LM-79-08 TEST REPORT

for

GREEN CREATIVE LTD

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

LED Lamp

Model: 6GU10DLM/827FL35/R

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ19040047g

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: **6GU10DLM/827FL35/R**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
93.7	546.0	5.83	0.8535

CCT (K)	CRI	Stabilization Time (Light & Power)
2707	82.1	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. 29, 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	: 6GU10DLM/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℃.

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)	0.057
Power Factor	0.8535
Test Power (W)	5.83
THD A%	42.95
Luminous Efficacy (lm/W)	93.7
Total Luminous Flux (lm)	546.0
Color Rendering Index (CRI)	82.1
R9	8.9
Correlated Color Temperature (CCT)(K)	2707
Chromaticity Chroma x	0.4581
Chromaticity Chroma y	0.4084
Chromaticity Chroma u	0.2623
Chromaticity Chroma v	0.3508
Duv	0.0010
Chromaticity Chroma u ’	0.2623
Chromaticity Chroma v’	0.5262

Special Color Rendering Indices	
R1	80.1
R2	90
R3	96.8
R4	80.2
R5	80.2
R6	88.3
R7	82.4
R8	58.4
R9	8.9
R10	77.8
R11	79.7
R12	75.1
R13	82.2
R14	98.7

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 24.7℃.

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	0.8551
Power (W)	5.89
Luminous Efficacy (lm/W)	94.5
Total Luminous Flux (lm)	556.5
Beam Angle (°)	31.1（0^o-180^o）/ 31.1（90^o-270^o）
Center Beam Candle Power (cd)	1192
Maximum Beam Candle Power (cd)	1202 (At: C=50.0, Gamma=1.5)
Spacing Criteria	0.50（0^o-180^o）/0.50 (90^o-270^o)
Zonal Lumens in the 0 °-60 °Zone	95.75%
Zonal Lumens in the 60 °-90 °Zone	3.89%
Zonal Lumens in the 90 °-120 °Zone	0.33%
Zonal Lumens in the 120 °-180 °Zone	0.03%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

