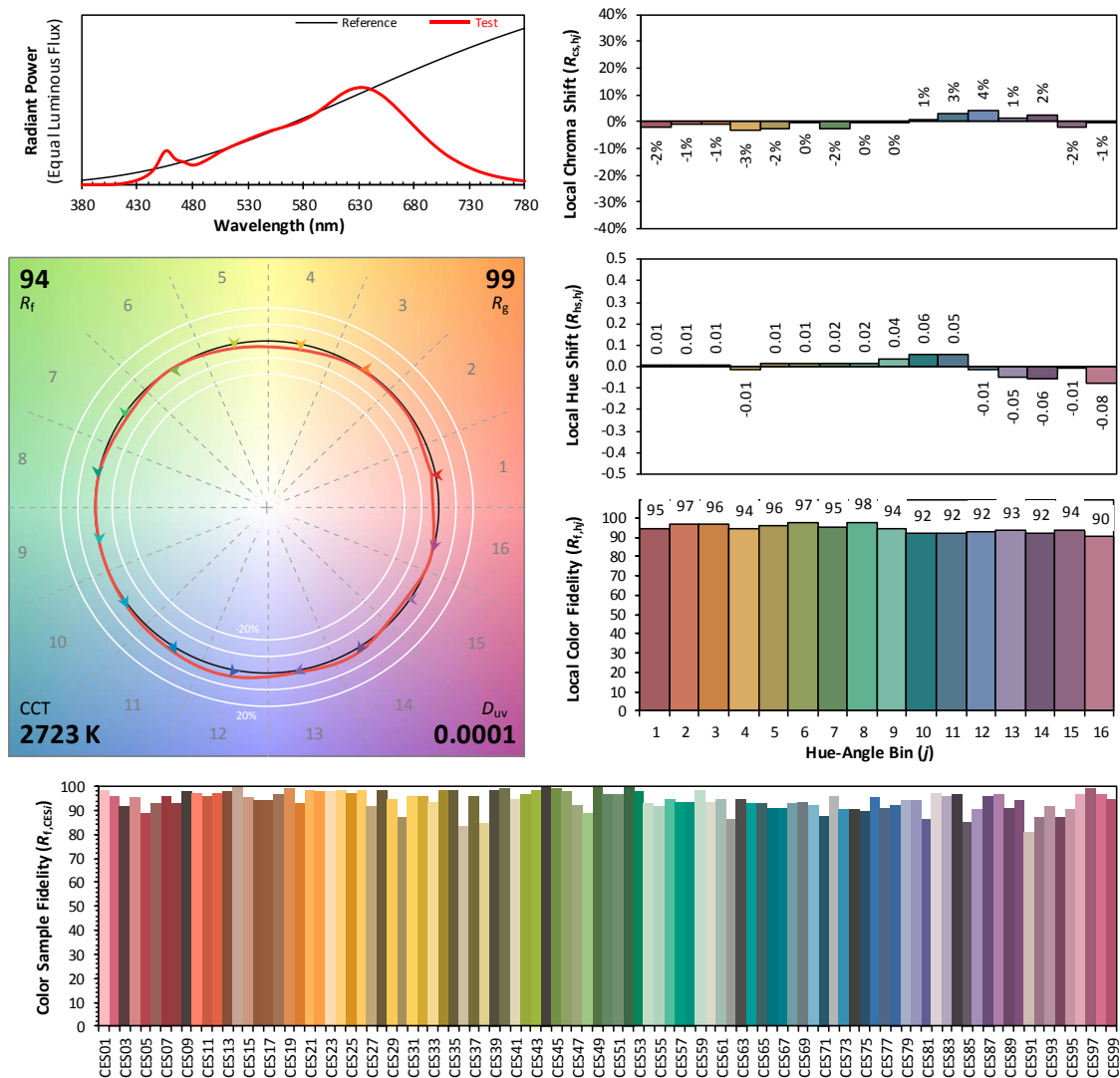
## ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2020/06/25

Model: 7.5MR16DIM/927FL35/R



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

$x$  0.4580  
 $y$  0.4103  
 $u'$  0.2614  
 $v'$  0.5270

CIE 13.3-1995  
(CRI)

$R_a$  97  
 $R_g$  83

Colors are for visual orientation purposes only. Created with the ANSI/IES TM-30-18 Calculator Version 2.00.

