



LM-79-08 Test Report

for

GREEN CREATIVE LTD

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

LED Lamp

Model: 18.5A21DIM/927

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ15100032a

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

Review by:

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Oct. 30, 2015

Approved by:



Manager: Jim Zhang
Oct. 30, 2015

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: **18.5A21DIM/927**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
94.5	1728.0	18.28	0.9858
CCT (K)	CRI	Stabilization Time (Light & Power)	
2666	91.4	75	

Table 1: Executive Data Summary

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

Test specifications:

Date of Receipt	: Oct. 21, 2015
Date of Test	: Oct. 27, 2015 to Oct. 30, 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

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Sample Photo



Figure 1- Overview of the sample

Equipment Under Test (EUT)

Name	: LED Lamp
Model	: 18.5A21DIM/927
Electrical Ratings	: 120Vac, 60Hz, 18.5W
Product Description	: E26 base, 2700K, Frosted lens
Manufacturer	: GREEN CREATIVE LTD
Address	: 756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai

TEST RESULTS

Test ambient temperature was 24.7°C.

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

The stabilization time of the sample was 75 minutes, and the total operating time including stabilization was 80 minutes.

Sphere-Spectroradiometer Method

Parameter	Result
Test Voltage (V)	120.0
Voltage frequency (Hz)	60
Test Current (A)	0.155
Power Factor	0.9858
Test Power (W)	18.28
THD A%	7.22
Luminous Efficacy (lm/W)	94.5
Total Luminous Flux (lm)	1728.0
Color Rendering Index (CRI)	91.4
R9	54.5
Correlated Color Temperature (CCT) (K)	2666
Chromaticity Chroma x	0.4620
Chromaticity Chroma y	0.4103
Chromaticity Chroma u	0.2640
Chromaticity Chroma v	0.3517
Duv	0.0003
Chromaticity Chroma u'	0.2640
Chromaticity Chroma v'	0.5276

Special Color Rendering Indices	
R1	91.3
R2	95.4
R3	97.9
R4	91.2
R5	90.9
R6	94.8
R7	90.9
R8	79.1
R9	54.5
R10	88.4
R11	91.7
R12	84.3
R13	92.3
R14	98.1

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 22.5°horizontal intervals.

Parameter	Result
Test Voltage (V)	120.0
Voltage frequency (Hz)	60
Test Current (A)	0.155
Power Factor	0.9856
Test Power (W)	18.36
Luminous Efficacy (lm/W)	94.3
Total Luminous Flux (lm)	1732.2
Beam Angle (°)	311.6
Center Beam Candle Power (cd)	125
Maximum Beam Candle Power (cd)	165.4 (At: C=315.0, Gamma=78.5)
Spacing Criteria	1.76 (0°-180°)/ 1.76 (90°-270°)
Zonal Lumens in the 0°-60°Zone	26.29%
Zonal Lumens in the 60°-90°Zone	29.35%
Zonal Lumens in the 90°-120°Zone	27.19%
Zonal Lumens in the 120°-180°Zone	17.17%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

