LM-79-08 TEST REPORT

for

GREEN CREATIVE LTD

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

LED Tube

Model: 6PLV/827/DIR/R

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ19060003f

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

Review by: April Zou

Engineer: April Zou
Jun. 10, 2019

Approved by: Jim Zhang

Manager: Jim Zhang
Jun. 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: **6PLV/827/DIR/R**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)/2	Power Factor
93.7	694.7	7.42	0.9965

CCT (K)	CRI	Stabilization Time (Light & Power)
2716	81.3	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 : Jun. 04, 2019

Date of Test : Jun. 05, 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

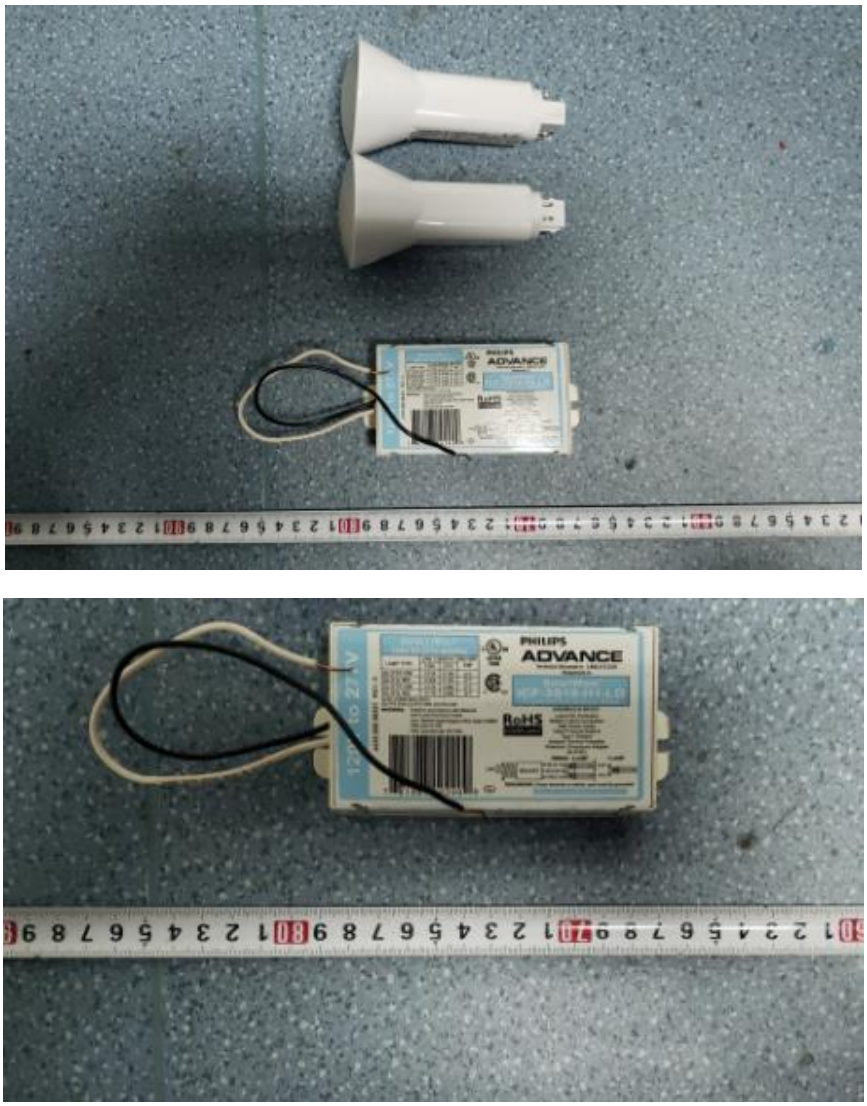


Figure 1- Overview of the sample

Equipment Under Test(EUT)	
Name	: LED Tube
Model	: 6PLV/827/DIR/R
Electrical Ratings	: 120-277V, 60Hz, 6W
Product Description	: 2700K LED Tubes supplied by a high frequency fluorescent lamp ballast: ICF-2S18-H1-LD
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 light down. 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	277.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.124	0.057
Power Factor	0.9965	0.9637
Test Power (W)/2	7.42	7.62
THD A%	6.46	9.48
Luminous Efficacy (lm/W)	93.7	91.4
Total Luminous Flux (lm)	694.7	696.2
Color Rendering Index (CRI)	81.3	
R9	3.2	
Correlated Color Temperature (CCT)(K)	2716	
Chromaticity Chroma x	0.4580	
Chromaticity Chroma y	0.4095	
Chromaticity Chroma u	0.2618	
Chromaticity Chroma v	0.3511	
Duv	0.0005	
Chromaticity Chroma u ’	0.2618	
Chromaticity Chroma v’	0.5266	

Special Color Rendering Indices	
R1	79.9
R2	92
R3	93.8
R4	78
R5	80.3
R6	91.3
R7	79.9
R8	54.8
R9	3.2
R10	82.4
R11	77.2
R12	75.8
R13	82.8
R14	97.3

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 24.8 ℃.

