

LM-79-08 TEST REPORT

for

GREEN CREATIVE LTD

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

LED Lamp

Model: 9A19/940/277V

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ19040047e

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

Review by:



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May 10, 2019

Approved by:



Manager: Jim Zhang
May 10, 2019

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: 9A19/940/277V

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
103.7	907.8	8.75	0.9493
CCT (K)	CRI	Stabilization Time (Light & Power)	
4018	92.0	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)

Name	: LED Lamp
Model	: 9A19/940/277V
Electrical Ratings	: 120-277V, 60Hz, 9W
Product Description	: 4000K
Manufacturer	: GREEN CREATIVE LTD
Address	: 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	277.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.077	0.037
Power Factor	0.9493	0.8535
Test Power (W)	8.75	8.83
THD A%	29.71	33.16
Luminous Efficacy (lm/W)	103.7	103.5
Total Luminous Flux (lm)	907.8	913.7
Color Rendering Index (CRI)	92.0	
R9	64.8	
Correlated Color Temperature (CCT)(K)	4018	
Chromaticity Chroma x	0.3790	
Chromaticity Chroma y	0.3742	
Chromaticity Chroma u	0.2252	
Chromaticity Chroma v	0.3335	
Duv	0.0015	
Chromaticity Chroma u'	0.2252	
Chromaticity Chroma v'	0.5002	

Special Color Rendering Indices	
R1	95.1
R2	98.6
R3	94.6
R4	88.5
R5	92.8
R6	95.1
R7	88.5
R8	82.6
R9	64.8
R10	98.9
R11	90.3
R12	73.8
R13	97.9
R14	97.7

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 2.47 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)	0.077
Power Factor	0.9481
Power (W)	8.72
Luminous Efficacy (lm/W)	105.8
Total Luminous Flux (lm)	922.1
Beam Angle (°)	221.4 (0°-180°) / 222.5 (90°-270°)
Center Beam Candle Power (cd)	114
Maximum Beam Candle Power (cd)	113.9 (At: C=280.0, Gamma=13.0)
Spacing Criteria	1.51 (0°-180°) / 1.52 (90°-270°)
Zonal Lumens in the 0°-60° Zone	37.41%
Zonal Lumens in the 60°-90° Zone	30.88%
Zonal Lumens in the 90°-120° Zone	21.53%
Zonal Lumens in the 120°-180° Zone	10.19%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