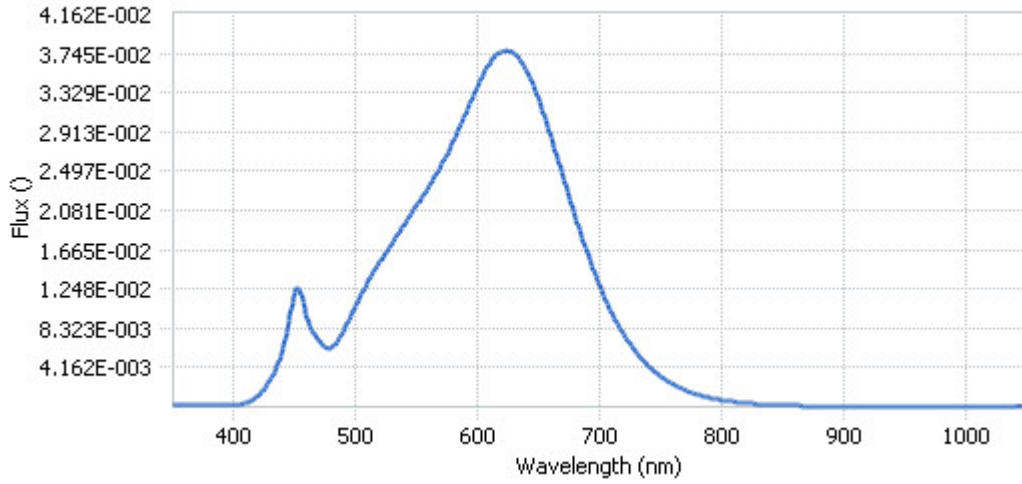
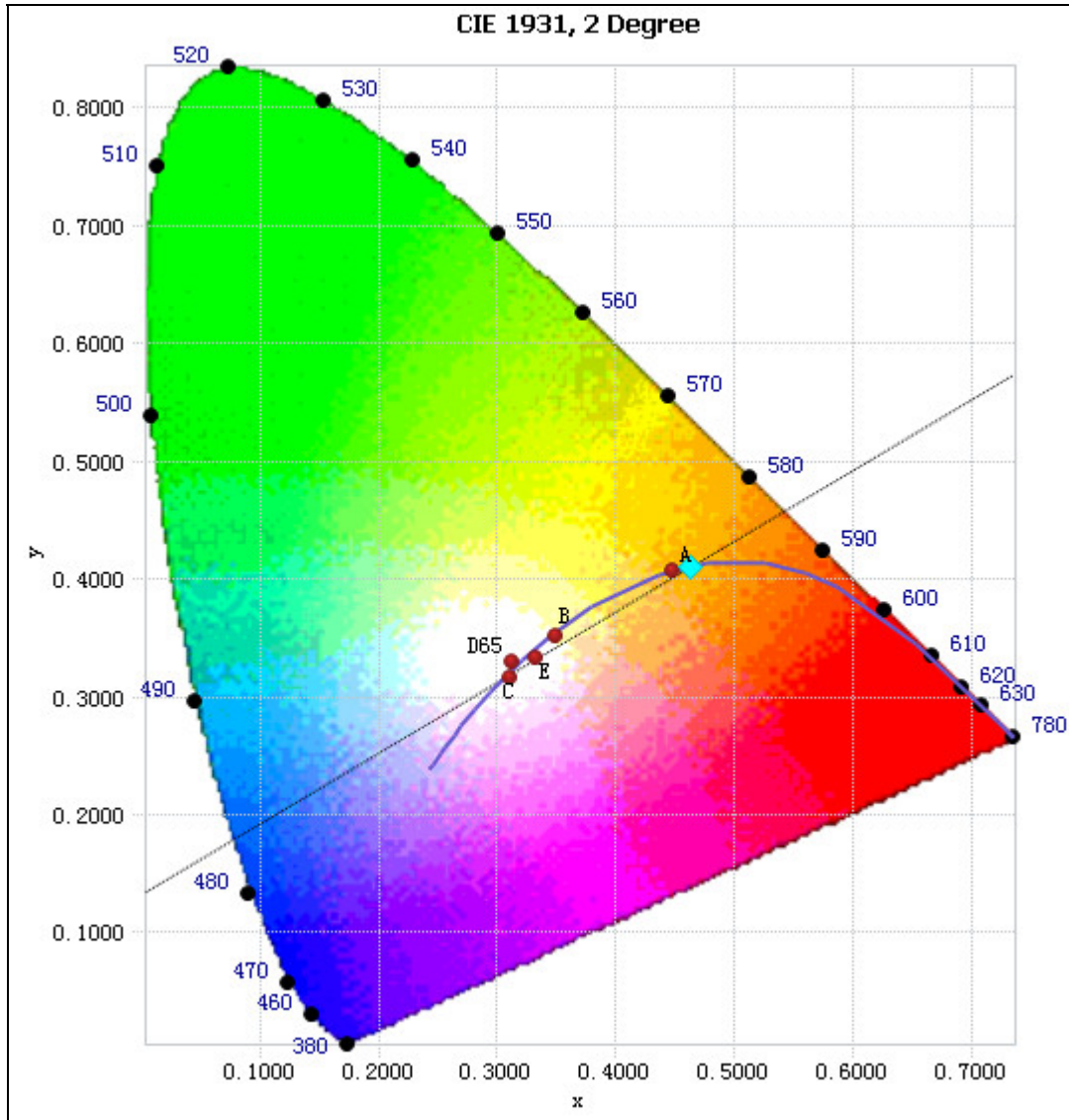