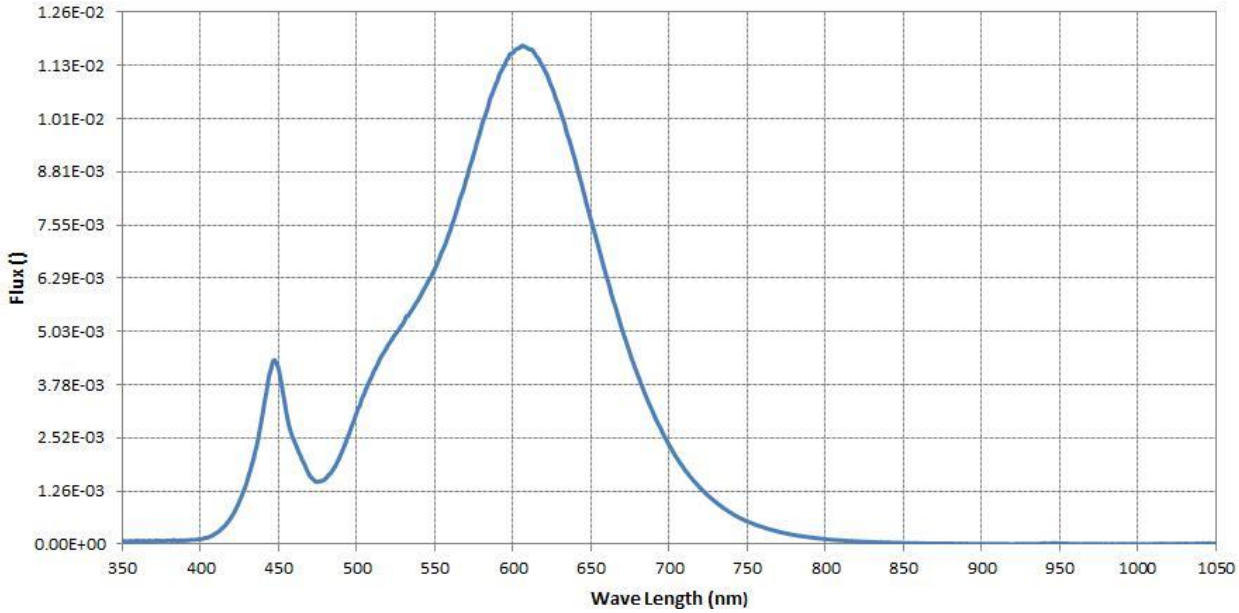
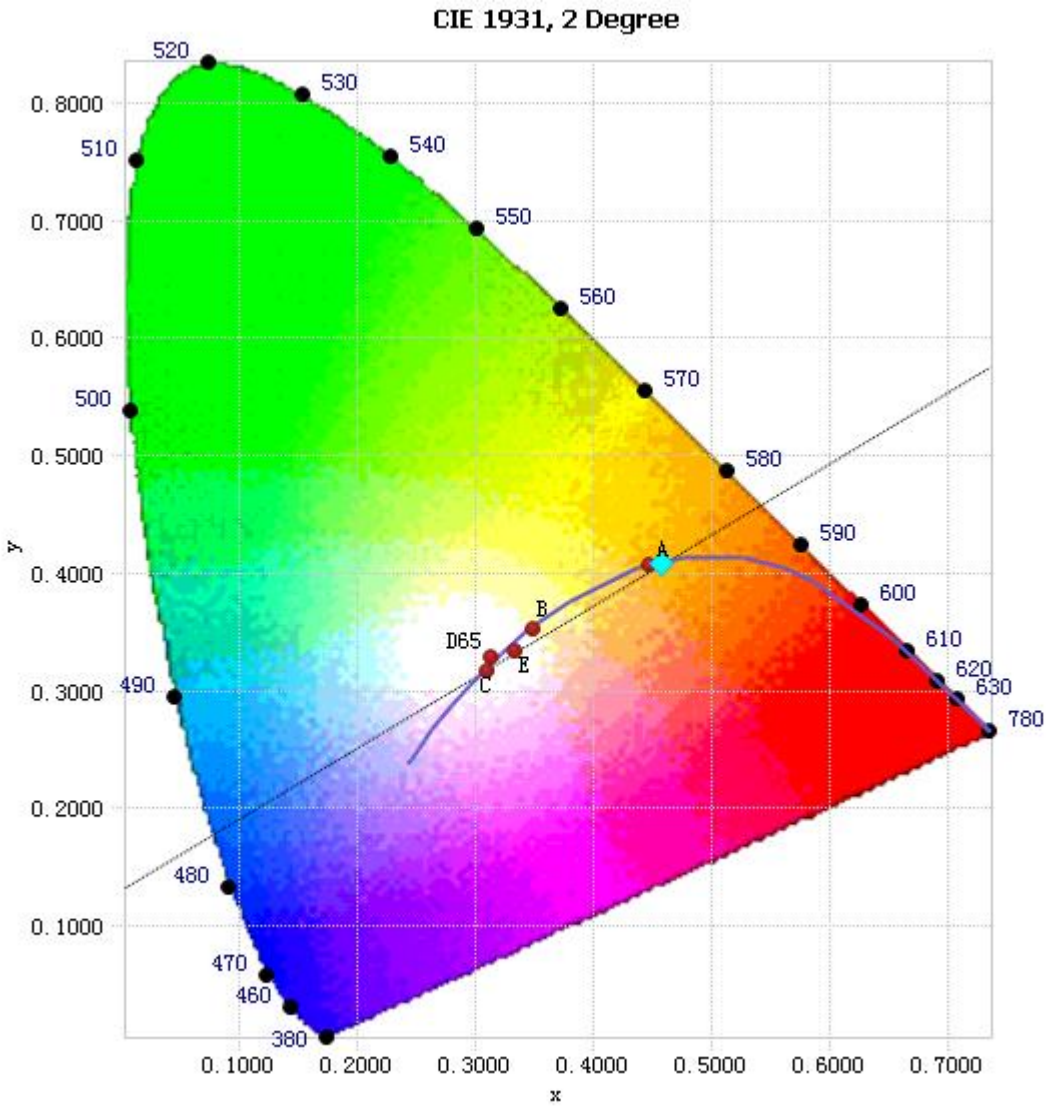


