



LM-79-08 Test Report

for

Philips (China) Investment Co., Ltd.

Building 9, Lane 888, Tianlin Road
Shanghai, China

InstantFit LEDtube

Model: 9290011809(2 lamps+ballast ICF-2S26-H1-LD)

Laboratory: Leading Testing Laboratories

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Report No.: HZ15070054h

Review by:

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Engineer: April Zou
Aug. 06, 2015

Approved by:



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Manager: Jim Zhang
Aug. 06, 2015

Test Summary

Sample Tested: 9290011809(2 lamps+ballast ICF-2S26-H1-LD)

Photometric and Electrical Measurements for two lamps

Voltage (V AC)	Current (A)	Test power (W) (ballast + 2 tubes)	Power Factor	Total Luminous Flux (lm)	Luminous Efficacy (lm/W)	Total Harmonic Distortion
120.0	0.172	20.59	0.9958	1901.3	92.3	5.81

Photometric and Colorimetric Measurements for each lamp

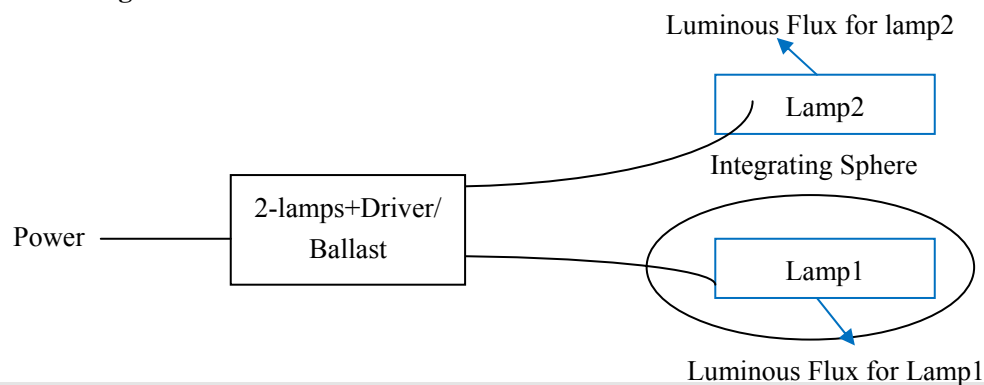
Sample Number	Luminous Flux(lm)	Correlated Color Temperature (K)	Color Rendering Index Ra
1#	950.9	3434	83.4
2#	950.4	3434	83.2
Sample Number	Color Rendering Index R9	Chromaticity Coordinate x	Chromaticity Coordinate y
1#	9.9	0.4085	0.3914
2#	9.4	0.4088	0.3921

Table 1: Executive Data Summary

Note: The above results are recorded/ derived from measurements made using an Integrating Sphere.

Luminous Efficacy= (Luminous Flux for lamp1+ Luminous Flux for lamp2)/Power

Test figure is shown as following:



Test specifications:

Date of Receipt : Jul. 31, 2015

Date of Test : Aug. 04, 2015 to Aug. 05, 2015

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

TABLE OF CONTENT

LM-79-08 Test Report.....	1
Test Summary.....	2
Sample Photos	4
TEST RESULTS	5
Goniophotometer Method	6
Spectral Power Distribution of 1# tube - Sphere Spectroradiometer Method	7
Chromaticity Diagram of 1# tube - Sphere Spectroradiometer Method.....	8
Nominal CCT Quadrangles of 1# tube – Sphere Spectroradiometer Method	9
Zonal Lumen Tabulation- Goniophotometer Method	10
Illuminance Plots- Goniophotometer Method	11
Luminous Intensity Distribution Plots- Goniophotometer Method.....	12
Luminous Intensity Data- Goniophotometer Method.....	13
EQUIPMENT LIST	15
TEST METHODS	15
Seasoning of SSL Product.....	15
Sphere-Spectroradiometer Method- Photometric and Electrical Measurements.....	15
Goniophotometer Method	16
Photometric and Electrical Measurements.....	16
Color Characteristics Measurements.....	16
Color Spatial Uniformity	16

Sample Photos



Figure 1- Overview of the sample

Equipment Under Test (EUT)

Name	: InstantFit LEDtube
Model	: 9290011809(2 lamps+ballast ICF-2S26-H1-LD)
Electrical Ratings	: 120Vac, 60Hz, 10.5W
Product Description	: 3500K, Frosted Plastic lens LED lamps supplied by a high frequency fluorescent lamp ballast: Philips ICF-2S26-H1-LD
Manufacturer	: Philips (China) Investment Co., Ltd.
Address	: Building 9, Lane 888, Tianlin Road Shanghai, China

TEST RESULTS

Test ambient temperature was 25.3°C.

Base orientation was Horizontal. Test was conducted without a dimmer in the circuit.

The stabilization time of the sample was 65 minutes, and the total operating time including stabilization was 70 minutes.