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.95E-04	485	6.97E-03	590	3.10E-02	695	1.45E-02
385	1.78E-04	490	8.07E-03	595	3.25E-02	700	1.29E-02
390	1.90E-04	495	9.40E-03	600	3.40E-02	705	1.13E-02
395	2.13E-04	500	1.08E-02	605	3.54E-02	710	9.97E-03
400	2.00E-04	505	1.21E-02	610	3.63E-02	715	8.77E-03
405	2.76E-04	510	1.33E-02	615	3.73E-02	720	7.67E-03
410	4.26E-04	515	1.44E-02	620	3.77E-02	725	6.70E-03
415	7.04E-04	520	1.55E-02	625	3.76E-02	730	5.82E-03
420	1.17E-03	525	1.64E-02	630	3.75E-02	735	5.01E-03
425	1.91E-03	530	1.74E-02	635	3.68E-02	740	4.34E-03
430	2.95E-03	535	1.84E-02	640	3.57E-02	745	3.74E-03
435	4.34E-03	540	1.95E-02	645	3.43E-02	750	3.25E-03
440	6.19E-03	545	2.04E-02	650	3.27E-02	755	2.80E-03
445	9.05E-03	550	2.15E-02	655	3.07E-02	760	2.41E-03
450	1.22E-02	555	2.24E-02	660	2.87E-02	765	2.08E-03
455	1.20E-02	560	2.34E-02	665	2.66E-02	770	1.79E-03
460	9.36E-03	565	2.45E-02	670	2.44E-02	775	1.53E-03
465	7.85E-03	570	2.56E-02	675	2.23E-02	780	1.31E-03
470	6.98E-03	575	2.68E-02	680	2.02E-02		
475	6.29E-03	580	2.82E-02	685	1.82E-02		
480	6.30E-03	585	2.96E-02	690	1.63E-02		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4620, 0.4103)