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	8.92E-05	485	1.77E-03	590	1.10E-02	695	2.70E-03
385	8.63E-05	490	2.14E-03	595	1.14E-02	700	2.35E-03
390	8.83E-05	495	2.60E-03	600	1.16E-02	705	2.04E-03
395	1.07E-04	500	3.11E-03	605	1.18E-02	710	1.76E-03
400	1.18E-04	505	3.57E-03	610	1.17E-02	715	1.53E-03
405	1.63E-04	510	4.00E-03	615	1.15E-02	720	1.33E-03
410	2.63E-04	515	4.40E-03	620	1.12E-02	725	1.15E-03
415	4.12E-04	520	4.71E-03	625	1.08E-02	730	9.97E-04
420	6.55E-04	525	4.97E-03	630	1.03E-02	735	8.53E-04
425	1.02E-03	530	5.23E-03	635	9.67E-03	740	7.34E-04
430	1.51E-03	535	5.52E-03	640	9.07E-03	745	6.29E-04
435	2.18E-03	540	5.82E-03	645	8.36E-03	750	5.46E-04
440	3.11E-03	545	6.16E-03	650	7.66E-03	755	4.68E-04
445	4.11E-03	550	6.51E-03	655	7.00E-03	760	4.05E-04
450	4.16E-03	555	6.95E-03	660	6.32E-03	765	3.49E-04
455	3.12E-03	560	7.43E-03	665	5.68E-03	770	2.99E-04
460	2.45E-03	565	8.01E-03	670	5.06E-03	775	2.58E-04
465	2.01E-03	570	8.62E-03	675	4.51E-03	780	2.23E-04
470	1.62E-03	575	9.23E-03	680	4.00E-03		
475	1.47E-03	580	9.89E-03	685	3.52E-03		
480	1.55E-03	585	1.05E-02	690	3.09E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4581, 0.4084)

