



LM-79-08 Test Report

for

Elec-Tech International Co.,Ltd

No.1 Jinfeng Rd.,Tangjiawan Town, Xiangzhou District, Zhuhai City, Guangdong province, China

LED CEILING LIGHT

Model: 546171XX (XX: 41-50)

546062XX (XX: 41-50)

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ14060021b/R1

This report is replaced the old report No. HZ14060021b dated Jul. 18, 2014

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

Tested by:

Engineer: April Zou
Jul. 28, 2014

Approved by:



Manager: Jim Zhang
Jul. 28, 2014

Note: This report does not imply product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.



U.S. Department of Energy

Lighting Facts™ Uniform LM-79 Reporting Template

Laboratory Information:

Name of test Laboratory	Leading Testing Laboratories
Date of test Report	Jul. 28, 2014
Test Report Number	HZ14060021b/R1
Laboratory Contact Name	Jim Zhang

Product Information:

Organization Name	Elec-Tech International Co., Ltd.	
Brand Name	ETI, CE	
Model Number	546171XX (XX: 41-50), 546062XX (XX: 41-50)	
SKU (if available)	N/A	
Type of Luminaire (for integral lamps, list base type and lamp type)	LED CEILING LIGHT, E26 BASE, Luminaire	
Luminaire Aperture (downlights)	N/A	in.
Luminaire Length	7.1	in.
Luminaire Width	7.1	in.
Number of Units (modular products)	N/A	

Integrating sphere output

Goniophotometer output

Electrical Measurements:

Input Wattage	11.3	11.3	W
Input Current	0.096	0.096	A
Input Voltage ac	120.0	120.0	V
Power Factor	0.9801	0.9797	
Off-state Power	0	0	W

Photometric Characteristics

Total Initial Lumen Output	872.8	878.8	lm
Initial Luminaire Efficacy	77.2	77.8	lm/W
Correlated Color Temperature/ CCT	4032	K	
Color Rendering Index / CRI	89.8		
R9 Value	52.5		
Duv	0.0039		

Luminous Intensity Distribution

Center Beam Candlepower (if application)	222	cd
Beam Angle (if application)	121.7	°
Zonal Lumens in the 0°-60°Zone	59.35%	
Zonal Lumens in the 60°-90°Zone	26.16%	
Zonal Lumens in the 90°-120°Zone	9.43%	
Zonal Lumens in the 120°-180°Zone	5.06%	

Test Summary

Sample Tested: **546171XX (XX: 41-50)**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
77.2	872.8	11.3	0.9801
CCT (K)	CRI	Stabilization Time (Light & Power)	
4032	89.8	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.23, 2014
Date of Test	: Jun.27, 2014 to Jul. 01, 2014
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

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Sample Photos



546171XX (XX: 41-50)



546062XX (XX: 41-50)

Figure 1- Overview of the sample

Equipment Under Test (EUT)

Name	: LED CEILING LIGHT
Model	: 546171XX (XX: 41-50)
Electrical Ratings	: 120VAC, 60Hz, 11.5W
Product Description	: E26 base, LED CEILING LIGHT, Luminaire , 4000K Model of LED light source: 62-217D Quantity of LED light source: 24 pcs
Manufacturer	: Elec-Tech International Co.,Ltd
Address	: No.18-1, Keji 6th Road, Gangwan Avenue, Tangjiawan Town, Xiangzhou District, Zhuhai City, Guangdong Province, P.R.China
Manufacturer	: Wuhu 3E Lighting Co., Ltd
Address	: No11.wei Rd.East Zone of wuhu Economic and Technological Development Area
Manufacturer	: Elec-Tech International Co.,Ltd
Address	: No.1 Jinfeng Rd.,Tangjiawan Town, Xiangzhou District, Zhuhai City, Guangdong province, China

Model discrepancy:

Model 546171XX(XX:41-50) is identical with model 546062XX (XX: 41-50) except 546171XX(XX:41-50) has a switch while 546062XX (XX: 41-50) not.

For Model 546171XX (XX: 41-50) and 546062XX (XX: 41-50) “XX” could be 41-50, indicate for different packages, different customer No. and different painting color of metal enclosure.

TEST RESULTS

Test ambient temperature was 25.2°C.

Test 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 80 minutes.

Sphere-Spectroradiometer Method

Parameter	Result	Special Color Rendering Indices	
Test Voltage (V)	120.0	R1	89.8
Voltage frequency (Hz)	60	R2	94.2
Test Current (A)	0.096	R3	95.1
Power Factor	0.9801	R4	88.4
Test Power (W)	11.3	R5	89
Luminous Efficacy (lm/W)	77.2	R6	89.8
Total Luminous Flux (lm)	872.8	R7	91.4
Color Rendering Index (CRI)	89.8	R8	80.8
R9	52.5	R9	52.5
Correlated Color Temperature (CCT) (K)	4032	R10	84.2
Chromaticity (Chroma x, Chroma y)	(0.3768, 0.3677)	R11	86.9
Chromaticity (Chroma u, Chroma v)	(0.2263, 0.3313)	R12	70.9
Chromaticity (Chroma u', Chroma v')	(0.2263, 0.4970)	R13	91.1
Duv	0.0039	R14	97.1

Table2: 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 24.6°C.

The photometric distance is 2.475m.

Luminous data was taken at 0.5°vertical intervals and 10°horizontal intervals.