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

$\gamma(^{\circ})$	Lumens	% Total
0- 10	139.534	24.78%
10- 20	246.021	43.69%
20- 30	112.79	20.03%
30- 40	31.185	5.54%
40- 50	11.74	2.08%
50- 60	7.816	1.39%
60- 70	5.759	1.02%
70- 80	3.358	0.60%
80- 90	1.503	0.27%
90-100	0.553	0.10%
100-110	0.618	0.11%
110-120	0.751	0.13%
120-130	1.036	0.18%
130-140	0.091	0.02%
140-150	0.101	0.02%
150-160	0.112	0.02%
160-170	0.094	0.02%
170-180	0.032	0.01%
Total	563.1	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	549.086	97.51%
60- 90	10.62	1.89%
0-90	559.706	99.40%
90- 180	3.388	0.60%
0- 180	563.1	100%

Table 5: Zonal Lumen

## Illuminance Plots- Goniophotometer Method

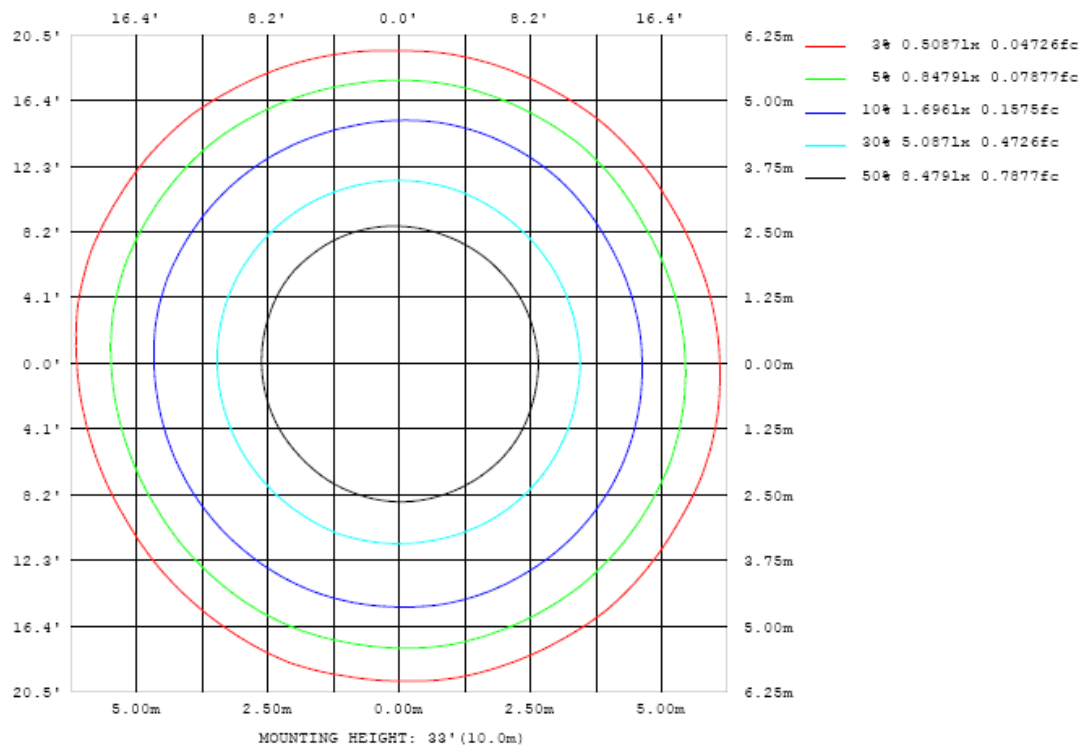


Chart 5: Illuminance Plot (Footcandles)