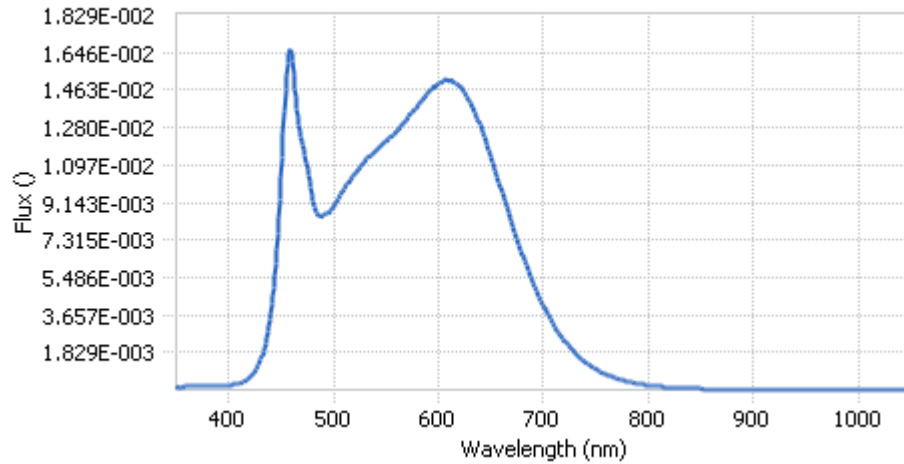
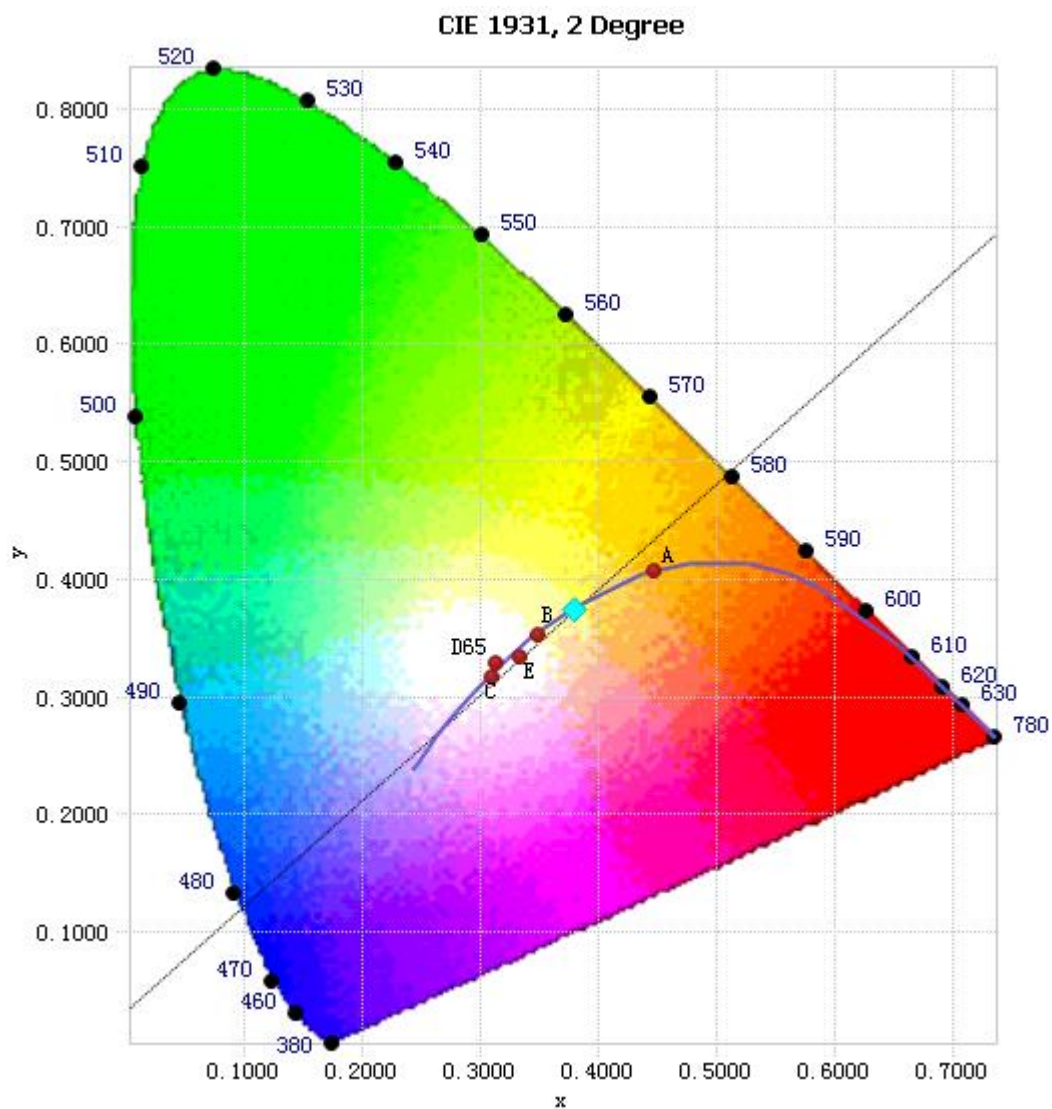


