

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/927SP10/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

Report No.: HZ20060050c

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

Review by:



Engineer: April Zou

Nov. 20, 2020

Approved by:



Manager: Jim Zhang

Nov. 20, 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/927SP10/R

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
80.0	533.1	6.66	0.9193
CCT (K)	CRI	Stabilization Time (Light & Power)	
2719	96.8	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	: Jun. 29, 2020
Date of Test	: Jul. 02, 2020
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

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)

Name	: LED Lamp
Model	: 7.5MR16DIM/927SP10/R
Electrical Ratings	: 12Vac 50/60Hz, 7.5W
Product Description	: 2700K
Manufacturer	: GREEN CREATIVE LTD
Address	: Room 3603, Level 36, Tower 1, Enterprise Square Five, 38 Wang Chiu Road, Kowloon Bay, KL, Hong Kong

TEST RESULTS

Test ambient temperature was 25.1 °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)	0.604
Power Factor	0.9193
Test Power (W)	6.66
THD A%	30.46
Luminous Efficacy (lm/W)	80.0
Total Luminous Flux (lm)	533.1
Color Rendering Index (CRI)	96.8
R9	91.1
Correlated Color Temperature (CCT)(K)	2719
Chromaticity Chroma x	0.4549
Chromaticity Chroma y	0.4043
Chromaticity Chroma u	0.2621
Chromaticity Chroma v	0.3495
Duv	-0.0019
Chromaticity Chroma u'	0.2621
Chromaticity Chroma v'	0.5242

Special Color Rendering Indices	
R1	97.8
R2	97.3
R3	99.1
R4	98.8
R5	97.4
R6	94
R7	95.1
R8	94.8
R9	91.1
R10	96.2
R11	97.3
R12	85.9
R13	97.1
R14	98.9

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 25.2 °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)	0.616
Power Factor	0.9192
Power (W)	6.75
Luminous Efficacy (lm/W)	79.9
Total Luminous Flux (lm)	539.1
Beam Angle (°)	10.2 (0°-180°) / 10.4 (90°-270°)
Center Beam Candle Power (cd)	7545
Maximum Beam Candle Power (cd)	7545 (At: C=0.0, Gamma=0.0)
Spacing Criteria	0.17 (0°-180°) / 0.19 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	97.46%
Zonal Lumens in the 60 °-90 °Zone	2.01%
Zonal Lumens in the 90 °-120 °Zone	0.34%
Zonal Lumens in the 120 °-180 °Zone	0.20%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

