

LM-79-08 TEST REPORT

for

GREEN CREATIVE LTD

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

LED Lamp

Model: 6PAR16DIM/827FL35/R

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ19040047f

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

Review by:



Engineer: April Zou
May 10, 2019

Approved by:



Manager: Jim Zhang
May 10, 2019

TEST SUMMARY

Sample Tested: **6PAR16DIM/827FL35/R**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
94.3	539.2	5.72	0.8477
CCT (K)	CRI	Stabilization Time (Light & Power)	
2712	82.5	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	: May 01, 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	: 6PAR16DIM/827FL35/R
Electrical Ratings	: 120V, 60Hz, 6W
Product Description	: 2700K
Manufacturer	: GREEN CREATIVE LTD
Address	: 756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai

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)	120.0
Voltage frequency (Hz)	60
Test Current (A)	0.056
Power Factor	0.8477
Test Power (W)	5.72
THD A%	43.59
Luminous Efficacy (lm/W)	94.3
Total Luminous Flux (lm)	539.2
Color Rendering Index (CRI)	82.5
R9	10.5
Correlated Color Temperature (CCT)(K)	2712
Chromaticity Chroma x	0.4573
Chromaticity Chroma y	0.4077
Chromaticity Chroma u	0.2621
Chromaticity Chroma v	0.3506
Duv	0.0012
Chromaticity Chroma u'	0.2621
Chromaticity Chroma v'	0.5258

Special Color Rendering Indices	
R1	80.7
R2	90.3
R3	96.8
R4	80.7
R5	80.8
R6	88.8
R7	82.5
R8	59.1
R9	10.5
R10	78.5
R11	80.3
R12	76
R13	82.7
R14	98.7

Table 2: Test data per Sphere-Spectroradiometer Method

Note: According to CIE 1976 (u',v') diagram, $u' = u / (-2x + 12y + 3)$, $v' = 3v / 2 = 9y / (-2x + 12y + 3)$.

Goniophotometer Method

Test ambient temperature was 24.7°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)	120.0
Voltage frequency (Hz)	60
Test Current (A)	0.057
Power Factor	0.8492
Power (W)	5.77
Luminous Efficacy (lm/W)	95.1
Total Luminous Flux (lm)	548.8
Beam Angle (°)	33.7 (0°-180°) / 33.5 (90°-270°)
Center Beam Candle Power (cd)	1054
Maximum Beam Candle Power (cd)	1054 (At: C=0.0, Gamma=0.0)
Spacing Criteria	0.55 (0°-180°) /0.53 (90°-270°)
Zonal Lumens in the 0°-60° Zone	94.20%
Zonal Lumens in the 60°-90° Zone	5.26%
Zonal Lumens in the 90°-120° Zone	0.52%
Zonal Lumens in the 120°-180° Zone	0.03%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

