

## LM-79-08 TEST REPORT

for

### GREEN CREATIVE LTD

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

### LED Lamp

Model: 9A19DIM/927/GU24/R

### Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ19040047a

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

Review by:



Engineer: April Zou  
May 10, 2019

Approved by:



Manager: Jim Zhang  
May 10, 2019

## TEST SUMMARY

Sample Tested: 9A19DIM/927/GU24/R

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
99.7	891.4	8.94	0.9167
CCT (K)	CRI	Stabilization Time (Light & Power)	
2807	92.9	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** : Apr. 26, 2019

**Date of Test** : May 01, 2019

**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  
ANSI/IES TM-30-18 IES Method for Evaluating Light Source Color Rendition

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## SAMPLE PHOTO



Figure 1- Overview of the sample

### Equipment Under Test(EUT)

<b>Name</b>	: LED Lamp
<b>Model</b>	: 9A19DIM/927/GU24/R
<b>Electrical Ratings</b>	: 120V, 60Hz, 9W
<b>Product Description</b>	: 2700K
<b>Manufacturer</b>	: GREEN CREATIVE LTD
<b>Address</b>	: 756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai

## TEST RESULTS

Test ambient temperature was 26.0°C.

Base orientation was base 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)	0.081
Power Factor	0.9167
Test Power (W)	8.94
THD A%	35.09
Luminous Efficacy (lm/W)	99.7
Total Luminous Flux (lm)	891.4
Color Rendering Index (CRI)	92.9
R9	53.6
Correlated Color Temperature (CCT)(K)	2807
Chromaticity Chroma x	0.4510
Chromaticity Chroma y	0.4082
Chromaticity Chroma u	0.2579
Chromaticity Chroma v	0.3501
Duv	0.0001
Chromaticity Chroma u'	0.2579
Chromaticity Chroma v'	0.5251

Special Color Rendering Indices	
R1	95.5
R2	95.9
R3	93.9
R4	95.5
R5	94.2
R6	95.7
R7	92.1
R8	80.6
R9	53.6
R10	87.3
R11	95.3
R12	79.4
R13	96.1
R14	95

Table 2: Test data per Sphere-Spectroradiometer Method

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

### Goniophotometer Method

Test ambient temperature was 24.7°C.

The photometric distance is 2.47 m.

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)	0.081
Power Factor	0.9211
Power (W)	8.99
Luminous Efficacy (lm/W)	99.2
Total Luminous Flux (lm)	904.8
Beam Angle (°)	225.2 (0°-180°) / 223.4 (90°-270°)
Center Beam Candle Power (cd)	110
Maximum Beam Candle Power (cd)	110.7 (At: C=260.0, Gamma=27.5)
Spacing Criteria	1.52 (0°-180°) / 1.54 (90°-270°)
Zonal Lumens in the 0°-60° Zone	36.98%
Zonal Lumens in the 60°-90° Zone	30.85%
Zonal Lumens in the 90°-120° Zone	21.65%
Zonal Lumens in the 120°-180° Zone	10.52%