Parameter	Results
Test Voltage (V)	120.0
Voltage frequency (Hz)	60
Test Current (A)	0.096
Power Factor	0.9797
Test Power (W)	11.3
Luminous Efficacy (lm/W)	77.8
Total Luminous Flux (lm)	878.8
Beam Angle (°)	121.7
Center Beam Candle Power (cd)	222
Spacing Criteria	1.27 (0°-180°)/ 1.28 (90°-270°)

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

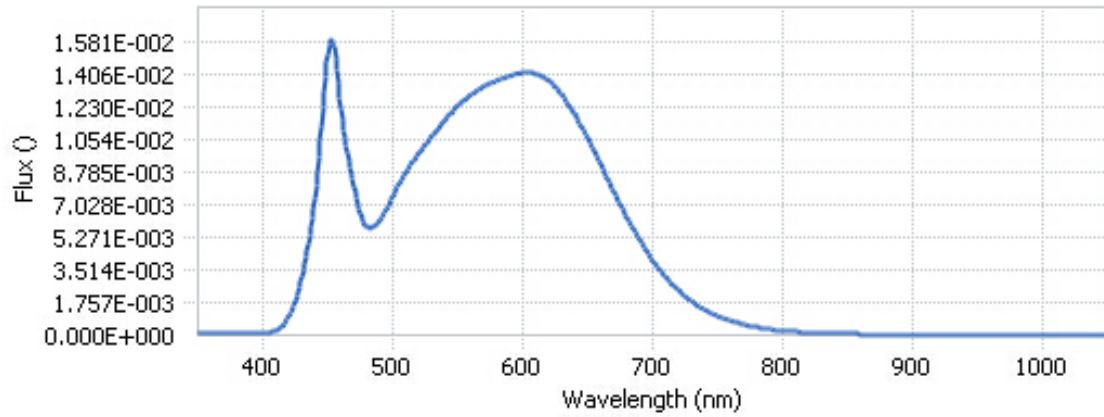
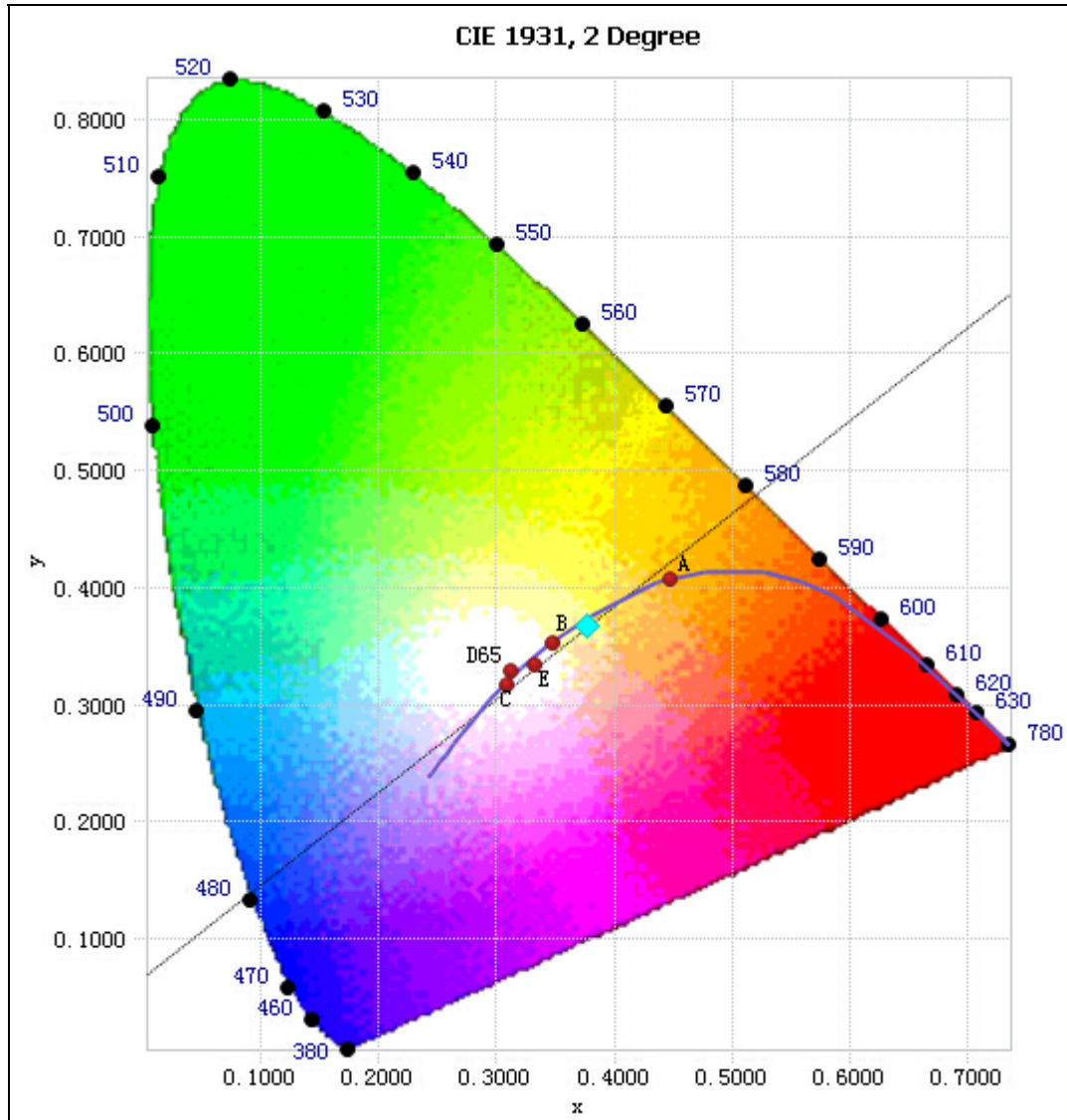