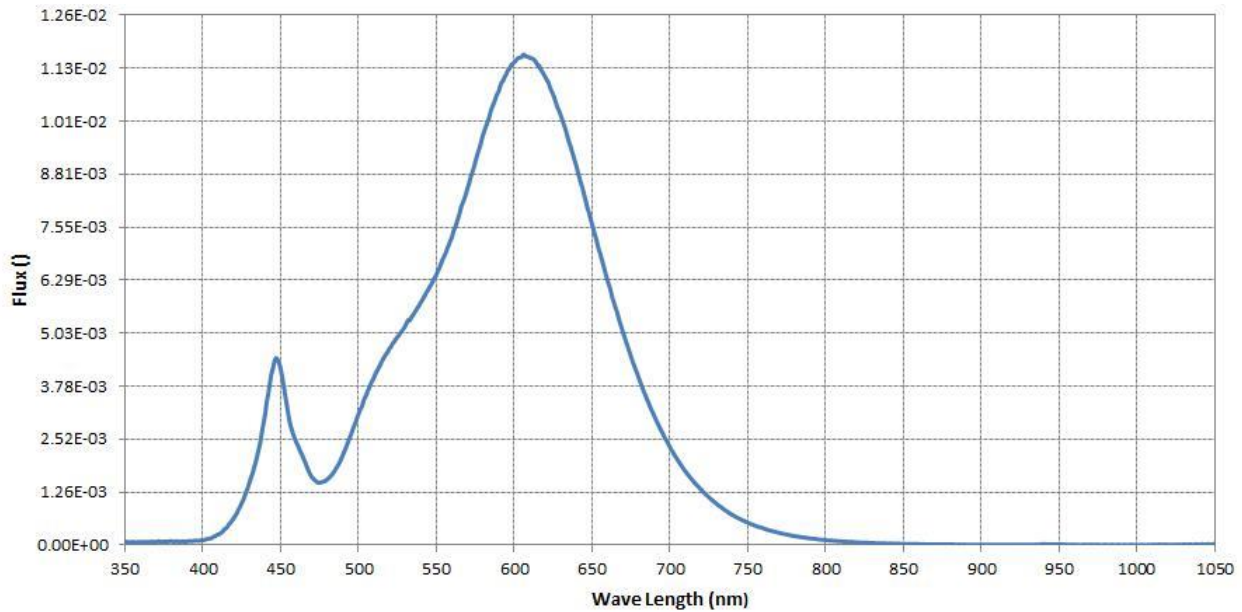
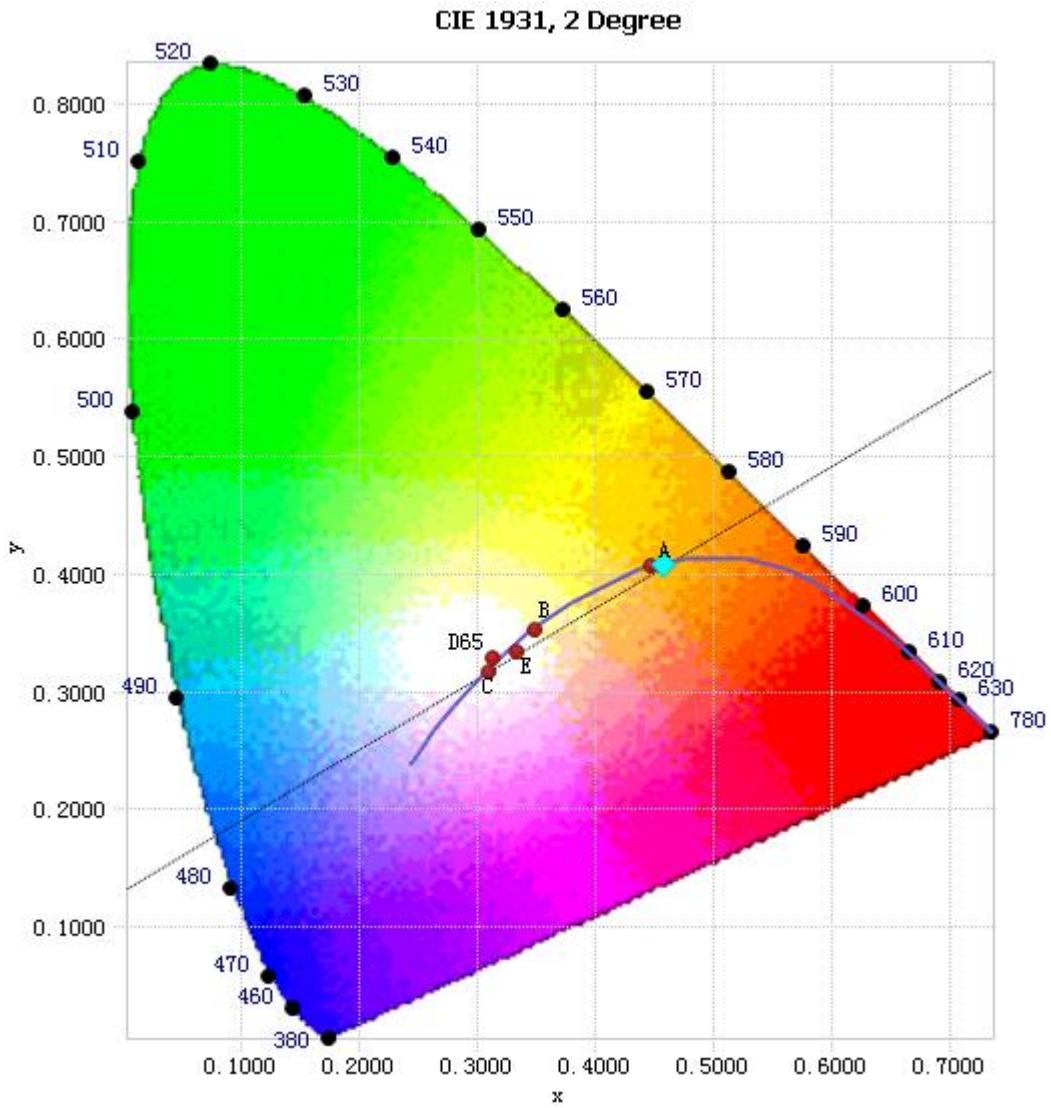