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)	0.124
Power Factor	0.9967
Power (W)/2	7.43
Luminous Efficacy (lm/W)	94.8
Total Luminous Flux (lm)	704.6
Beam Angle (°)	106.3 (0^o-180^o) / 106.1 (90^o-270^o)
Center Beam Candle Power (cd)	254
Maximum Beam Candle Power (cd)	254.4 (At: C=120.0, Gamma=1.0)
Spacing Criteria	1.23 (0^o-180^o) / 1.23 (90^o-270^o)
Zonal Lumens in the 0 °-60 °Zone	77.76%
Zonal Lumens in the 60 °-90 °Zone	21.01%
Zonal Lumens in the 90 °-120 °Zone	1.15%
Zonal Lumens in the 120 °-180 °Zone	0.08%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

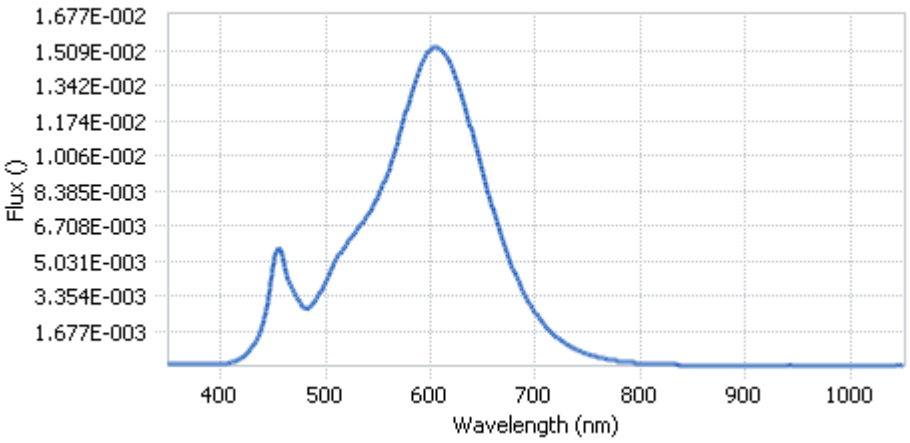
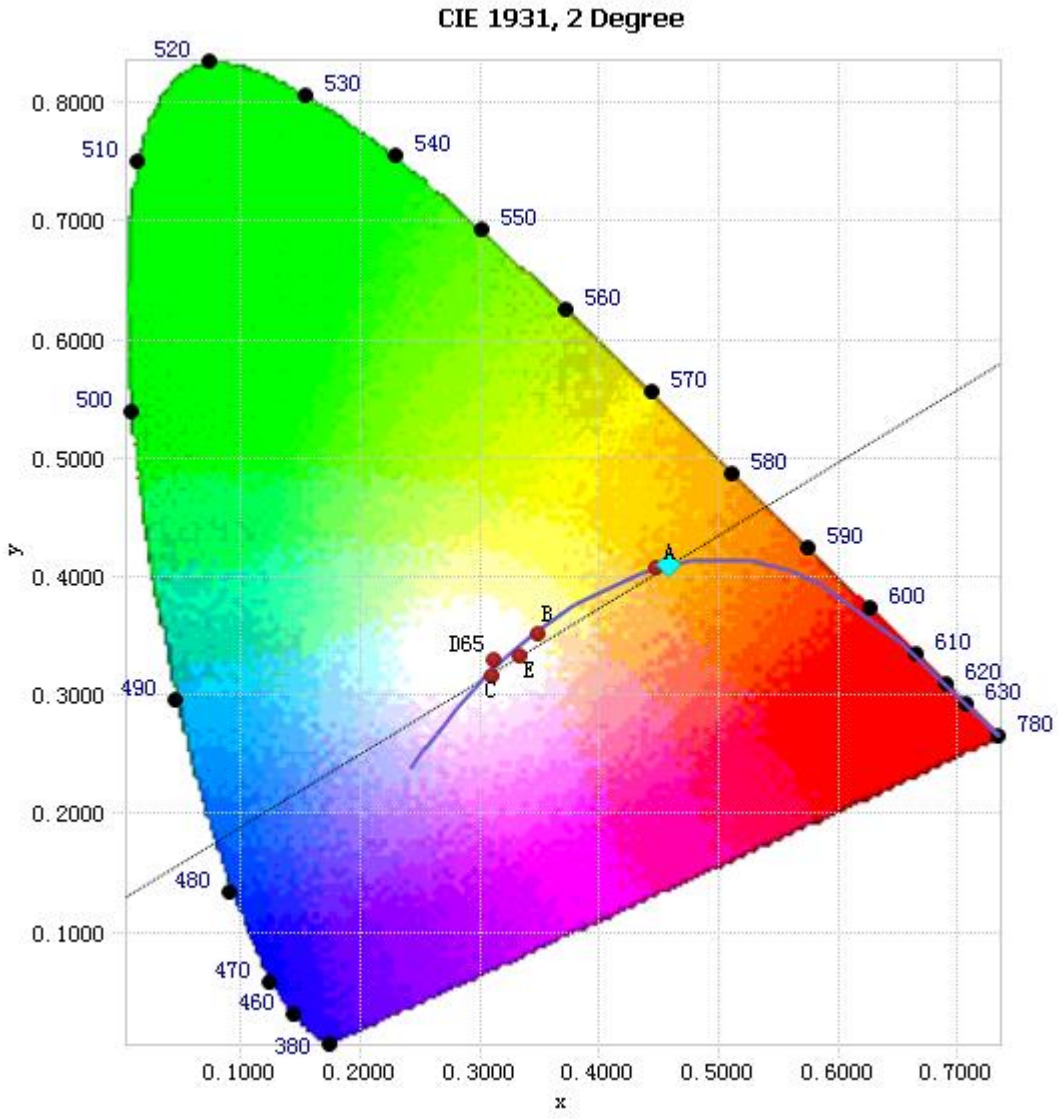


