



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 tube

Model: 541081xx (xx could be 11-20)

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ13010010c

Jan. 31, 2013

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

Reviewed by:

April Zou

Engineer: April Zou

Jan. 31, 2013

Approved by:



Jim Zhang

Manager: Jim Zhang

Jan. 31, 2013

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	Jan. 31, 2013
Test Report Number	HZ13010010c
Laboratory Contact Name	Jim Zhang

Product Information:

Organization Name	Elec-Tech International Co.,Ltd.	
Brand Name	ETI	
Model Number	541081xx (xx could be 11-20)	
SKU (if available)	N/A	
Type of Luminaire (for integral lamps, list base type and lamp type)	T8 LED TUBE, G13 base	
Luminaire Aperture (for downlights)	N/A	in.
Luminaire Length	48	in.
Luminaire Width	1	in.
Number of Units (modular products)	N/A	

Electrical Measurements:	Integrating sphere output	Goniophotometer output	
Input Wattage	17.7	17.8	W
Input Current	0.154	0.154	A
Input Voltage ac	120.0	120.0	V
Power Factor	0.9585	0.9595	
Off-state Power	0	0	W

Photometric Characteristics

Total Initial Lumen Output	1649.0	1655.7	lm
Initial Luminaire Efficacy	93.2	93.0	lm/W
Correlated Color Temperature/ CCT	2894	K	
Color Rendering Index / CRI	81.7		
R9 Value	21.7		
Duv	0.0015		

Luminous Intensity Distribution

Center Beam Candlepower (if application)	400	cd
Beam Angle (if application)	129.1	°
Zonal Lumens in the 0°-60°Zone	58.44%	
Zonal Lumens in the 60°-90°Zone	27.46%	
Zonal Lumens in the 90°-120°Zone	10.56%	
Zonal Lumens in the 120°-180°Zone	3.54%	

Test Summary

Sample Tested: **541081xx** (xx could be 11-20)

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
93.2	1649.0	17.7	0.9585
CCT (K)	CRI	Stabilization Time (Light & Power)	
2894	81.7	70	

Table 1: Executive Data Summary

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

Test specifications:

Date of Receipt	: Jan. 23, 2013
Date of Test	: Jan. 24, 2013
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 difference description: For model 541081xx, “xx” could be 11-20, indicate for different packages, different customer No. and different painting color of metal enclosure

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Sample Photos



Figure 1- Overview of the sample

Equipment Under Test (EUT)

Name	: LED tube
Model	: 541081xx (xx could be 11-20)
Electrical Ratings	: 120 -277V ac, 60Hz, 18W
Product Description	: G13 base, 2900K Quantity of light source: 84pcs
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	: NO.11, Wei Er ci Rd., East Zone of Wuhu Economic and Technological Development Zone. Wuhu City Anhui Province, P.R. China

TEST RESULTS

Test ambient temperature was 25.2°C.

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

The stabilization time of the sample was 70 minutes, and the total operating time including stabilization was 105 minutes.

Sphere-Spectroradiometer Method

Parameter	Result		Special Color Rendering Indices	
Test Voltage (V)	120.0	277.0	R1	80.2
Voltage frequency (Hz)	60	60	R2	86.7
Test Current (A)	0.154	0.072	R3	91.8
Power Factor	0.9585	0.9151	R4	80.9
Test Power (W)	17.7	18.4	R5	78.5
THD A%	26.61	19.51	R6	81.1
Luminous Efficacy (lm/W)	93.2		R7	87.3
Total Luminous Flux (lm)	1649.0		R8	66.8
Color Rendering Index (CRI)	81.7		R9	21.7
R9	21.7		R10	68.1
Correlated Color Temperature (CCT) (K)	2894		R11	78
Chromaticity (Chroma x, Chroma y)	(0.4474, 0.4123)		R12	60.1
Chromaticity (Chroma u, Chroma v)	(0.2538, 0.3508)		R13	80.9
Chromaticity (Chroma u', Chroma v')	(0.2538, 0.5261)		R14	94.7
Duv	0.0015			

Table: 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 0.5°vertical intervals and 10°horizontal intervals.