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	9.70E-05	485	5.85E-03	590	1.40E-02	695	4.54E-03
385	1.11E-04	490	6.20E-03	595	1.41E-02	700	4.03E-03
390	1.14E-04	495	6.74E-03	600	1.42E-02	705	3.55E-03
395	1.25E-04	500	7.52E-03	605	1.42E-02	710	3.12E-03
400	1.31E-04	505	8.18E-03	610	1.41E-02	715	2.73E-03
405	1.60E-04	510	8.79E-03	615	1.40E-02	720	2.40E-03
410	2.41E-04	515	9.32E-03	620	1.37E-02	725	2.09E-03
415	4.94E-04	520	9.81E-03	625	1.34E-02	730	1.81E-03
420	1.03E-03	525	1.03E-02	630	1.30E-02	735	1.57E-03
425	1.90E-03	530	1.07E-02	635	1.24E-02	740	1.35E-03
430	3.18E-03	535	1.11E-02	640	1.19E-02	745	1.18E-03
435	4.92E-03	540	1.16E-02	645	1.13E-02	750	1.01E-03
440	7.42E-03	545	1.20E-02	650	1.06E-02	755	8.72E-04
445	1.13E-02	550	1.24E-02	655	9.90E-03	760	7.62E-04
450	1.52E-02	555	1.27E-02	660	9.20E-03	765	6.49E-04
455	1.55E-02	560	1.30E-02	665	8.44E-03	770	5.65E-04
460	1.21E-02	565	1.32E-02	670	7.73E-03	775	4.85E-04
465	9.79E-03	570	1.34E-02	675	7.04E-03	780	4.21E-04
470	8.01E-03	575	1.35E-02	680	6.36E-03		
475	6.54E-03	580	1.37E-02	685	5.73E-03		
480	5.82E-03	585	1.38E-02	690	5.11E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3768, 0.3677)

