NVLAP LAB CODE 200960-0

LM-79-08 Test Report

for

GREEN CREATIVE LTD

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

LED A19

Model: 9.5A19DIM/8CCTD

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ16030009a

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

Review by: April Zou

Engineer: April Zou

Mar. 21, 2016

Approved by: Zhang

Manager: Jim Zhang

Mar. 21, 2016

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: **9.5A19DIM/8CCTD**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
85.8	805.7	9.39	0.9910

CCT (K)	CRI	Stabilization Time (Light & Power)
2705	80.8	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 : Mar. 08, 2016

Date of Test : Mar. 10, 2016

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 Photo

Figure 1- Overview of the sample

Equipment Under Test (EUT)	
Name	: LED A19
Model	: 9.5A19DIM/8CCTD
Electrical Ratings	: 120Vac, 60Hz, 9.5W
Product Description	: E26 base, A19 Lamp, 2700K
Manufacturer	: GREEN CREATIVE LTD
Address	: 756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai

TEST RESULTS

Test ambient temperature was 25.1℃.

Base orientation was Light 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)	0.079
Power Factor	0.9910
Test Power (W)	9.39
Luminous Efficacy (lm/W)	11.09
THD A%	85.8
Total Luminous Flux (lm)	805.7
Color Rendering Index (CRI)	80.8
R9	3.1
Correlated Color Temperature (CCT) (K)	2705
Chromaticity (Chroma x, Chroma y)	(0.4612, 0.4136)
Chromaticity (Chroma u, Chroma v)	(0.2620, 0.3525)
Chromaticity (Chroma u', Chroma v')	(0.2620, 0.5287)
Duv	0.0010

Special Color Rendering Indices	
R1	78.9
R2	90.4
R3	95.8
R4	77.4
R5	78.4
R6	88.2
R7	81.6
R8	55.8
R9	3.1
R10	78.3
R11	75.8
R12	72.5
R13	81.4
R14	98.3

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 24.2℃.

The photometric distance is 30m.

Luminous data was taken at 0.5°vertical intervals and 22.5°horizontal intervals.

Parameter	Result
Test Voltage (V)	120.0
Voltage frequency (Hz)	60
Test Current (A)	0.079
Power Factor	0.9919
Test Power (W)	9.37
Luminous Efficacy (lm/W)	85.9
Total Luminous Flux (lm)	804.8
Beam Angle (°)	306.4
Center Beam Candle Power (cd)	67.4
Spacing Criteria	1.64 (0°-180°)/ 1.70(90°-270°)
Zonal Lumens in the 0°-60°Zone	28.75%
Zonal Lumens in the 60°-90°Zone	29.71%
Zonal Lumens in the 90°-120°Zone	25.38%
Zonal Lumens in the 120°-180°Zone	16.15%