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

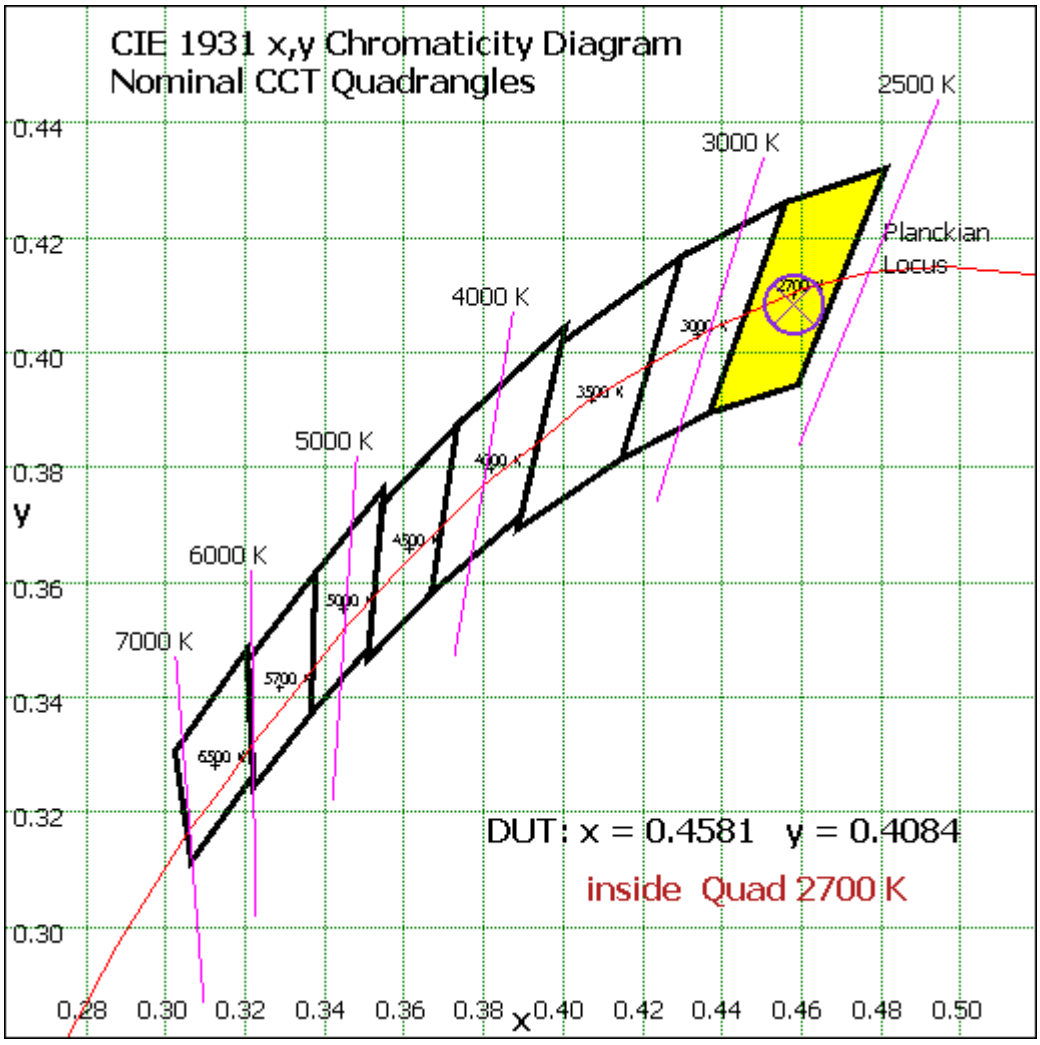
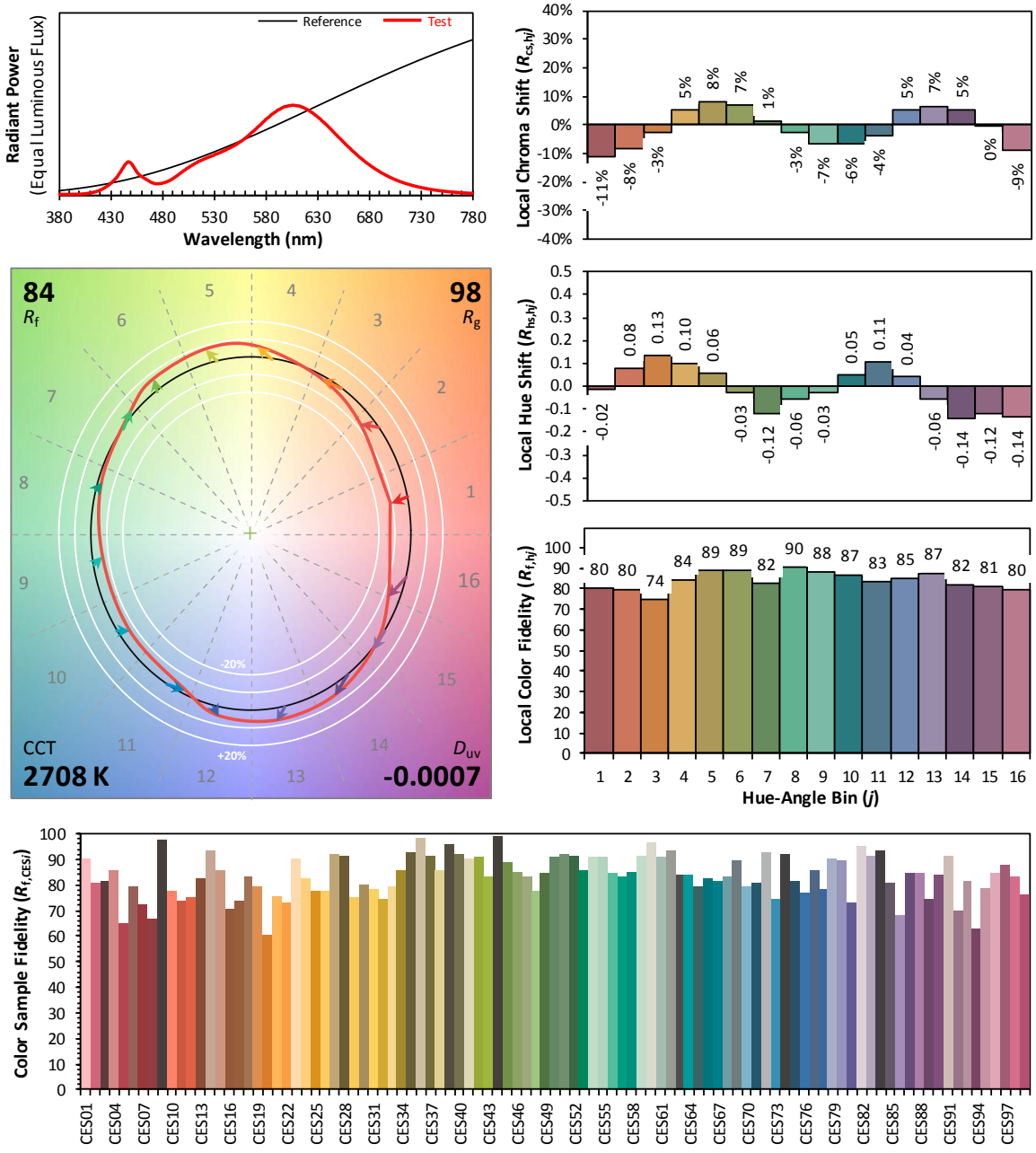


