LM-79-08 Test Report

for

Elec-Tech International Co., Ltd

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

Model: 54104431, 541044XX "XX could be 31-40"

Laboratory: Leading Testing Laboratories Co., LTD

NVLAP CODE: 200960-0

No.1805, DongLiu road, BingJiang District, Hangzhou, China
Tel: +86-571-56680806
www.ledtestlab.com

Report No.: HZ12070014a

Aug. 07, 2012

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

Tested by: April Zou

Engineer: April Zou
Aug. 07, 2012

Approved by:

Manager: Jim Zhang
Aug. 07, 2012

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	Aug. 07, 2012
Test Report Number	HZ12070014a
Laboratory Contact Name	Jim Zhang

Product Information:

Organization Name	Elec-Tech International Co.,Ltd.	
Brand Name	ETI, AEG	
Model Number	54104431, 541044XX “XX could be 31-40”	
SKU (if available)	N/A	
Type of Luminaire (for integral lamps, list base type and lamp type)	Linear T8 tube, G13 base	
Luminaire Aperture (downlights)	N/A	in.
Luminaire Length	48	in.
Luminaire Width	1.1	in.
Number of Units (modular products)	N/A	

Electrical Measurements:	**Integrating sphere output**	**Goniophotometer output**	
Input Wattage	17. 6	17.7	W
Input Current	0.149	0.149	A
Input Voltage ac	120.0	120.0	V
Power Factor	0.9820	0.9842	
Off-state Power	0	0	W

Photometric Characteristics

Total Initial Lumen Output	1631.0	1626.7	lm
Initial Luminaire Efficacy	92.7	91.9	lm/W
Correlated Color Temperature/ CCT	3371	K	
Color Rendering Index / CRI	85.3		
R9 Value	30.6		
Duv	0.0036		

Luminous Intensity Distribution

Center Beam Candlepower (if application)	474	cd
Beam Angle (if application)	110.1 (0°-180°) 123.0 (90°-270°)	°
Zonal Lumens in the 0°-60°Zone	66.47%	
Zonal Lumens in the 60°-90°Zone	25.85%	
Zonal Lumens in the 90°-120°Zone	6.54%	
Zonal Lumens in the 120°-180°Zone	1.13%	

Test Summary

Sample Tested: **54104431**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
92.7	1631.0	17.6	0.9820

CCT (K)	CRI	Stabilization Time (Light & Power)
3371	85.3	80

Table 1: Executive Data Summary

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

Test specifications:	
Date of Receipt	: July 23, 2012
Date of Test	: July 23, 2012 to July 25, 2012
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

Model discrepancy: Model 541044XX is identical with Model 54104431. “XX” could be 31-40, indicate for different packages, different costumer No. and different painting color of metal enclosure. Model 54104431 is chosen to represent for both models in this report.