Table 3: Test data per Goniophotometer Method

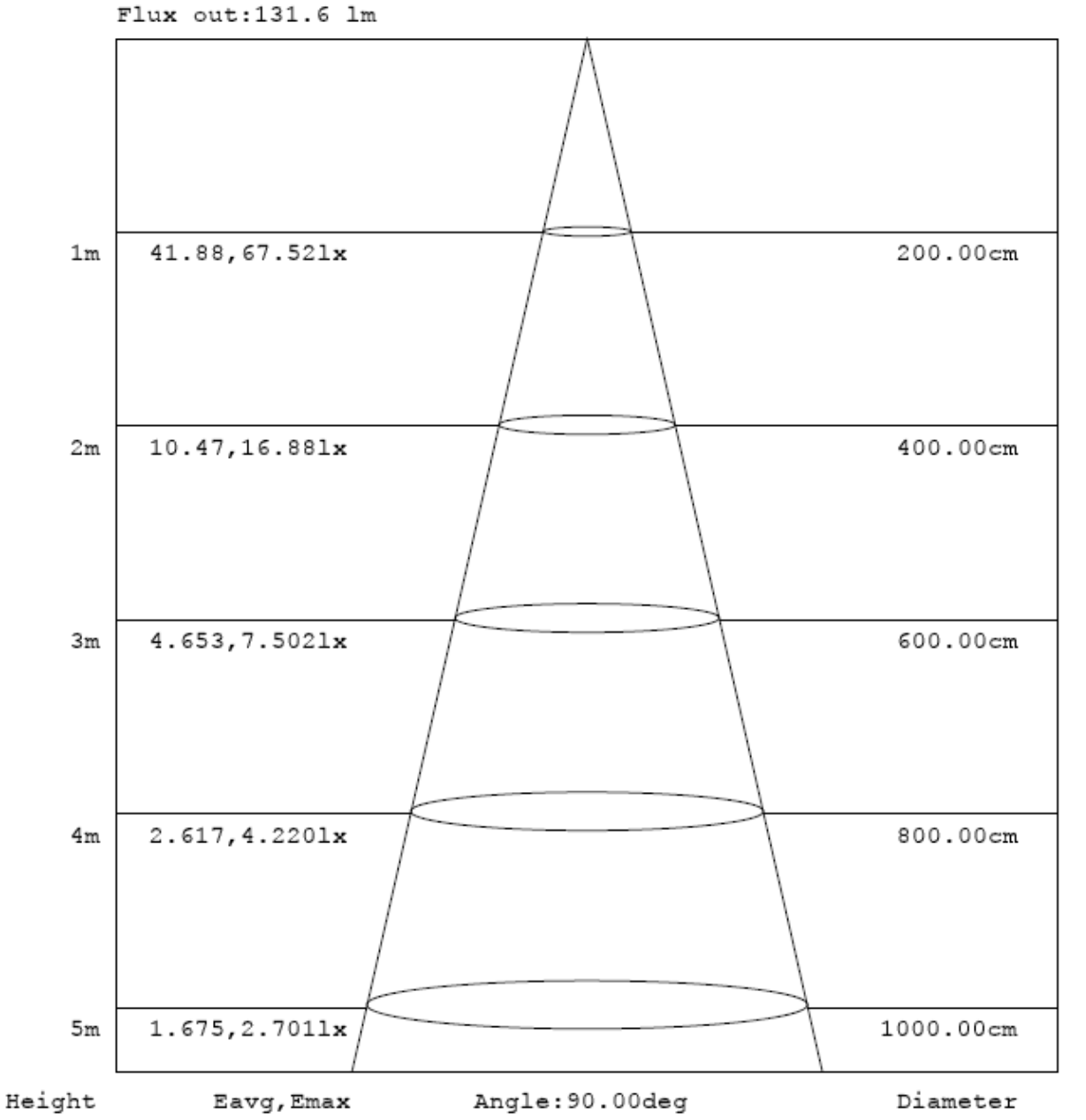
Zonal Lumen Tabulation- Goniophotometer Method

γ(°)	Lumens	% Total	γ(°)	Lumens	% Total
0~ 5	1.611	0.20%	90~95	39.158	4.87%
5~10	4.836	0.60%	95~100	37.592	4.67%
10~15	8.066	1.00%	100~105	35.592	4.42%
15~20	11.308	1.41%	105~110	33.243	4.13%
20~25	14.565	1.81%	110~115	30.696	3.81%
25~30	17.857	2.22%	115~120	27.995	3.48%
30~35	21.177	2.63%	120~125	25.204	3.13%
35~40	24.471	3.04%	125~130	22.325	2.77%
40~45	27.667	3.44%	130~135	19.407	2.41%
45~50	30.671	3.81%	135~140	16.536	2.05%
50~55	33.4	4.15%	140~145	13.757	1.71%
55~60	35.779	4.45%	145~150	11.112	1.38%
60~65	37.748	4.69%	150~155	8.661	1.08%
65~70	39.269	4.88%	155~160	6.335	0.79%
70~75	40.294	5.01%	160~165	4.126	0.51%
75~80	40.804	5.07%	165~170	2.107	0.26%
80~85	40.774	5.07%	170~175	0.434	0.05%
85~90	40.226	5.00%	175~180	0	0.00%