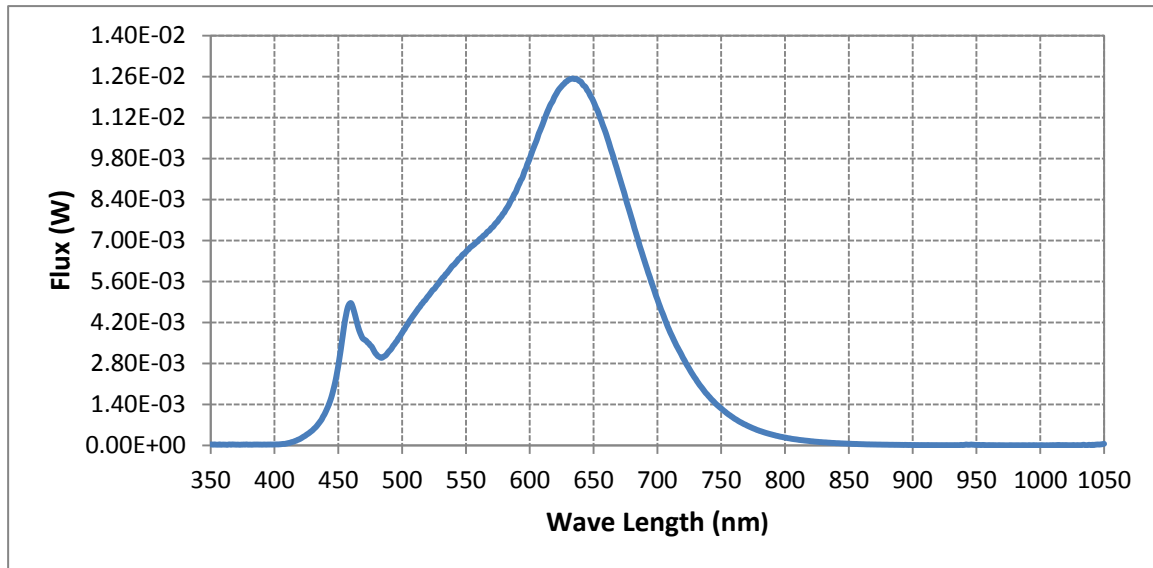
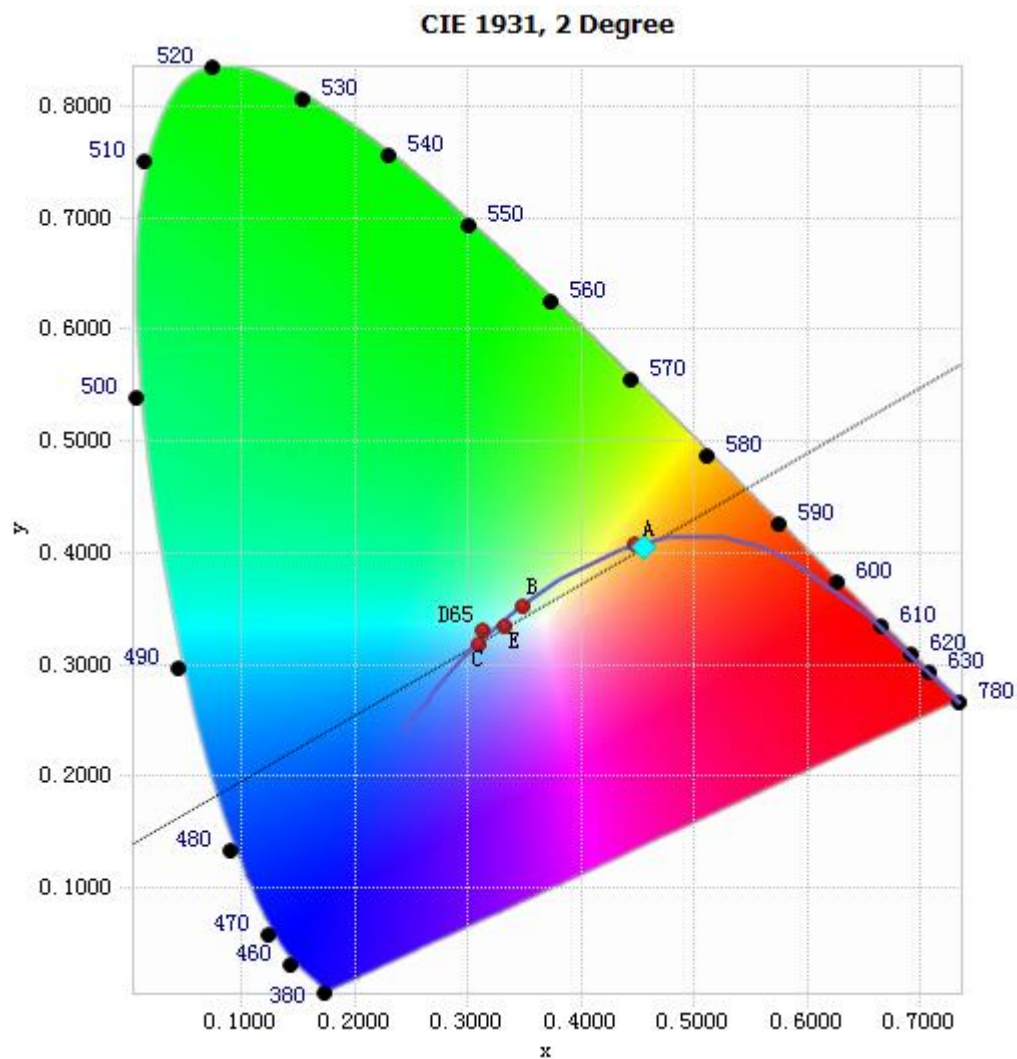


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.80E-05	485	3.02E-03	590	8.76E-03	695	5.62E-03
385	3.21E-05	490	3.23E-03	595	9.24E-03	700	4.99E-03
390	2.85E-05	495	3.52E-03	600	9.81E-03	705	4.41E-03
395	3.28E-05	500	3.85E-03	605	1.04E-02	710	3.87E-03
400	3.52E-05	505	4.19E-03	610	1.10E-02	715	3.41E-03
405	4.33E-05	510	4.51E-03	615	1.15E-02	720	3.00E-03
410	7.34E-05	515	4.81E-03	620	1.20E-02	725	2.62E-03
415	1.31E-04	520	5.08E-03	625	1.23E-02	730	2.27E-03
420	2.25E-04	525	5.34E-03	630	1.25E-02	735	1.96E-03
425	3.64E-04	530	5.63E-03	635	1.25E-02	740	1.69E-03
430	5.26E-04	535	5.88E-03	640	1.24E-02	745	1.46E-03
435	7.71E-04	540	6.15E-03	645	1.21E-02	750	1.27E-03
440	1.14E-03	545	6.39E-03	650	1.17E-02	755	1.09E-03
445	1.71E-03	550	6.61E-03	655	1.12E-02	760	9.30E-04
450	2.73E-03	555	6.82E-03	660	1.06E-02	765	7.99E-04
455	4.21E-03	560	7.01E-03	665	9.93E-03	770	6.86E-04
460	4.86E-03	565	7.20E-03	670	9.20E-03	775	5.87E-04
465	4.13E-03	570	7.43E-03	675	8.47E-03	780	5.00E-04
470	3.63E-03	575	7.67E-03	680	7.73E-03		
475	3.42E-03	580	7.96E-03	685	7.00E-03		
480	3.11E-03	585	8.35E-03	690	6.29E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4549, 0.4043)