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method



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

x	0.4581
y	0.4084
u'	0.2623
v'	0.5262

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	97.113	17.45%
10- 20	172.601	31.01%
20- 30	125.407	22.53%
30- 40	77.165	13.87%
40- 50	41.009	7.37%
50- 60	19.608	3.52%
60- 70	11.247	2.02%
70- 80	7.212	1.30%
80- 90	3.2	0.57%
90-100	1.208	0.22%
100-110	0.524	0.09%
110-120	0.085	0.02%
120-130	0.005	0.00%
130-140	0.015	0.00%
140-150	0.029	0.01%
150-160	0.044	0.01%
160-170	0.046	0.01%
170-180	0.017	0.00%
Total	556.5	100%

γ(°)	Lumens	% Total
0- 60	532.903	95.75%
60- 90	21.659	3.89%
0-90	554.562	99.65%
90- 180	1.973	0.35%
0- 180	556.5	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

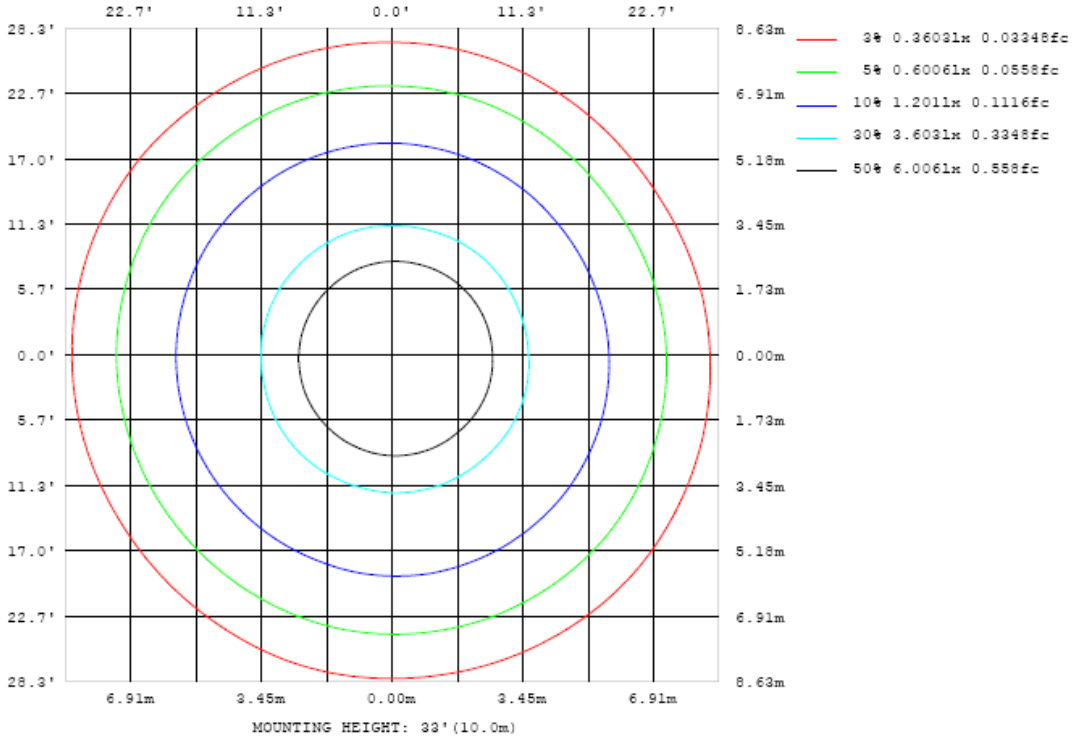


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

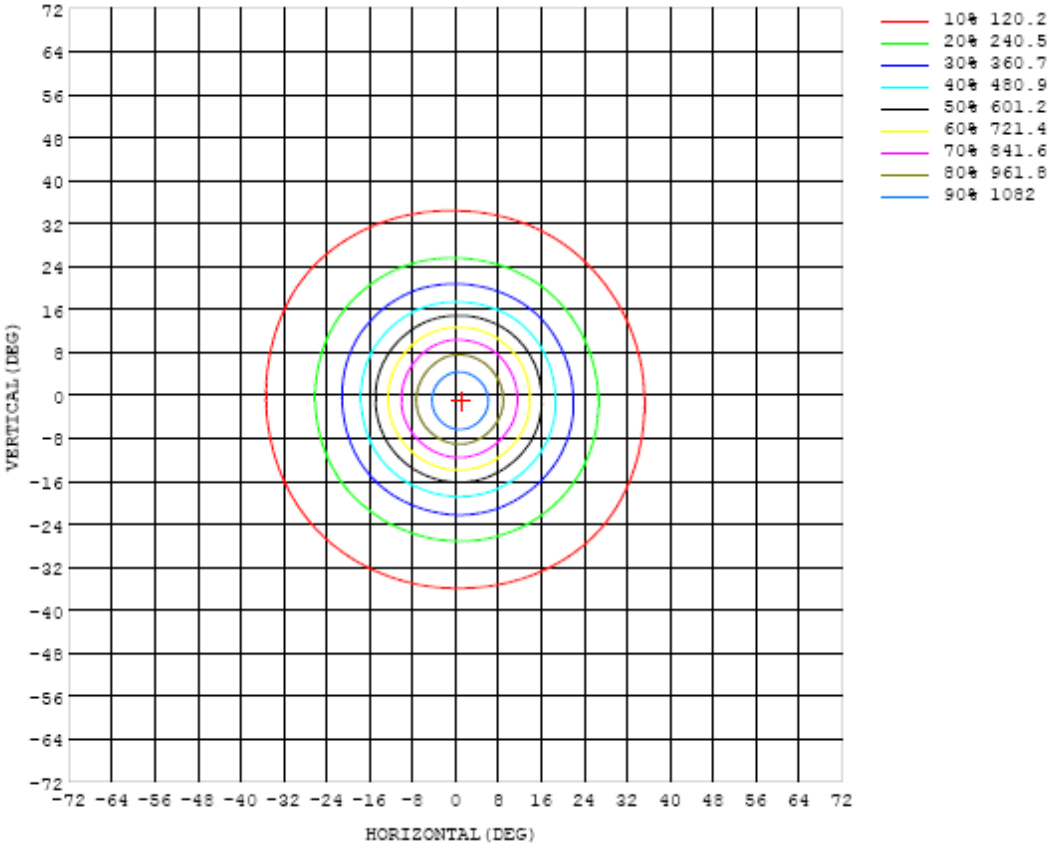


Chart 6: Isocandela Plot

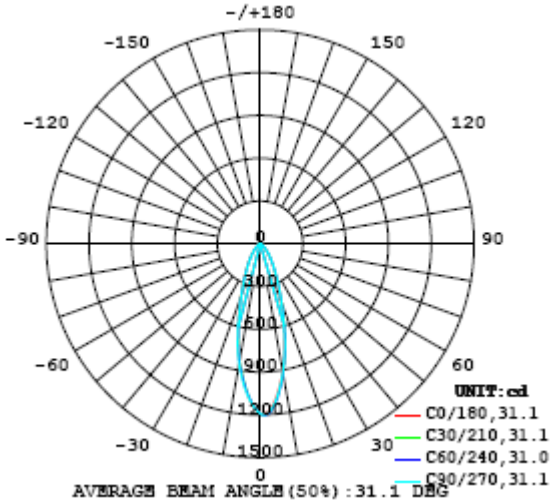


Chart 7: Polar Candela Distribution

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	1192	1192	1192	1192	1192	1192	1192	1192	1192	1192	1192	1192	1192	1192	1192	1192	1192	1192	1192
5	1117	1125	1132	1136	1138	1139	1140	1138	1134	1130	1122	1113	1103	1094	1085	1076	1068	1061	1055
10	911	917	921	922	922	924	925	924	923	917	908	898	888	880	873	866	860	852	845
15	656	665	671	673	671	669	670	670	667	663	656	647	640	631	624	618	610	603	598