Table 3: Test data per Goniophotometer Method

**Spectral Power Distribution - Sphere Spectroradiometer Method**

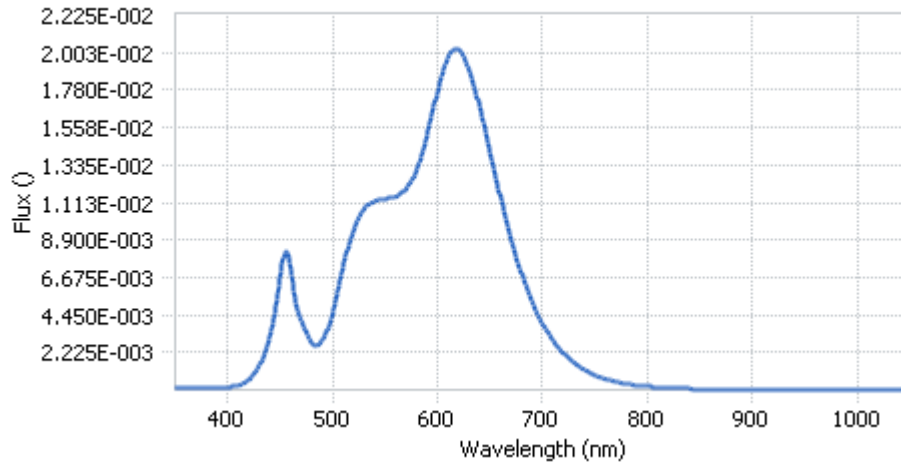
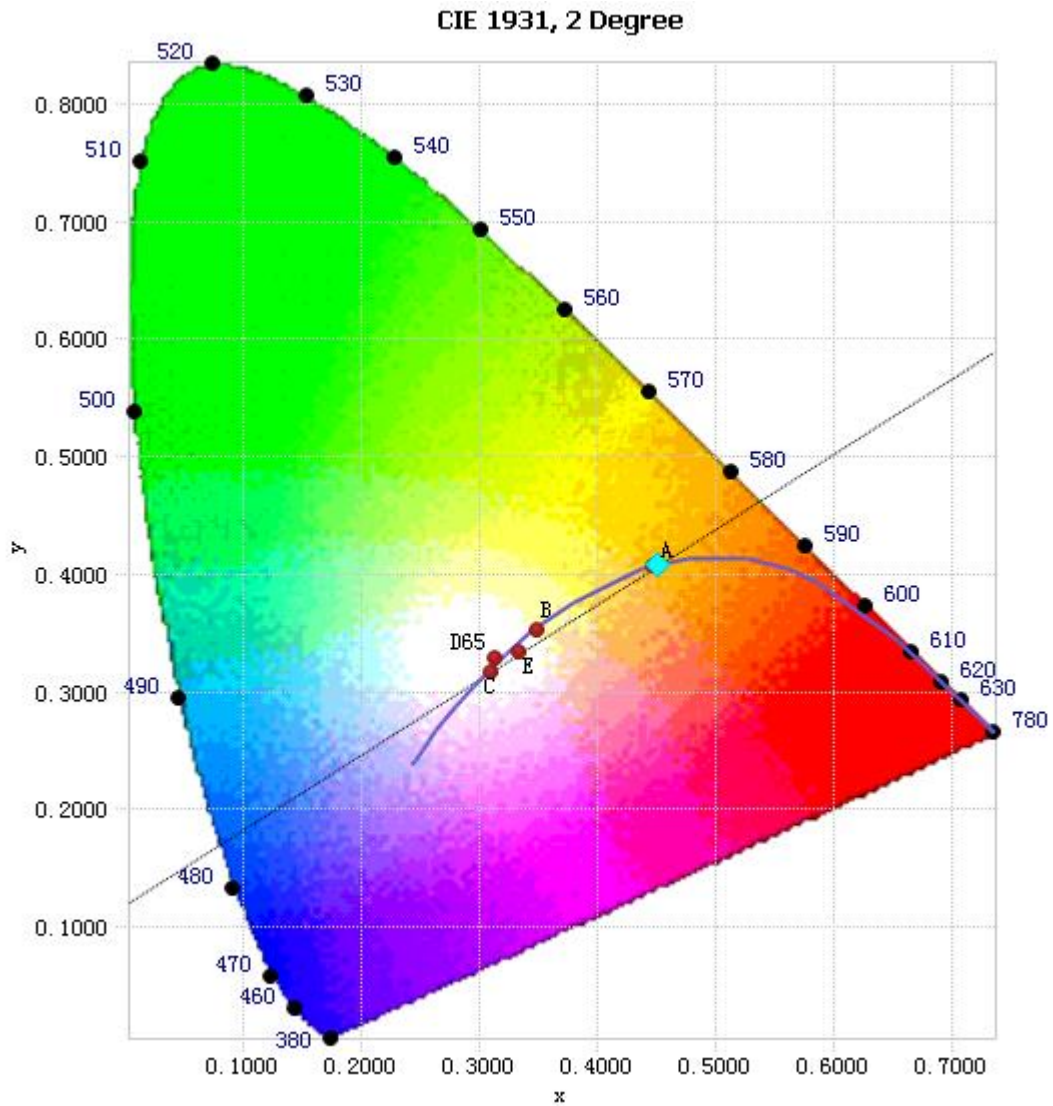


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.42E-04	485	2.63E-03	590	1.52E-02	695	4.56E-03
385	1.47E-04	490	2.93E-03	595	1.65E-02	700	3.95E-03
390	1.46E-04	495	3.56E-03	600	1.78E-02	705	3.41E-03
395	1.57E-04	500	4.59E-03	605	1.89E-02	710	2.93E-03
400	1.65E-04	505	5.92E-03	610	1.98E-02	715	2.53E-03
405	2.04E-04	510	7.30E-03	615	2.02E-02	720	2.19E-03
410	2.79E-04	515	8.56E-03	620	2.02E-02	725	1.88E-03
415	3.88E-04	520	9.56E-03	625	1.98E-02	730	1.62E-03
420	6.04E-04	525	1.03E-02	630	1.90E-02	735	1.39E-03
425	9.43E-04	530	1.07E-02	635	1.79E-02	740	1.19E-03
430	1.46E-03	535	1.10E-02	640	1.68E-02	745	1.02E-03
435	2.19E-03	540	1.12E-02	645	1.55E-02	750	8.76E-04
440	3.21E-03	545	1.13E-02	650	1.41E-02	755	7.61E-04
445	4.58E-03	550	1.13E-02	655	1.28E-02	760	6.54E-04
450	6.67E-03	555	1.14E-02	660	1.15E-02	765	5.63E-04
455	8.23E-03	560	1.15E-02	665	1.02E-02	770	4.86E-04
460	7.20E-03	565	1.16E-02	670	8.95E-03	775	4.21E-04
465	5.18E-03	570	1.19E-02	675	7.88E-03	780	3.60E-04
470	4.15E-03	575	1.24E-02	680	6.92E-03		
475	3.40E-03	580	1.31E-02	685	6.05E-03		
480	2.75E-03	585	1.40E-02	690	5.25E-03		