Sphere-Spectroradiometer Method

Parameter	Result	
	1#	2#
Test Voltage (V)	120.0	
Voltage frequency (Hz)	60	
Test Current (A)	0.172	
Power Factor	0.9958	
Test power (W) (ballast + 2 tubes)	20.59	
THD A%	5.81	
Luminous Efficacy (lm/W)	92.3	
Total Luminous Flux (lm)	950.9	950.4
Color Rendering Index (CRI)	83.4	83.2
R9	9.9	9.4
Correlated Color Temperature (CCT) (K)	3434	3434
Chromaticity Chroma x	0.4085	0.4088
Chromaticity Chroma y	0.3914	0.3921
Chromaticity Chroma u	0.2375	0.2374
Chromaticity Chroma v	0.3413	0.3416
Duv	0.0007	0.0005
Chromaticity Chroma u'	0.2375	0.2374
Chromaticity Chroma v'	0.5120	0.5123

Special Color Rendering Indices		
	1#	2#
R1	82.2	82.1
R2	92.9	92.7
R3	95	95.1
R4	80	79.9
R5	82.4	82.2
R6	90.3	90.1
R7	82.9	83
R8	61.1	61
R9	9.9	9.4
R10	83	82.6
R11	78.9	78.8
R12	69.2	68.9
R13	85.2	85
R14	97.9	98

Table 2: Test data per Sphere-Spectroradiometer Method

Note: According to CIE 1976 (u' , v') diagram, $u' = u = 4x/(-2x+12y+3)$, $v' = 3v/2 = 9y/(-2x+12y+3)$.

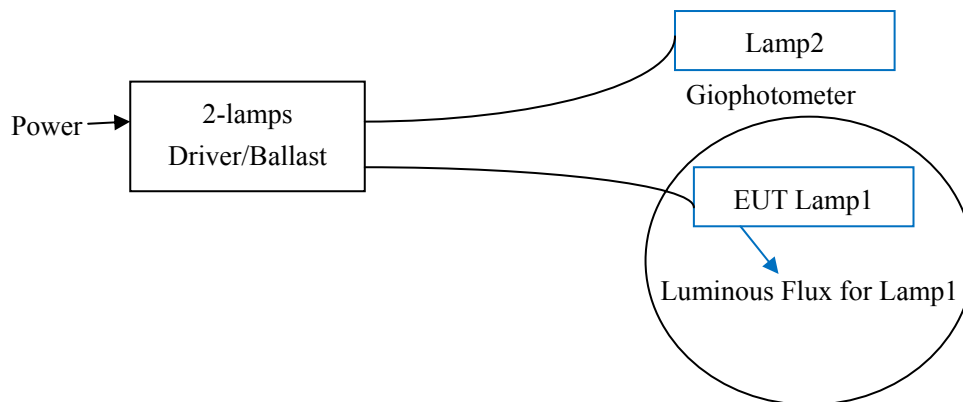
Goniophotometer Method

Test ambient temperature was 24.7°C.

The photometric distance is 2.475m.

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

Test figure is shown as following:



Note: One lamp was tested in Goniophotometer system. The total electrical input data was recorded before the ballast and divided by 2 in table below to be used as the input data of the tested one lamp.

Parameter	Result
Test Voltage (V)	120.0
Voltage frequency (Hz)	60
Test Current (A)	0.174
Power Factor	0.9904
Test Power (W) (ballast + 2 tubes)/2	10.32
Luminous Efficacy (lm/W)	91.7
Total Luminous Flux (lm) (Single tube)	946.2
Beam Angle (°)	110.8 (0°-180°)/ 123.1 (90°-270°)
Center Beam Candle Power (cd)	289
Maximum Beam Candle Power (cd)	288.9 (At: C=60.0, Gamma=1.5)
Spacing Criteria	1.25 (0°-180°)/ 1.28 (90°-270°)
Zonal Lumens in the 0°-60°Zone	69.73%
Zonal Lumens in the 60°-90°Zone	24.81%
Zonal Lumens in the 90°-120°Zone	4.78%
Zonal Lumens in the 120°-180°Zone	0.68%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution of 1# tube - Sphere Spectroradiometer Method