20	425	435	439	442	441	439	440	441	439	436	429	424	422	419	416	409	403	399	398
25	275	281	285	287	287	288	290	290	289	287	283	278	276	274	272	270	268	265	264
30	181	184	187	190	191	192	193	193	193	191	189	186	184	183	182	181	181	180	180
35	122	124	127	129	131	131	131	131	130	129	128	127	125	124	124	123	123	123	124
40	80.4	82.7	84.6	86.2	87.8	87.9	87.4	86.9	86.2	85.8	86.1	85.5	83.8	82.7	81.9	81.7	82.2	82.7	82.9
45	51.3	53.5	54.8	55.7	57.0	57.0	56.3	55.9	55.3	55.6	56.1	55.9	54.4	53.1	52.1	51.7	52.4	53.1	53.4
50	32.0	33.3	34.2	35.1	35.6	35.6	35.1	34.5	34.3	34.9	35.3	35.2	34.3	32.8	31.8	31.7	32.2	33.0	33.5
55	21.0	21.5	22.0	22.6	22.9	22.8	22.6	22.1	22.0	22.4	22.9	22.8	22.2	21.0	20.4	20.4	20.9	21.5	21.7
60	14.8	14.8	15.0	15.4	15.8	15.8	15.5	15.0	15.0	15.5	15.9	15.9	15.2	14.5	14.2	14.4	14.8	15.2	15.2
65	11.1	11.0	11.1	11.4	11.7	11.7	11.5	11.2	11.2	11.4	11.7	11.7	11.2	10.8	10.6	10.8	11.1	11.4	11.3
70	9.07	9.02	9.04	9.21	9.39	9.46	9.37	9.14	9.03	9.16	9.33	9.32	8.99	8.69	8.51	8.56	8.74	8.91	8.80
75	7.08	7.02	7.00	7.11	7.24	7.30	7.27	7.13	7.02	7.12	7.20	7.16	6.90	6.72	6.61	6.62	6.69	6.76	6.70
80	5.06	5.03	4.99	5.03	5.09	5.08	5.09	5.04	4.99	5.06	5.11	5.03	4.86	4.76	4.67	4.67	4.68	4.66	4.59
85	2.99	3.01	2.98	2.96	2.96	2.95	2.96	2.97	2.96	2.99	2.99	2.92	2.86	2.83	2.78	2.75	2.72	2.66	2.63
90	1.64	1.66	1.65	1.65	1.64	1.62	1.63	1.63	1.62	1.63	1.63	1.61	1.58	1.57	1.53	1.51	1.50	1.48	1.48