γ(°)	Lumens	% Total
0-130	722.328	89.75%
130-180	82.475	10.25%
0-180	804.8	100%

Table 4: 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 1: Beam Angle

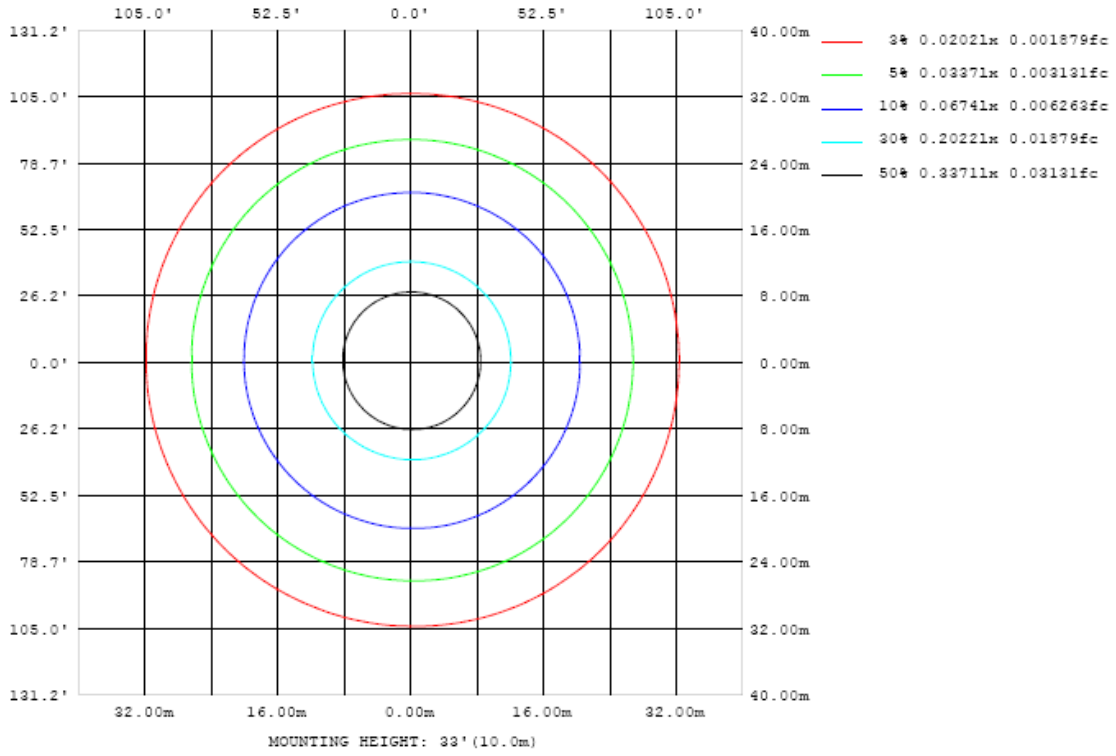


Chart 2: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

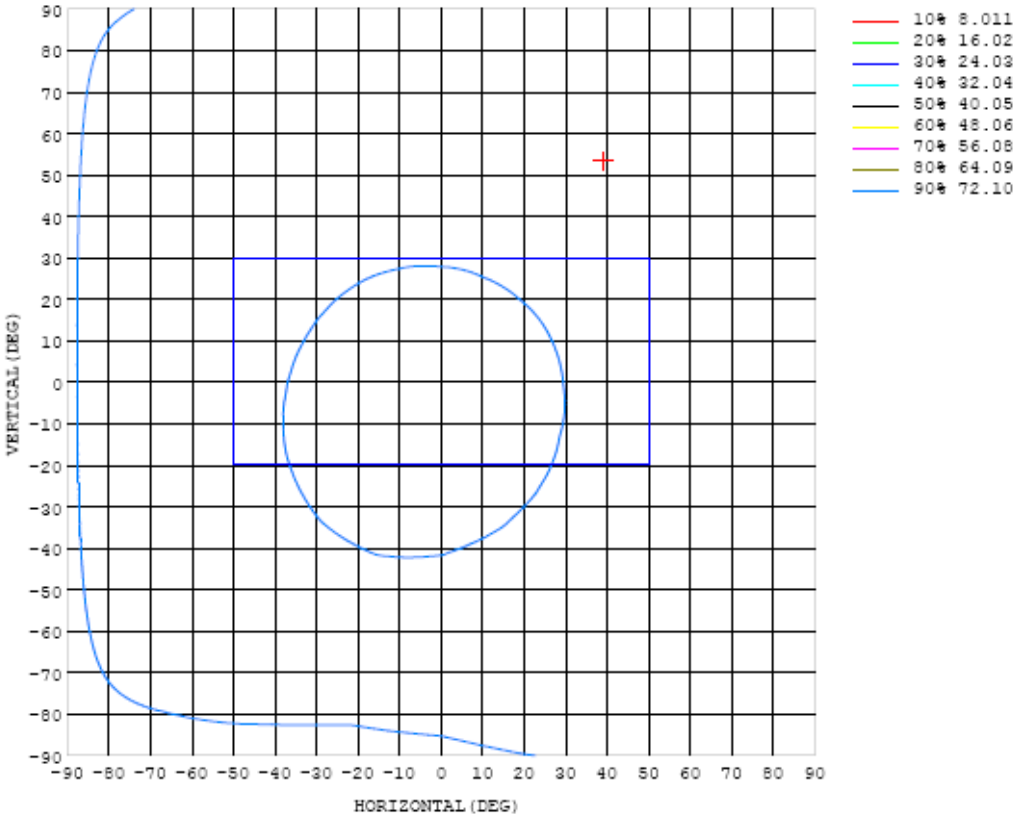


Chart 3: Isocandela Plot

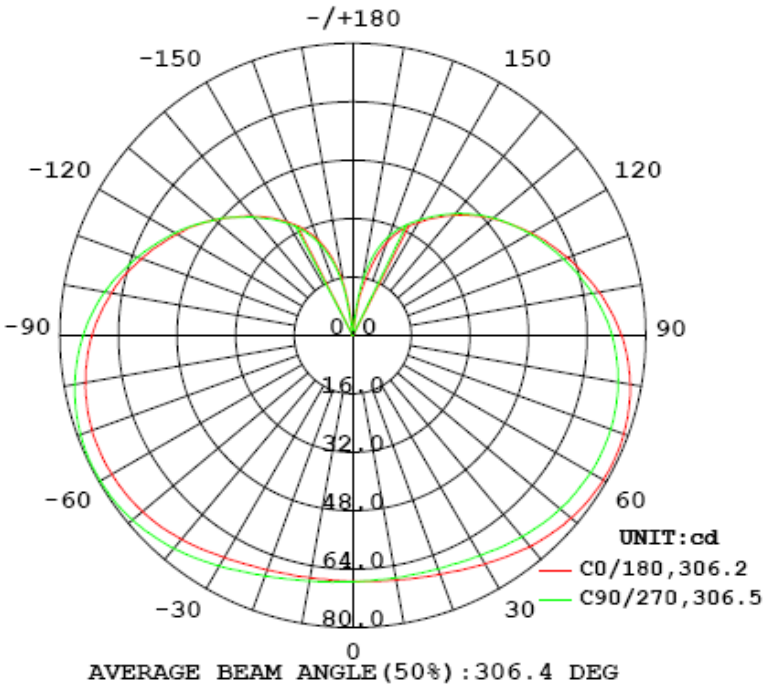


Chart 4: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1 UNIT: cd

γ (DEG) \ C (DEG)	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5			
0	67.4	67.4	67.4	67.4	67.4	67.4	67.4	67.4	67.4	67.4	67.4	67.4	67.4	67.4	67.4	67.4			
5	67.6	67.5	67.4	67.3	67.2	67.2	67.2	67.1	67.2	67.4	67.5	67.6	67.7	67.7	67.8	67.7			
10	68.0	67.9	67.7	67.4	67.4	67.2	67.1	67.1	67.4	67.7	67.8	68.0	68.2	68.3	68.3	68.3			
15	68.7	68.6	68.2	67.8	67.6	67.4	67.4	67.3	67.6	68.1	68.4	68.7	69.0	69.0	69.1	69.0			
20	69.6	69.3	68.8	68.3	68.0	67.7	67.6	67.8	68.3	68.9	69.3	69.7	70.1	70.1	70.1	69.9			
25	70.8	70.3	69.7	69.0	68.7	68.2	68.1	68.5	69.1	69.8	70.4	70.9	71.3	71.3	71.3	71.1			
30	72.2	71.7	70.9	70.1	69.5	69.1	69.1	69.4	70.2	71.1	71.8	72.4	72.8	72.9	73.0	72.6			
35	73.7	73.3	72.4	71.4	70.7	70.1	70.2	70.6	71.5	72.6	73.5	74.1	74.5	74.5	74.6	74.3			