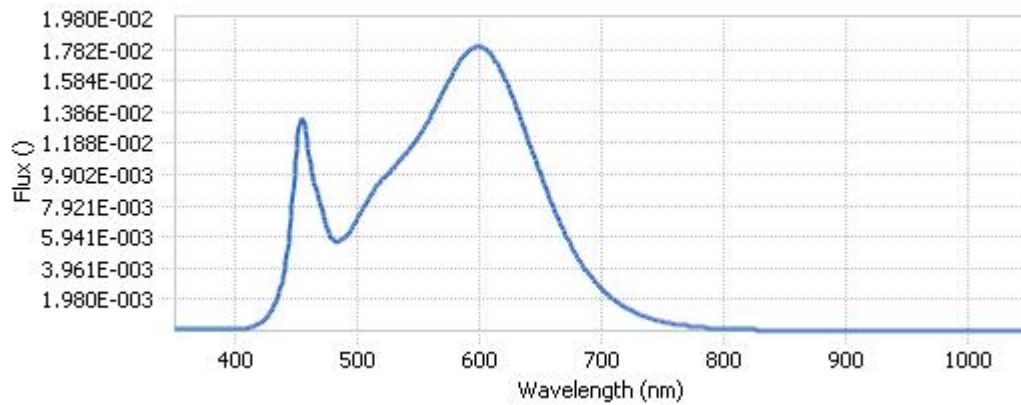
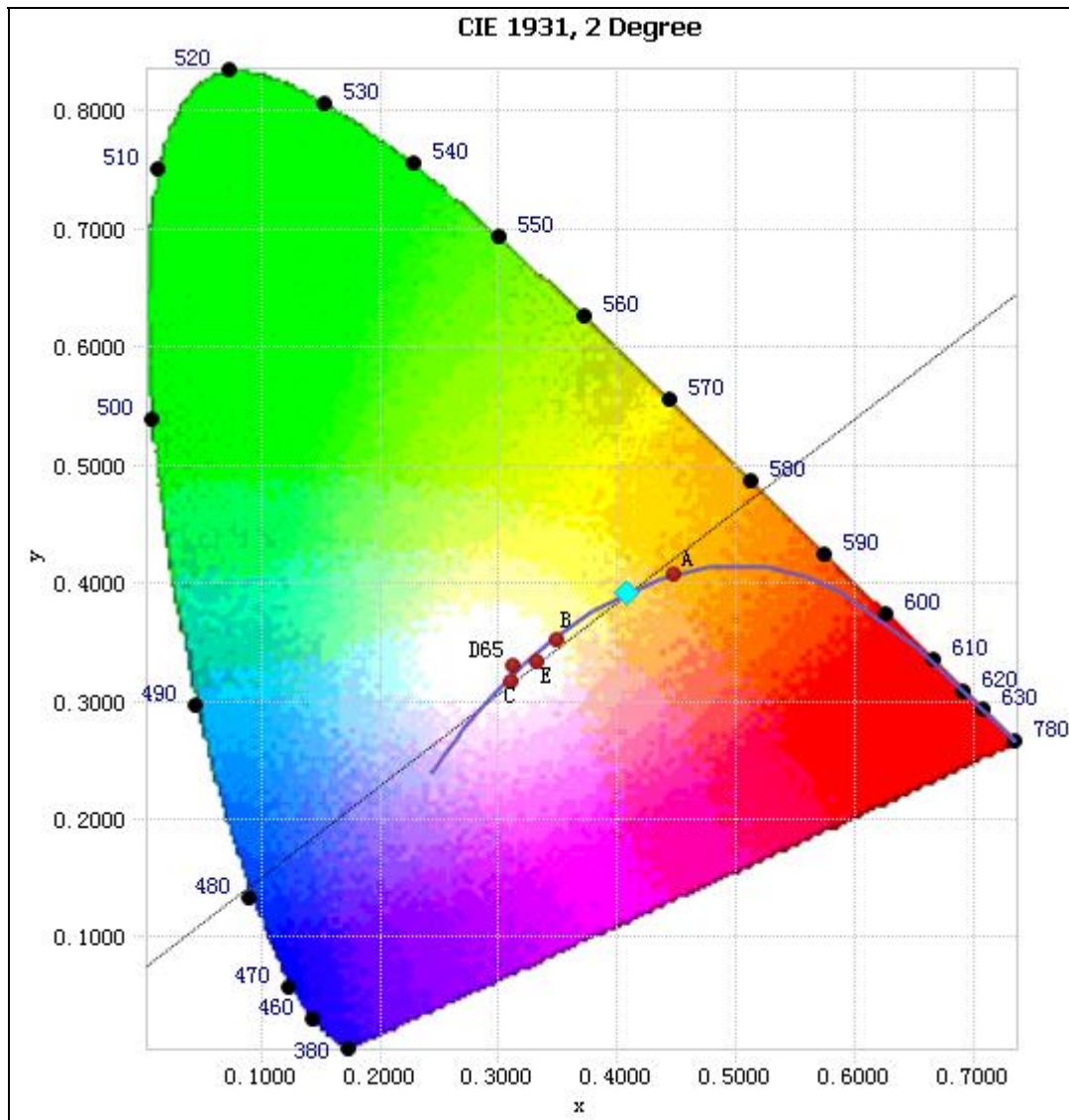


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.16E-04	485	5.70E-03	590	1.77E-02	695	3.09E-03
385	1.20E-04	490	5.96E-03	595	1.79E-02	700	2.66E-03
390	1.15E-04	495	6.48E-03	600	1.80E-02	705	2.29E-03
395	1.29E-04	500	7.19E-03	605	1.79E-02	710	1.97E-03
400	1.21E-04	505	7.91E-03	610	1.74E-02	715	1.70E-03
405	1.49E-04	510	8.52E-03	615	1.69E-02	720	1.46E-03
410	1.95E-04	515	9.08E-03	620	1.61E-02	725	1.25E-03
415	3.02E-04	520	9.59E-03	625	1.52E-02	730	1.07E-03
420	4.98E-04	525	1.00E-02	630	1.42E-02	735	9.15E-04
425	8.63E-04	530	1.03E-02	635	1.32E-02	740	7.90E-04
430	1.44E-03	535	1.09E-02	640	1.20E-02	745	6.72E-04
435	2.43E-03	540	1.13E-02	645	1.10E-02	750	5.78E-04
440	3.99E-03	545	1.18E-02	650	9.92E-03	755	4.97E-04
445	7.20E-03	550	1.23E-02	655	8.86E-03	760	4.31E-04
450	1.16E-02	555	1.30E-02	660	7.90E-03	765	3.65E-04
455	1.33E-02	560	1.36E-02	665	7.00E-03	770	3.22E-04
460	1.10E-02	565	1.44E-02	670	6.15E-03	775	2.68E-04
465	9.18E-03	570	1.52E-02	675	5.40E-03	780	2.37E-04
470	7.81E-03	575	1.59E-02	680	4.73E-03		
475	6.44E-03	580	1.66E-02	685	4.09E-03		
480	5.66E-03	585	1.72E-02	690	3.56E-03		