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.82E-04	485	8.54E-03	590	1.45E-02	695	4.62E-03
385	1.86E-04	490	8.50E-03	595	1.47E-02	700	4.08E-03
390	1.90E-04	495	8.66E-03	600	1.49E-02	705	3.59E-03
395	2.20E-04	500	8.95E-03	605	1.51E-02	710	3.14E-03
400	2.43E-04	505	9.37E-03	610	1.51E-02	715	2.75E-03
405	2.61E-04	510	9.80E-03	615	1.50E-02	720	2.39E-03
410	3.29E-04	515	1.02E-02	620	1.48E-02	725	2.09E-03
415	4.17E-04	520	1.06E-02	625	1.45E-02	730	1.81E-03
420	6.07E-04	525	1.09E-02	630	1.41E-02	735	1.57E-03
425	9.14E-04	530	1.11E-02	635	1.35E-02	740	1.35E-03
430	1.43E-03	535	1.14E-02	640	1.29E-02	745	1.16E-03
435	2.29E-03	540	1.17E-02	645	1.21E-02	750	1.00E-03
440	3.76E-03	545	1.19E-02	650	1.14E-02	755	8.68E-04
445	6.16E-03	550	1.21E-02	655	1.05E-02	760	7.49E-04
450	1.03E-02	555	1.24E-02	660	9.74E-03	765	6.46E-04
455	1.54E-02	560	1.26E-02	665	8.91E-03	770	5.56E-04
460	1.64E-02	565	1.29E-02	670	8.08E-03	775	4.78E-04
465	1.37E-02	570	1.32E-02	675	7.33E-03	780	4.12E-04
470	1.21E-02	575	1.35E-02	680	6.58E-03		
475	1.08E-02	580	1.39E-02	685	5.89E-03		
480	9.21E-03	585	1.42E-02	690	5.23E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3790, 0.3742)