Parameter	Result
Test Voltage (V)	120.0
Voltage frequency (Hz)	60
Test Current (A)	0.154
Power Factor	0.9595
Test Power (W)	17.8
Luminous Efficacy (lm/W)	93.0
Total Luminous Flux (lm)	1655.7
Beam Angle (°)	107.3 (0°-180°)/ 149.0 (90°-270°)
Center Beam Candle Power (cd)	400
Spacing Criteria	1.23 (0°-180°)/ 1.38 (90°-270°)

Table 2: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

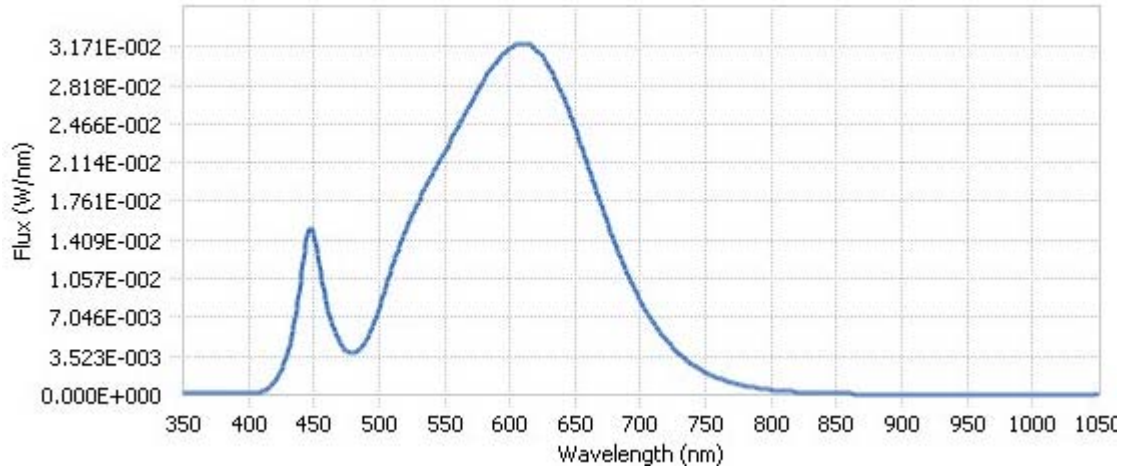
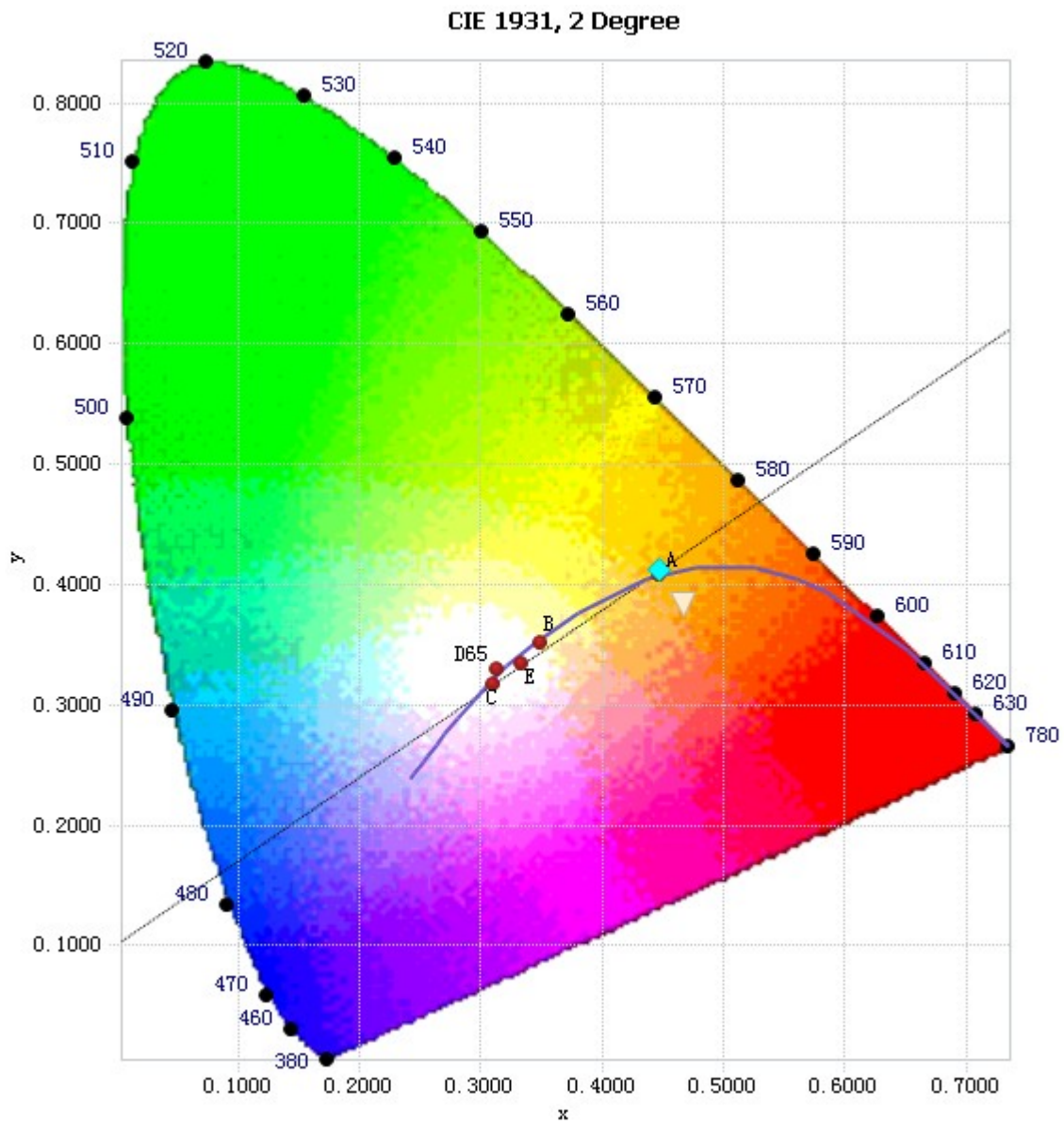