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

Chromaticity Diagram of 1# tube - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4085, 0.3914)

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 of 1# tube – Sphere Spectroradiometer Method

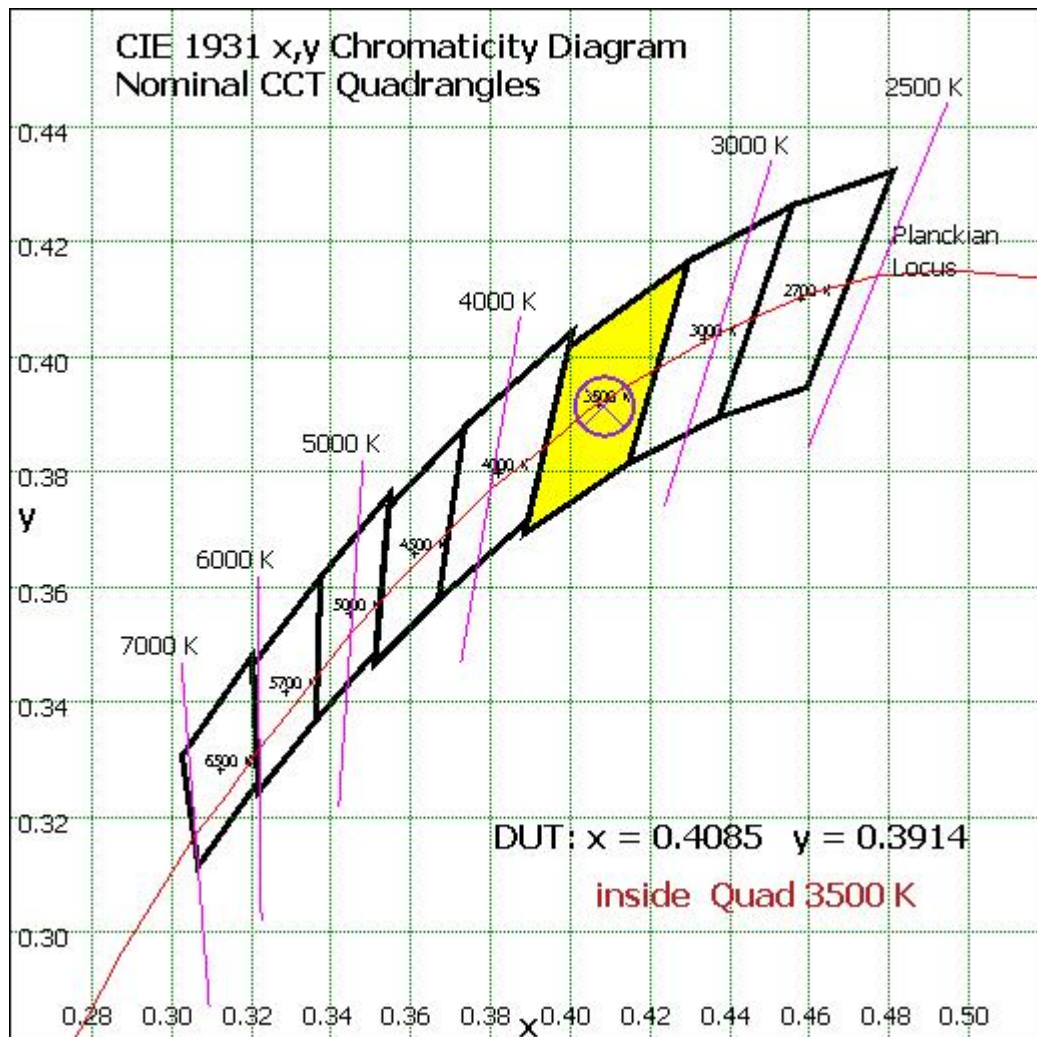


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	27.314	2.89%
10- 20	78.196	8.26%
20- 30	118.619	12.54%
30- 40	143.722	15.19%
40- 50	151.088	15.97%
50- 60	140.83	14.88%
60- 70	114.891	12.14%
70- 80	78.115	8.26%
80- 90	41.772	4.41%
90-100	22.946	2.42%
100-110	14.18	1.50%
110-120	8.138	0.86%
120-130	4.086	0.43%
130-140	1.596	0.17%
140-150	0.465	0.05%
150-160	0.171	0.02%
160-170	0.081	0.01%
170-180	0.027	0.00%
Total	946.2	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	659.769	69.73%
60- 90	234.778	24.81%
0-90	894.547	94.54%
90- 180	51.69	5.46%
0- 180	946.2	100%