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

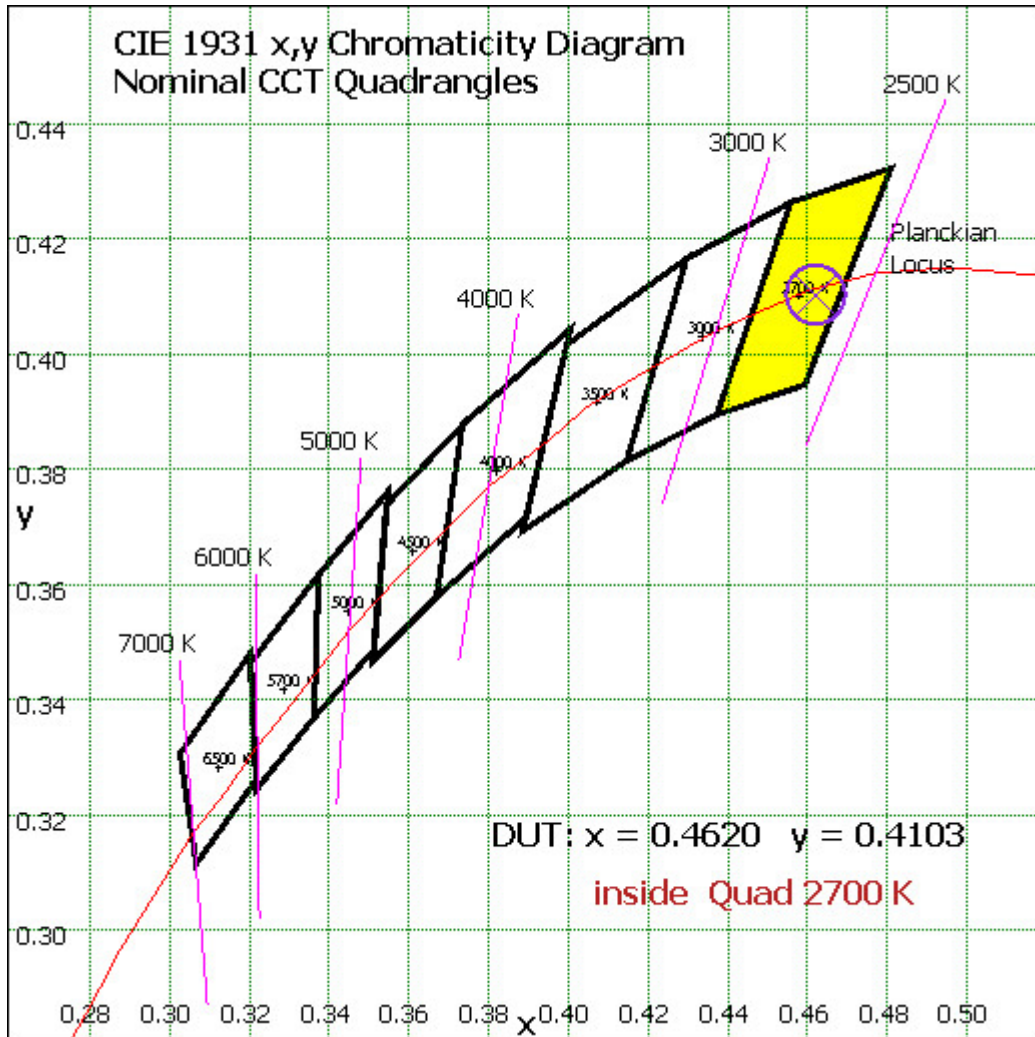


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

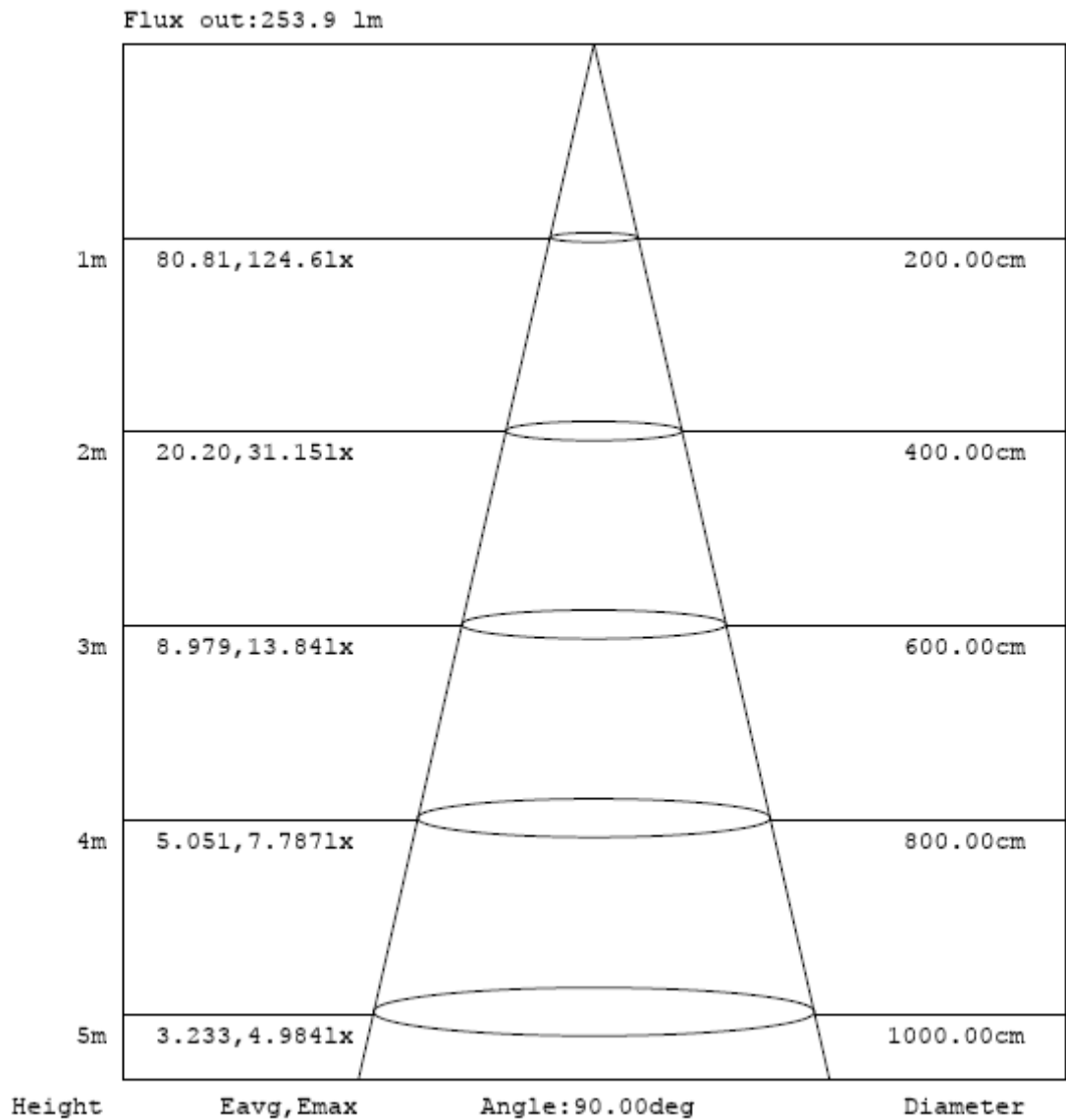
Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total	$\gamma(^{\circ})$	Lumens	% Total
0~5	2.981	0.17%	90~95	86.902	5.02%
5~10	8.981	0.52%	95~100	84.718	4.89%
10~15	15.083	0.87%	100~105	81.648	4.71%
15~20	21.329	1.23%	105~110	77.707	4.49%
20~25	27.746	1.60%	110~115	72.891	4.21%
25~30	34.328	1.98%	115~120	67.199	3.88%
30~35	41.04	2.37%	120~125	60.733	3.51%
35~40	47.821	2.76%	125~130	53.643	3.10%
40~45	54.577	3.15%	130~135	46.153	2.66%
45~50	61.137	3.53%	135~140	38.551	2.23%
50~55	67.333	3.89%	140~145	31.123	1.80%
55~60	72.98	4.21%	145~150	24.114	1.39%
60~65	77.917	4.50%	150~155	17.755	1.03%
65~70	81.996	4.73%	155~160	12.302	0.71%
70~75	85.105	4.91%	160~165	7.851	0.45%
75~80	87.175	5.03%	165~170	4.172	0.24%
80~85	88.165	5.09%	170~175	0.955	0.06%
85~90	88.067	5.08%	175~180	0.012	0.00%

$\gamma(^{\circ})$	Lumens	% Total
0-135	1595.355	92.10%
135-180	136.835	7.90%
0-180	1732.2	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