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	8.20E-05	485	2.81E-03	590	1.42E-02	695	2.93E-03
385	7.78E-05	490	3.11E-03	595	1.48E-02	700	2.53E-03
390	9.22E-05	495	3.50E-03	600	1.51E-02	705	2.18E-03
395	9.66E-05	500	4.02E-03	605	1.53E-02	710	1.87E-03
400	1.06E-04	505	4.56E-03	610	1.51E-02	715	1.62E-03
405	1.22E-04	510	5.04E-03	615	1.48E-02	720	1.39E-03
410	1.65E-04	515	5.51E-03	620	1.43E-02	725	1.20E-03
415	2.45E-04	520	5.84E-03	625	1.36E-02	730	1.03E-03
420	3.80E-04	525	6.18E-03	630	1.29E-02	735	8.83E-04
425	5.90E-04	530	6.51E-03	635	1.20E-02	740	7.55E-04
430	8.95E-04	535	6.83E-03	640	1.11E-02	745	6.47E-04
435	1.36E-03	540	7.22E-03	645	1.01E-02	750	5.51E-04
440	2.03E-03	545	7.63E-03	650	9.20E-03	755	4.81E-04
445	3.10E-03	550	8.09E-03	655	8.27E-03	760	4.14E-04
450	4.72E-03	555	8.68E-03	660	7.42E-03	765	3.54E-04
455	5.67E-03	560	9.34E-03	665	6.58E-03	770	3.05E-04
460	4.94E-03	565	1.01E-02	670	5.80E-03	775	2.65E-04
465	4.01E-03	570	1.10E-02	675	5.09E-03	780	2.27E-04
470	3.55E-03	575	1.19E-02	680	4.47E-03		
475	3.06E-03	580	1.27E-02	685	3.90E-03		
480	2.75E-03	585	1.36E-02	690	3.37E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4580, 0.4095)