TABLE OF CONTENT

Sample Photos

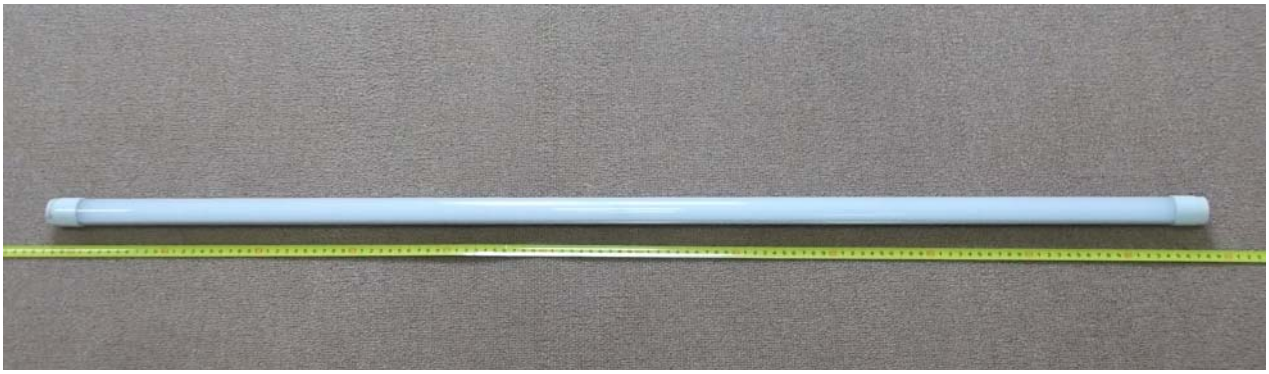


Figure 1- Overview of the sample

Equipment Under Test (EUT)	
Name	: LED TUBE
Model	: 54104431
Electrical Ratings	: 100-277 V ac, 50/60Hz
Product Description	: G13 base, Non dimmable, 3500K, Frosted lens Quantity of light source: 108 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 (Alternative)	: Wuhu 3E Lighting Co., Ltd
Address	: No11.wei Rd.East Zone of wuhu Economic and Technological Development Area

TEST RESULTS

Test ambient temperature was 25.6℃.

Sample orientation was Light down.

The stabilization time of the sample was 80 minutes, and the total operating time including stabilization was 115 minutes.

Sphere-Spectroradiometer Method

Parameter	Result
Test Voltage (V)	120.0
Voltage frequency (Hz)	60
Test Current (A)	0.149
Power Factor	0.9820
Test Power (W)	17.6
THD A%	13.4
Luminous Efficacy (lm/W)	92.7
Total Luminous Flux (lm)	1631
Color Rendering Index (CRI)	85.3
R9	30.6
Correlated Color Temperature (CCT) (K)	3371
Chromaticity (Chroma x, Chroma y)	(0.4091, 0.3855)
Chromaticity (Chroma u, Chroma v)	(0.2404, 0.3398)
Chromaticity (Chroma u', Chroma v')	(0.2404, 0.5096)
Duv	0.0036

Special Color Rendering Indices	
R1	84.7
R2	89.7
R3	93.4
R4	85.2
R5	84.7
R6	86.4
R7	86.8
R8	71.2
R9	30.6
R10	75.9
R11	85.1
R12	75.4
R13	85.4
R14	96

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

The photometric distance is 2.475m.

Luminous data was taken at 1.0°vertical intervals and 10°horizontal intervals.

Parameter	Result
Test Voltage (V)	120.0
Voltage frequency (Hz)	60
Test Current (A)	0.149
Power Factor	0.9842
Test Power (W)	17.7
Luminous Efficacy (lm/W)	91.9
Total Luminous Flux (lm)	1626.7
Beam Angle (。)	110.1 (0°-180°)/ 123.0 (90°-270°)
Center Beam Candle Power (cd)	474
Spacing Criteria	1.25 (0°-180°)/ 1.27 (90°-270°)