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	9.75E-05	485	1.78E-03	590	1.08E-02	695	2.68E-03
385	7.90E-05	490	2.14E-03	595	1.12E-02	700	2.33E-03
390	8.63E-05	495	2.60E-03	600	1.15E-02	705	2.02E-03
395	1.05E-04	500	3.11E-03	605	1.16E-02	710	1.75E-03
400	1.16E-04	505	3.56E-03	610	1.16E-02	715	1.52E-03
405	1.60E-04	510	3.99E-03	615	1.14E-02	720	1.32E-03
410	2.53E-04	515	4.36E-03	620	1.11E-02	725	1.14E-03
415	4.00E-04	520	4.67E-03	625	1.07E-02	730	9.80E-04
420	6.45E-04	525	4.94E-03	630	1.02E-02	735	8.42E-04
425	9.99E-04	530	5.20E-03	635	9.60E-03	740	7.23E-04
430	1.48E-03	535	5.46E-03	640	9.00E-03	745	6.23E-04
435	2.11E-03	540	5.77E-03	645	8.31E-03	750	5.37E-04
440	3.08E-03	545	6.08E-03	650	7.61E-03	755	4.61E-04
445	4.18E-03	550	6.41E-03	655	6.95E-03	760	4.00E-04
450	4.20E-03	555	6.86E-03	660	6.28E-03	765	3.43E-04
455	3.10E-03	560	7.31E-03	665	5.65E-03	770	2.96E-04
460	2.45E-03	565	7.88E-03	670	5.04E-03	775	2.54E-04
465	2.03E-03	570	8.47E-03	675	4.47E-03	780	2.17E-04
470	1.62E-03	575	9.09E-03	680	3.97E-03		
475	1.48E-03	580	9.74E-03	685	3.50E-03		
480	1.57E-03	585	1.03E-02	690	3.06E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4573, 0.4077)