95	1.10	1.12	1.13	1.14	1.14	1.13	1.13	1.12	1.11	1.12	1.14	1.14	1.12	1.10	1.06	1.03	1.02	1.01	1.00
100	0.79	0.81	0.82	0.83	0.84	0.84	0.84	0.83	0.83	0.83	0.84	0.83	0.82	0.79	0.77	0.74	0.73	0.72	0.71
105	0.51	0.52	0.54	0.55	0.56	0.55	0.55	0.54	0.54	0.53	0.53	0.51	0.50	0.49	0.48	0.46	0.45	0.44	0.44
110	0.27	0.28	0.30	0.31	0.31	0.31	0.30	0.29	0.28	0.27	0.26	0.25	0.25	0.24	0.24	0.23	0.22	0.22	0.21
115	0.07	0.08	0.09	0.09	0.10	0.10	0.09	0.09	0.08	0.07	0.07	0.06	0.06	0.06	0.06	0.06	0.05	0.05	0.05
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	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.01	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	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	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	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	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.07
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	0.09	0.09	0.09	0.09	0.10
160	0.12	0.12	0.12	0.11	0.12	0.12	0.11	0.11	0.11	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.14
165	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.17
170	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	0.19	0.18	0.19
175	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	0.18	0.18	0.18	0.17	0.17	0.17
180	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