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

**Chromaticity Diagram - Sphere Spectroradiometer Method**



Tristimulus values(x, y): (0.4510, 0.4082)

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

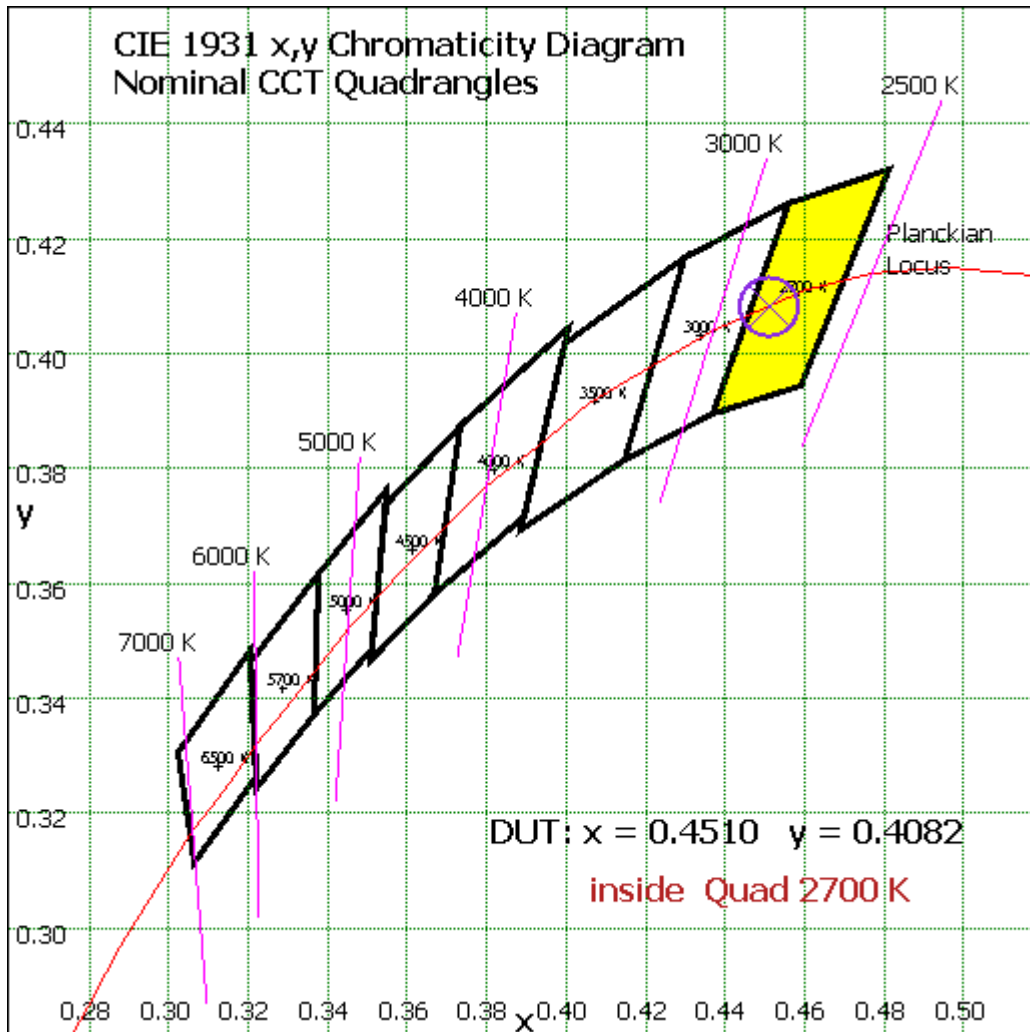
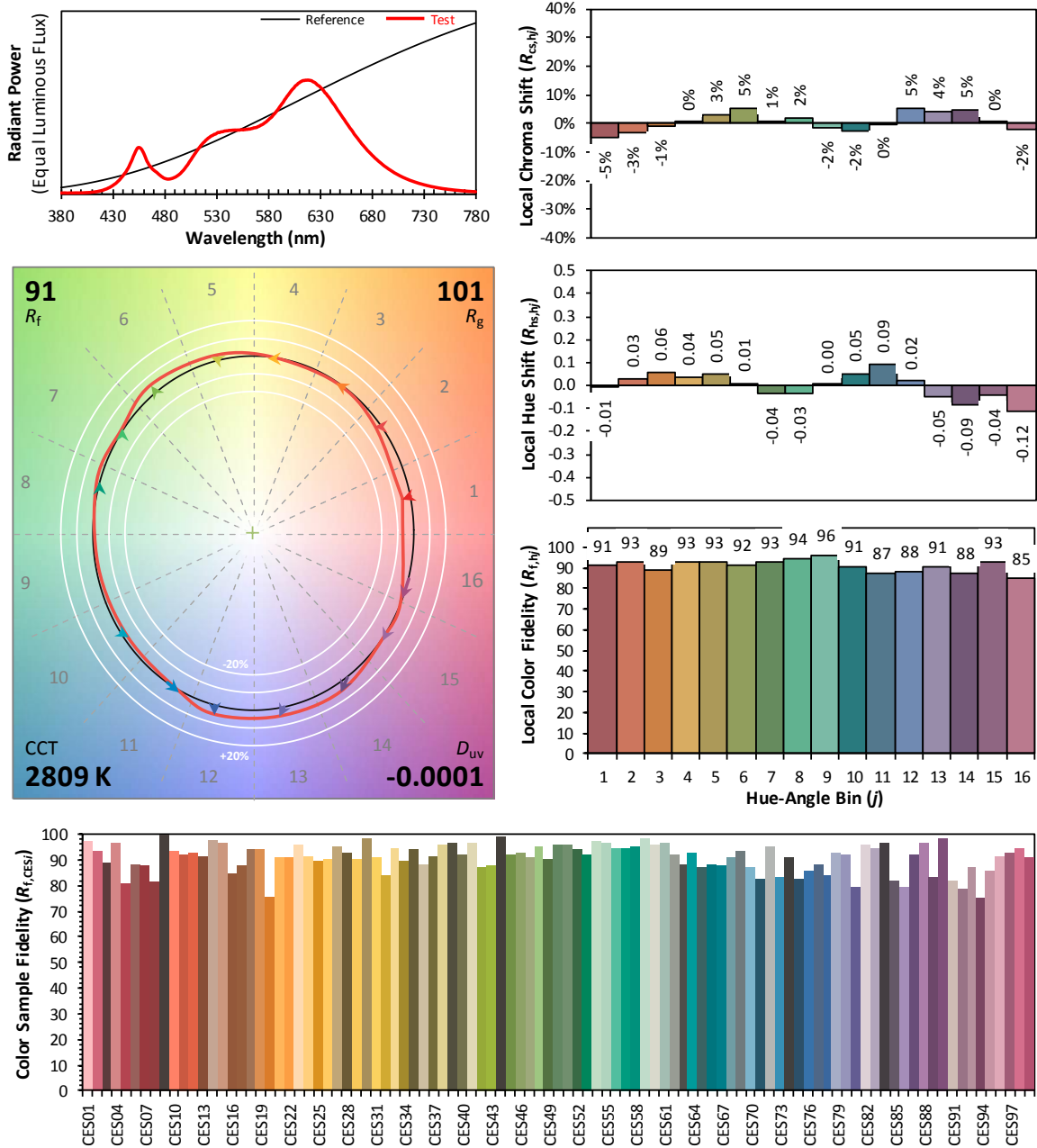