Table 5: Zonal Lumen Data

Illuminance Plots- Goniophotometer Method

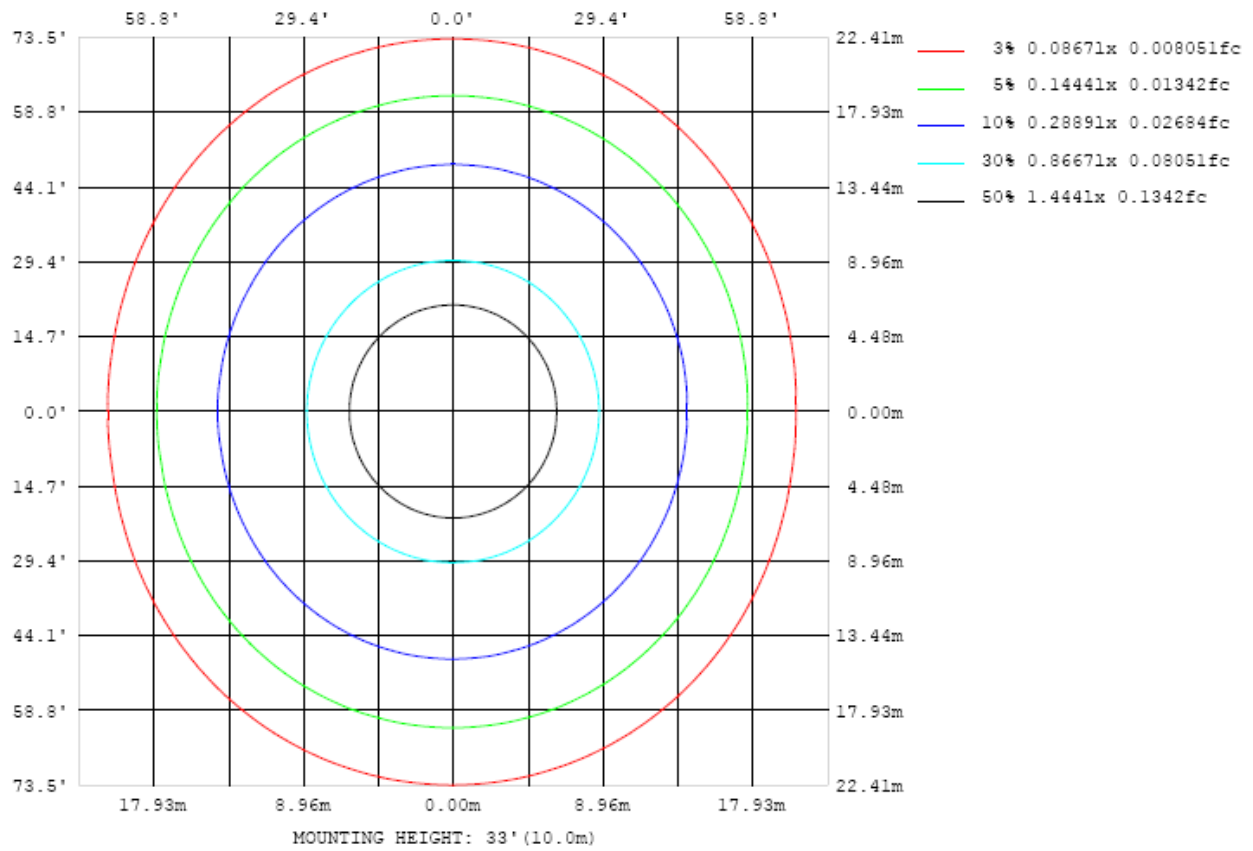


Chart 4: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

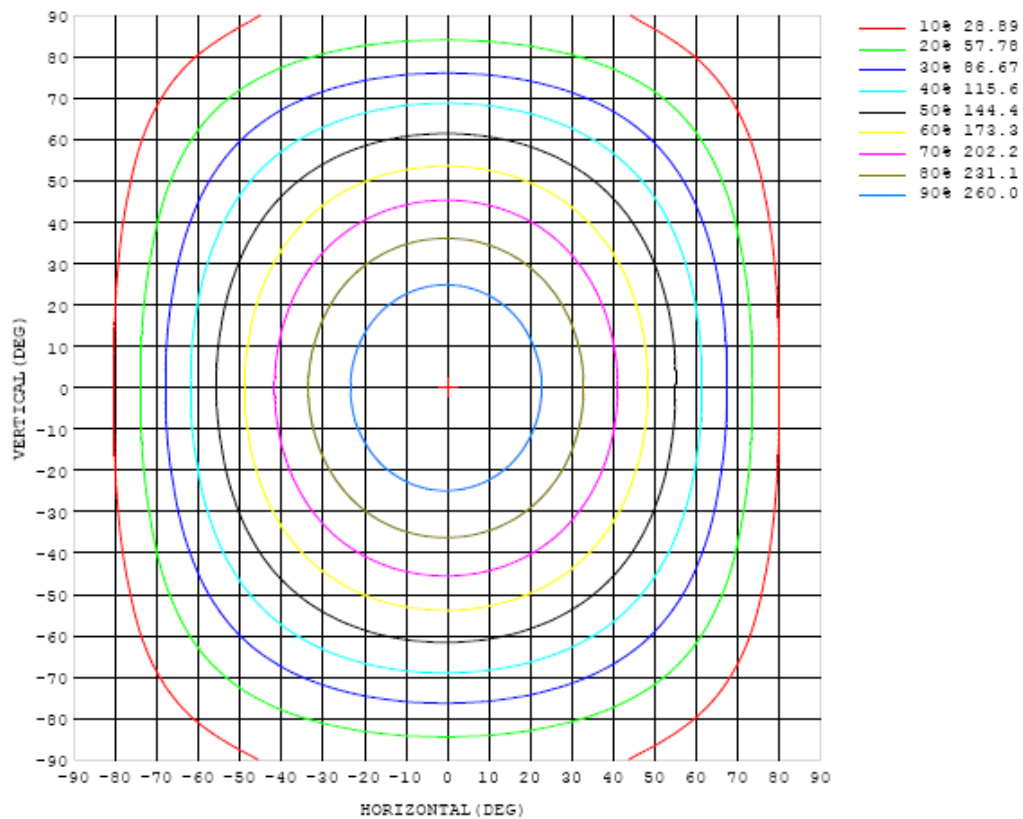


Chart 5: Isocandela Plot

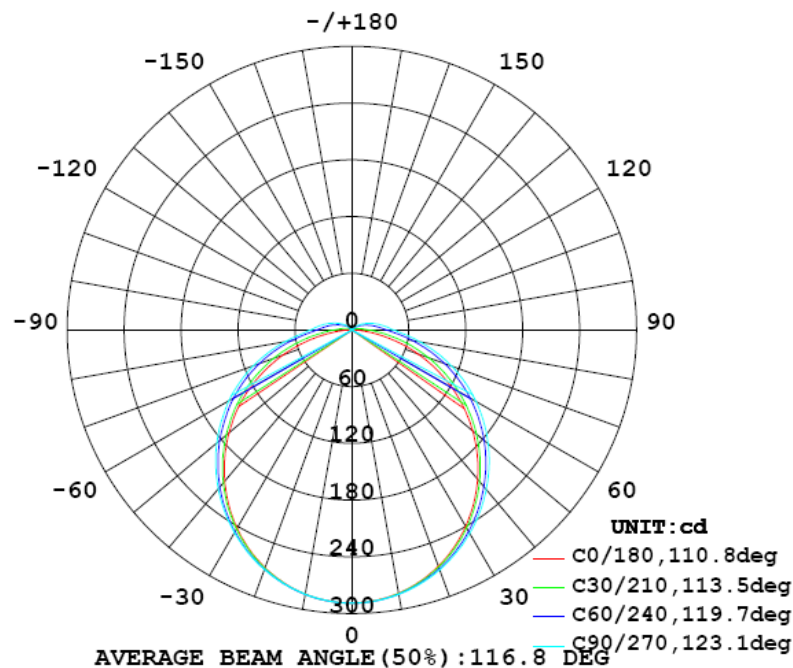


Chart 6: Polar Candela Distribution

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	289	289	289	289	289	289	289	289	289	289	289	289	289	289	289	289	289	289	289
5	287	287	287	287	287	287	288	288	287	288	288	288	288	288	287	288	288	287	287
10	283	283	283	283	283	283	284	284	284	284	284	284	284	284	284	284	284	284	284
15	276	276	276	276	277	277	277	278	278	278	278	278	278	278	277	277	277	277	277
20	266	266	267	267	267	268	269	269	270	270	270	270	270	269	269	268	268	268	268
25	254	254	255	255	256	257	258	259	260	260	260	260	259	258	258	257	257	256	256
30	240	240	241	242	243	244	246	247	248	248	248	248	247	246	245	244	243	242	242
35	224	224	225	226	228	230	232	233	234	235	235	234	233	231	230	228	227	227	226
40	206	206	207	209	211	214	216	218	220	220	220	219	218	216	213	212	210	209	209
45	187	187	189	191	194	196	200	202	204	204	204	203	201	198	196	193	191	190	190
50	166	167	168	171	175	178	182	184	187	187	187	186	183	180	177	174	171	170	169