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.02E-04	485	4.11E-03	590	3.04E-02	695	9.69E-03
385	1.08E-04	490	4.91E-03	595	3.11E-02	700	8.56E-03
390	1.01E-04	495	6.21E-03	600	3.16E-02	705	7.46E-03
395	1.15E-04	500	7.92E-03	605	3.19E-02	710	6.50E-03
400	1.23E-04	505	9.86E-03	610	3.20E-02	715	5.66E-03
405	1.62E-04	510	1.16E-02	615	3.19E-02	720	4.92E-03
410	2.64E-04	515	1.33E-02	620	3.14E-02	725	4.27E-03
415	5.40E-04	520	1.49E-02	625	3.08E-02	730	3.68E-03
420	1.18E-03	525	1.63E-02	630	2.98E-02	735	3.14E-03
425	2.24E-03	530	1.75E-02	635	2.87E-02	740	2.73E-03
430	3.91E-03	535	1.88E-02	640	2.74E-02	745	2.34E-03
435	6.32E-03	540	1.99E-02	645	2.59E-02	750	2.02E-03
440	1.04E-02	545	2.10E-02	650	2.43E-02	755	1.73E-03
445	1.45E-02	550	2.21E-02	655	2.25E-02	760	1.49E-03
450	1.46E-02	555	2.33E-02	660	2.08E-02	765	1.28E-03
455	1.11E-02	560	2.43E-02	665	1.90E-02	770	1.08E-03
460	8.12E-03	565	2.54E-02	670	1.73E-02	775	9.33E-04
465	6.13E-03	570	2.66E-02	675	1.55E-02	780	8.00E-04
470	4.80E-03	575	2.77E-02	680	1.40E-02		
475	4.03E-03	580	2.87E-02	685	1.24E-02		
480	3.81E-03	585	2.96E-02	690	1.10E-02		

Table 3: Spectral Power Distribution Numerical Data per Sphere - Spectroradiometer Method

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y) : (0.4474, 0.4123)