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

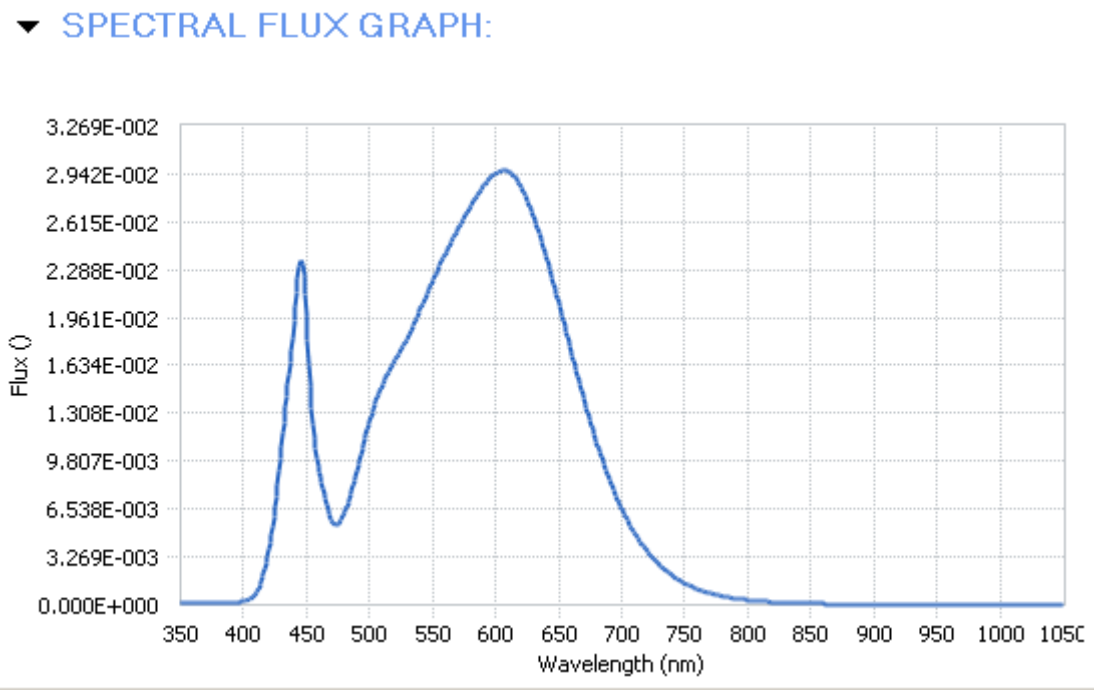
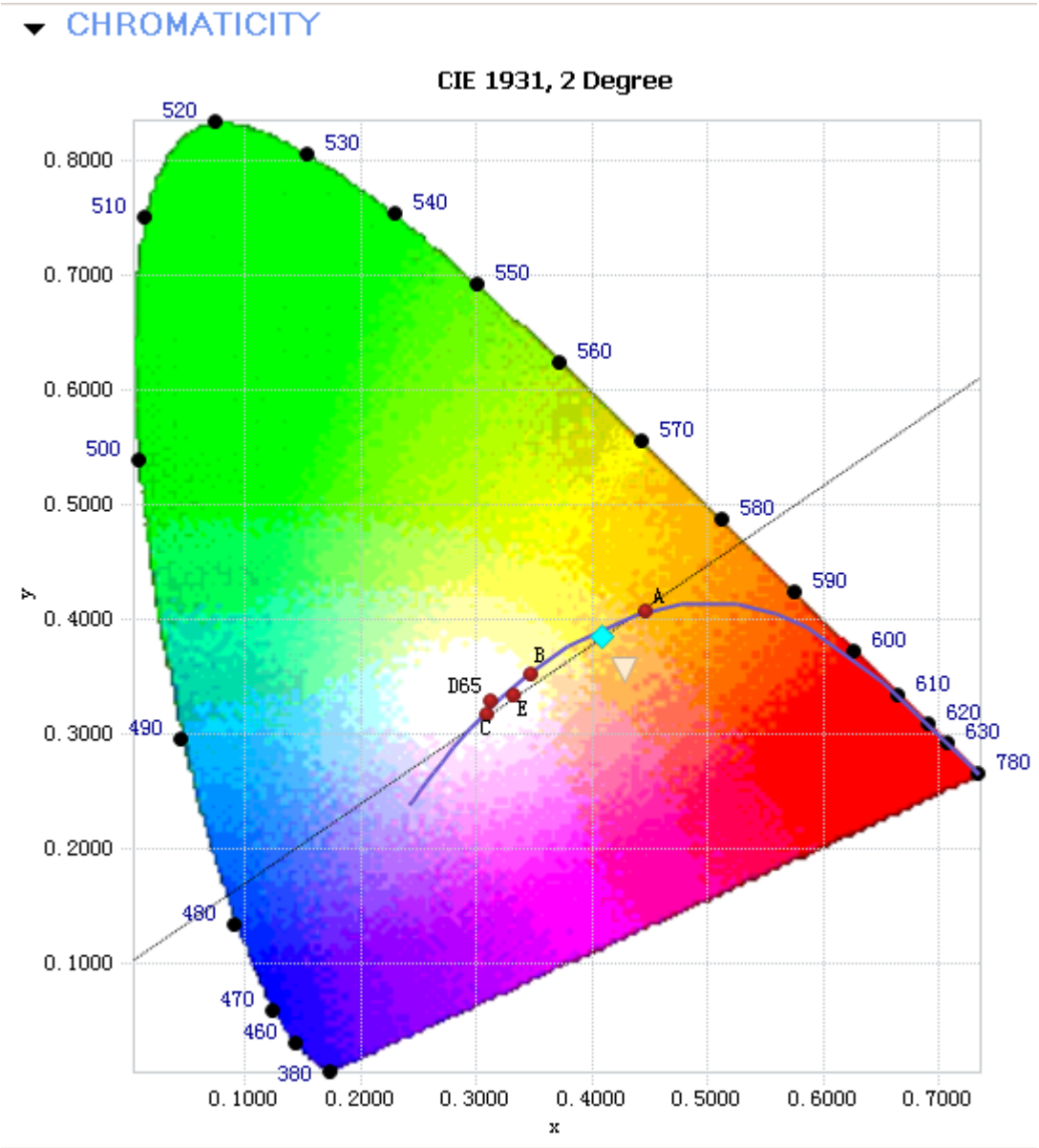