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

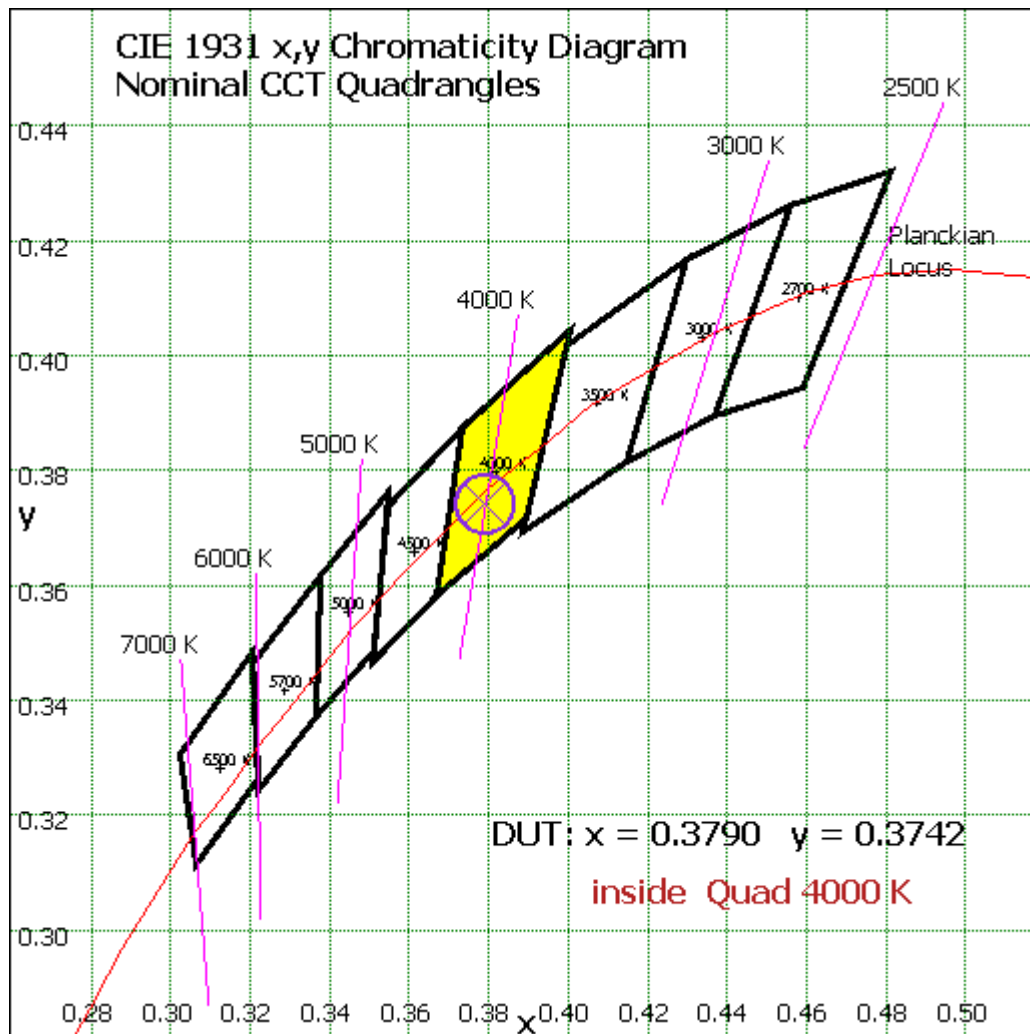
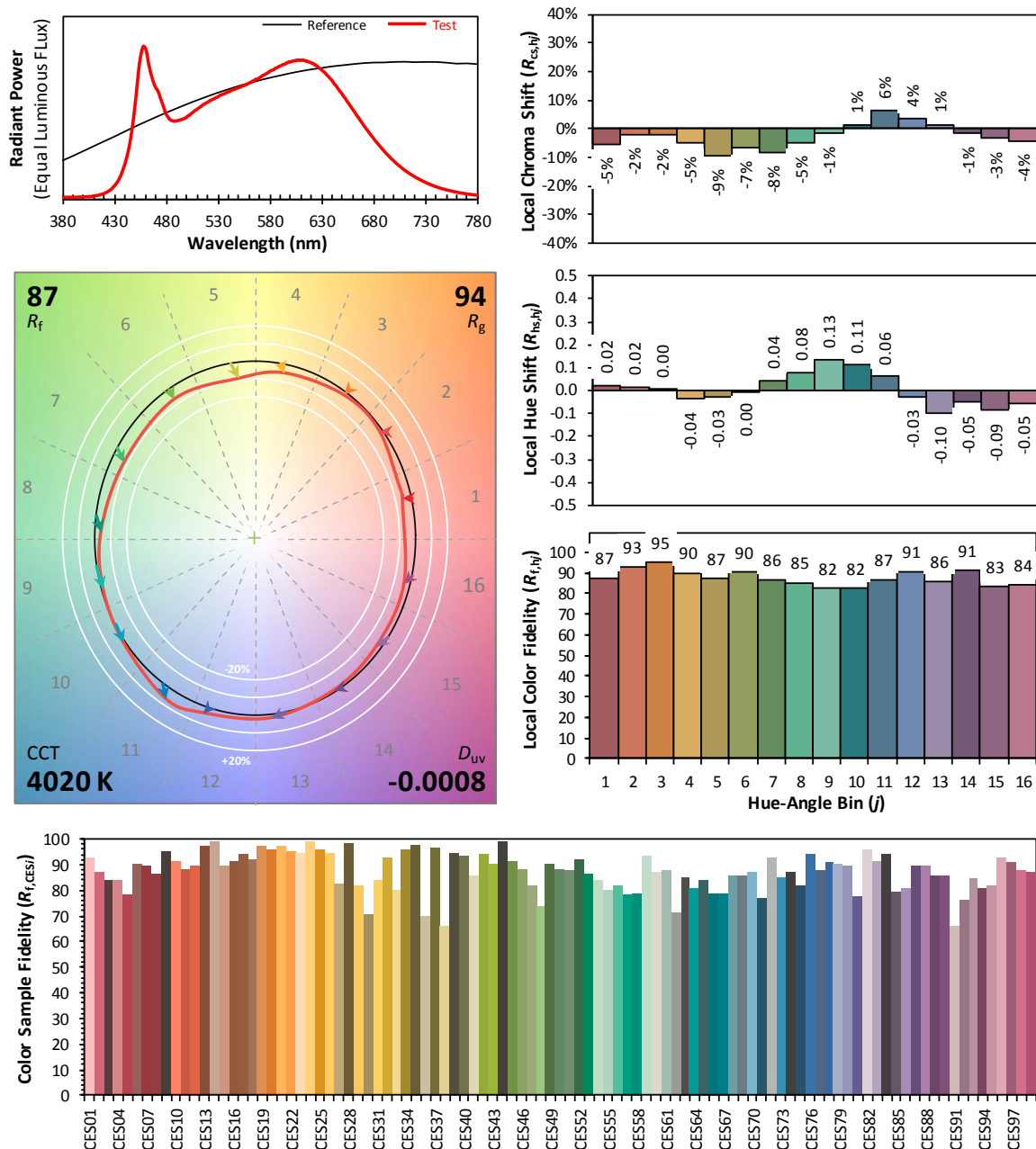