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

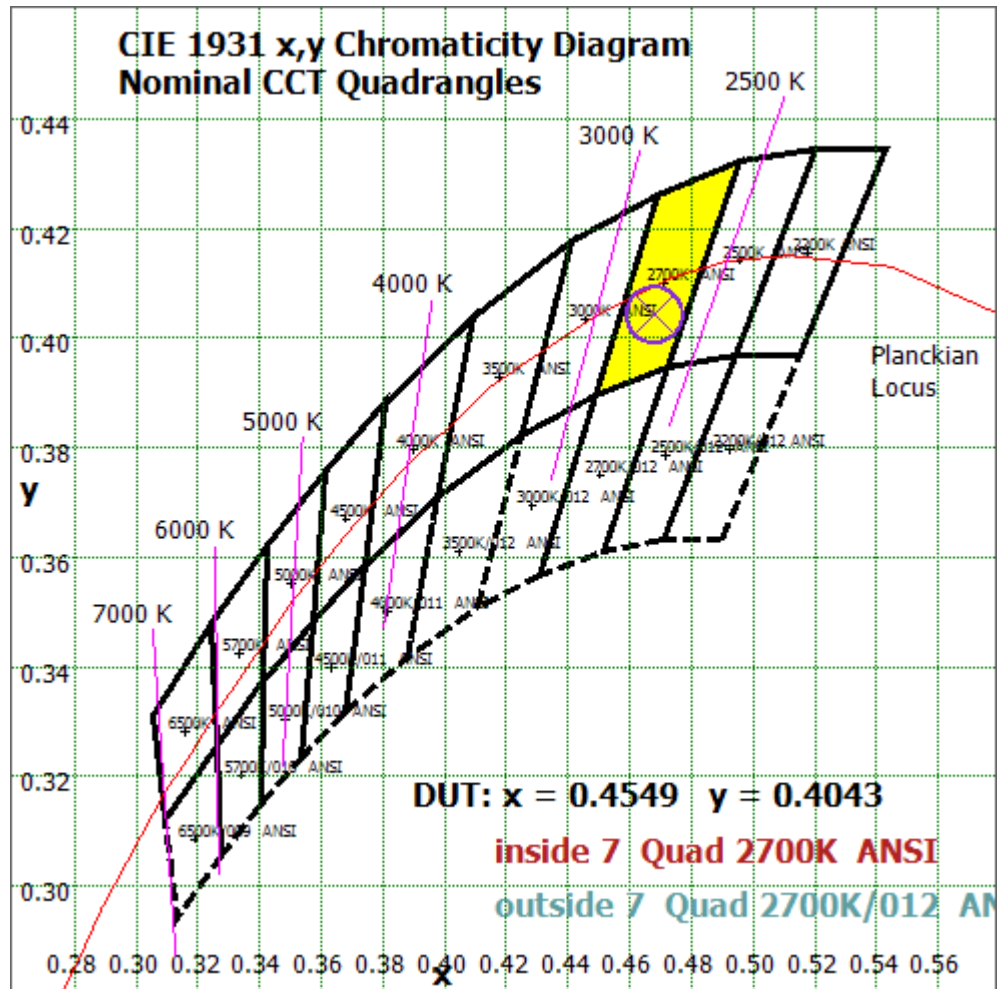


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

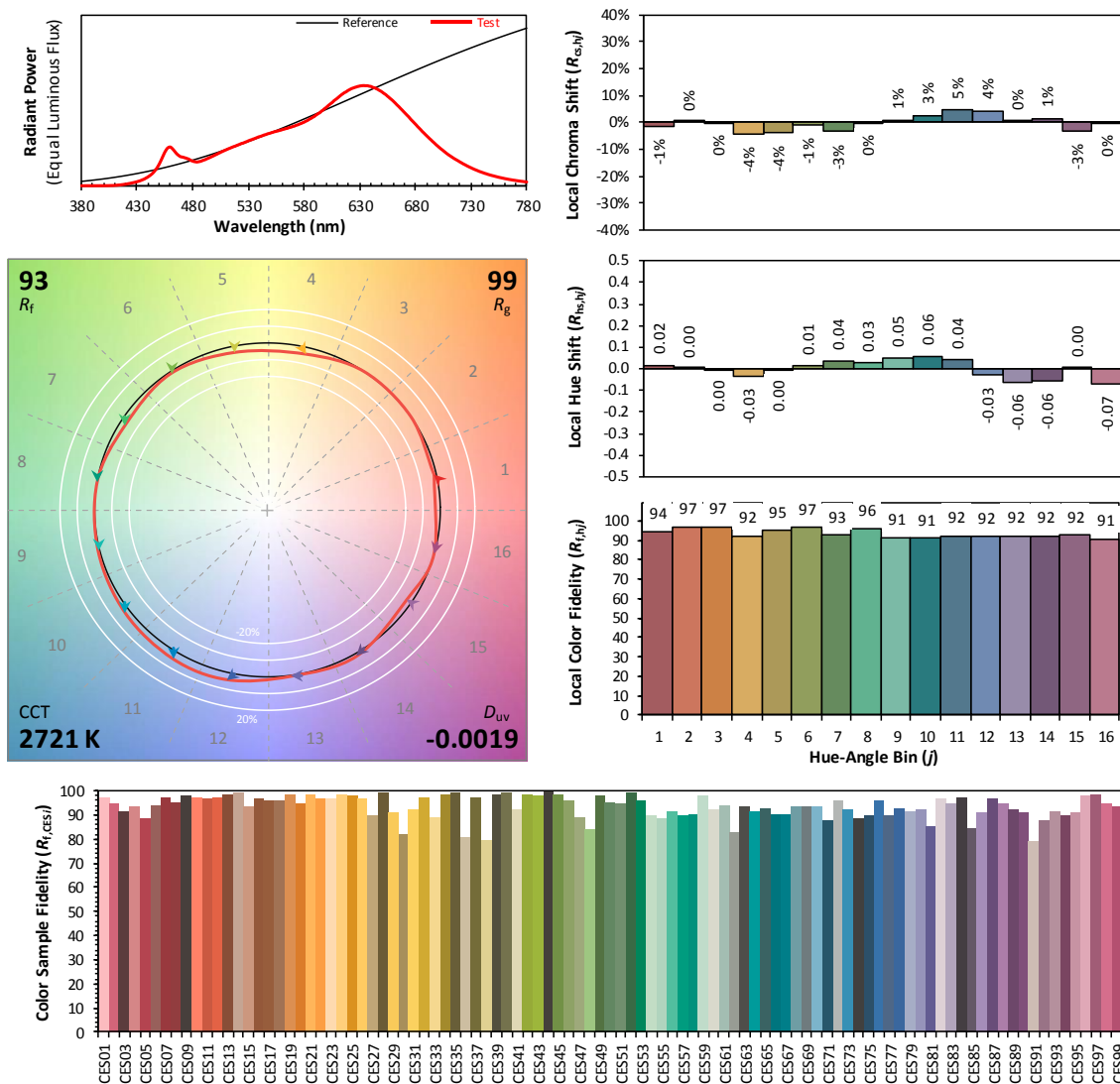
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2020/07/02

Model: 7.5MR16DIM/927SP10/R



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

x 0.4549
 y 0.4043
 u' 0.2621
 v' 0.5242

CIE 13.3-1995
(CRI)
 R_a 97
 R_g 91

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	286.184	53.08%
10- 20	134.142	24.88%
20- 30	62.392	11.57%
30- 40	24.242	4.50%
40- 50	10.749	1.99%
50- 60	7.717	1.43%
60- 70	6.349	1.18%
70- 80	3.209	0.60%
80- 90	1.268	0.24%
90-100	0.54	0.10%
100-110	0.629	0.12%
110-120	0.64	0.12%
120-130	0.479	0.09%
130-140	0.191	0.04%
140-150	0.113	0.02%
150-160	0.133	0.02%
160-170	0.105	0.02%
170-180	0.037	0.01%
Total	539.1	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	525.426	97.46%
60- 90	10.826	2.01%
0-90	536.252	99.47%
90- 180	2.867	0.53%
0- 180	539.1	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