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

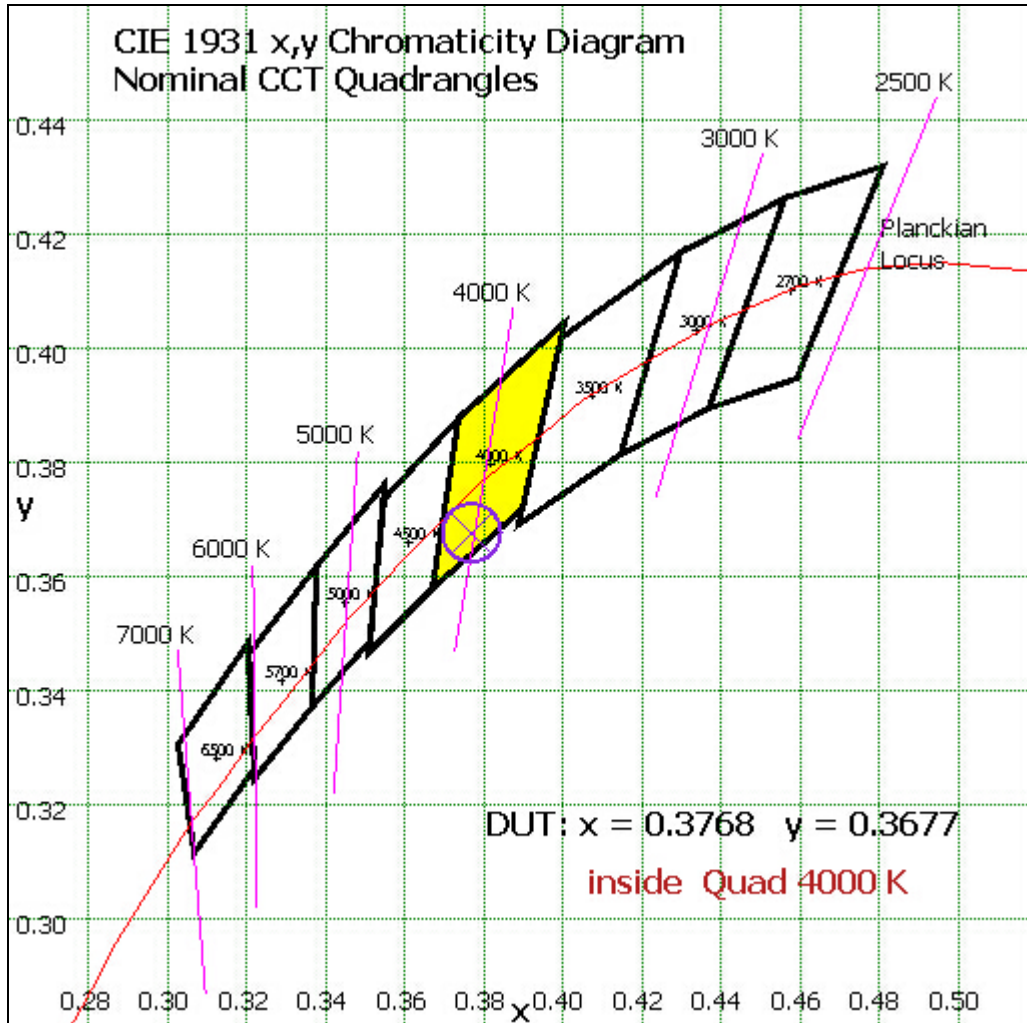


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

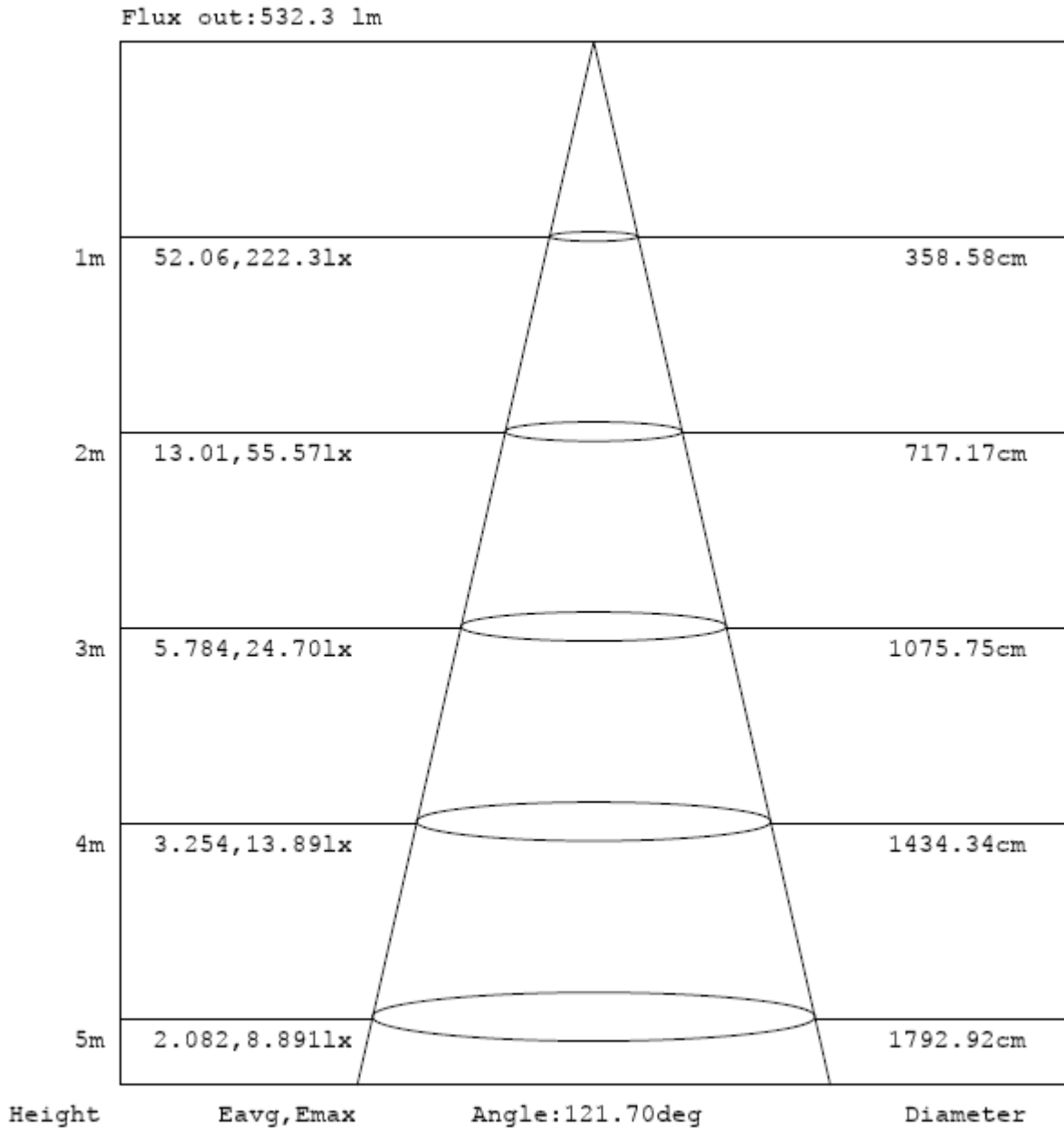
Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	21.027	2.39%
10- 20	60.431	6.88%
20- 30	92.303	10.50%
30- 40	112.869	12.84%
40- 50	120.281	13.69%
50- 60	114.658	13.05%
60- 70	98.418	11.20%
70- 80	76.554	8.71%
80- 90	54.948	6.25%
90-100	37.566	4.27%
100-110	26.098	2.97%
110-120	19.203	2.19%
120-130	14.853	1.69%
130-140	11.483	1.31%
140-150	8.384	0.95%
150-160	5.658	0.64%
160-170	3.245	0.37%
170-180	0.819	0.09%
Total	878.8	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	521.569	59.35%
60- 90	229.92	26.16%
0-90	751.489	85.51%
90- 180	127.309	14.49%
0- 180	878.8	100%

Table 5: Zonal Lumen Data

Illuminance Plots- Goniophotometer Method



Note: The Curves indicate the illuminated area and the average illumination when the luminaire is at different distance.