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.10E-04	485	7.55E-03	590	2.86E-02	695	7.54E-03
385	1.08E-04	490	9.17E-03	595	2.91E-02	700	6.58E-03
390	1.27E-04	495	1.10E-02	600	2.94E-02	705	5.71E-03
395	1.56E-04	500	1.26E-02	605	2.97E-02	710	4.93E-03
400	2.37E-04	505	1.40E-02	610	2.96E-02	715	4.26E-03
405	4.15E-04	510	1.50E-02	615	2.92E-02	720	3.69E-03
410	8.43E-04	515	1.59E-02	620	2.86E-02	725	3.19E-03
415	1.87E-03	520	1.67E-02	625	2.77E-02	730	2.73E-03
420	3.77E-03	525	1.74E-02	630	2.66E-02	735	2.35E-03
425	6.67E-03	530	1.82E-02	635	2.52E-02	740	2.00E-03
430	1.09E-02	535	1.91E-02	640	2.38E-02	745	1.72E-03
435	1.50E-02	540	2.02E-02	645	2.22E-02	750	1.47E-03
440	1.94E-02	545	2.12E-02	650	2.07E-02	755	1.27E-03
445	2.35E-02	550	2.22E-02	655	1.90E-02	760	1.09E-03
450	1.97E-02	555	2.31E-02	660	1.73E-02	765	9.38E-04
455	1.23E-02	560	2.40E-02	665	1.56E-02	770	7.95E-04
460	9.06E-03	565	2.49E-02	670	1.41E-02	775	6.85E-04
465	7.20E-03	570	2.57E-02	675	1.25E-02	780	5.93E-04
470	5.69E-03	575	2.64E-02	680	1.11E-02		
475	5.53E-03	580	2.72E-02	685	9.81E-03		
480	6.32E-03	585	2.79E-02	690	8.63E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y) : (0.4091, 0.3855)