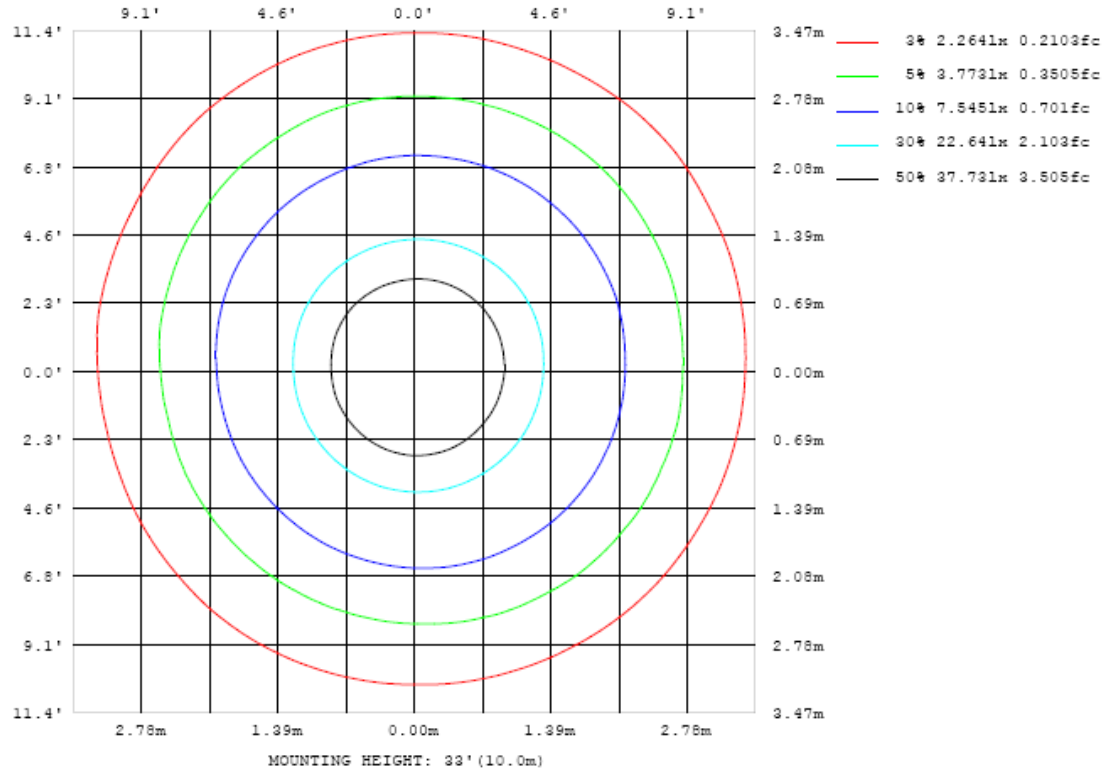


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

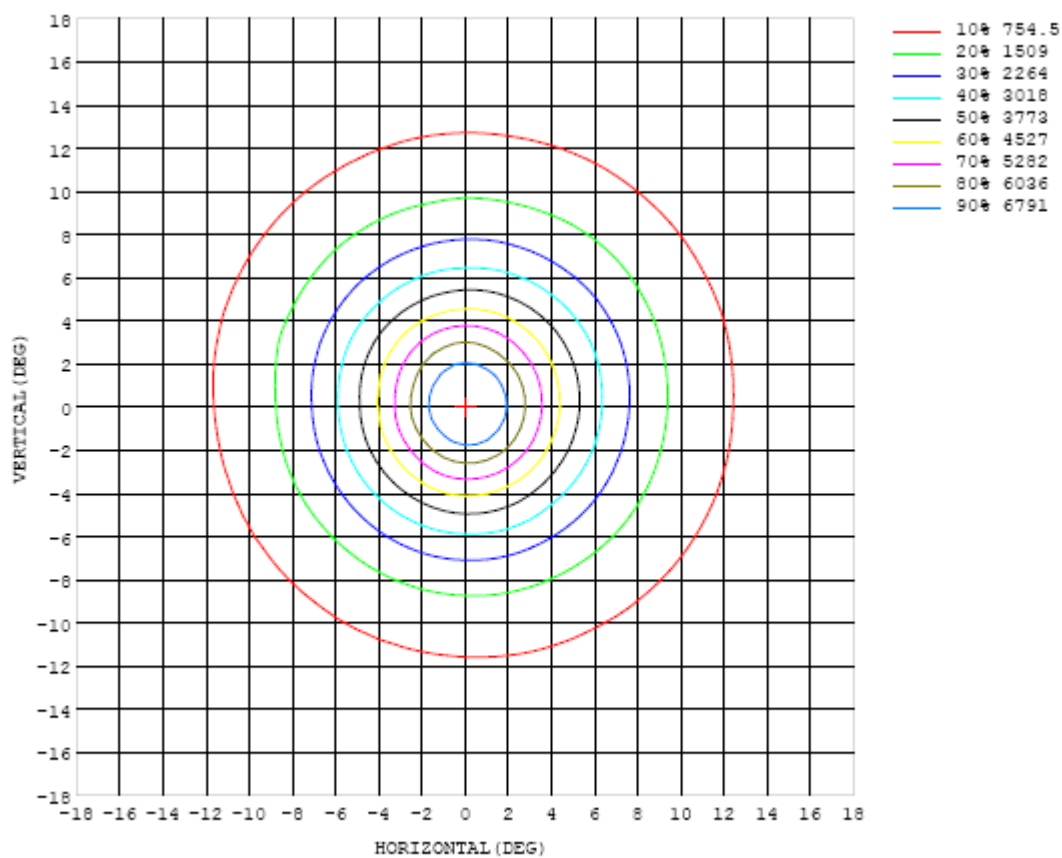


Chart 6: Isocandela Plot

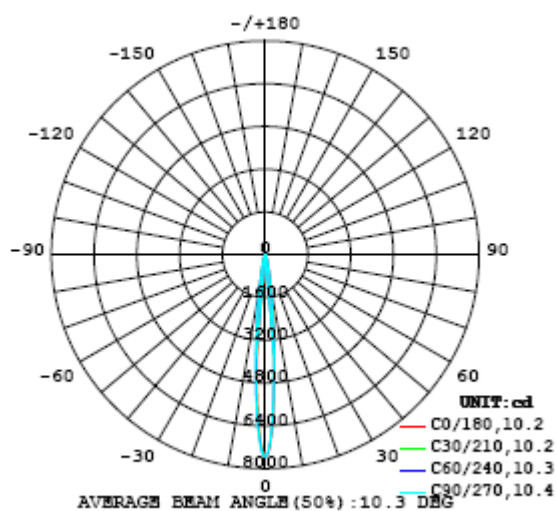


Chart 7: Polar Candela Distribution

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	7545	7545	7545	7545	7545	7545	7545	7545	7545	7545	7545	7545	7545	7545	7545	7545	7545	7545	7545
5	4010	3955	3919	3870	3833	3808	3793	3770	3743	3721	3683	3653	3637	3623	3623	3632	3644	3653	3681
10	1299	1277	1255	1236	1215	1187	1159	1135	1118	1101	1083	1065	1061	1058	1058	1066	1077	1089	1117
15	441	440	427	422	413	406	397	390	382	376	371	368	366	365	366	368	369	372	382
20	230	228	224	219	216	213	210	209	208	205	205	206	207	207	206	204	203	205	211
25	138	136	134	130	130	129	127	126	125	125	124	124	125	123	122	122	122	122	125
30	76.3	75.0	72.5	72.3	71.7	70.8	67.8	67.7	69.0	69.5	69.3	69.1	67.7	66.7	65.8	66.2	65.7	65.6	65.8
35	37.7	36.8	36.2	35.0	34.5	34.0	33.5	32.9	33.6	34.0	33.8	33.5	33.1	32.7	32.3	31.6	31.3	31.4	31.7
40	19.8	19.8	19.7	19.3	18.9	18.8	18.5	18.4	18.5	18.4	18.5	18.4	18.4	18.1	18.0	17.7	17.4	17.2	17.4
45	13.1	12.9	13.1	13.2	13.3	13.5	13.5	13.2	12.9	12.7	12.7	12.6	12.5	12.4	12.5	12.4	12.8	12.8	12.8
50	10.2	10.1	10.2	10.3	10.5	10.7	10.9	10.8	10.5	10.2	10.2	10.0	9.85	9.71	9.88	9.79	9.83	9.85	9.69