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

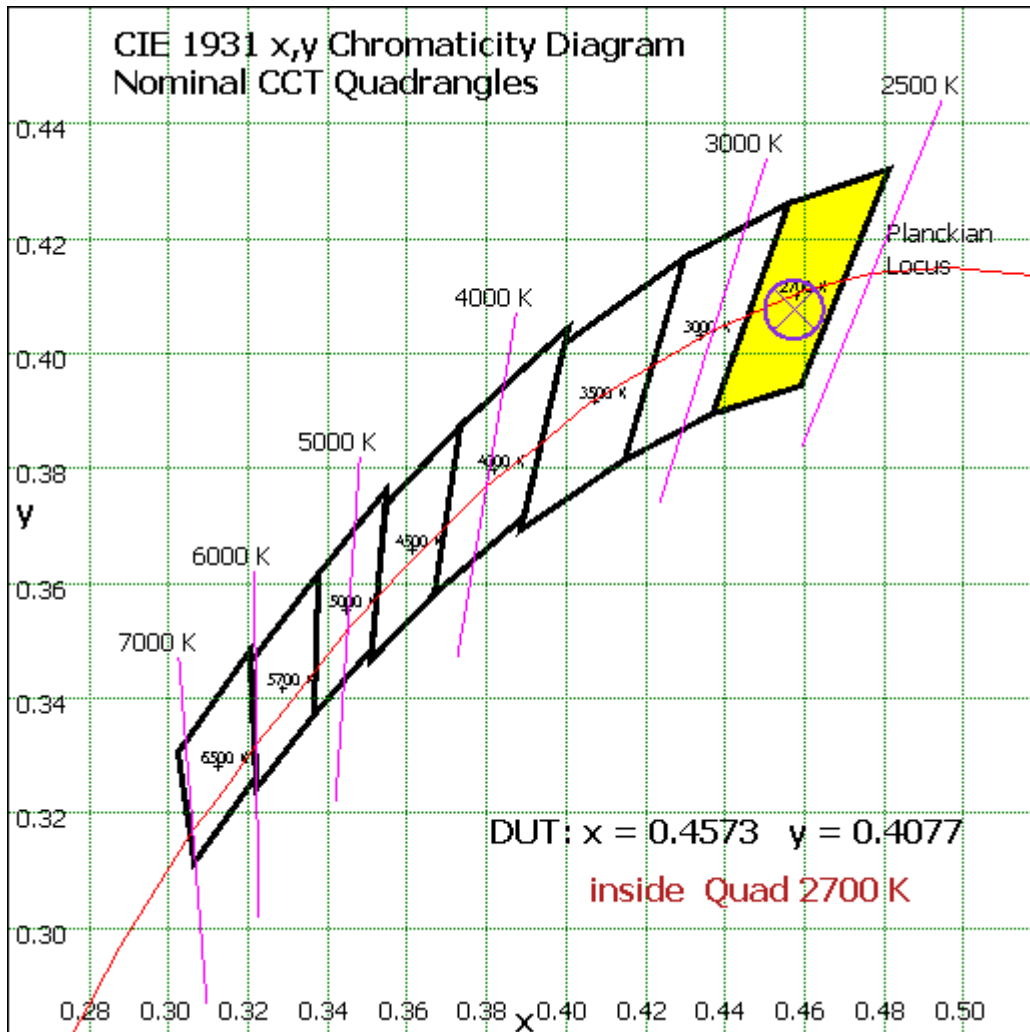
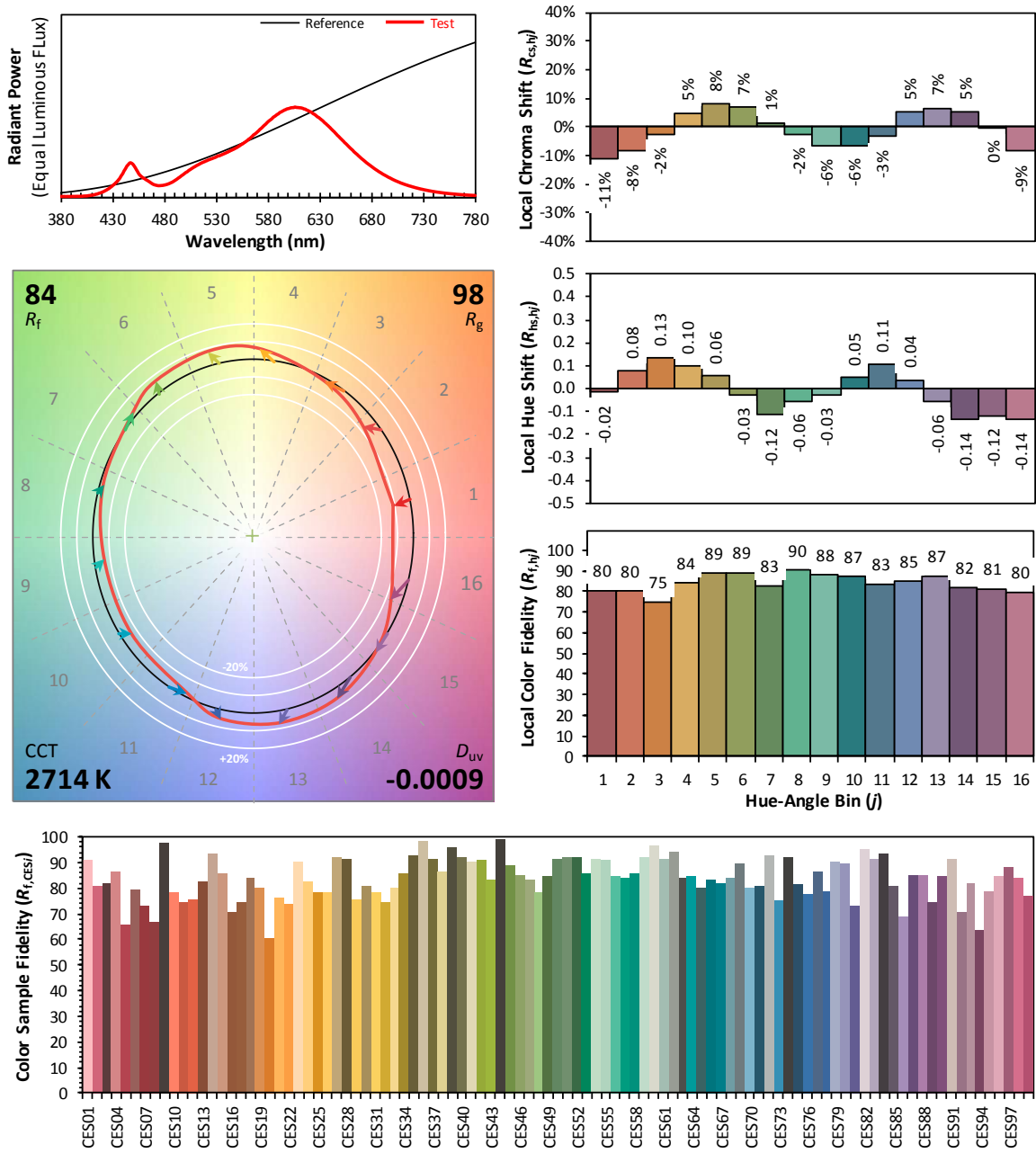