Chart 4: Beam angle

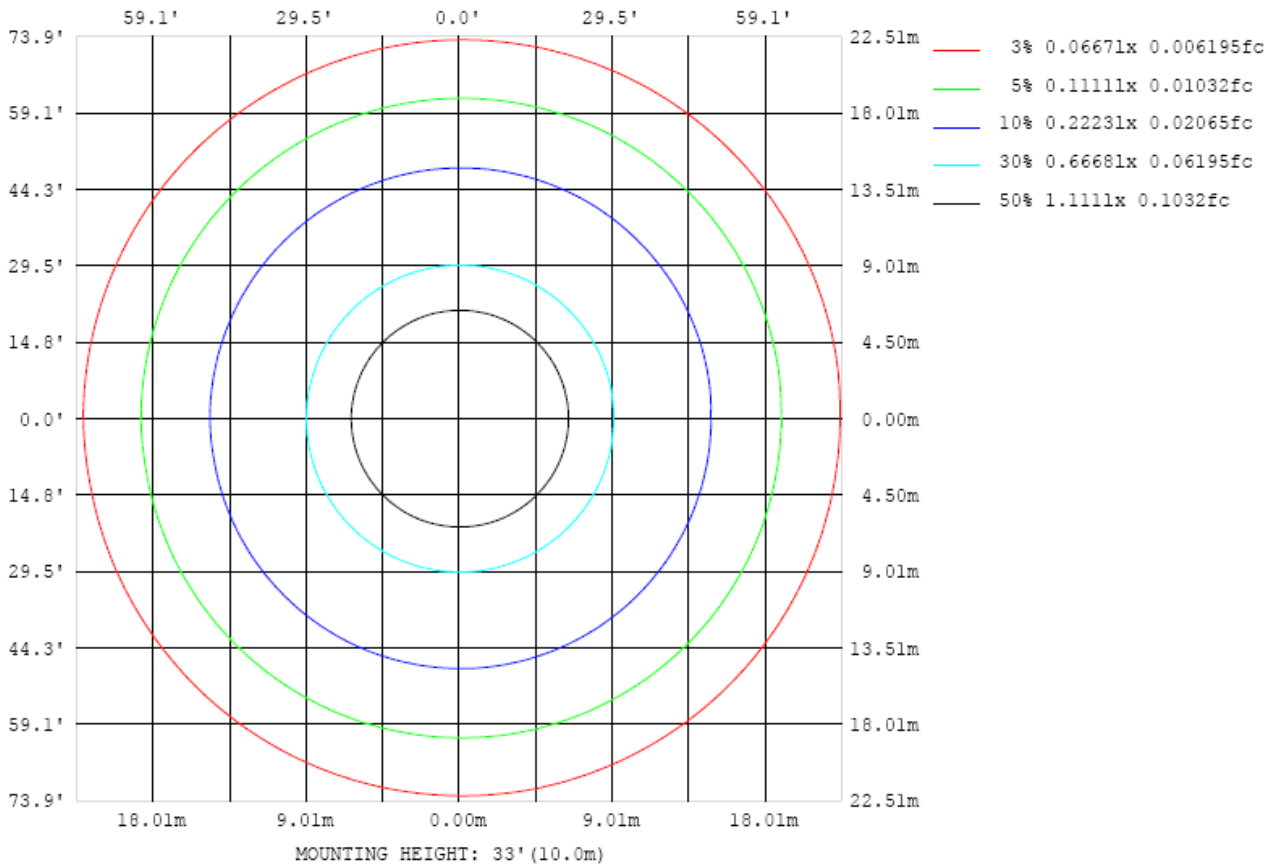


Chart 2: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

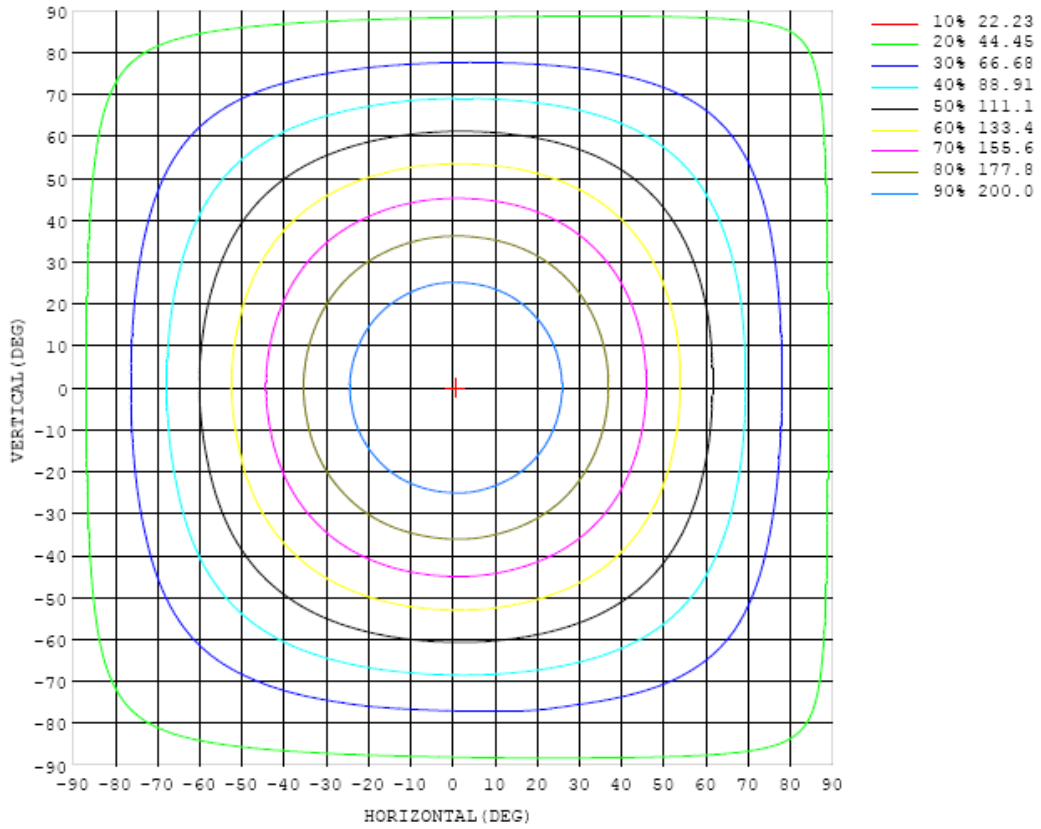


Chart 6: Isocandela Plot

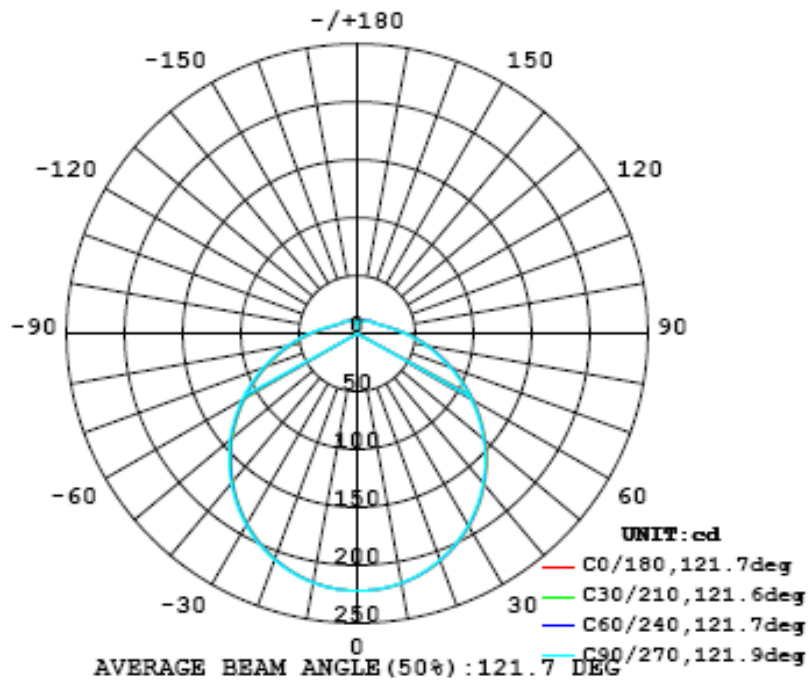


Chart 7: Polar Candela Distribution

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	222	222	222	222	222	222	222	222	222	222	222	222	222	222	222	222	222	222	222
5	221	221	221	221	221	221	221	221	221	221	221	221	221	221	221	221	221	221	221
10	219	219	219	219	219	219	219	219	219	219	218	218	218	218	218	218	218	218	218
15	215	215	215	215	215	215	214	214	214	214	214	214	214	214	214	213	213	213	213
20	209	209	209	209	209	208	208	208	208	208	208	208	207	207	207	207	207	207	207
25	201	201	201	201	201	201	201	201	200	200	200	200	200	200	199	199	199	199	199
30	192	192	192	192	192	192	191	191	191	191	191	190	190	190	190	190	190	189	190
35	182	182	182	181	181	181	181	181	180	180	180	180	180	179	179	179	179	179	179
40	170	170	170	170	170	169	169	169	169	168	168	168	168	167	167	167	167	167	167
45	158	158	157	157	157	157	156	156	156	156	155	155	155	154	154	154	154	154	154
50	144	144	144	143	143	143	143	142	142	142	142	141	141	141	140	140	140	140	140
55	130	130	130	129	129	129	129	128	128	128	127	127	127	126	126	126	125	125	126