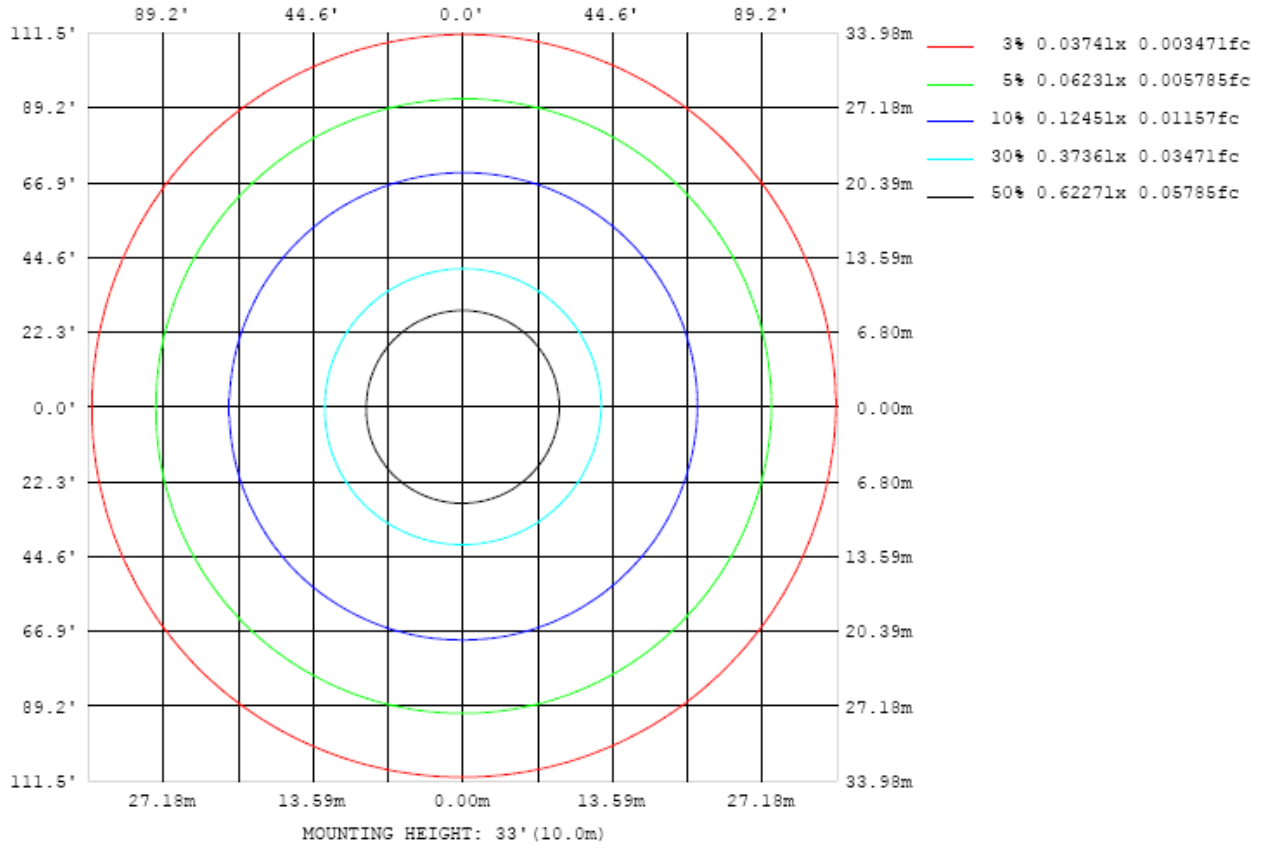


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

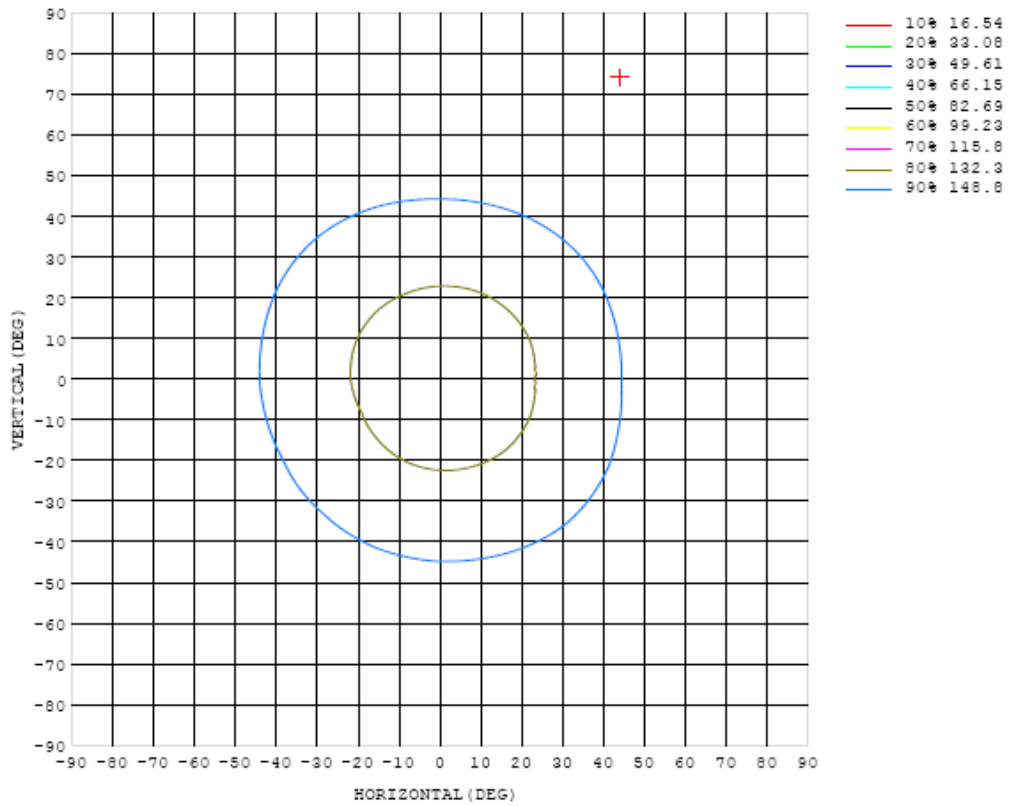


Chart 6: Isocandela Plot

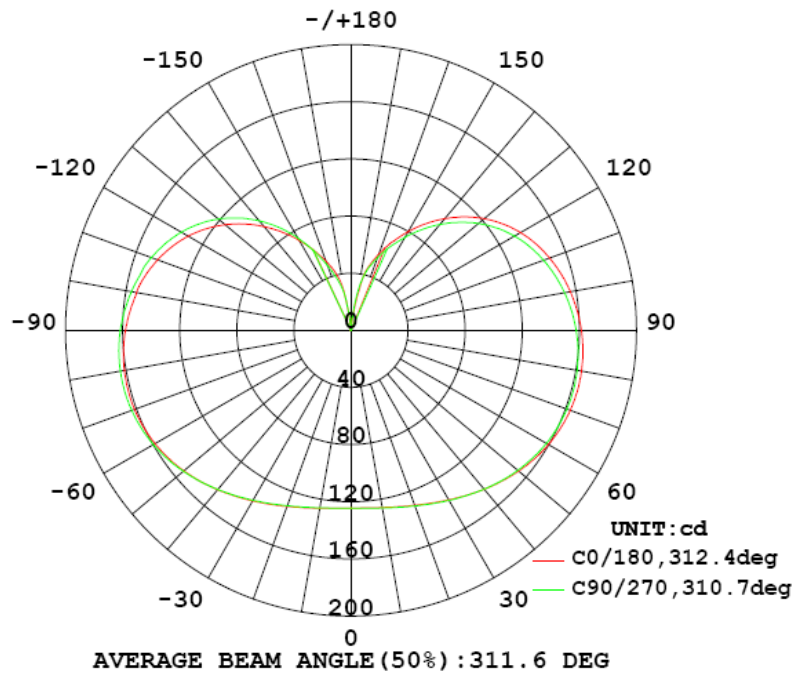


Chart 7: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1 UNIT: cd

C (DEG) \ y (DEG)	0	23	45	68	90	113	135	158	180	203	225	248	270	293	315	338			
0	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125			
5	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125			
10	126	126	126	126	126	126	127	127	126	126	126	126	126	126	126	126			
15	128	128	128	128	128	128	129	129	128	128	128	128	128	128	128	128			
20	130	130	130	130	131	131	132	132	131	131	131	131	131	130	130	130			
25	133	133	133	133	134	134	135	135	134	134	134	134	134	134	133	133			
30	137	137	137	137	137	138	139	139	138	138	137	137	137	137	137	137			
35	141	140	140	141	141	142	143	143	142	141	141	141	141	141	141	141			
40	145	145	144	145	145	146	147	147	146	145	145	145	145	145	145	145			
45	149	148	148	149	149	150	151	151	149	149	149	149	150	150	149	149			
50	153	152	152	152	152	153	155	154	153	153	153	153	153	154	154	153			