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

**Color Rendition Report – Sphere Spectroradiometer Method**



**Notes:** This is a recommended method for displaying ANSI/IES TM-30-18 information.

$x$  0.4510  
 $y$  0.4082  
 $u'$  0.2579  
 $v'$  0.5251

Chart 4: Full Report Created with the IES TM-30 Calculator

Note: The values in this diagram might be a little different from the values in Table 2 due to rounding.

**Zonal Lumen Tabulation- Goniophotometer Method**

$\gamma(^{\circ})$	Lumens	% Total
0- 10	10.456	1.16%
10- 20	31.052	3.43%
20- 30	50.642	5.60%
30- 40	68.218	7.54%
40- 50	82.367	9.10%
50- 60	91.854	10.15%
60- 70	95.976	10.61%
70- 80	94.668	10.46%
80- 90	88.458	9.78%
90-100	78.304	8.65%
100-110	65.637	7.25%
110-120	51.961	5.74%
120-130	38.608	4.27%
130-140	26.639	2.94%
140-150	16.757	1.85%
150-160	9.222	1.02%
160-170	3.623	0.40%
170-180	0.349	0.04%
Total	904.8	100%

$\gamma(^{\circ})$	Lumens	% Total
0-130	848.201	93.75%
130-180	56.59	6.25%
0-180	904.8	100%