60	115	115	115	115	115	114	114	114	113	113	113	112	112	112	111	111	111	111	112
65	101	101	101	100	100	100.0	99.7	99.4	99.1	98.7	98.4	98.0	97.6	97.3	97.0	96.6	96.4	96.2	97.1
70	87.1	86.9	86.8	86.5	86.3	86.0	85.8	85.5	85.2	84.8	84.4	84.1	83.7	83.4	83.1	82.7	82.5	82.3	83.1
75	73.9	73.8	73.6	73.4	73.2	72.9	72.7	72.4	72.1	71.7	71.4	71.0	70.6	70.3	70.0	69.6	69.4	69.3	70.1
80	62.3	62.2	62.1	61.9	61.7	61.5	61.3	61.1	60.7	60.4	60.1	59.7	59.4	59.0	58.7	58.4	58.2	58.0	58.3
85	51.7	51.6	51.5	51.4	51.2	51.0	50.9	50.6	50.3	50.1	49.7	49.4	49.1	48.7	48.4	48.2	48.0	47.8	48.0
90	42.7	42.6	42.5	42.4	42.3	42.2	42.0	41.8	41.6	41.3	41.0	40.7	40.4	40.2	39.9	39.6	39.4	39.3	39.5
95	35.3	35.3	35.2	35.1	35.0	34.9	34.7	34.6	34.4	34.2	34.0	33.7	33.5	33.2	33.0	32.7	32.6	32.4	32.6
100	29.5	29.5	29.5	29.4	29.3	29.2	29.1	29.0	28.9	28.7	28.5	28.3	28.1	27.9	27.7	27.4	27.3	27.2	27.3
105	25.2	25.2	25.1	25.1	25.0	25.0	24.9	24.8	24.7	24.6	24.5	24.3	24.1	23.9	23.7	23.5	23.4	23.3	23.4
110	22.0	22.0	22.0	21.9	21.9	21.8	21.8	21.8	21.7	21.6	21.5	21.3	21.2	21.0	20.8	20.7	20.6	20.5	20.5
115	19.8	19.8	19.7	19.6	19.5	19.5	19.5	19.5	19.5	19.5	19.4	19.2	19.0	18.8	18.7	18.5	18.5	18.5	18.5
120	18.1	18.1	18.1	18.1	17.9	17.8	17.9	18.0	17.9	17.9	17.8	17.6	17.4	17.3	17.1	17.0	17.0	17.0	17.0