## Luminous Intensity Distribution Plots- Goniophotometer Method

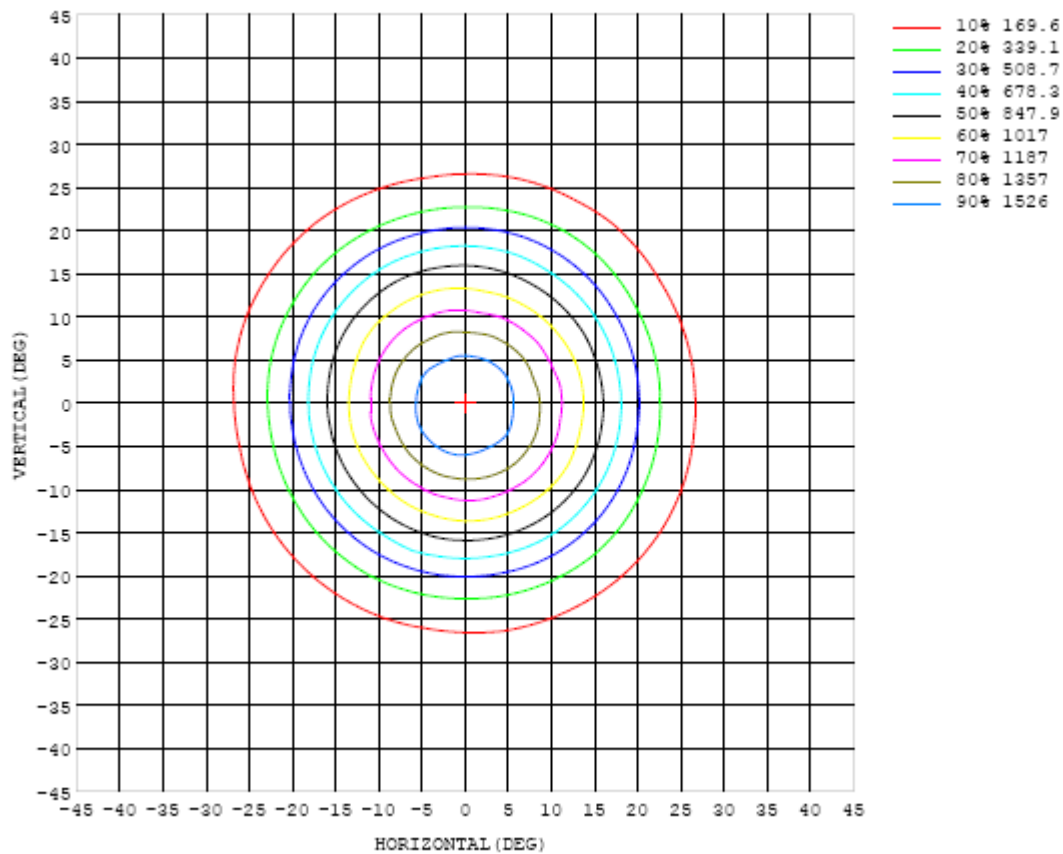


Chart 6: Isocandela Plot

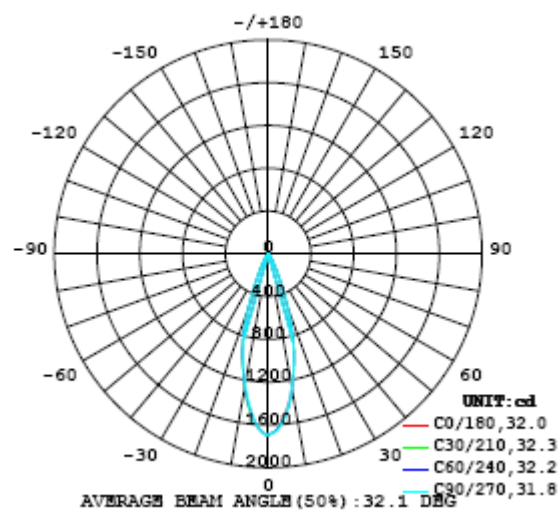


Chart 7: Polar Candela Distribution

## Luminous Intensity Data- Goniophotometer Method

Table--1

UNIT: cd

C (DEG) y (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	1696	1696	1696	1696	1696	1696	1696	1696	1696	1696	1696	1696	1696	1696	1696	1696	1696	1696	1696
5	1559	1558	1561	1566	1569	1569	1567	1570	1575	1578	1580	1581	1579	1577	1576	1575	1574	1570	1562
10	1268	1270	1279	1280	1284	1291	1285	1281	1276	1269	1266	1272	1263	1261	1260	1256	1258	1266	1261
15	928	925	930	936	936	929	925	923	924	921	918	912	908	905	903	907	911	912	917
20	522	519	524	528	530	528	526	521	515	516	516	515	516	516	518	520	522	527	533
25	221	224	227	229	229	229	227	227	226	222	221	222	220	219	220	222	223	225	229
30	101	104	105	103	103	103	100	99.6	99.3	97.0	96.2	98.6	97.2	94.7	94.2	93.7	96.1	99.9	104
35	47.1	48.9	50.0	48.7	49.2	49.6	47.8	47.3	47.1	45.2	44.4	45.0	44.6	44.6	44.7	43.9	45.4	46.8	48.6
40	23.2	23.3	23.4	23.3	23.0	23.3	23.2	23.3	23.3	23.1	22.5	22.3	22.1	22.1	22.2	21.9	22.4	22.9	23.6
45	14.6	14.5	14.3	14.3	14.4	14.4	14.5	14.6	14.5	14.5	14.6	14.6	14.5	14.4	14.4	14.4	14.6	14.8	15.2
50	10.8	10.8	10.7	10.7	10.6	10.6	10.7	10.8	10.7	10.7	10.7	10.7	10.7	10.5	10.5	10.6	10.7	10.8	10.9
55	8.68	8.70	8.76	8.70	8.64	8.60	8.58	8.60	8.64	8.67	8.68	8.63	8.60	8.57	8.54	8.57	8.63	8.76	8.75
60	7.03	7.05	7.10	7.06	7.10	7.07	7.06	7.06	7.10	7.10	7.17	7.20	7.16	7.11	7.08	7.07	7.13	7.27	7.38
65	5.82	5.80	5.81	5.88	5.86	5.79	5.85	5.82	5.82	5.87	5.90	5.95	5.98	5.91	5.85	5.88	5.90	5.98	6.25
70	4.46	4.36	4.28	4.46	4.34	4.26	4.39	4.32	4.24	4.43	4.36	4.35	4.56	4.42	4.33	4.52	4.49	4.46	4.79
75	3.12	3.10	3.10	3.10	3.08	3.05	3.05	3.03	3.04	3.07	3.07	3.09	3.13	3.09	3.09	3.16	3.19	3.21	3.35
80	2.00	2.01	2.02	2.01	2.01	1.99	1.97	1.98	1.99	2.00	2.01	2.03	2.03	2.03	2.02	2.03	2.07	2.11	2.13