Table 5: Zonal Lumen

**Illuminance Plots- Goniophotometer Method**

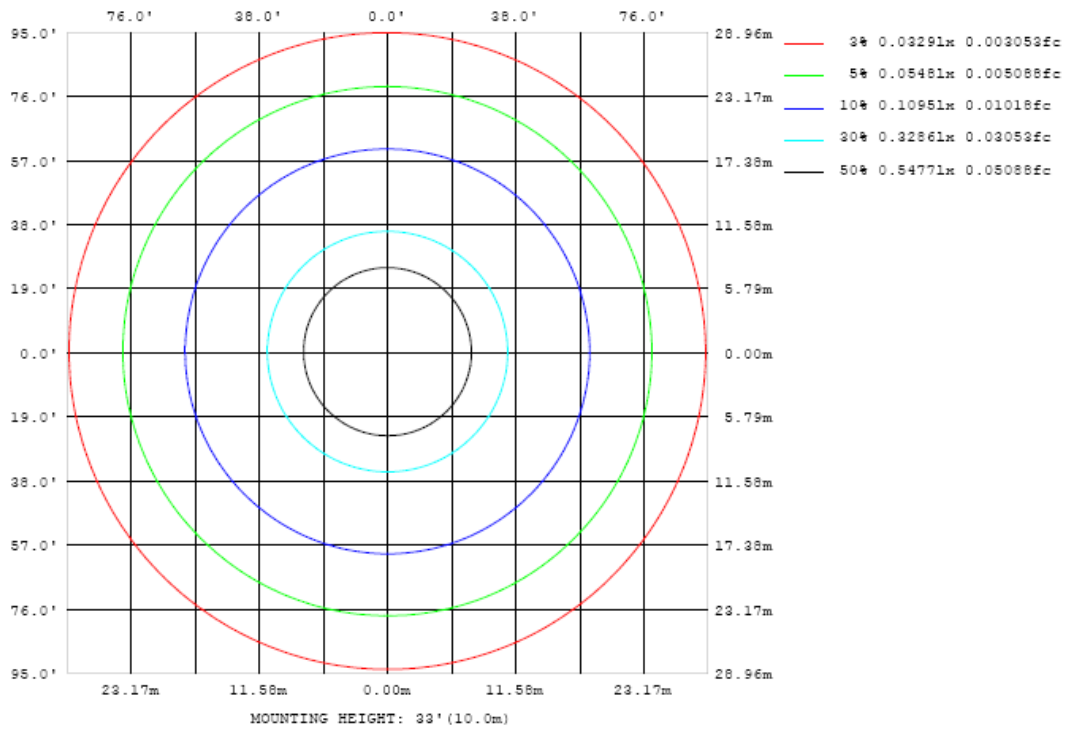


Chart 5: Illuminance Plot (Footcandles)