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

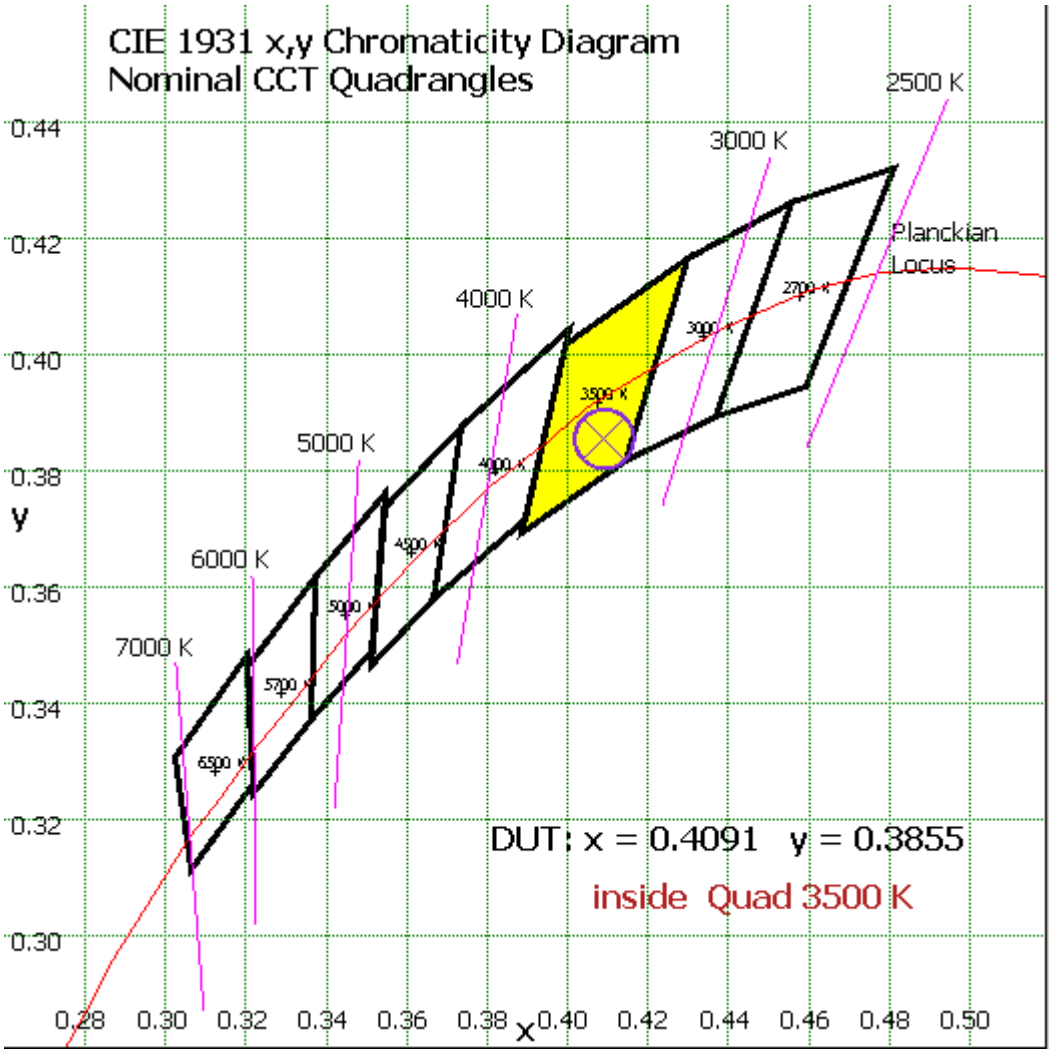


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Zonal Lumen Tabulation- Goniophotometer Method

Γ(°)	Lumens	% Total
0- 10	44.884	2.76%
10- 20	128.532	7.90%
20- 30	194.915	11.98%
30- 40	235.774	14.49%
40- 50	247.093	15.19%
50- 60	230.089	14.14%
60- 70	191.021	11.74%
70- 80	139.796	8.59%
80- 90	89.774	5.52%
90-100	54.605	3.36%
100-110	32.896	2.02%
110-120	18.935	1.16%
120-130	10.195	0.63%
130-140	4.97	0.31%
140-150	2.098	0.13%
150-160	0.805	0.05%
160-170	0.286	0.02%
170-180	0.07	0.00%
Total	1626.7	100%

γ(°)	Lumens	% Total
0- 60	1081.287	66.47%
60- 90	420.591	25.85%
0-90	1501.878	92.32%
90- 180	124.86	7.68%
0- 180	1626.738	100%