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method



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

x 0.3790
 y 0.3742
 u' 0.2252
 v' 0.5002

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	10.851	1.18%
10- 20	32.21	3.49%
20- 30	52.435	5.69%
30- 40	70.422	7.64%
40- 50	84.767	9.19%
50- 60	94.241	10.22%
60- 70	98.176	10.65%
70- 80	96.554	10.47%
80- 90	89.977	9.76%
90-100	79.496	8.62%
100-110	66.514	7.21%
110-120	52.499	5.69%
120-130	38.826	4.21%
130-140	26.591	2.88%
140-150	16.495	1.79%
150-160	8.751	0.95%
160-170	3.104	0.34%
170-180	0.215	0.02%
Total	922.1	100%

$\gamma(^{\circ})$	Lumens	% Total
0-130	866.968	94.02%
130-180	55.156	5.98%
0-180	922.1	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

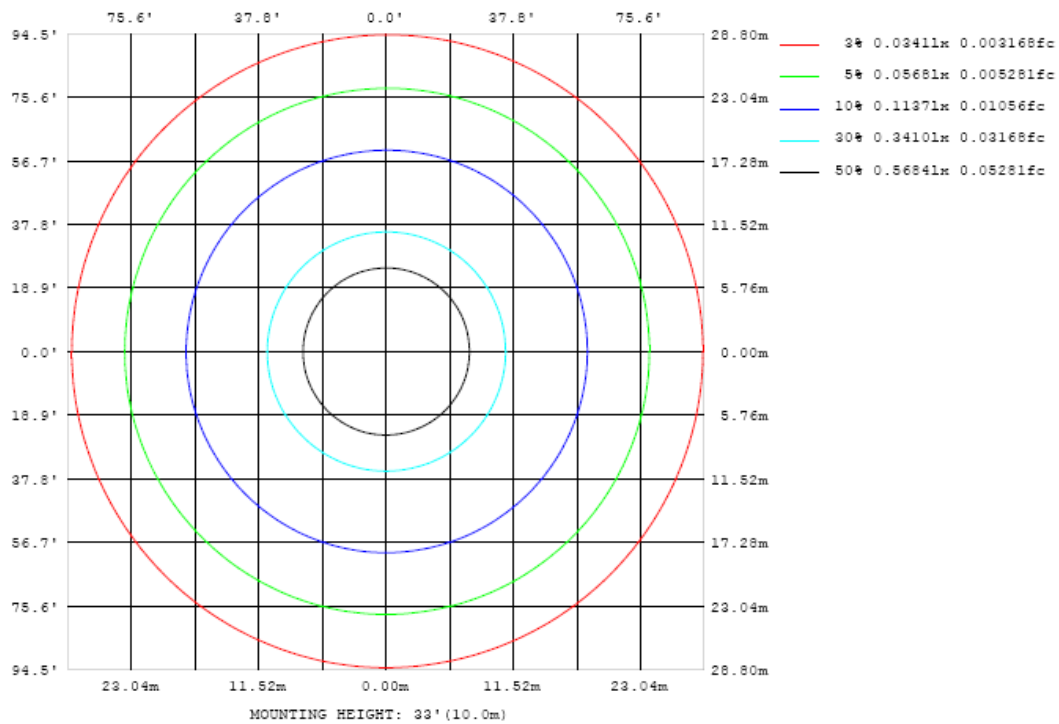


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

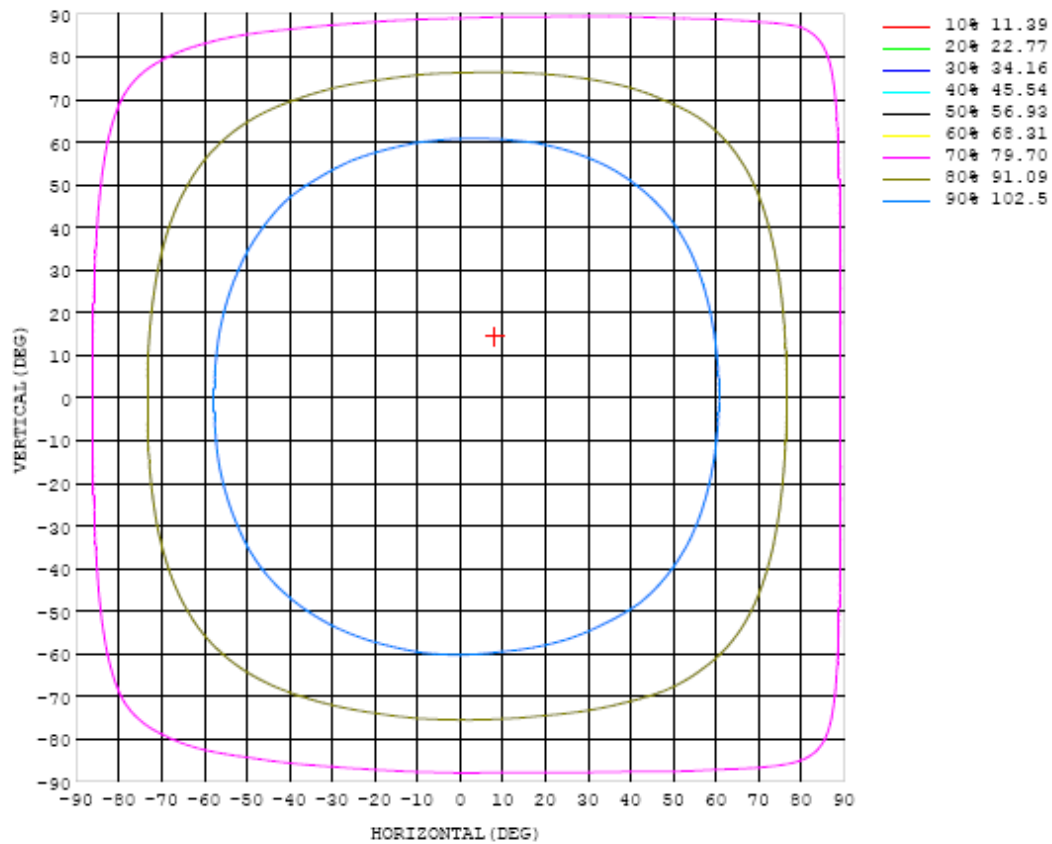


Chart 6: Isocandela Plot

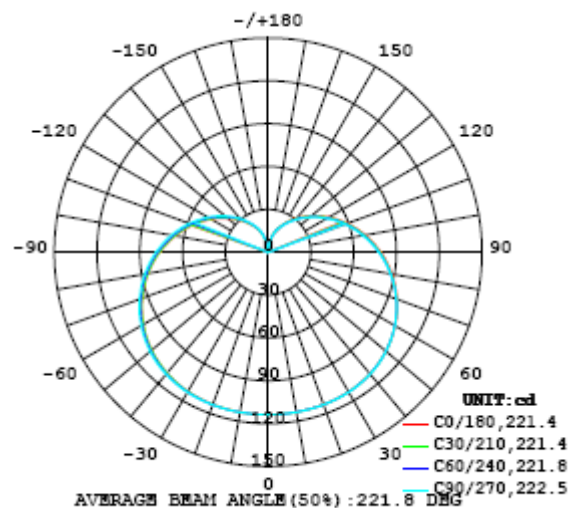


Chart 7: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1		UNIT: cd																		
y (DEG)	C (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114
5	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114
10	114	114	114	114	114	114	114	114	114	113	114	114	114	114	114	114	114	114	114	114