**Luminous Intensity Distribution Plots- Goniophotometer Method**

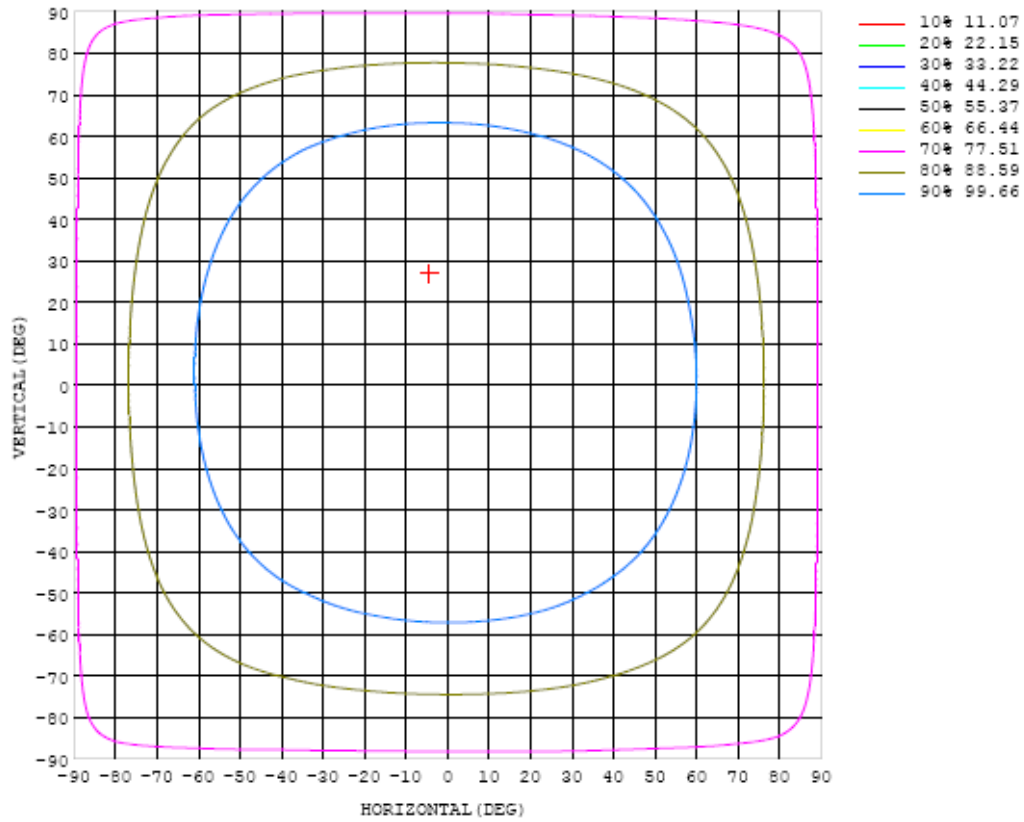


Chart 6: Isocandela Plot

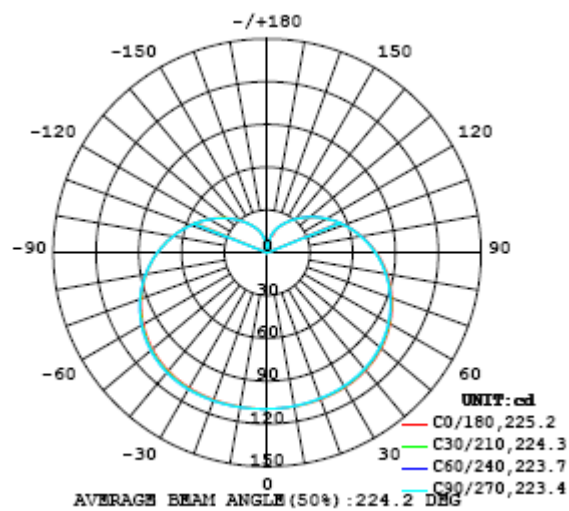


Chart 7: Polar Candela Distribution

**Luminous Intensity Data- Goniophotometer Method**

Table--1 UNIT: cd

C (DEG) y (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110
5	110	110	109	109	109	109	109	109	109	109	109	109	109	109	109	109	109	110	110
10	110	109	109	109	109	109	109	109	109	109	109	109	109	109	109	109	109	109	110
15	110	109	109	109	109	109	109	109	109	109	109	109	109	109	109	109	109	109	110
20	109	109	109	109	109	109	109	109	109	109	109	109	109	109	109	109	109	109	109
25	109	109	109	109	109	109	108	108	108	108	108	108	108	109	109	109	109	109	109
30	109	109	109	108	108	108	108	108	108	108	108	108	108	108	108	109	109	109	109
35	109	108	108	108	108	107	107	107	107	107	107	107	107	107	108	108	108	109	109
40	108	107	107	107	107	106	106	106	106	106	106	106	106	106	107	107	107	108	108
45	106	106	106	105	105	105	105	105	105	105	105	105	105	105	105	106	106	106	107
50	104	104	104	104	103	103	103	103	103	103	103	103	103	103	104	104	104	105	105
55	102	102	102	101	101	101	101	101	101	101	101	101	101	101	101	102	102	103	103
60	99.7	99.4	99.0	98.8	98.5	98.3	98.3	98.2	98.2	98.1	98.1	98.2	98.3	98.5	98.9	99.2	99.5	99.9	100
65	96.6	96.4	96.0	95.8	95.5	95.3	95.3	95.3	95.2	95.1	95.2	95.2	95.4	95.5	95.9	96.2	96.5	96.9	97.2
70	93.3	93.0	92.7	92.4	92.1	92.0	92.0	91.9	91.9	91.8	91.8	91.9	92.0	92.2	92.5	92.8	93.2	93.5	93.8
75	89.6	89.3	89.0	88.7	88.5	88.4	88.4	88.3	88.2	88.2	88.2	88.2	88.4	88.5	88.8	89.1	89.4	89.8	90.1
80	85.6	85.3	85.0	84.7	84.5	84.4	84.4	84.4	84.3	84.3	84.3	84.3	84.4	84.6	84.9	85.1	85.4	85.8	86.0
85	81.3	81.1	80.7	80.6	80.4	80.3	80.4	80.3	80.2	80.2	80.2	80.2	80.3	80.4	80.6	80.8	81.1	81.4	81.7
90	76.8	76.6	76.4	76.2	76.1	76.0	76.0	76.0	75.9	75.9	75.9	75.8	75.9	76.0	76.1	76.3	76.5	76.8	77.0
95	72.0	71.9	71.8	71.6	71.5	71.4	71.5	71.4	71.4	71.3	71.3	71.2	71.3	71.3	71.5	71.6	71.8	72.0	72.1
100	67.2	67.1	67.0	66.9	66.8	66.7	66.8	66.7	66.7	66.6	66.6	66.6	66.5	66.6	66.7	66.8	66.9	67.1	67.2
105	62.3	62.3	62.2	62.1	62.1	62.1	62.1	62.1	62.0	61.9	61.9	61.8	61.8	61.8	61.9	62.0	62.0	62.1	62.2
110	57.5	57.5	57.4	57.4	57.3	57.3	57.4	57.3	57.3	57.2	57.1	57.2	57.1	57.1	57.1	57.2	57.2	57.2	57.2
115	52.6	52.7	52.7	52.7	52.7	52.7	52.7	52.7	52.6	52.5	52.5	52.4	52.3	52.3	52.4	52.4	52.3	52.3	52.3
120	47.9	48.0	48.0	48.0	48.0	48.1	48.1	48.1	48.0	47.9	47.8	47.8	47.7	47.7	47.7	47.6	47.6	47.6	47.5
125	43.3	43.4	43.4	43.5	43.5	43.6	43.6	43.6	43.5	43.4	43.3	43.2	43.2	43.1	43.1	43.0	43.0	42.9	42.8
130	38.9	39.0	39.1	39.1	39.1	39.2	39.2	39.2	39.1	39.0	39.0	38.8	38.8	38.7	38.7	38.6	38.5	38.4	38.3
135	34.7	34.8	34.9	34.9	35.0	35.0	35.0	35.0	34.9	34.8	34.8	34.6	34.6	34.5	34.5	34.4	34.2	34.1	34.0
140	30.7	30.8	30.9	30.9	31.0	31.0	31.0	31.0	30.9	30.9	30.8	30.7	30.6	30.5	30.4	30.3	30.2	30.1	30.0
145	26.9	27.0	27.1	27.2	27.2	27.2	27.3	27.2	27.1	27.0	26.9	26.8	26.7	26.7	26.6	26.5	26.3	26.2	26.2
150	23.4	23.5	23.6	23.7	23.7	23.7	23.7	23.7	23.7	23.6	23.5	23.4	23.3	23.2	23.2	23.1	23.0	22.8	22.7
155	20.1	20.4	20.4	20.5	20.5	20.5	20.5	20.5	20.5	20.4	20.3	20.2	20.1	20.1	20.0	19.9	19.8	19.7	19.5
160	15.3	17.3	17.5	17.5	17.5	17.5	17.5	17.5	17.4	17.3	17.3	17.2	17.1	17.0	16.9	16.8	16.6	16.7	16.5
165	12.4	13.5	14.0	14.1	14.0	14.0	14.1	14.0	13.8	13.7	13.8	13.7	13.6	13.5	13.4	13.3	13.0	13.0	12.9
170	8.60	8.91	9.51	9.57	9.43	9.32	9.48	9.43	9.28	8.85	9.12	9.11	9.00	8.92	8.84	8.76	8.27	8.50	8.54
175	0.29	0.22	0.18	0.18	0.17	0.15	0.11	0.09	0.10	0.08	0.07	0.08	0.06	0.05	0.06	0.06	0.07	0.05	0.06
180	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02