40	75.3	74.7	73.8	72.7	71.9	71.2	71.3	71.8	72.8	74.0	75.0	75.6	76.1	76.1	76.1	76.0			
45	76.7	76.1	75.2	73.9	73.0	72.3	72.4	73.0	74.1	75.3	76.4	77.2	77.4	77.5	77.5	77.3			
50	77.8	77.2	76.3	75.0	73.9	73.1	73.4	73.9	75.0	76.3	77.5	78.2	78.5	78.7	78.8	78.6			
55	78.6	77.9	77.2	75.8	74.6	73.8	74.1	74.5	75.7	77.0	78.4	79.1	79.3	79.3	79.6	79.4			
60	79.0	78.5	77.7	76.4	75.0	74.3	74.5	75.1	76.0	77.4	78.9	79.5	79.6	79.8	80.0	79.7			
65	79.1	78.6	77.9	76.6	75.1	74.4	74.6	75.1	76.1	77.4	78.9	79.5	79.6	79.5	79.9	79.8			
70	78.7	78.4	77.8	76.5	74.9	74.2	74.5	75.0	75.8	77.2	78.6	79.1	79.2	79.2	79.6	79.4			
75	78.0	77.7	77.3	76.0	74.4	73.7	74.0	74.4	75.2	76.5	78.0	78.4	78.3	78.4	78.7	78.7			
80	76.9	76.6	76.3	75.1	73.6	72.9	73.1	73.5	74.2	75.5	77.0	77.3	77.2	77.1	77.6	77.6			
85	75.3	75.2	75.0	73.8	72.3	71.7	72.0	72.3	72.8	74.1	75.4	75.7	75.5	75.5	76.0	75.9			
90	73.4	73.4	73.2	72.1	70.8	70.1	70.3	70.7	71.3	72.4	73.7	73.8	73.7	73.7	74.2	74.1			
95	71.0	71.0	71.0	70.1	68.8	68.2	68.4	68.6	69.2	70.4	71.5	71.7	71.4	71.4	71.8	71.8			
100	68.3	68.4	68.4	67.6	66.5	65.8	66.1	66.2	67.0	68.0	68.9	69.1	68.8	68.8	69.1	69.2			
105	65.3	65.5	65.6	65.0	63.9	63.2	63.3	63.5	64.5	65.1	66.1	66.1	65.8	65.8	66.1	66.2			
110	62.4	62.7	62.8	62.1	61.2	60.7	60.7	60.8	61.4	62.2	62.9	62.9	62.7	62.5	62.8	62.9			