55	8.37	8.10	8.13	8.24	8.24	8.70	9.01	8.98	8.72	8.50	8.52	8.35	8.14	8.09	8.23	7.90	7.76	7.68	7.58
60	7.06	7.17	7.35	7.53	7.73	7.81	8.00	8.26	8.31	8.26	7.88	7.42	7.26	7.48	8.00	8.05	7.90	7.86	7.74
65	6.42	6.56	6.72	6.86	6.85	6.75	6.71	6.67	6.56	6.53	6.40	6.23	6.11	6.18	6.21	6.41	6.58	6.57	6.59
70	4.24	4.44	4.18	4.21	4.45	4.20	4.32	4.60	4.28	4.26	4.58	4.24	4.20	4.40	4.11	4.05	4.32	4.04	3.98
75	2.89	2.91	2.87	2.89	2.93	2.89	2.97	3.04	2.95	2.95	3.09	2.93	2.90	2.99	2.88	2.86	2.97	2.84	2.80
80	1.91	1.92	1.89	1.90	1.93	1.90	1.93	1.99	1.93	1.93	1.96	1.91	1.89	1.91	1.88	1.90	1.91	1.90	1.90
85	1.06	1.15	1.07	1.06	1.15	1.08	1.07	1.16	1.08	1.07	1.17	1.09	1.06	1.14	1.06	1.06	1.14	1.09	1.09
90	0.50	0.58	0.50	0.53	0.60	0.53	0.55	0.61	0.55	0.57	0.68	0.60	0.59	0.63	0.55	0.57	0.62	0.57	0.60
95	0.42	0.44	0.43	0.46	0.52	0.48	0.47	0.51	0.50	0.51	0.55	0.54	0.52	0.54	0.49	0.49	0.53	0.50	0.51
100	0.60	0.43	0.46	0.63	0.51	0.50	0.60	0.51	0.51	0.61	0.55	0.55	0.56	0.53	0.54	0.53	0.54	0.54	0.53
105	0.53	0.61	0.47	0.53	0.62	0.50	0.60	0.67	0.57	0.63	0.70	0.59	0.60	0.67	0.63	0.61	0.75	0.63	0.59
110	0.63	0.45	0.57	0.62	0.51	0.58	0.68	0.58	0.70	0.76	0.64	0.80	0.81	0.64	0.90	0.81	0.70	0.95	0.80
115	0.37	0.39	0.36	0.38	0.41	0.38	0.40	0.45	0.45	0.47	0.52	0.53	0.55	0.57	0.57	0.60	0.70	0.65	0.61