85	1.35	1.32	1.29	1.42	1.42	1.31	1.38	1.36	1.30	1.40	1.38	1.31	1.39	1.35	1.25	1.31	1.33	1.31	1.43
90	0.83	0.79	0.73	0.88	0.84	0.74	0.83	0.81	0.73	0.86	0.84	0.79	0.90	0.83	0.73	0.78	0.77	0.74	0.91
95	0.44	0.45	0.39	0.44	0.44	0.39	0.42	0.45	0.39	0.44	0.44	0.40	0.45	0.44	0.39	0.44	0.45	0.42	0.49
100	0.43	0.44	0.40	0.45	0.45	0.40	0.44	0.44	0.41	0.45	0.45	0.42	0.46	0.45	0.41	0.44	0.43	0.41	0.45
105	0.63	1.76	0.47	0.79	1.45	0.42	0.79	1.42	0.41	0.80	1.18	0.40	0.76	1.24	0.40	0.89	1.32	0.39	0.67
110	0.44	0.42	0.48	0.43	0.39	0.48	0.40	0.37	0.48	0.40	0.39	0.47	0.43	0.43	0.45	0.47	0.44	0.45	0.48
115	0.38	0.40	0.61	0.39	0.38	0.89	0.39	0.34	0.85	0.35	0.38	0.69	0.33	0.40	0.76	0.32	0.35	0.45	0.33
120	1.55	3.80	1.62	1.58	5.04	1.86	1.22	4.34	1.44	1.82	3.86	1.04	2.01	3.70	0.74	2.11	2.48	0.90	2.12
125	1.00	1.05	0.20	0.89	0.72	0.20	0.49	0.59	0.20	0.45	0.53	0.18	0.52	0.62	0.19	0.60	0.61	0.26	1.25
130	0.11	0.11	0.12	0.12	0.12	0.12	0.11	0.11	0.11	0.10	0.09	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.11
135	0.13	0.13	0.13	0.13	0.12	0.12	0.11	0.11	0.11	0.11	0.10	0.11	0.10	0.10	0.11	0.11	0.12	0.12	0.11
140	0.14	0.14	0.14	0.14	0.13	0.14	0.13	0.13	0.13	0.13	0.12	0.12	0.12	0.12	0.12	0.13	0.13	0.13	0.13
145	0.17	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.15	0.16	0.15	0.15	0.15	0.15	0.15	0.16	0.16	0.16	0.16
150	0.20	0.20	0.20	0.20	0.20	0.20	0.19	0.20	0.20	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
155	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	0.25	0.25	0.25	0.24	0.23
160	0.29	0.31	0.31	0.31	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.29
165	0.34	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	0.33
170	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.36	0.36	0.35
175	0.32	0.32	0.33	0.35	0.35	0.35	0.35	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.35	0.33	0.31	0.31	0.31
180	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	0.28	0.28