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method



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

x	0.4573
y	0.4077
u'	0.2621
v'	0.5258

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	92.122	16.79%
10- 20	168.851	30.77%
20- 30	123.503	22.50%
30- 40	73.462	13.39%
40- 50	38.163	6.95%
50- 60	20.871	3.80%
60- 70	14.343	2.61%
70- 80	9.95	1.81%
80- 90	4.563	0.83%
90-100	1.78	0.32%
100-110	0.896	0.16%
110-120	0.176	0.03%
120-130	0.003	0.00%
130-140	0.013	0.00%
140-150	0.027	0.00%
150-160	0.042	0.01%
160-170	0.043	0.01%
170-180	0.016	0.00%
Total	548.8	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	516.972	94.20%
60- 90	28.856	5.26%
0-90	545.828	99.45%
90- 180	2.996	0.55%
0- 180	548.8	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

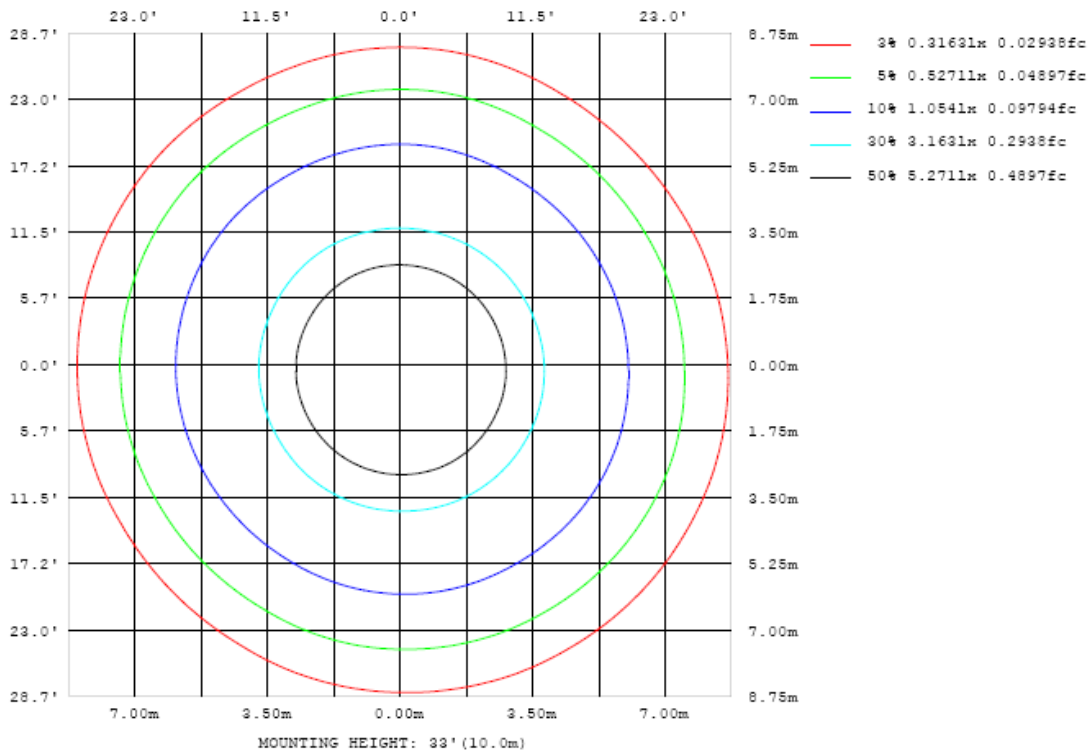


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

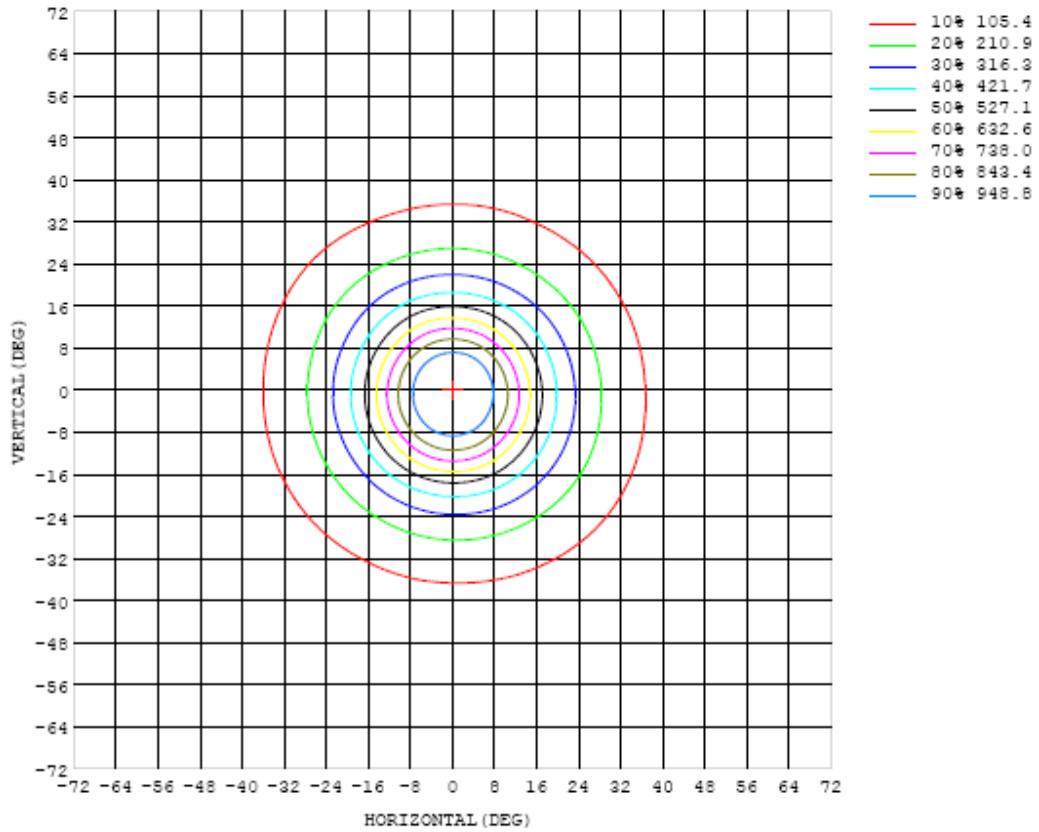


Chart 6: Isocandela Plot

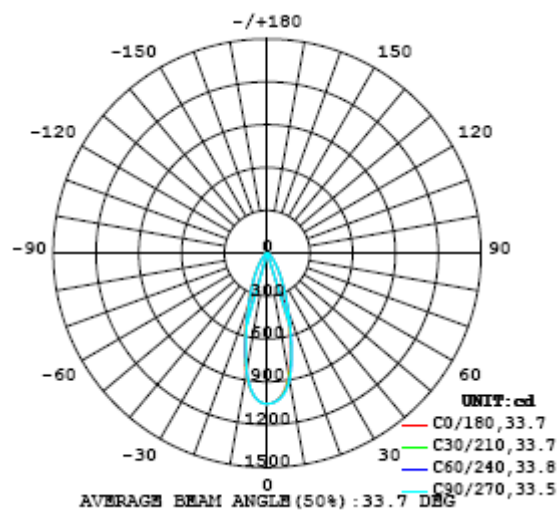


Chart 7: Polar Candela Distribution

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	1054	1054	1054	1054	1054	1054	1054	1054	1054	1054	1054	1054	1054	1054	1054	1054	1054	1054	1054
5	1013	1014	1016	1017	1019	1020	1021	1022	1023	1023	1023	1023	1021	1020	1018	1015	1013	1011	1010
10	865	871	876	882	888	895	900	902	903	903	902	900	895	889	883	876	871	864	858