120	0.94	1.52	0.75	1.94	2.16	0.88	2.37	1.99	1.09	1.15	1.47	1.26	0.64	0.96	1.50	0.52	0.97	1.50	0.55
125	0.37	0.37	0.34	0.41	0.43	0.38	0.40	0.42	0.41	0.45	0.47	0.46	0.46	0.51	0.53	0.49	0.51	0.46	0.43
130	0.29	0.29	0.28	0.31	0.31	0.31	0.32	0.33	0.33	0.35	0.35	0.35	0.36	0.45	0.51	0.53	0.47	0.41	0.39
135	0.23	0.21	0.22	0.23	0.24	0.24	0.25	0.25	0.25	0.26	0.26	0.26	0.26	0.27	0.29	0.32	0.34	0.33	0.30
140	0.16	0.16	0.16	0.16	0.17	0.18	0.18	0.18	0.19	0.19	0.20	0.20	0.20	0.20	0.21	0.22	0.22	0.22	0.22
145	0.17	0.17	0.17	0.17	0.17	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.19	0.20	0.19	0.20	0.20
150	0.23	0.23	0.24	0.24	0.25	0.24	0.24	0.25	0.24	0.24	0.24	0.24	0.23	0.23	0.22	0.22	0.22	0.23	0.24
155	0.29	0.29	0.30	0.30	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.30	0.29	0.28	0.27	0.27	0.25	0.30	0.31
160	0.33	0.35	0.35	0.36	0.36	0.37	0.37	0.37	0.37	0.36	0.36	0.35	0.34	0.33	0.32	0.31	0.30	0.36	0.36
165	0.36	0.39	0.40	0.41	0.42	0.42	0.43	0.42	0.42	0.42	0.41	0.40	0.39	0.38	0.37	0.36	0.36	0.39	0.38
170	0.38	0.41	0.43	0.44	0.44	0.44	0.43	0.43	0.43	0.43	0.42	0.42	0.42	0.41	0.41	0.40	0.39	0.37	0.36
175	0.38	0.41	0.42	0.43	0.41	0.40	0.39	0.38	0.37	0.36	0.34	0.31	0.29	0.25	0.25	0.48	0.47	0.46	0.44
180	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	0.31	0.31