125	16.9	16.9	16.9	16.9	16.9	16.8	16.8	16.8	16.8	16.7	16.6	16.4	16.3	16.1	16.0	15.9	15.9	15.9	15.9
130	15.9	15.9	15.9	16.0	16.2	16.2	16.3	15.9	15.8	15.8	15.6	15.4	15.2	15.1	15.0	14.9	14.9	14.9	14.9
135	15.0	15.2	15.1	15.4	15.6	15.5	15.9	15.3	15.0	15.1	14.6	14.4	14.3	14.2	14.0	14.1	14.1	14.1	14.0
140	13.9	14.2	14.5	14.7	14.7	14.7	14.7	14.6	14.4	14.0	13.7	13.6	13.5	13.3	13.2	13.3	13.4	13.4	13.4
145	13.3	13.5	13.7	14.0	14.0	14.0	14.0	13.9	13.6	13.3	13.4	13.0	12.8	12.6	12.6	12.7	12.8	12.9	13.1
150	12.9	13.0	12.9	13.1	13.3	13.4	13.4	13.0	12.8	12.7	12.7	12.5	12.4	12.2	12.2	12.3	12.4	12.5	12.7
155	12.3	12.3	12.3	12.3	12.8	12.5	12.8	12.4	12.2	12.2	12.1	12.0	11.9	11.8	11.8	11.8	11.9	12.1	12.1
160	11.9	11.9	11.9	11.7	11.5	11.6	11.8	11.8	11.8	11.7	11.6	11.5	11.4	11.2	11.2	11.3	11.6	11.7	11.8
165	11.7	11.8	11.7	11.5	11.2	11.3	11.5	11.7	11.8	11.6	11.4	11.2	11.1	11.2	11.3	11.5	11.7	11.8	11.8
170	11.3	11.3	11.3	11.2	11.3	11.3	11.3	11.1	10.9	10.9	11.1	11.3	11.4	11.5	11.6	11.7	11.7	11.8	11.9
175	7.29	7.22	7.18	7.20	7.21	7.22	7.24	7.27	7.28	7.36	7.43	7.54	7.60	7.40	7.25	7.21	7.31	7.41	7.51
180	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.07	0.10	1.24	1.29	1.24	1.26	1.37	1.79	2.00	0.17