15	619	626	632	638	644	651	656	658	657	656	654	651	645	639	632	625	618	613	607
20	415	421	425	428	432	434	435	435	433	430	428	426	422	419	413	408	405	404	401
25	276	280	284	287	288	288	287	286	284	282	279	276	273	269	266	264	264	264	262
30	184	187	191	192	191	190	189	189	188	186	184	180	177	175	174	174	174	175	175
35	121	124	127	127	127	125	124	124	123	122	120	118	115	114	114	114	115	115	115
40	79.0	81.2	82.5	82.5	82.2	81.7	81.2	80.8	79.9	78.8	78.0	76.3	74.4	73.6	73.3	73.2	74.4	75.0	75.0
45	50.7	52.3	53.4	53.4	53.0	52.8	52.4	52.4	52.2	51.9	50.9	49.4	48.2	47.4	47.1	47.4	48.0	48.2	48.2
50	32.9	33.9	34.9	35.2	34.8	34.3	34.1	34.0	34.6	35.0	34.1	32.8	31.8	31.2	31.3	31.7	32.0	31.9	31.9
55	22.9	23.5	24.4	25.0	24.8	24.2	23.9	24.0	24.4	24.8	24.5	23.5	22.8	22.6	22.7	23.1	23.1	22.8	22.5
60	17.6	17.9	18.4	18.8	18.7	18.4	18.2	18.2	18.7	19.0	18.8	18.1	17.6	17.4	17.5	17.7	17.8	17.5	17.3
65	14.4	14.6	15.0	15.2	15.1	14.9	14.7	14.8	15.1	15.3	15.2	14.7	14.3	14.1	14.2	14.4	14.5	14.3	14.0
70	12.1	12.2	12.5	12.7	12.7	12.4	12.3	12.3	12.5	12.6	12.5	12.1	11.9	11.8	11.8	12.0	12.0	11.8	11.6
75	9.72	9.85	10.0	10.2	10.2	10.00	9.90	9.90	9.99	10.1	9.95	9.73	9.53	9.46	9.44	9.49	9.49	9.37	9.18
80	7.03	7.14	7.28	7.42	7.44	7.38	7.32	7.31	7.34	7.35	7.26	7.11	6.98	6.90	6.84	6.83	6.79	6.70	6.60
85	4.11	4.20	4.32	4.43	4.52	4.55	4.55	4.55	4.54	4.51	4.44	4.36	4.27	4.19	4.11	4.04	3.96	3.87	3.81