Table 6: Luminous Intensity Data

Table--2

UNIT: cd

C (DEG) y (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	7545	7545	7545	7545	7545	7545	7545	7545	7545	7545	7545	7545	7545	7545	7545	7545	7545		
5	3732	3810	3881	3950	4005	4036	4072	4083	4131	4169	4179	4178	4167	4151	4123	4090	4046		
10	1154	1218	1240	1276	1323	1346	1363	1374	1414	1408	1413	1439	1443	1428	1387	1374	1326		
15	397	406	417	430	442	450	463	472	475	475	477	480	480	476	466	463	450		
20	217	220	221	228	234	238	241	242	241	242	242	244	246	246	240	237	233		
25	130	132	136	140	145	148	149	149	150	150	149	147	148	146	145	143	141		
30	68.1	72.0	74.7	77.9	80.0	82.0	83.2	84.6	85.4	85.1	84.7	82.1	81.1	82.6	82.6	80.0	79.2		
35	32.1	33.1	34.5	35.8	37.8	39.3	41.0	41.8	42.2	42.0	42.0	41.1	39.8	40.0	40.4	39.3	38.8		
40	17.7	17.9	18.1	18.2	18.6	19.5	20.3	21.0	21.3	21.4	21.2	20.8	20.7	20.7	20.7	20.4	20.2		
45	12.9	13.1	13.3	13.6	13.7	13.8	14.0	14.5	14.6	14.9	14.9	14.7	14.5	14.4	14.4	13.7	13.6		
50	9.74	9.81	10.2	10.4	10.6	10.8	11.0	11.2	11.0	11.1	10.8	10.7	10.8	11.0	11.1	10.8	10.5		
55	7.77	7.95	8.30	8.51	8.60	8.67	8.75	8.80	8.83	8.81	8.68	8.53	8.62	8.75	8.81	8.76	8.64		
60	7.81	7.88	7.99	7.97	7.88	7.80	7.70	7.72	7.63	7.45	7.09	7.09	7.10	7.12	7.08	7.05	7.09		
65	6.58	6.70	6.96	7.06	7.07	7.12	7.05	6.97	6.85	6.54	6.23	6.35	6.42	6.38	6.46	6.46	6.43		
70	4.32	4.17	4.24	4.65	4.45	4.45	4.85	4.57	4.44	4.72	4.40	4.36	4.72	4.35	4.33	4.65	4.29		
75	3.00	2.94	2.97	3.18	3.07	3.04	3.19	3.06	2.98	3.15	3.02	2.99	3.10	3.01	2.99	3.03	2.94		
80	1.95	1.95	1.98	2.02	2.00	2.01	2.03	1.98	1.97	1.97	1.96	1.96	2.01	1.97	1.97	1.97	1.94		
85	1.19	1.12	1.13	1.21	1.13	1.13	1.20	1.12	1.10	1.18	1.11	1.11	1.21	1.11	1.10	1.19	1.10		
90	0.66	0.58	0.57	0.63	0.55	0.54	0.59	0.53	0.52	0.59	0.52	0.52	0.60	0.51	0.50	0.57	0.51		
95	0.53	0.49	0.49	0.51	0.46	0.46	0.47	0.45	0.44	0.46	0.43	0.43	0.45	0.43	0.42	0.44	0.42		
100	0.52	0.52	0.48	0.50	0.49	0.46	0.47	0.46	0.47	0.45	0.44	0.63	0.44	0.42	0.69	0.43	0.43		
105	0.77	0.62	0.55	0.73	0.57	0.50	0.67	0.50	0.47	0.59	0.45	0.51	0.60	0.45	0.56	0.61	0.44		
110	0.67	0.88	0.72	0.64	0.81	0.55	0.52	0.68	0.61	0.51	0.81	0.66	0.46	0.75	0.65	0.44	0.63		
115	0.60	0.52	0.48	0.50	0.43	0.40	0.40	0.38	0.38	0.41	0.37	0.37	0.39	0.36	0.36	0.37	0.36		
120	1.03	1.33	0.68	1.35	1.34	0.66	1.32	1.51	0.49	1.41	1.82	0.39	0.99	1.44	0.66	1.25	0.86		
125	0.45	0.42	0.43	0.44	0.37	0.36	0.38	0.34	0.33	0.37	0.34	0.32	0.36	0.35	0.36	0.36	0.34		
130	0.38	0.36	0.36	0.35	0.30	0.28	0.28	0.26	0.26	0.28	0.27	0.26	0.28	0.27	0.28	0.27	0.28		
135	0.27	0.26	0.27	0.26	0.22	0.21	0.20	0.19	0.20	0.20	0.20	0.20	0.20	0.21	0.22	0.20	0.22		
140	0.20	0.19	0.18	0.17	0.16	0.15	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.15	0.15	0.15	0.16		
145	0.18	0.18	0.17	0.16	0.16	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.16	0.16	0.16	0.16		
150	0.24	0.24	0.23	0.23	0.23	0.22	0.23	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.23	0.23	0.23		
155	0.30	0.30	0.30	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		
160	0.35	0.34	0.34	0.34	0.33	0.33	0.33	0.33	0.33	0.32	0.32	0.33	0.33	0.32	0.32	0.32	0.33		
165	0.38	0.37	0.37	0.37	0.37	0.36	0.36	0.36	0.35	0.35	0.35	0.35	0.34	0.32	0.32	0.33	0.35		
170	0.37	0.41	0.41	0.40	0.38	0.37	0.38	0.37	0.38	0.39	0.38	0.37	0.34	0.32	0.32	0.34	0.36		
175	0.41	0.38	0.39	0.41	0.40	0.39	0.40	0.42	0.42	0.42	0.40	0.38	0.34	0.31	0.32	0.34	0.36		
180	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		

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 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.

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° 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.