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

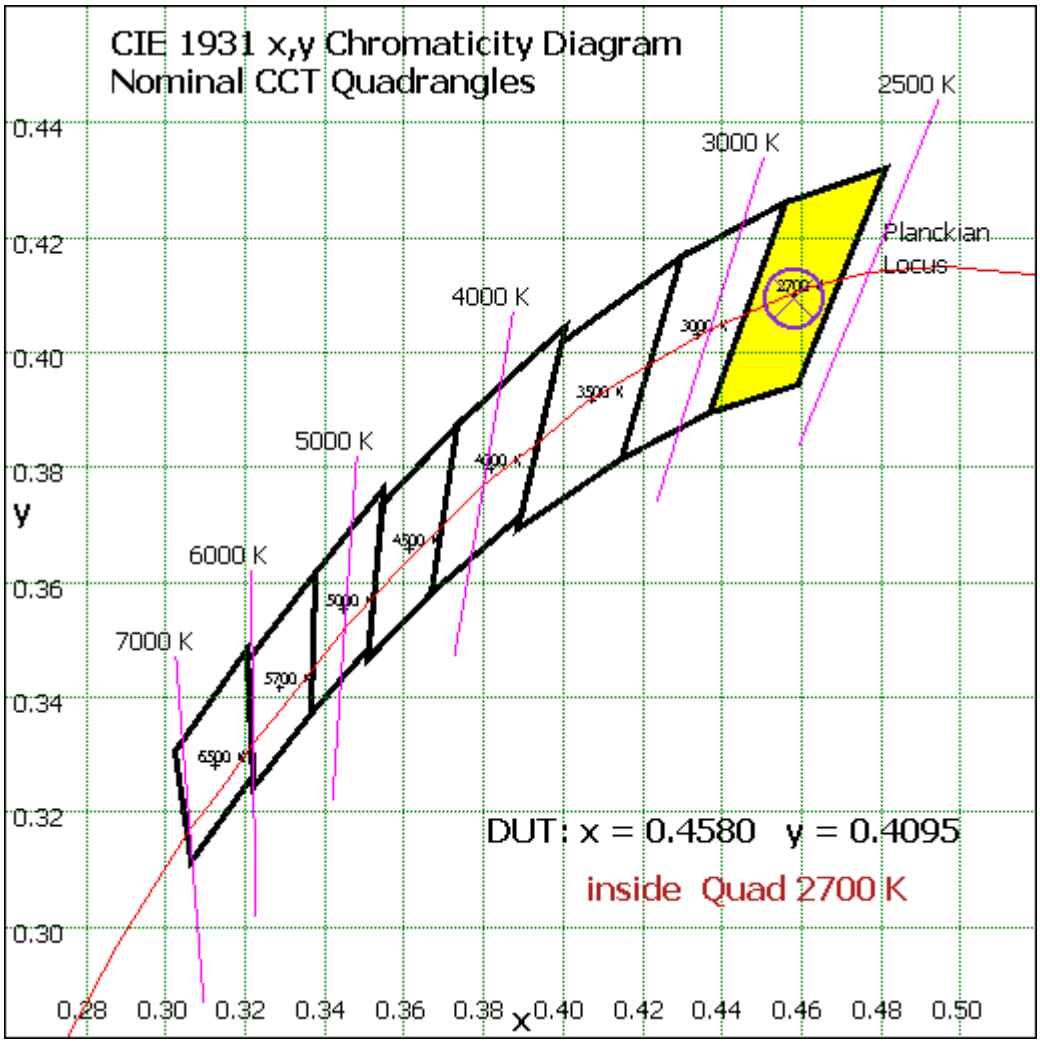
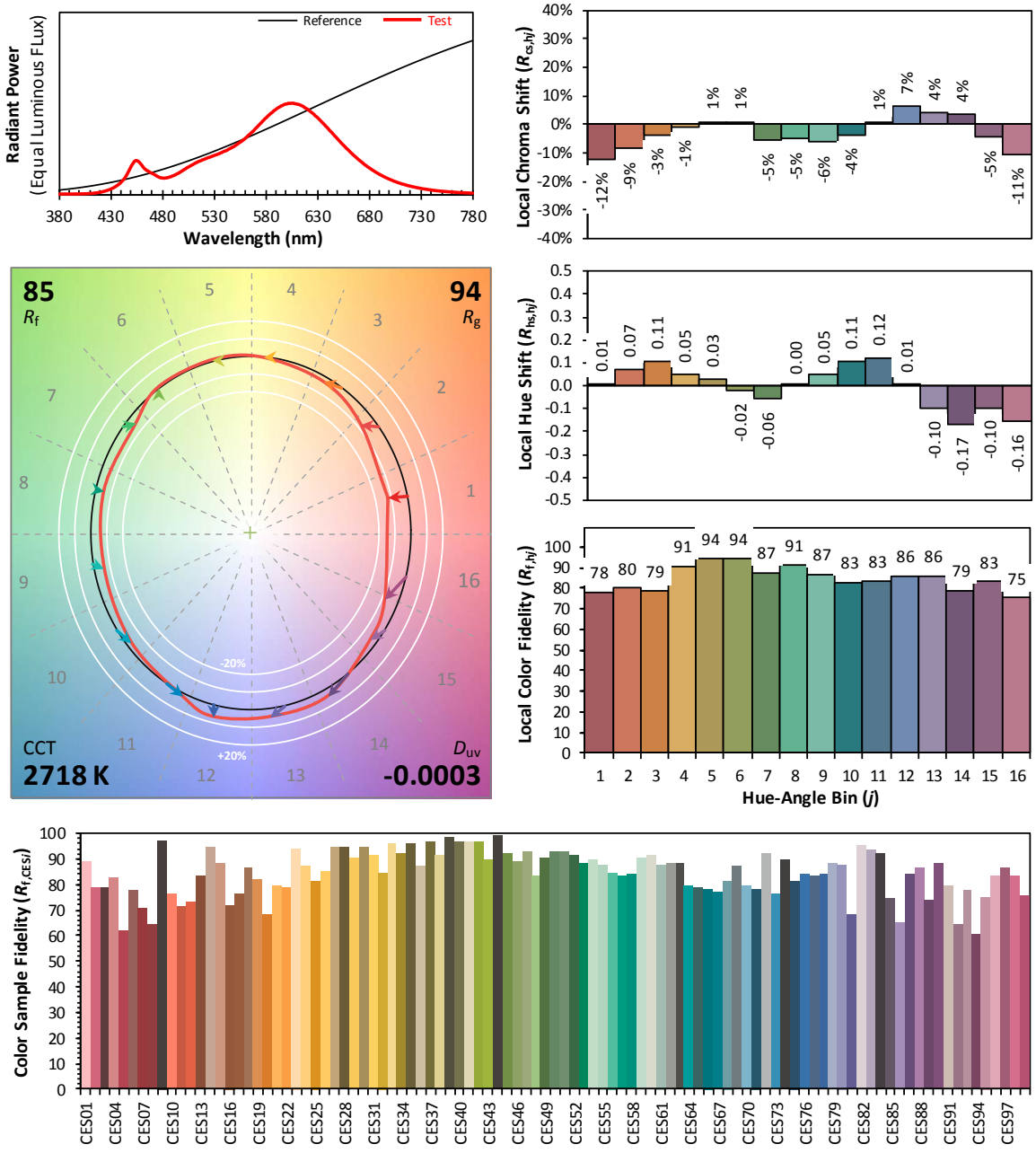