Table 5: Zonal Lumen Data

Illuminance Plots- Goniophotometer Method

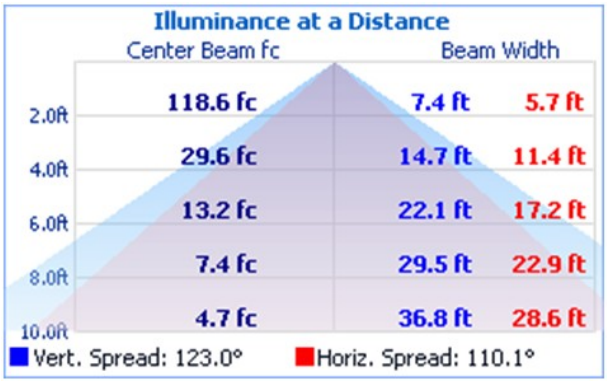


Chart 4: Beam angle

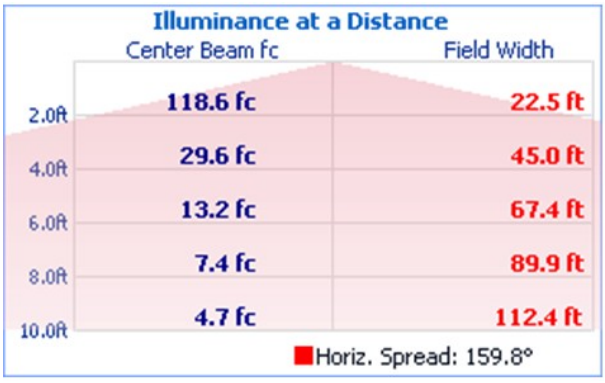


Chart 5: Field Angle

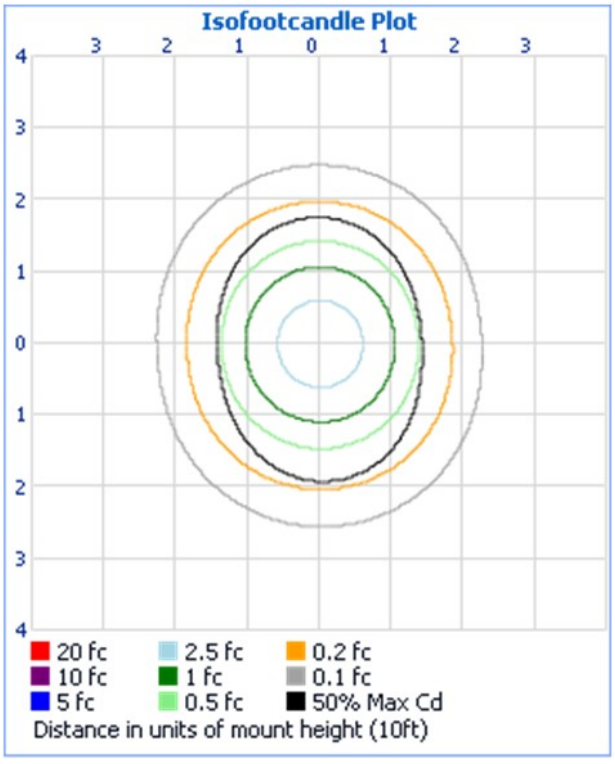


Chart 6: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

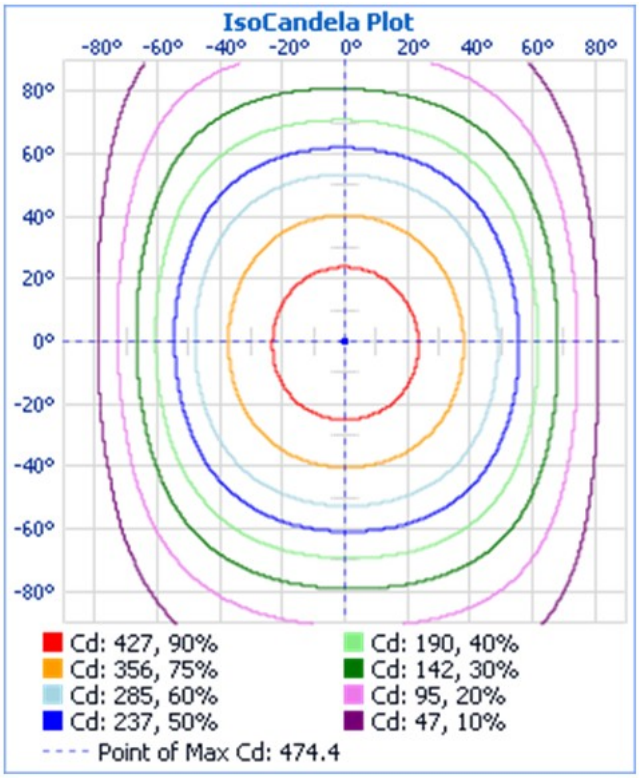


Chart 7: Isocandela Plot

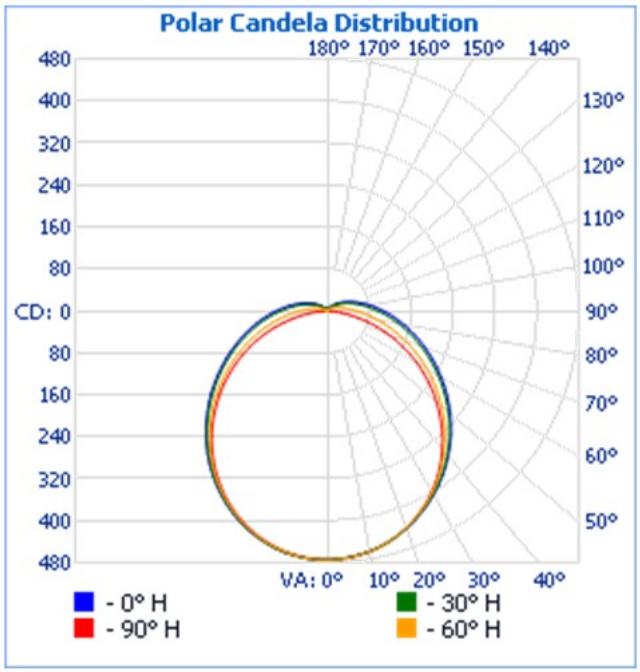


Chart 8: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360
0	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474
2.5	473	473	473	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	473	474	474	474	474	473	473	473	473
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92.5	99	98	95	88	78	64	48	29	11	1	2	13	30	47	62	73	82	87	89	89	86	80	71	59	44	27	11	1	3	17	36	54	69	82	90	96	99
95	90	90	87	80	70	57	41	23	8	1	1	9	24	40	54	66	74	79	81	81	78	72	63	52	37	22	7	0	1	12	29	46	61	73	82	88	90
97.5	83	82	79	72	63	50	35	19	6	0	0	7	20	34	48	59	67	72	74	73	70	65	56	45	31	17	5	0	1	9	24	40	55	66	75	80	83
100	75	75	72	65	56	44	30	16	5	0	0	5	16	29	42	52	60	65	67	67	64	58	50	39	26	13	3	0	1	7	20	34	48	59	67	73	75
102.5	68	68	65	59	50	39	26	13	3	0	0	4	13	25	36	46	54	58	61	60	57	52	44	34	22	11	3	0	1	5	16	30	42	53	61	66	68
105	62	62	59	53	45	34	22	11	3	0	0	3	11	21	32	41	48	53	55	54	51	46	39	29	19	8	2	0	1	4	14	25	37	47	55	60	62

Table 6: Luminous Intensity Data

107.5	57	56	53	48	40	30	19	9	2	0	0	3	9	18	28	36	43	47	49	49	46	41	34	25	16	7	2	0	0	3	11	22	33	42	49	54	57
110	51	51	48	43	35	26	16	8	2	0	0	2	7	15	24	32	38	42	44	44	41	36	30	22	13	6	1	0	0	3	10	19	29	37	44	49	51
112.5	46	46	43	38	31	23	14	6	2	0	0	2	6	13	21	28	34	38	39	39	37	32	26	18	11	5	1	0	0	2	8	16	25	33	40	44	46
115	41	41	39	34	28	20	12	6	2	0	0	2	5	11	18	24	30	33	35	35	32	28	22	16	9	4	1	0	0	2	7	14	22	29	35	39	41
117.5	37	37	34	30	25	18	11	5	1	0	0	1	4	9	15	21	26	29	31	31	28	24	19	14	8	3	1	0	0	2	6	12	19	26	31	35	37