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	1192	1192	1192	1192	1192	1192	1192	1192	1192	1192	1192	1192	1192	1192	1192	1192	1192		
5	1051	1047	1045	1044	1045	1048	1052	1056	1060	1063	1067	1072	1077	1084	1091	1100	1109		
10	841	838	836	836	838	842	848	854	858	862	866	873	879	884	888	895	903		
15	595	591	587	585	584	586	590	591	594	599	605	613	623	631	638	645	650		
20	397	396	395	390	389	388	388	386	385	385	388	394	400	405	409	413	419		
25	263	262	261	259	257	257	256	254	253	250	251	252	254	256	259	264	269		
30	179	178	178	176	175	174	172	171	170	169	169	168	169	169	171	174	178		
35	123	123	123	122	120	118	117	116	114	114	113	112	112	112	113	116	119		
40	83.1	83.1	82.8	81.9	80.0	78.2	77.4	76.2	75.3	75.4	74.8	73.5	72.9	72.5	73.3	75.8	78.5		
45	53.6	53.9	53.5	52.7	51.2	49.9	49.4	48.9	48.6	48.5	47.9	47.0	46.2	45.6	46.0	47.5	49.3		
50	33.5	33.6	33.6	33.1	32.2	31.4	30.8	30.6	30.9	31.0	30.7	29.9	28.7	28.2	28.5	29.3	30.5		
55	21.5	21.5	21.7	21.8	21.3	20.7	20.2	20.2	20.5	20.9	20.7	20.1	19.1	18.7	18.9	19.6	20.3		
60	14.9	14.8	15.3	15.4	15.2	14.5	14.1	14.1	14.5	15.1	14.9	14.3	13.6	13.3	13.5	14.2	14.5		
65	11.1	11.0	11.3	11.5	11.4	11.0	10.7	10.7	11.0	11.4	11.3	10.9	10.5	10.3	10.5	10.8	11.1		
70	8.65	8.64	8.80	8.97	8.86	8.60	8.42	8.46	8.69	8.96	8.90	8.68	8.49	8.54	8.63	8.83	9.01		
75	6.59	6.54	6.61	6.71	6.65	6.48	6.38	6.44	6.59	6.78	6.74	6.62	6.54	6.63	6.74	6.94	7.09		
80	4.55	4.50	4.52	4.55	4.52	4.41	4.38	4.43	4.52	4.66	4.64	4.59	4.55	4.62	4.75	4.91	5.03		
85	2.64	2.62	2.61	2.60	2.59	2.57	2.57	2.60	2.63	2.68	2.69	2.71	2.71	2.76	2.83	2.91	2.96		
90	1.50	1.50	1.49	1.48	1.48	1.47	1.47	1.49	1.50	1.53	1.54	1.55	1.55	1.55	1.57	1.59	1.61		
95	1.01	1.02	1.02	1.02	1.01	1.01	1.01	1.02	1.03	1.05	1.07	1.09	1.09	1.08	1.08	1.08	1.08		
100	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.72	0.73	0.75	0.76	0.77	0.77	0.77	0.77	0.78		
105	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.45	0.46	0.47	0.47	0.48	0.48	0.49	0.50		
110	0.21	0.21	0.22	0.22	0.22	0.22	0.22	0.22	0.23	0.23	0.23	0.24	0.24	0.24	0.24	0.24	0.25		
115	0.05	0.05	0.05	0.05	0.05	0.06	0.05	0.06	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.06	0.06		
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	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.01		
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	0.05	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	0.08	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	0.07		
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	0.11	0.11	0.10		
160	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.14	0.14	0.14	0.14	0.14		
165	0.18	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.17		
170	0.20	0.20	0.20	0.20	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.18		
175	0.17	0.16	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	0.16		
180	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		

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

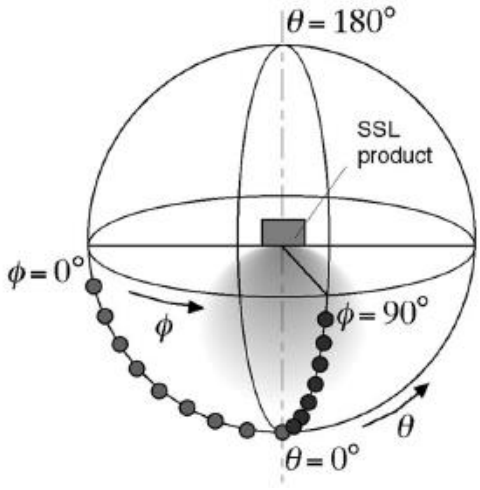
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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

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