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method



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

x	0.4580
y	0.4095
u'	0.2618
v'	0.5266

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	24.051	3.41%
10- 20	68.706	9.75%
20- 30	103.203	14.65%
30- 40	122.153	17.34%
40- 50	123.002	17.46%
50- 60	106.724	15.15%
60- 70	78.668	11.17%
70- 80	47.352	6.72%
80- 90	21.998	3.12%
90-100	6.876	0.98%
100-110	1.119	0.16%
110-120	0.131	0.02%
120-130	0.097	0.01%
130-140	0.125	0.02%
140-150	0.136	0.02%
150-160	0.118	0.02%
160-170	0.078	0.01%
170-180	0.027	0.00%
Total	704.6	100%

γ(°)	Lumens	% Total
0- 60	547.839	77.76%
60- 90	148.018	21.01%
0-90	695.857	98.76%
90- 180	8.707	1.24%
0- 180	704.6	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

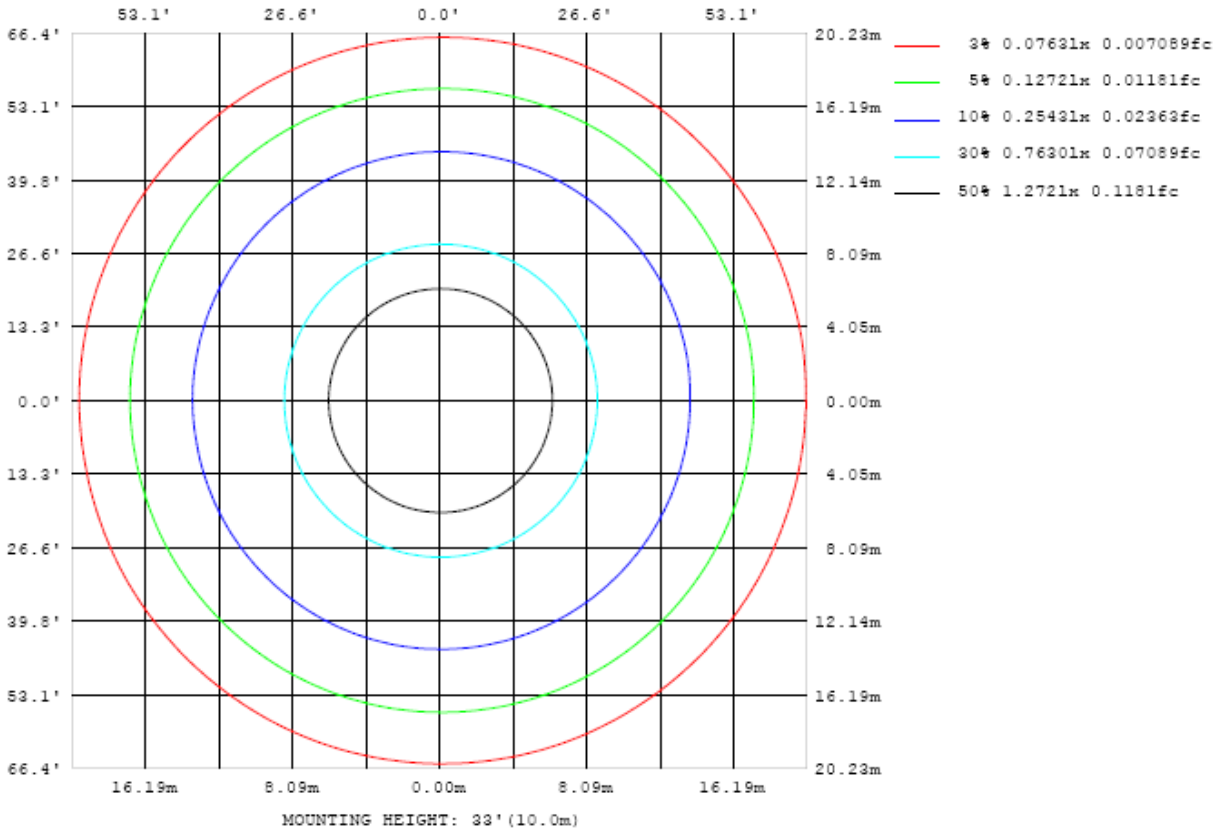


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

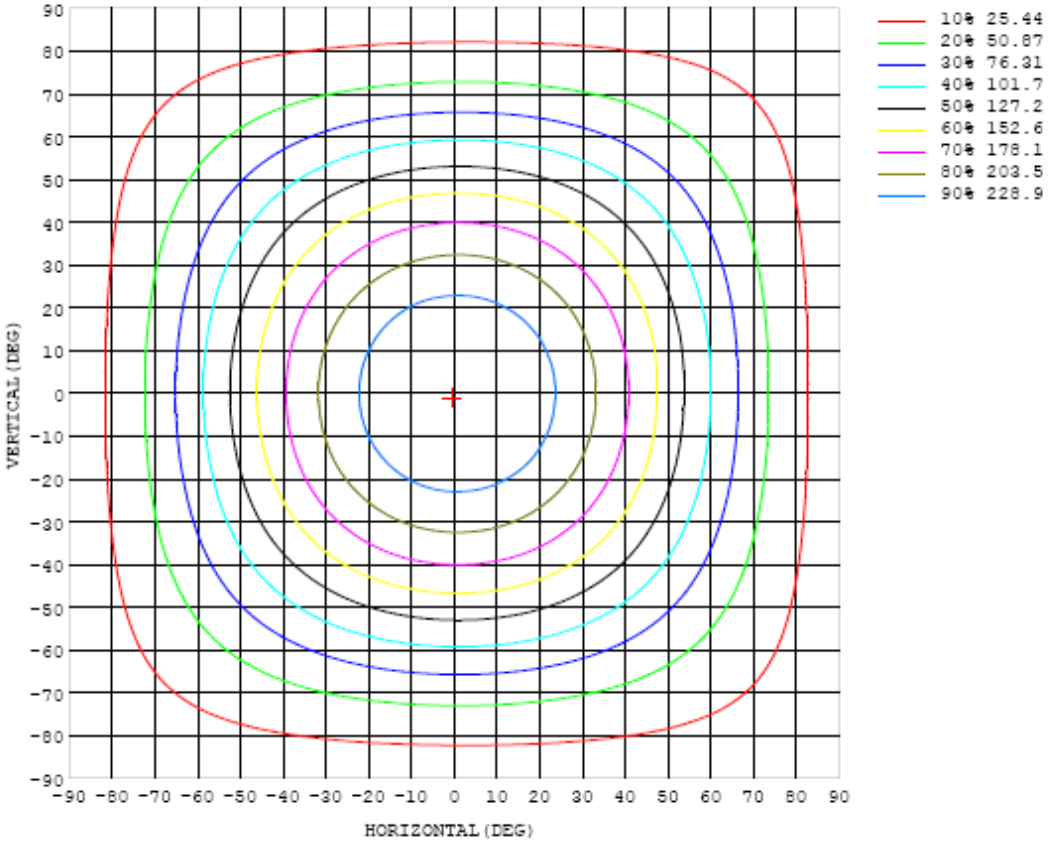


Chart 6: Isocandela Plot

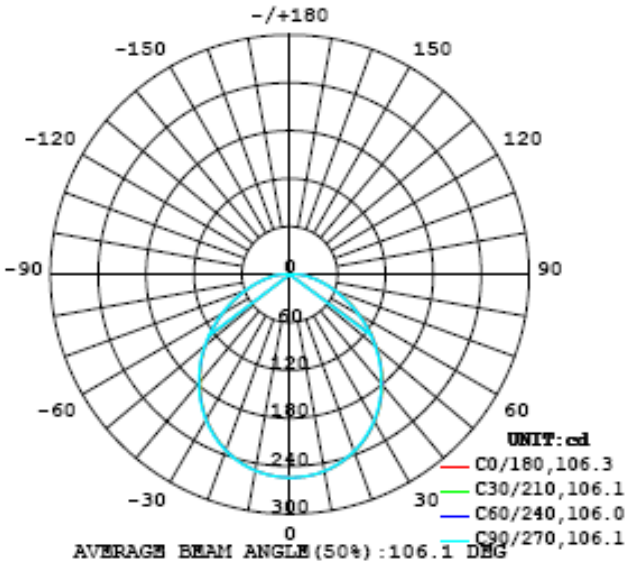


Chart 7: Polar Candela Distribution

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	254	254	254	254	254	254	254	254	254	254	254	254	254	254	254	254	254	254	254
5	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253
10	250	250	250	250	250	250	250	250	250	250	250	250	249	249	249	249	249	249	249
15	244	245	245	245	245	244	244	244	244	244	243	243	243	243	243	243	243	243	243
20	236	236	236	236	236	236	236	236	235	235	235	235	235	234	234	234	234	234	234