55	144	145	147	151	155	159	163	166	169	170	169	167	165	161	157	153	150	148	148
60	121	122	125	129	134	139	144	147	150	151	150	148	145	141	137	132	128	125	125
65	97.8	99.2	103	108	113	119	124	128	131	132	131	129	125	121	116	110	106	102	101
70	73.6	75.6	80.1	85.9	92.2	98.2	104	108	111	112	111	109	105	100	94.6	88.4	82.8	78.1	77.1
75	50.5	53.0	58.6	65.1	71.5	78.0	83.6	88.2	91.0	92.1	91.5	89.2	85.2	79.9	73.8	67.4	61.2	55.4	53.2
80	28.4	31.5	38.1	45.5	52.8	59.5	65.1	69.2	71.9	72.9	72.3	69.9	66.2	61.3	54.8	47.8	40.5	33.9	30.8
85	11.0	14.4	21.2	28.8	36.1	42.8	48.4	52.7	55.4	56.3	55.7	53.4	49.6	44.3	37.9	30.8	23.4	16.5	13.2
90	0.78	4.29	11.0	18.0	24.9	31.2	36.5	40.6	43.1	43.9	43.3	41.2	37.5	32.4	26.2	19.4	12.5	6.28	2.47
95	0.06	1.64	6.06	12.2	18.7	24.7	29.9	33.9	36.4	37.3	36.7	34.5	30.8	25.9	20.0	13.5	7.32	2.49	0.64
100	0.08	0.83	3.67	8.49	14.0	19.5	24.3	28.0	30.4	31.3	30.7	28.6	25.2	20.6	15.2	9.66	4.64	1.35	0.64
105	0.09	0.41	2.22	5.90	10.5	15.2	19.5	22.8	25.0	25.8	25.3	23.4	20.3	16.2	11.5	6.88	3.04	1.04	0.65
110	0.13	0.19	1.33	4.04	7.74	11.7	15.4	18.3	20.3	21.0	20.5	18.8	16.1	12.5	8.63	4.89	1.96	0.84	0.63
115	0.13	0.16	0.91	2.68	5.55	8.81	11.9	14.4	16.0	16.7	16.3	14.8	12.5	9.54	6.34	3.42	1.17	0.64	0.61