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

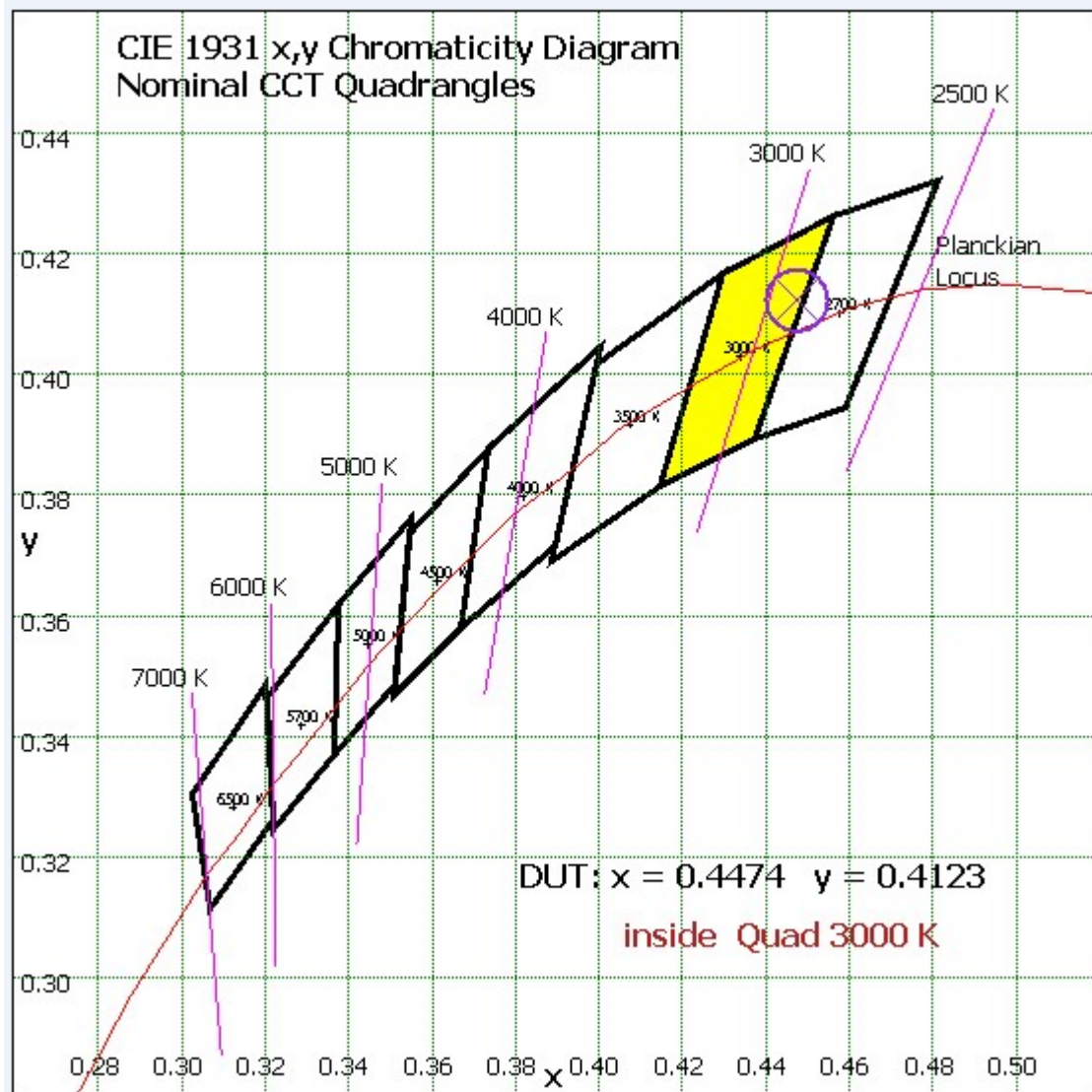


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	37.844	2.29%
10- 20	109.2	6.60%
20- 30	168.185	10.16%
30- 40	208.303	12.58%
40- 50	225.402	13.61%
50- 60	218.619	13.20%
60- 70	191.448	11.56%
70- 80	151.935	9.18%
80- 90	111.347	6.72%
90-100	79.733	4.82%
100-110	56.457	3.41%
110-120	38.692	2.34%
120-130	25.445	1.54%
130-140	16.012	0.97%
140-150	9.463	0.57%
150-160	4.968	0.30%
160-170	2.122	0.13%
170-180	0.55	0.03%
Total	1655.7	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	967.553	58.44%
60- 90	454.73	27.46%
41-500	1422.283	85.90%
90- 180	233.442	14.10%
0- 180	1655.7	100%