115	59.3	59.6	59.8	59.4	58.6	57.9	58.0	58.0	58.5	59.0	59.7	59.6	59.4	59.2	59.5	59.7			
120	56.2	56.7	56.8	56.5	55.8	55.3	55.2	55.2	55.5	56.0	56.4	56.4	56.1	56.0	56.3	56.4			
125	53.0	53.5	53.8	53.6	52.9	52.5	52.4	52.3	52.5	52.9	53.2	53.0	52.8	52.5	52.9	53.0			
130	49.8	50.3	50.7	50.5	50.1	49.7	49.5	49.3	49.3	49.4	49.7	49.5	49.3	49.1	49.3	49.5			
135	46.5	47.0	47.4	47.3	46.9	46.5	46.4	46.2	45.8	46.0	46.1	45.9	45.7	45.5	45.7	46.0			
140	43.0	43.6	43.9	43.8	43.6	43.3	43.1	43.0	42.6	42.7	42.7	42.5	42.3	42.1	42.3	42.5			
145	39.3	39.8	40.2	40.2	40.1	39.8	39.6	39.5	39.4	39.3	39.4	39.1	38.9	38.6	38.8	39.1			
150	35.7	36.2	36.6	36.6	36.6	36.3	36.2	36.1	36.0	35.9	35.8	35.6	35.4	35.2	35.3	35.5			
155	32.1	32.7	33.0	33.2	33.1	33.0	32.9	32.5	32.4	32.2	32.1	31.8	31.6	31.3	31.4	31.6			
160	27.1	28.3	28.5	29.0	29.0	28.9	28.8	28.4	27.9	27.8	27.4	27.1	26.8	26.2	26.6	26.7			
165	19.7	22.4	22.6	23.3	23.3	23.4	23.2	22.9	22.0	21.9	20.9	20.9	20.6	19.8	19.0	20.2			
170	11.0	13.4	14.6	15.3	14.8	15.3	15.2	14.2	13.4	13.4	12.1	11.3	10.6	9.80	8.53	7.43			
175	0.00	0.00	0.03	0.18	0.46	0.34	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
180	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			