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	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110		
5	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110		
10	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110		
15	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110		
20	110	110	110	110	110	110	111	111	111	111	111	110	110	110	110	110	110		
25	110	110	110	110	111	111	111	111	111	111	111	110	110	110	110	110	109		
30	110	110	110	110	111	111	111	111	111	111	110	110	110	110	110	109	109		
35	109	109	110	110	110	110	110	110	110	110	110	110	110	109	109	109	109		
40	108	109	109	109	109	110	110	110	110	109	109	109	109	109	108	108	108		
45	107	107	108	108	108	108	108	108	108	108	108	108	108	107	107	107	106		
50	105	106	106	106	106	107	107	107	107	107	106	106	106	105	105	105	105		
55	103	103	104	104	104	104	104	105	104	104	104	104	104	103	103	103	102		
60	101	101	101	101	102	102	102	102	102	102	101	101	101	100	100	99.9	99.7		
65	97.5	97.7	98.0	98.3	98.5	98.6	98.6	98.6	98.5	98.4	98.1	97.9	97.6	97.4	97.1	96.8	96.7		
70	94.1	94.2	94.5	94.7	94.9	95.0	95.0	95.0	94.9	94.8	94.5	94.3	94.1	93.8	93.6	93.4	93.3		
75	90.3	90.4	90.6	90.8	90.9	91.0	91.0	91.0	90.9	90.8	90.6	90.4	90.1	89.9	89.7	89.6	89.5		
80	86.2	86.2	86.4	86.5	86.6	86.7	86.7	86.6	86.5	86.4	86.2	86.1	85.9	85.7	85.5	85.5	85.4		
85	81.7	81.8	81.8	82.0	82.0	82.0	82.0	82.0	81.9	81.8	81.6	81.6	81.4	81.2	81.1	81.1	81.1		
90	77.1	77.0	77.1	77.2	77.2	77.1	77.2	77.2	77.1	77.0	76.9	76.8	76.6	76.5	76.5	76.5	76.7		
95	72.1	72.1	72.1	72.2	72.2	72.1	72.1	72.2	72.1	72.0	71.9	71.9	71.8	71.7	71.7	71.8	71.9		
100	67.2	67.1	67.1	67.1	67.1	67.0	67.1	67.0	67.0	67.0	66.9	66.9	66.8	66.8	66.9	66.9	67.0		
105	62.1	62.1	62.1	62.0	62.0	61.9	61.9	61.9	61.9	61.9	61.8	61.8	61.8	61.8	61.9	62.0	62.1		
110	57.2	57.0	57.0	57.0	56.9	56.8	56.8	56.8	56.8	56.8	56.8	56.8	56.8	56.9	57.0	57.1	57.3		
115	52.2	52.1	52.0	52.0	51.9	51.8	51.8	51.8	51.8	51.8	51.8	51.9	51.9	52.0	52.1	52.3	52.4		
120	47.4	47.2	47.2	47.1	47.0	46.9	46.9	46.9	46.9	47.0	47.0	47.1	47.1	47.3	47.4	47.6	47.8		
125	42.7	42.6	42.5	42.4	42.3	42.2	42.2	42.2	42.2	42.3	42.3	42.4	42.5	42.6	42.8	43.0	43.2		
130	38.2	38.0	38.0	37.9	37.8	37.7	37.7	37.7	37.7	37.8	37.8	38.0	38.1	38.2	38.4	38.6	38.7		
135	33.9	33.8	33.7	33.6	33.5	33.4	33.4	33.4	33.5	33.5	33.6	33.7	33.8	34.0	34.1	34.3	34.5		
140	29.8	29.7	29.6	29.6	29.5	29.4	29.4	29.4	29.5	29.6	29.6	29.8	29.8	30.0	30.2	30.3	30.5		
145	26.1	26.0	25.9	25.8	25.8	25.7	25.7	25.7	25.8	25.8	25.9	26.1	25.9	26.3	26.4	26.6	26.8		
150	22.6	22.5	22.4	22.4	22.3	22.3	22.3	22.3	22.4	22.4	22.5	22.6	21.9	22.8	23.0	23.1	22.5		
155	19.5	19.4	19.3	19.3	19.2	19.2	19.2	19.2	19.3	19.4	19.4	19.4	17.5	19.1	19.6	19.4	18.8		
160	16.5	16.4	16.3	16.4	16.4	16.3	16.3	16.4	16.4	16.4	15.8	15.6	13.9	14.3	14.0	14.9	15.2		
165	12.9	12.8	12.7	12.8	12.8	12.8	12.8	12.9	12.4	11.8	11.0	9.38	9.58	7.95	6.64	7.97	8.80		
170	8.58	8.49	8.28	8.54	8.57	8.58	8.32	7.72	7.21	6.43	4.92	2.30	2.13	3.75	5.83	6.23	6.34		
175	0.12	0.17	0.22	0.29	0.30	0.27	0.32	0.48	0.40	0.41	0.59	0.53	0.26	0.09	0.17	0.33	0.36		
180	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02		