55	157	156	155	155	155	156	158	157	156	156	156	156	157	157	157	157			
60	160	158	158	158	158	159	160	160	159	159	159	159	160	160	160	160			
65	162	160	160	160	160	161	162	162	160	161	161	161	162	162	163	163			
70	163	162	161	161	161	162	163	163	161	162	162	162	164	164	164	164			
75	164	162	162	161	161	162	163	163	162	162	163	163	164	165	165	165			
80	164	162	161	161	161	162	162	162	161	161	162	163	164	165	165	165			
85	163	162	160	160	160	160	161	160	160	160	161	162	163	164	165	165			
90	161	160	159	158	158	158	159	158	158	158	159	161	162	163	164	163			
95	159	158	157	155	155	155	156	155	155	156	157	158	159	160	162	161			
100	156	155	153	152	152	152	152	152	153	153	154	155	156	158	159	158			
105	152	152	150	148	148	148	148	148	149	149	151	152	153	154	155	155			
110	148	147	146	144	144	143	143	143	144	144	146	148	149	151	152	151			
115	143	142	141	139	138	138	137	137	139	139	141	143	144	145	147	147			
120	137	136	135	133	132	132	131	131	132	132	134	137	137	139	141	141			
125	130	129	128	125	125	124	123	123	124	124	126	129	130	132	134	134			
130	122	121	119	117	116	116	114	114	115	114	117	120	121	123	126	125			