Table 4: Zonal Lumen Data

Illuminance Plots- Goniophotometer Method

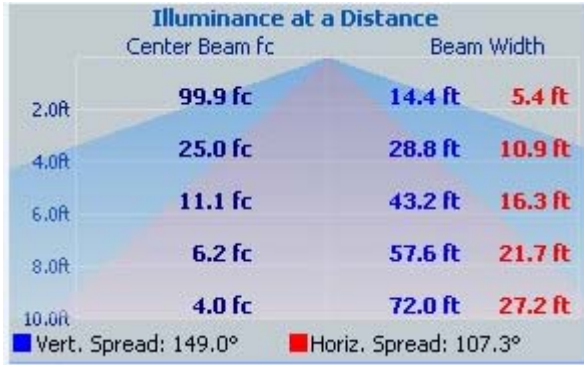


Chart 4: Beam angle



Chart 5: Field angle



Chart 6: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

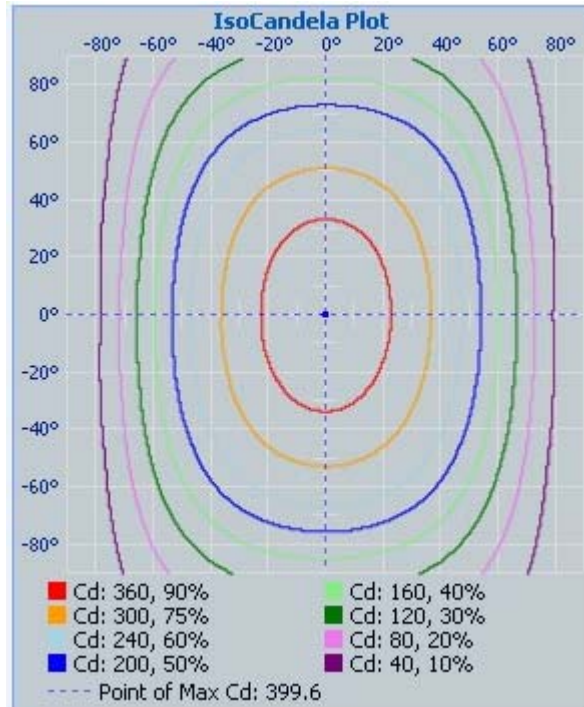


Chart 7: Isocandela Plot

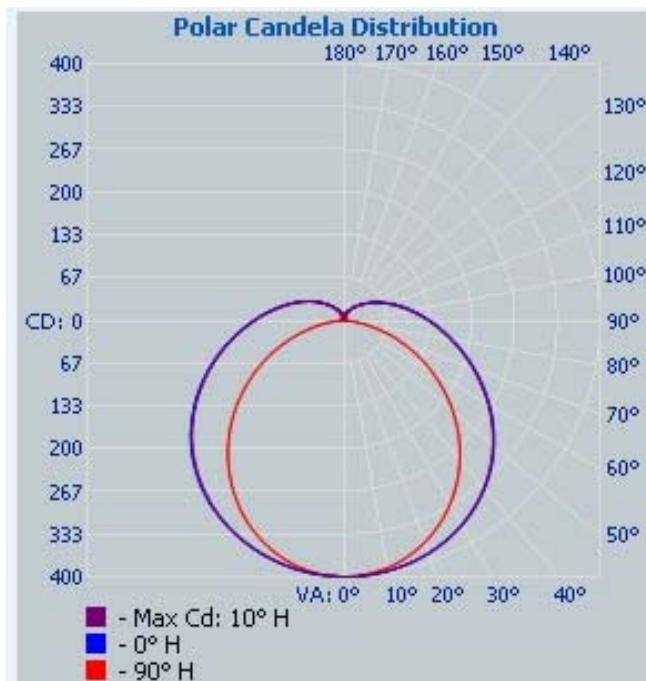


Chart 8: Polar Candela Distribution

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Sep. 18, 2012	Sep. 17, 2013
Digital Power Meter	PF2010A	HZTE028	Sep. 19, 2012	Sep. 18, 2013
AC Power Supply	DPS1060	HZTE001-6	Sep. 19, 2012	Sep. 18, 2013
DC Power Supply	WY12010	HZTE004-03	Sep. 19, 2012	Sep. 18, 2013
Temperature Meter	TES1310	HZTE017-01	Sep. 19, 2012	Sep. 18, 2013
Standard source	SCL-1400	HZTE012-02	Sep. 19, 2012	Sep. 18, 2013
Integrate Sphere system	2M	HZTE015	Sep. 18, 2012	Sep. 17, 2013
Digital Power Meter	WT210	HZTE008	Sep. 19, 2012	Sep. 18, 2013
AC Power Supply	APS6005	HZTE001-01	Sep. 19, 2012	Sep. 18, 2013
DC Power Supply	GPR--6030D	HZTE004-01	Sep. 19, 2012	Sep. 18, 2013
Temperature and humidity recorder	JR900	HZTE018-01	Sep. 19, 2012	Sep. 18, 2013
Standard source	D908	HZTE012-01	Sep. 19, 2012	Sep. 18, 2013

Table 7: 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 1.39% 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 expanded uncertainty is 1.8% with a coverage factor $k=2$.

Color Characteristics Measurements

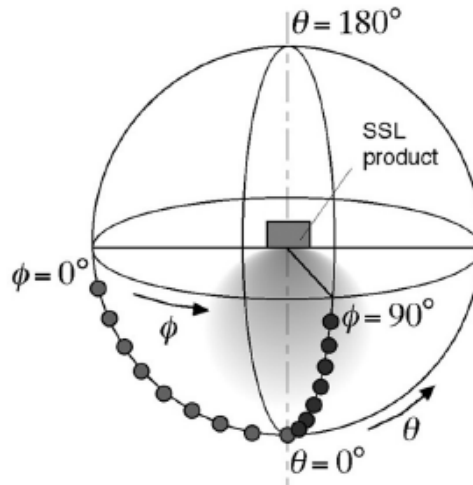
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as 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 ($C=0^\circ/180^\circ$ 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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