Table 6: Luminous Intensity Data

Table--2

UNIT: cd

C (DEG) γ (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	1696	1696	1696	1696	1696	1696	1696	1696	1696	1696	1696	1696	1696	1696	1696	1696	1696		
5	1559	1559	1560	1560	1553	1551	1550	1554	1556	1554	1555	1556	1559	1560	1559	1559	1561		
10	1265	1271	1270	1267	1266	1258	1250	1251	1238	1229	1242	1242	1245	1253	1248	1246	1267		
15	920	925	932	938	930	928	925	918	912	905	902	900	904	907	913	919	921		
20	539	545	548	546	542	541	538	537	536	537	536	531	527	524	520	521	521		
25	236	236	231	227	223	219	215	213	217	222	224	223	222	217	213	215	218		
30	109	111	109	107	105	100	96.6	93.7	90.8	91.9	91.8	91.5	94.2	93.3	91.7	94.1	98.0		
35	51.2	52.3	51.8	51.6	50.3	46.8	45.3	43.3	41.4	42.2	42.4	42.3	43.0	43.4	43.9	45.4	47.1		
40	24.4	25.1	25.3	24.9	24.5	23.8	23.3	22.8	22.1	21.9	21.9	22.1	22.4	22.6	23.1	23.1	23.1		
45	15.6	15.5	15.5	15.3	15.3	15.1	14.9	14.5	14.2	14.1	14.1	14.5	14.6	14.8	14.7	14.7	14.6		
50	11.0	11.0	10.8	10.7	10.7	10.7	10.6	10.6	10.5	10.4	10.5	10.6	10.5	10.5	10.5	10.7	10.8		
55	8.78	8.69	8.55	8.50	8.47	8.52	8.56	8.67	8.63	8.58	8.52	8.59	8.69	8.80	8.88	8.74	8.57		
60	7.39	7.34	7.21	7.08	7.02	7.01	7.13	7.28	7.32	7.23	7.23	7.37	7.51	7.62	7.55	7.35	7.13		
65	6.23	6.05	6.04	5.90	5.87	5.90	5.80	5.78	5.89	5.86	5.88	6.01	5.90	5.79	5.74	5.72	5.74		
70	4.65	4.46	4.71	4.40	4.34	4.51	4.31	4.25	4.51	4.36	4.36	4.62	4.39	4.29	4.41	4.29	4.27		
75	3.28	3.21	3.33	3.17	3.13	3.22	3.12	3.10	3.24	3.16	3.19	3.25	3.16	3.11	3.13	3.09	3.10		
80	2.14	2.14	2.09	2.07	2.06	2.04	2.04	2.06	2.07	2.10	2.13	2.10	2.08	2.05	2.02	2.02	2.02		
85	1.47	1.42	1.49	1.43	1.32	1.37	1.37	1.33	1.45	1.47	1.39	1.43	1.36	1.28	1.35	1.33	1.25		
90	0.92	0.89	0.97	0.88	0.80	0.85	0.80	0.79	0.92	0.86	0.80	0.84	0.76	0.71	0.82	0.77	0.71		
95	0.50	0.45	0.50	0.49	0.42	0.46	0.47	0.41	0.47	0.47	0.42	0.45	0.44	0.41	0.46	0.44	0.39		
100	0.46	0.42	0.43	0.42	0.38	0.37	0.37	0.35	0.38	0.40	0.37	0.39	0.39	0.38	0.41	0.41	0.39		
105	1.51	0.42	0.65	1.82	0.38	0.54	1.39	0.37	0.53	1.82	0.42	0.48	1.54	0.45	0.55	1.25	0.47		
110	0.46	0.50	0.51	0.46	0.48	0.47	0.40	0.44	0.44	0.41	0.46	0.47	0.42	0.44	0.47	0.42	0.46		
115	0.37	0.45	0.37	0.40	0.35	0.36	0.36	0.38	0.33	0.37	0.39	0.38	0.36	0.49	0.36	0.39	0.49		
120	3.22	0.93	2.13	2.81	1.17	1.67	1.87	0.96	2.33	3.46	1.08	1.15	2.10	1.55	1.62	3.40	2.58		
125	1.50	0.14	1.46	2.38	0.20	1.58	2.14	0.17	1.50	2.76	0.23	0.98	1.34	0.26	1.48	1.69	0.40		
130	0.10	0.11	0.12	0.11	0.11	0.11	0.10	0.11	0.11	0.11	0.11	0.11	0.12	0.12	0.14	0.12	0.11		
135	0.11	0.12	0.12	0.12	0.12	0.11	0.11	0.12	0.11	0.11	0.12	0.11	0.11	0.13	0.13	0.13	0.14		
140	0.13	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.13	0.13	0.14	0.14	0.14	0.14	0.14	0.14	0.15		
145	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.17	0.16	0.16	0.16	0.16	0.17	0.17	0.17	0.17		
150	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		
155	0.23	0.23	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.25	0.25	0.25	0.25	0.25	0.25	0.25		
160	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		
165	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33		
170	0.35	0.35	0.36	0.36	0.35	0.35	0.35	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36		
175	0.31	0.32	0.32	0.32	0.32	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.32		
180	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		