120	33	33	31	27	22	16	9	4	1	0	0	1	3	8	13	18	23	26	27	27	25	21	17	12	7	3	1	0	0	2	5	11	17	23	28	31	33
122.5	29	29	27	24	19	14	8	3	1	0	0	1	3	7	11	16	20	23	24	24	22	19	15	10	6	2	1	0	0	1	4	9	15	20	25	28	29
125	26	26	24	21	17	12	7	3	1	0	0	1	3	6	10	14	17	20	21	21	19	16	13	8	5	2	1	0	0	1	4	8	13	18	22	25	26
127.5	23	23	21	18	15	10	6	3	1	0	0	1	2	5	9	12	15	17	18	18	16	14	11	7	4	2	1	0	0	1	3	7	11	15	19	22	23
130	20	20	19	16	13	9	5	2	1	0	0	1	2	4	7	10	13	15	16	15	14	12	9	6	3	2	1	0	1	1	3	6	9	13	17	19	20
132.5	18	18	16	14	11	7	4	2	1	0	0	1	2	3	6	9	11	13	14	13	12	10	8	5	3	2	1	0	1	1	2	5	8	11	14	17	18
135	15	15	14	12	9	6	4	2	1	1	0	1	2	3	5	8	10	11	12	11	10	9	6	4	3	1	1	0	1	1	2	4	7	10	12	14	15
137.5	13	13	12	10	8	5	3	2	1	1	0	1	2	2	4	6	8	9	10	10	9	7	6	4	2	1	1	0	1	1	2	4	6	8	11	12	13
140	11	11	10	8	7	5	3	2	1	1	0	1	1	2	3	5	7	8	8	8	7	6	5	3	2	1	1	0	1	1	2	3	5	7	9	10	11
142.5	9	9	8	7	6	4	2	1	1	1	0	1	1	2	3	4	5	6	7	7	6	5	4	3	2	1	1	0	1	1	2	3	4	6	7	8	9
145	7	7	7	6	5	3	2	1	1	1	0	1	1	2	2	3	4	5	6	6	5	4	3	2	2	1	1	0	1	1	1	2	3	5	6	7	7
147.5	6	6	6	5	4	3	2	1	1	1	0	1	1	1	2	3	4	4	5	5	4	4	3	2	1	1	1	0	1	1	1	2	3	4	5	6	6
150	5	5	5	4	3	2	2	1	1	1	1	1	1	1	2	2	3	4	4	4	4	3	3	2	1	1	1	0	1	1	1	2	3	3	4	5	5
152.5	4	4	4	3	3	2	2	1	1	1	1	1	1	1	1	2	2	3	3	3	3	3	2	2	1	1	1	1	1	1	1	2	2	3	3	4	4
155	3	3	3	3	2	2	1	1	1	1	1	1	1	1	1	1	2	2	3	3	3	2	2	1	1	1	1	1	1	1	1	1	2	2	3	3	3
157.5	3	3	3	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	1	1	1	1	1	1	1	1	1	2	2	2	3	3
160	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2
162.5	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2
165	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
167.5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
170	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
172.5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
175	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
177.5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
180	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Table 7: Luminous Intensity Data-Continuous