120	0.14	0.18	0.44	1.54	3.88	6.37	8.98	11.0	12.4	13.0	12.6	11.4	9.50	7.10	4.57	1.77	0.99	0.61	0.59
125	0.15	0.19	0.29	0.81	2.01	4.52	6.42	8.20	9.35	9.79	9.51	8.55	7.01	5.12	2.44	1.31	0.76	0.59	0.57
130	0.17	0.15	0.20	0.52	1.08	2.20	4.34	5.84	6.76	7.13	6.93	6.16	4.96	2.64	1.27	0.98	0.64	0.57	0.56
135	0.19	0.21	0.21	0.37	0.67	1.19	1.93	2.93	4.03	4.58	4.28	3.28	2.24	1.35	1.09	0.73	0.58	0.56	0.56
140	0.21	0.22	0.24	0.31	0.46	0.66	1.05	1.47	1.82	2.00	1.92	1.36	1.38	1.05	0.77	0.59	0.54	0.54	0.55
145	0.22	0.23	0.25	0.27	0.34	0.47	0.58	0.72	0.88	0.96	1.01	1.04	0.89	0.71	0.59	0.51	0.50	0.52	0.54
150	0.23	0.23	0.25	0.26	0.29	0.33	0.40	0.51	0.57	0.61	0.57	0.60	0.58	0.52	0.48	0.47	0.48	0.48	0.47
155	0.24	0.24	0.25	0.26	0.27	0.28	0.30	0.34	0.37	0.36	0.37	0.35	0.33	0.33	0.34	0.35	0.36	0.36	0.36
160	0.25	0.24	0.25	0.25	0.26	0.26	0.26	0.27	0.27	0.27	0.28	0.28	0.29	0.30	0.31	0.32	0.33	0.34	0.34
165	0.26	0.26	0.26	0.26	0.27	0.26	0.26	0.26	0.25	0.25	0.26	0.27	0.28	0.29	0.30	0.31	0.32	0.32	0.32
170	0.27	0.27	0.27	0.27	0.27	0.27	0.26	0.26	0.26	0.26	0.26	0.27	0.28	0.29	0.29	0.30	0.30	0.31	0.32
175	0.29	0.29	0.28	0.28	0.28	0.28	0.27	0.27	0.27	0.27	0.27	0.28	0.28	0.29	0.29	0.30	0.30	0.30	0.29
180	0.26	0.26	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	0.25	0.24	0.26