Table 7: Luminous Intensity Data

## EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Aug. 02, 2019	Aug. 01, 2020
Digital Power Meter	PF2010A	HZTE028-01	Aug. 02, 2019	Aug. 01, 2020
AC Power Supply	DPS1060	HZTE001-06	Aug. 02, 2019	Aug. 01, 2020
DC Power Supply	WY12010	HZTE004-03	Aug. 02, 2019	Aug. 01, 2020
Temperature recorder	JM624U	HZTE018-08	Aug. 02, 2019	Aug. 01, 2020
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 02, 2019	Aug. 01, 2020
Standard source	D908	HZTE012-01	Aug. 02, 2019	Aug. 01, 2020
Integrate Sphere system	3M	HZTE015-04	Aug. 02, 2019	Aug. 01, 2020
Digital Power Meter	WT210	HZTE008-01	Aug. 02, 2019	Aug. 01, 2020
AC Power Supply	PCR 500L	HZTE001-07	Aug. 02, 2019	Aug. 01, 2020
DC Power Supply	IT6154	HZTE004-04	Aug. 02, 2019	Aug. 01, 2020
Standard source	SCL-1400	HZTE012-02	Aug. 02, 2019	Aug. 01, 2020
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 02, 2019	Aug. 01, 2020
Temperature Meter	TES1310	HZTE017-01	Aug. 02, 2019	Aug. 01, 2020

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  $4\pi$ . 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.

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

### **Color Characteristics Measurements**

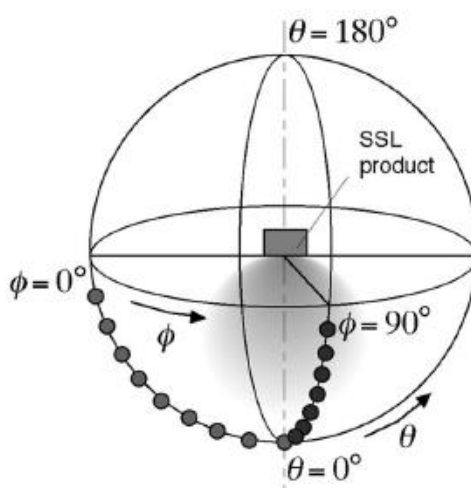
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as 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 ( $C=0^\circ/180^\circ$  and  $C=90^\circ/270^\circ$ ) and at  $10^\circ$  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,  $\Delta u'v'$ , 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 \*\*\*

This report is considered invalidated without the Special Seal for Inspection of the LTL. This report shall not be altered, increased or deleted. The results shown in this test report refer only to the sample(s) tested. Without written approval of LTL, this test report shall not be copied except in full and published as advertisement.