15	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114
20	113	113	114	113	114	114	114	114	113	113	114	114	114	114	113	113	113	113	113	113
25	113	113	113	113	113	113	113	113	113	113	113	113	113	113	113	113	113	113	113	113
30	113	113	113	113	113	113	113	113	113	113	113	113	113	113	113	113	113	113	113	113
35	112	112	112	112	112	112	112	112	112	112	112	112	112	112	112	112	112	112	112	112
40	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	110	110
45	110	110	110	110	110	110	110	110	110	110	110	110	110	109	109	109	109	109	109	109
50	108	108	108	108	108	108	108	108	108	108	108	108	108	107	107	107	107	107	107	107
55	106	106	105	105	105	105	105	105	105	105	106	105	105	105	105	104	104	104	104	104
60	103	103	103	103	103	102	103	103	102	103	103	102	102	102	102	101	101	101	101	101
65	99.7	99.7	99.5	99.4	99.3	99.2	99.3	99.2	99.2	99.3	99.3	98.9	98.6	98.3	98.0	97.8	97.7	97.9	97.6	97.6
70	96.2	96.1	95.9	95.8	95.8	95.6	95.5	95.5	95.5	95.6	95.6	95.1	94.8	94.5	94.3	94.1	94.0	94.1	93.9	93.9
75	92.4	92.2	92.0	91.8	91.8	91.6	91.5	91.4	91.5	91.5	91.5	91.0	90.7	90.4	90.0	90.0	89.9	90.0	89.9	89.9
80	88.2	88.1	87.7	87.6	87.5	87.3	87.2	87.1	87.1	87.2	87.0	86.6	86.3	86.0	85.6	85.5	85.5	85.7	85.6	85.6
85	83.8	83.5	83.3	83.1	82.9	82.7	82.6	82.5	82.4	82.5	82.4	82.0	81.6	81.3	81.0	80.8	80.8	81.1	80.9	80.9