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	289	289	289	289	289	289	289	289	289	289	289	289	289	289	289	289	289		
5	287	288	288	288	287	288	287	288	288	288	287	287	287	287	287	287	287		
10	284	284	284	283	284	284	284	284	284	284	283	283	283	283	283	283	283		
15	277	277	277	277	277	278	278	278	278	278	277	277	277	276	276	276	276		
20	268	268	268	269	269	269	270	270	270	269	269	269	268	267	267	266	266		
25	256	256	257	257	258	259	259	260	260	259	259	258	257	256	255	255	254		
30	242	243	243	244	245	246	247	248	248	247	246	245	244	243	242	241	240		
35	226	227	228	229	231	232	233	234	234	234	233	231	229	228	226	225	224		
40	209	210	211	213	215	217	218	219	219	219	218	216	213	211	209	208	206		
45	190	191	193	195	197	200	202	203	203	202	201	199	196	193	190	189	187		
50	169	171	173	176	179	182	184	186	186	185	183	181	177	174	171	169	167		
55	149	150	153	156	160	163	166	167	168	167	165	162	158	155	151	148	146		
60	126	128	132	136	140	144	147	149	150	149	147	143	139	134	130	126	123		
65	102	105	110	115	120	124	128	130	130	129	127	123	118	113	108	103	100		
70	78.4	82.4	87.7	93.4	98.8	104	107	110	110	109	107	103	97.6	91.9	85.9	80.5	76.3		
75	55.0	60.0	66.3	72.6	78.5	83.7	87.6	90.0	90.7	89.7	87.0	83.0	77.4	71.2	64.7	58.3	53.1		
80	33.5	39.5	46.4	53.2	59.4	64.6	68.5	70.9	71.6	70.6	68.0	63.8	58.3	52.0	45.0	37.9	31.7		
85	16.5	22.7	29.9	36.8	43.0	48.2	52.0	54.3	54.8	54.0	51.5	47.5	42.1	35.7	28.7	21.4	14.8		
90	5.88	12.1	19.1	25.9	32.0	37.3	41.1	43.3	43.9	43.0	40.6	36.7	31.4	25.2	18.4	11.4	5.04		
95	2.41	7.12	13.3	19.8	25.8	30.9	34.7	36.9	37.6	36.7	34.3	30.4	25.2	19.2	12.7	6.54	1.91		
100	1.39	4.61	9.62	15.3	20.7	25.4	29.0	31.1	31.8	31.0	28.6	25.0	20.2	14.8	9.08	4.11	0.98		
105	1.02	3.08	6.95	11.6	16.5	20.7	23.9	25.9	26.5	25.7	23.6	20.3	16.0	11.2	6.47	2.64	0.66		
110	0.88	2.08	5.00	8.80	12.8	16.5	19.4	21.1	21.7	21.0	19.1	16.2	12.4	8.36	4.57	1.70	0.47		
115	0.69	1.24	3.56	6.54	9.81	12.9	15.4	16.9	17.4	16.8	15.1	12.5	9.44	6.14	3.19	1.14	0.37		
120	0.63	1.03	2.45	4.77	7.36	9.85	11.9	13.1	13.5	13.0	11.6	9.56	7.02	4.42	2.14	0.70	0.21		
125	0.59	0.78	1.15	3.38	5.38	7.33	8.94	9.97	10.3	9.87	8.75	7.07	5.08	3.09	1.15	0.38	0.20		
130	0.57	0.66	1.04	1.68	3.80	5.29	6.53	7.33	7.57	7.24	6.36	5.07	3.55	1.58	0.66	0.29	0.21		
135	0.56	0.59	0.77	1.21	1.88	3.61	4.57	5.18	5.35	5.10	4.44	3.41	1.76	0.90	0.45	0.26	0.22		
140	0.55	0.55	0.63	0.85	1.28	1.60	2.34	3.03	3.31	2.96	2.25	1.54	0.99	0.58	0.34	0.26	0.24		
145	0.52	0.51	0.54	0.64	0.85	1.10	1.27	1.39	1.46	1.38	1.16	0.88	0.60	0.40	0.29	0.26	0.25		
150	0.48	0.49	0.49	0.52	0.61	0.70	0.79	0.85	0.81	0.76	0.65	0.52	0.41	0.31	0.27	0.26	0.25		
155	0.38	0.40	0.41	0.41	0.43	0.46	0.46	0.47	0.47	0.45	0.41	0.37	0.31	0.27	0.26	0.26	0.26		
160	0.34	0.33	0.33	0.32	0.32	0.33	0.32	0.32	0.32	0.31	0.30	0.28	0.27	0.26	0.26	0.26	0.26		
165	0.32	0.32	0.32	0.31	0.31	0.31	0.29	0.29	0.28	0.28	0.28	0.27	0.27	0.27	0.26	0.27	0.27		
170	0.31	0.31	0.31	0.30	0.30	0.30	0.30	0.29	0.29	0.29	0.29	0.28	0.28	0.28	0.28	0.28	0.28		
175	0.30	0.30	0.29	0.29	0.29	0.28	0.28	0.27	0.27	0.27	0.28	0.27	0.27	0.28	0.28	0.28	0.28		
180	0.27	0.27	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	0.27	0.27		

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, 2014	Sep. 17, 2015
Digital Power Meter	PF2010A	HZTE028-01	Sep. 18, 2014	Sep. 17, 2015
AC Power Supply	PCR 500L	HZTE001-08	Sep. 18, 2014	Sep. 17, 2015
DC Power Supply	WY12010	HZTE004-03	Sep. 18, 2014	Sep. 17, 2015
Temperature Meter	TES1310	HZTE017-01	Sep. 18, 2014	Sep. 17, 2015
Standard source	D908	HZTE012-01	Sep. 18, 2014	Sep. 17, 2015
Integrate Sphere system	2M	HZTE015-01	Sep. 18, 2014	Sep. 17, 2015
Digital Power Meter	WT210	HZTE008-01	Sep. 18, 2014	Sep. 17, 2015
AC Power Supply	PCR 500L	HZTE001-07	Sep. 18, 2014	Sep. 17, 2015
DC Power Supply	6154	HZTE004-04	Sep. 18, 2014	Sep. 17, 2015
Temperature and humidity recorder	JR900	HZTE018-01	Sep. 18, 2014	Sep. 17, 2015
Standard source	SCL-1400	HZTE012-02	Sep. 18, 2014	Sep. 17, 2015
Fluorescent Ballast Analyzer	HB-6B	HZTE002-01	Sep. 18, 2014	Sep. 17, 2015

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 expended 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

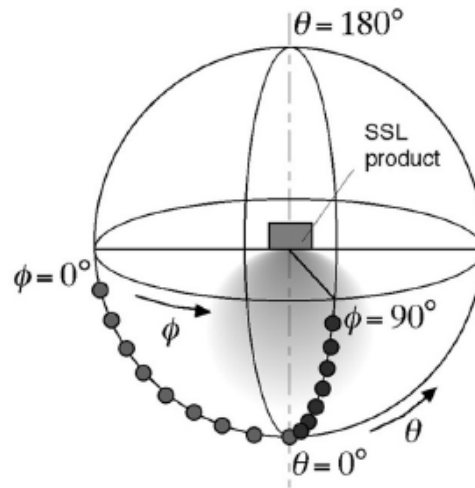
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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