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Sep. 10, 2011	Sep. 09, 2012
Digital Power Meter	PF2010A	HZTE028	Sep. 20, 2011	Sep. 19, 2012
AC Power Supply	DPS1060	HZTE001-6	Sep. 21, 2011	Sep. 20, 2012
DC Power Supply	WY12010	HZTE004-03	Sep. 21, 2011	Sep. 20, 2012
Temperature Meter	TES1310	HZTE017-01	Sep. 20, 2011	Sep. 19, 2012
Standard source	SCL-1400	HZTE012-02	Sep. 20, 2011	Sep. 19, 2012
Integrate Sphere system	2M	HZTE015	Sep. 20, 2011	Sep. 19, 2012
Digital Power Meter	WT210	HZTE008	Sep. 20, 2011	Sep. 19, 2012
AC Power Supply	APS6005	HZTE001-01	Sep. 21, 2011	Sep. 20, 2012
DC Power Supply	GPR--6030D	HZTE004-01	Sep. 20, 2011	Sep. 19, 2012
Temperature and humidity recorder	JR900	HZTE018-01	Sep. 21, 2011	Sep. 20, 2012
Standard source	D908	HZTE012-01	Sep. 20, 2011	Sep. 19, 2012

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 1.39% 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 1.8% with a coverage factor k=2.

Color Characteristics Measurements

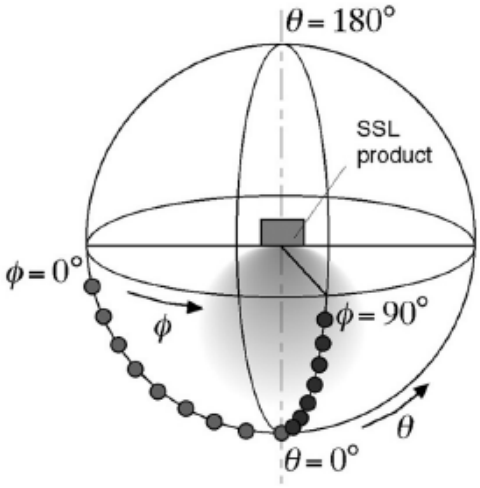
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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