90	2.18	2.21	2.25	2.30	2.35	2.39	2.39	2.40	2.39	2.36	2.32	2.29	2.24	2.21	2.16	2.12	2.09	2.07	2.06
95	1.62	1.64	1.66	1.67	1.68	1.69	1.70	1.70	1.69	1.68	1.67	1.65	1.63	1.61	1.59	1.57	1.56	1.55	1.55
100	1.26	1.27	1.28	1.28	1.29	1.29	1.29	1.29	1.28	1.28	1.26	1.25	1.23	1.21	1.19	1.17	1.16	1.16	1.15
105	0.88	0.89	0.90	0.91	0.92	0.92	0.92	0.92	0.92	0.91	0.90	0.89	0.87	0.85	0.83	0.81	0.80	0.79	0.79
110	0.52	0.52	0.53	0.54	0.55	0.55	0.56	0.56	0.56	0.56	0.55	0.53	0.52	0.50	0.48	0.47	0.46	0.44	0.43
115	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.22	0.22	0.22	0.21	0.20	0.19	0.18	0.17	0.16	0.15	0.13	0.12
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	0.02	0.01	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
140	0.02	0.02	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.03	0.03	0.03	0.03
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	0.06	0.05	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.06
155	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.09
160	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	0.12	0.12
165	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
170	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	0.17	0.17	0.17	0.18	0.17
175	0.15	0.16	0.16	0.17	0.17	0.17	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.17
180	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	0.14	0.14	0.14	0.14	0.14