Table 5: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Jul. 17, 2015	Jul. 16, 2016
Digital Power Meter	PF2010A	HZTE028-01	Jul. 17, 2015	Jul. 16, 2016
AC Power Supply	PCR 500L	HZTE001-08	Jul. 17, 2015	Jul. 16, 2016
DC Power Supply	WY12010	HZTE004-03	Jul. 17, 2015	Jul. 16, 2016
Temperature Meter	TES1310	HZTE017-01	Jul. 17, 2015	Jul. 16, 2016
Standard source	D908	HZTE012-01	Jul. 23, 2015	Jul. 22, 2016
Integrate Sphere system	2M	HZTE015-01	Jul. 16, 2015	Jul. 15, 2016
Digital Power Meter	WT210	HZTE008-01	Jul. 17, 2015	Jul. 16, 2016
AC Power Supply	PCR 500L	HZTE001-07	Jul. 17, 2015	Jul. 16, 2016
DC Power Supply	6154	HZTE004-04	Jul. 17, 2015	Jul. 16, 2016
Temperature and humidity recorder	JR900	HZTE018-01	Jul. 21, 2015	Jul. 20, 2016
Standard source	SCL-1400	HZTE012-02	Oct. 21, 2015	Oct. 20, 2016

Table 6: 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 A19s) 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 A19s) 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 1.94% with a coverage factor k=2.

Color Characteristics Measurements

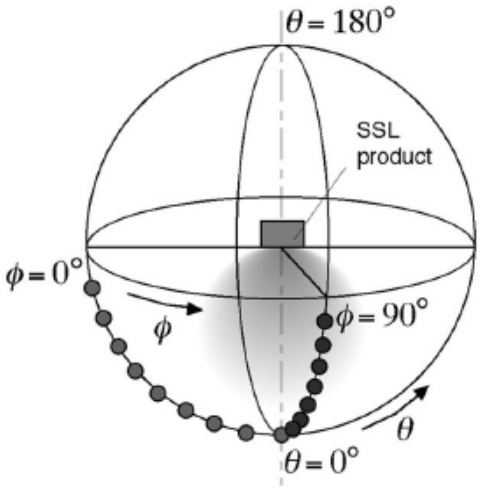
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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



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