Table 7: Luminous Intensity Data

## EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Aug. 14, 2018	Aug. 13, 2019
Digital Power Meter	PF2010A	HZTE028-01	Sep. 12, 2018	Sep. 11, 2019
AC Power Supply	DPS1060	HZTE001-06	Aug. 09, 2018	Aug. 08, 2019
DC Power Supply	WY12010	HZTE004-03	Aug. 09, 2018	Aug. 08, 2019
Temperature recorder	JM624U	HZTE018-08	Aug. 09, 2018	Aug. 08, 2019
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 09, 2018	Aug. 08, 2019
Standard source	D908	HZTE012-01	Aug. 14, 2018	Aug. 13, 2019
Integrate Sphere system	3M	HZTE015-04	Aug. 16, 2018	Aug. 15, 2019
Digital Power Meter	WT210	HZTE008-01	Aug. 02, 2018	Aug. 01, 2019
AC Power Supply	PCR 500L	HZTE001-07	Aug. 09, 2018	Aug. 08, 2019
DC Power Supply	IT6154	HZTE004-04	Aug. 09, 2018	Aug. 08, 2019
Standard source	SCL-1400	HZTE012-02	Aug. 16, 2018	Aug. 15, 2019
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 09, 2018	Aug. 08, 2019
Temperature Meter	TES1310	HZTE017-01	Aug. 09, 2018	Aug. 08, 2019

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  $4\pi$ . 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 2.1% 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 2.3% with a coverage factor  $k=2$ .

### **Color Characteristics Measurements**

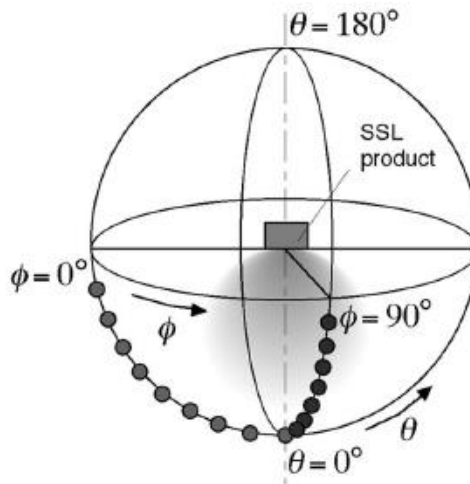
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as 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  $10^\circ$  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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