135	112	112	110	108	107	106	105	104	105	104	106	110	111	113	116	116			
140	102	102	100	97.9	96.8	95.9	94.8	94.1	94.8	93.8	95.2	98.1	100	102	106	106			
145	91.2	90.9	89.6	87.4	86.1	85.1	84.2	83.3	83.9	82.7	83.5	85.7	88.0	90.2	93.9	95.0			
150	79.8	79.7	78.6	76.6	75.1	74.0	73.2	72.3	72.8	71.6	71.4	72.9	74.7	77.0	81.1	83.3			
155	68.6	67.9	67.7	66.0	64.6	63.5	62.9	62.1	61.8	60.8	59.8	60.1	61.1	63.1	66.8	69.9			
160	56.7	57.7	57.3	55.7	54.0	52.8	52.5	51.8	51.4	50.8	49.5	48.2	48.3	49.4	52.5	56.2			
165	45.2	46.8	46.7	45.5	43.8	42.7	42.5	41.4	41.6	41.5	40.6	36.6	37.0	37.0	39.4	42.9			
170	23.5	27.5	32.5	30.5	27.7	26.3	26.1	20.8	24.2	24.2	19.1	19.0	23.3	22.6	23.6	27.1			
175	1.77	3.32	3.31	3.05	2.93	1.94	1.83	0.23	0.31	0.34	0.62	1.00	1.38	2.07	2.92	3.95			
180	0.20	0.21	0.21	0.21	0.21	0.20	0.21	0.21	0.20	0.21	0.21	0.21	0.20	0.20	0.20	0.21			

Table 6: 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 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 1.06% 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

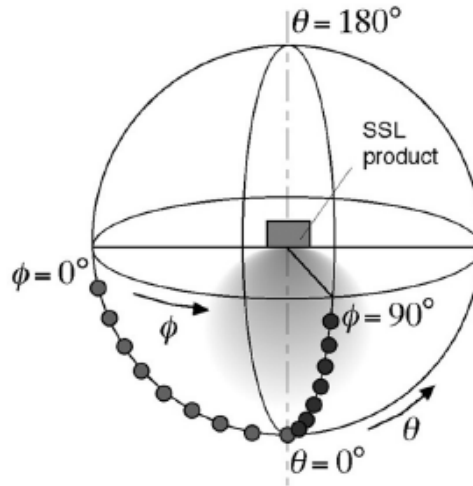
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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