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	1054	1054	1054	1054	1054	1054	1054	1054	1054	1054	1054	1054	1054	1054	1054	1054	1054		
5	1009	1008	1008	1008	1008	1008	1007	1007	1008	1009	1010	1010	1011	1011	1012	1012	1012		
10	852	846	842	839	836	833	831	830	830	831	833	836	839	843	847	852	858		
15	600	592	587	583	581	578	575	573	571	571	573	578	583	588	594	601	609		
20	395	390	386	384	383	380	377	374	373	374	376	379	384	389	395	400	408		
25	259	256	254	253	251	249	247	247	247	247	247	247	249	254	260	265	270		
30	173	172	171	170	167	165	165	165	166	166	164	164	165	169	172	177	180		
35	115	114	113	112	110	108	107	108	109	109	108	106	107	110	113	116	119		
40	74.6	73.8	72.8	71.9	70.6	69.2	69.0	69.6	69.9	69.8	69.0	68.2	68.4	69.7	71.8	74.8	77.2		
45	48.0	47.7	46.7	45.7	44.7	44.1	44.1	44.8	45.5	44.9	44.0	43.4	43.4	44.1	45.8	47.7	49.2		
50	31.9	31.7	31.3	30.6	29.7	29.2	29.2	29.9	30.5	30.0	29.2	28.7	28.6	29.2	30.3	31.4	32.1		
55	22.6	22.6	22.5	22.0	21.4	21.1	21.1	21.6	22.1	21.8	21.2	20.8	20.8	21.2	21.8	22.4	22.7		
60	17.3	17.4	17.4	17.2	16.8	16.6	16.7	17.1	17.4	17.2	16.8	16.5	16.5	16.8	17.2	17.5	17.5		
65	14.0	14.2	14.2	14.0	13.8	13.6	13.7	14.0	14.2	14.1	13.8	13.5	13.5	13.7	14.0	14.3	14.3		
70	11.6	11.7	11.7	11.6	11.4	11.3	11.4	11.7	11.8	11.7	11.5	11.4	11.3	11.4	11.7	12.0	12.0		
75	9.14	9.18	9.16	9.05	8.92	8.89	8.95	9.09	9.17	9.14	9.00	8.92	8.94	9.04	9.24	9.45	9.57		
80	6.55	6.53	6.49	6.40	6.30	6.27	6.28	6.32	6.36	6.36	6.33	6.32	6.38	6.49	6.64	6.81	6.92		
85	3.76	3.73	3.69	3.64	3.61	3.58	3.57	3.57	3.57	3.57	3.58	3.60	3.66	3.73	3.82	3.93	4.03		
90	2.07	2.09	2.09	2.08	2.07	2.07	2.08	2.08	2.08	2.07	2.08	2.08	2.08	2.09	2.10	2.13	2.15		
95	1.55	1.56	1.55	1.55	1.55	1.55	1.56	1.57	1.57	1.57	1.56	1.56	1.56	1.57	1.58	1.60	1.61		
100	1.15	1.15	1.15	1.15	1.15	1.16	1.17	1.18	1.19	1.19	1.20	1.19	1.20	1.20	1.22	1.23	1.25		
105	0.78	0.77	0.77	0.77	0.77	0.77	0.78	0.79	0.80	0.81	0.81	0.82	0.83	0.84	0.85	0.86	0.87		
110	0.43	0.42	0.41	0.40	0.40	0.40	0.40	0.40	0.41	0.42	0.44	0.45	0.46	0.48	0.49	0.50	0.51		
115	0.11	0.10	0.08	0.07	0.07	0.06	0.06	0.06	0.07	0.07	0.08	0.09	0.10	0.11	0.12	0.14	0.15		
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	0.01	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		
135	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		
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	0.04	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	0.04		
150	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.07	0.07	0.07	0.06		
155	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	0.10	0.10	0.09		
160	0.14	0.14	0.14	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	0.12		
165	0.16	0.18	0.18	0.18	0.18	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.15		
170	0.18	0.19	0.19	0.18	0.18	0.18	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.18	0.17	0.17		
175	0.17	0.16	0.16	0.15	0.14	0.14	0.13	0.13	0.13	0.13	0.13	0.13	0.14	0.14	0.14	0.14	0.15		
180	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	0.14	0.14	0.14		

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.

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

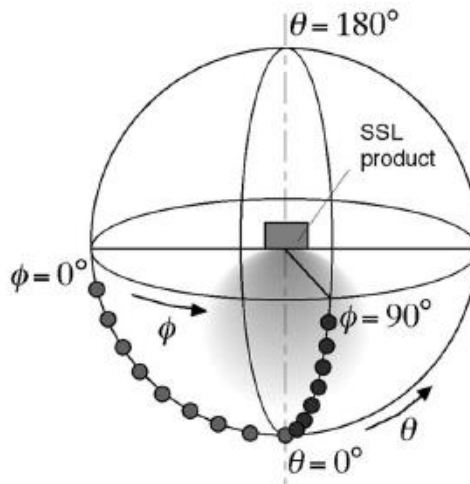
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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

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