25	226	226	226	226	226	225	225	225	224	224	224	224	223	223	223	223	223	223	222
30	213	213	213	213	212	212	212	212	211	211	211	210	210	210	209	209	209	209	209
35	198	198	198	197	197	197	197	196	196	196	195	195	194	194	194	194	193	193	193
40	181	181	180	180	180	180	179	179	179	178	178	178	177	177	176	176	176	176	176
45	162	162	162	161	161	161	160	160	160	159	159	159	158	158	158	157	157	157	158
50	142	142	142	142	141	141	141	140	140	139	139	139	138	138	138	138	137	137	138
55	122	122	121	121	121	120	120	120	119	119	119	118	118	118	117	117	117	117	117
60	101	101	101	101	100	100.0	99.6	99.4	99.0	98.6	98.2	97.9	97.7	97.3	97.1	96.9	96.6	96.4	96.9
65	81.6	81.4	81.0	80.7	80.5	80.1	80.0	79.6	79.3	79.0	78.7	78.4	78.1	77.8	77.6	77.5	77.1	76.9	77.3
70	63.2	63.0	62.7	62.4	62.2	61.9	61.7	61.5	61.2	61.0	60.7	60.5	60.2	60.0	59.7	59.6	59.4	59.1	59.0
75	46.2	46.0	45.8	45.5	45.4	45.1	44.9	44.8	44.6	44.5	44.3	44.1	43.9	43.6	43.4	43.3	43.1	42.9	42.9
80	32.1	31.9	31.7	31.5	31.4	31.2	31.1	31.0	30.8	30.7	30.5	30.4	30.2	30.0	29.8	29.7	29.6	29.4	29.4
85	20.8	20.7	20.6	20.4	20.3	20.2	20.1	20.0	19.9	19.8	19.7	19.5	19.4	19.2	19.1	19.0	18.9	18.8	18.8
90	12.4	12.3	12.2	12.1	12.0	12.0	11.9	11.8	11.7	11.6	11.5	11.4	11.3	11.2	11.1	11.1	11.0	10.9	10.8
95	6.43	6.46	6.41	6.37	6.33	6.29	6.23	6.17	6.09	6.01	5.88	5.84	5.78	5.73	5.69	5.60	5.54	5.48	5.48
100	2.71	2.71	2.72	2.72	2.71	2.69	2.67	2.63	2.58	2.53	2.49	2.46	2.43	2.39	2.36	2.32	2.29	2.26	2.27
105	0.93	0.93	0.93	0.94	0.94	0.93	0.93	0.92	0.90	0.89	0.87	0.85	0.84	0.83	0.81	0.80	0.79	0.78	0.80
110	0.30	0.31	0.31	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.31	0.31	0.31	0.30	0.30	0.29	0.29	0.29	0.30
115	0.08	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.09	0.09	0.08	0.09	0.09	0.08	0.08	0.08	0.08	0.08	0.09
120	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.09	0.09	0.09
125	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.11	0.10	0.11
130	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.13	0.13	0.15
135	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.15	0.14	0.14	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.18
140	0.17	0.16	0.16	0.16	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	0.22
145	0.19	0.18	0.18	0.18	0.18	0.18	0.18	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.25
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	0.21	0.28
155	0.22	0.21	0.21	0.21	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	0.23	0.29
160	0.24	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	0.23	0.23	0.24	0.31
165	0.26	0.24	0.24	0.24	0.25	0.24	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.26	0.31
170	0.27	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.27	0.30
175	0.29	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	0.29	0.29
180	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	0.29	0.29	0.29