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	222	222	222	222	222	222	222	222	222	222	222	222	222	222	222	222	222		
5	221	221	221	221	221	221	221	221	221	221	221	221	221	221	221	221	221		
10	218	218	218	218	218	218	218	218	218	219	219	219	219	219	219	219	219		
15	213	213	213	213	214	214	214	214	214	214	214	214	215	215	215	215	215		
20	207	207	207	207	207	207	208	208	208	208	208	209	209	209	209	209	209		
25	199	199	199	199	199	200	200	200	201	201	201	201	201	201	201	201	201		
30	190	190	190	190	190	190	191	191	191	191	192	192	192	192	192	192	192		
35	179	179	179	179	179	179	180	180	181	181	181	181	182	182	182	182	182		
40	167	167	167	167	167	168	168	168	169	169	170	170	170	170	171	171	171		
45	154	154	154	154	154	155	155	156	156	156	157	157	158	158	158	158	158		
50	141	141	141	141	141	142	142	143	143	144	144	144	145	145	145	145	145		
55	126	126	126	127	127	127	128	128	129	129	130	130	131	131	131	131	131		
60	112	112	112	112	113	113	113	114	115	115	115	116	116	117	117	117	117		
65	97.1	97.3	97.4	97.7	98.1	98.6	99.1	99.6	100	101	101	102	102	102	102	102	102		
70	83.2	83.3	83.5	83.8	84.3	84.7	85.1	85.6	86.2	86.7	87.1	87.5	87.9	88.1	88.2	88.2	88.2		
75	70.2	70.3	70.5	70.8	71.2	71.6	72.1	72.5	73.0	73.5	73.9	74.3	74.7	74.8	74.9	74.9	74.9		
80	58.4	58.6	58.7	59.0	59.4	59.8	60.2	60.6	61.0	61.4	61.8	62.2	62.5	62.7	62.8	62.8	62.8		
85	48.2	48.3	48.5	48.8	49.1	49.4	49.8	50.1	50.5	50.8	51.2	51.5	51.8	52.0	52.1	52.1	52.1		
90	39.6	39.7	39.8	40.1	40.4	40.7	41.0	41.3	41.6	41.9	42.2	42.5	42.8	42.9	43.0	43.0	43.0		
95	32.6	32.7	32.9	33.1	33.3	33.6	33.8	34.1	34.4	34.6	34.9	35.2	35.4	35.5	35.5	35.6	35.6		
100	27.3	27.4	27.5	27.7	27.9	28.1	28.3	28.5	28.8	29.0	29.2	29.5	29.6	29.7	29.7	29.8	29.8		
105	23.4	23.4	23.5	23.7	23.8	24.0	24.2	24.3	24.6	24.8	25.0	25.1	25.3	25.3	25.4	25.4	25.4		
110	20.5	20.5	20.6	20.7	20.9	21.0	21.1	21.3	21.5	21.7	21.8	22.0	22.1	22.1	22.2	22.2	22.2		
115	18.5	18.5	18.5	18.6	18.7	18.8	18.9	19.2	19.4	19.5	19.6	19.7	19.7	19.8	19.8	19.8	19.9		
120	17.1	17.1	17.2	17.1	17.2	17.3	17.5	17.7	17.8	17.9	17.9	17.9	18.0	18.1	18.1	18.1	18.1		
125	16.0	16.1	16.1	16.2	16.3	16.4	16.4	16.5	16.6	16.6	16.6	16.7	16.7	16.8	16.8	16.8	16.9		
130	15.2	15.3	15.5	15.7	15.8	15.8	15.6	15.6	15.7	15.6	15.5	15.6	15.7	15.7	15.7	15.8	15.8		
135	14.3	14.6	15.3	15.1	15.1	15.4	15.0	15.0	14.7	14.7	14.6	14.6	14.8	14.8	14.8	14.8	14.9		
140	13.5	14.1	14.3	14.4	14.4	14.1	14.1	14.2	13.7	13.7	13.6	13.7	13.8	13.9	13.9	13.9	13.9		
145	13.2	13.3	13.7	13.8	13.8	13.3	13.4	13.3	13.4	13.1	13.0	12.9	13.0	13.1	13.2	13.2	13.2		
150	12.7	12.6	12.9	13.3	13.3	13.2	12.7	12.7	12.7	12.6	12.5	12.4	12.4	12.5	12.6	12.7	12.8		
155	12.2	12.2	12.3	12.9	12.7	13.0	12.2	12.1	12.1	12.1	11.8	11.8	11.9	12.0	12.1	12.2	12.3		
160	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.6	11.4	11.4	11.1	10.9	11.2	11.4	11.4	11.5	11.7		
165	11.8	11.8	11.7	11.5	11.3	11.2	10.8	11.3	11.3	11.2	11.2	10.8	10.6	10.8	11.1	11.2	11.3		
170	11.9	11.8	11.6	11.1	11.1	10.9	10.8	10.9	11.0	11.1	11.1	10.9	10.7	10.6	10.6	10.8	11.0		
175	7.57	7.54	7.52	7.54	7.50	7.15	7.15	7.12	7.13	7.15	7.14	7.08	7.03	7.24	7.24	7.19	7.15		
180	0.14	0.18	0.18	0.15	0.19	0.19	0.20	0.21	0.20	0.20	0.19	0.20	0.20	0.20	0.21	0.22	0.19		

Table 7: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Sep. 18, 2013	Sep. 17, 2014
Digital Power Meter	PF2010A	HZTE028-01	Sep. 18, 2013	Sep. 17, 2014
AC Power Supply	PCR 500L	HZTE001-08	Sep. 18, 2013	Sep. 17, 2014
DC Power Supply	WY12010	HZTE004-03	Sep. 18, 2013	Sep. 17, 2014
Temperature Meter	TES1310	HZTE017-01	Sep. 18, 2013	Sep. 17, 2014
Standard source	D908	HZTE012-01	Sep. 18, 2013	Sep. 17, 2014
Integrate Sphere system	2M	HZTE015-01	Sep. 18, 2013	Sep. 17, 2014
Digital Power Meter	WT210	HZTE008-01	Sep. 18, 2013	Sep. 17, 2014
AC Power Supply	PCR 500L	HZTE001-07	Sep. 18, 2013	Sep. 17, 2014
DC Power Supply	6154	HZTE004-04	Sep. 18, 2013	Sep. 17, 2014
Temperature and humidity recorder	JR900	HZTE018-01	Sep. 18, 2013	Sep. 17, 2014
Standard source	SCL-1400	HZTE012-02	Sep. 18, 2013	Sep. 17, 2014

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 1.06% 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 1.94% with a coverage factor $k=2$.

Color Characteristics Measurements

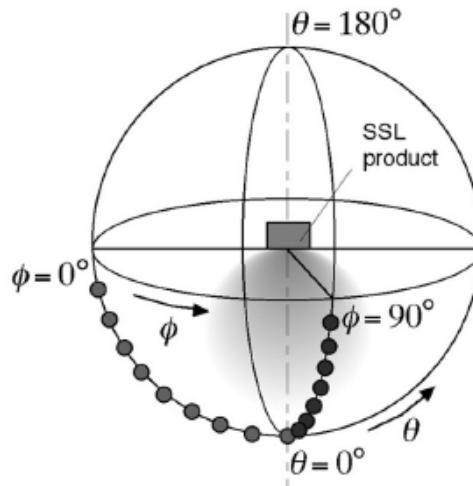
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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