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	254	254	254	254	254	254	254	254	254	254	254	254	254	254	254	254	254		
5	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253	254		
10	249	249	249	249	249	249	249	249	250	250	250	250	250	250	250	250	250		
15	243	243	243	243	243	243	243	243	244	244	244	244	244	244	244	244	245		
20	234	234	234	234	234	234	235	235	235	235	236	236	236	236	236	236	237		
25	222	223	223	223	223	223	224	224	224	224	225	225	225	225	226	226	226		
30	209	209	209	209	209	210	210	210	211	211	211	212	212	212	213	213	213		
35	193	193	193	194	194	194	194	195	195	196	196	196	197	197	198	198	198		
40	176	176	176	176	176	177	177	177	178	178	179	179	180	180	181	181	181		
45	158	158	158	158	158	158	159	159	159	160	160	161	161	162	162	162	163		
50	138	138	138	138	138	138	139	139	140	140	141	141	142	143	143	143	143		
55	117	117	117	117	118	118	118	119	119	120	120	121	121	122	123	123	123		
60	96.7	96.8	96.9	97.1	97.3	97.6	98.0	98.3	98.8	99.3	99.8	100	101	102	102	102	102		
65	77.2	77.3	77.4	77.6	77.8	78.1	78.3	78.6	79.1	79.6	80.1	80.6	81.2	81.8	82.3	82.5	82.5		
70	59.0	59.0	59.1	59.2	59.4	59.6	59.9	60.2	60.5	60.8	61.3	61.8	62.2	62.8	63.2	63.4	63.5		
75	42.9	42.9	42.9	43.0	43.1	43.3	43.6	43.8	44.0	44.3	44.7	45.0	45.4	45.9	46.3	46.5	46.5		
80	29.4	29.4	29.5	29.6	29.7	29.8	30.0	30.2	30.4	30.6	30.9	31.2	31.5	31.8	32.1	32.3	32.3		
85	18.8	18.8	18.8	18.9	19.0	19.1	19.3	19.4	19.6	19.7	19.9	20.1	20.3	20.6	20.9	21.0	21.0		
90	10.8	10.8	10.9	10.9	10.9	11.0	11.1	11.2	11.3	11.5	11.6	11.7	11.9	12.1	12.2	12.3	12.4		
95	5.46	5.47	5.49	5.52	5.55	5.59	5.64	5.69	5.75	5.83	5.92	6.01	6.12	6.24	6.34	6.40	6.43		
100	2.26	2.27	2.28	2.29	2.32	2.34	2.36	2.39	2.41	2.44	2.49	2.53	2.58	2.64	2.69	2.71	2.74		
105	0.80	0.81	0.82	0.82	0.83	0.85	0.85	0.86	0.87	0.87	0.88	0.88	0.90	0.91	0.92	0.93	0.94		
110	0.30	0.31	0.31	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.31	0.31	0.31	0.31	0.31	0.31	0.31		
115	0.09	0.09	0.10	0.10	0.10	0.10	0.10	0.10	0.09	0.09	0.09	0.09	0.08	0.08	0.08	0.08	0.09		
120	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09		
125	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		
130	0.15	0.14	0.15	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14		
135	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	0.18		
140	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		
145	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		
150	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	0.27	0.28		
155	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.30	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.30		
160	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.31	0.31	0.30	0.31	0.30	0.30	0.31	0.30	0.30	0.31		
165	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31		
170	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.31	0.31	0.30	0.30	0.31	0.30	0.31	0.30	0.30	0.31		
175	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30		
180	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	0.29		

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.

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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

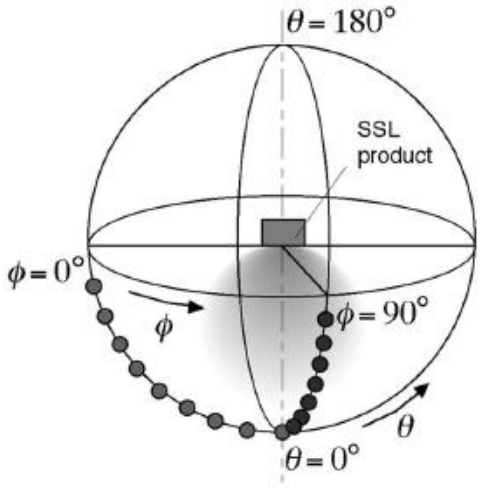
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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