90	79.1	78.9	78.6	78.3	78.2	77.9	77.8	77.7	77.6	77.7	77.4	77.1	76.7	76.4	76.1	76.0	76.0	76.2	76.2	76.2
95	74.2	74.0	73.8	73.4	73.3	73.0	72.9	72.8	72.6	72.6	72.5	72.1	71.8	71.4	71.2	71.1	71.1	71.3	71.2	71.2
100	69.2	69.0	68.8	68.5	68.3	68.0	67.9	67.7	67.6	67.5	67.4	67.0	66.6	66.3	66.2	66.1	66.0	66.2	66.1	66.1
105	64.1	64.0	63.7	63.5	63.3	63.0	62.8	62.7	62.5	62.4	62.2	61.9	61.6	61.3	61.1	61.0	60.9	61.1	61.2	61.2
110	59.1	58.9	58.7	58.4	58.2	57.9	57.7	57.5	57.4	57.4	57.2	56.9	56.5	56.2	56.0	55.9	55.9	56.0	56.1	56.1
115	54.0	53.9	53.7	53.4	53.2	52.9	52.7	52.5	52.3	52.3	52.1	51.8	51.4	51.2	51.0	51.0	50.9	51.1	51.2	51.2
120	49.2	49.0	48.8	48.5	48.3	48.0	47.9	47.6	47.4	47.3	47.2	46.8	46.6	46.4	46.2	46.0	46.1	46.2	46.3	46.3
125	44.4	44.2	44.0	43.8	43.6	43.2	43.0	42.9	42.7	42.5	42.4	42.1	41.9	41.6	41.5	41.4	41.4	41.5	41.6	41.6
130	39.8	39.6	39.4	39.2	38.9	38.7	38.5	38.3	38.1	38.0	37.7	37.5	37.3	37.1	37.0	36.9	36.9	37.0	37.1	37.1
135	35.3	35.2	35.0	34.8	34.6	34.3	34.1	33.8	33.7	33.6	33.4	33.1	33.0	32.8	32.7	32.6	32.6	32.7	32.9	32.9
140	31.1	31.0	30.8	30.6	30.4	30.2	30.1	29.8	29.6	29.5	29.2	29.1	28.9	28.8	28.7	28.6	28.6	28.7	28.8	28.8
145	27.2	27.1	26.9	26.8	26.5	26.3	26.1	25.9	25.7	25.6	25.4	25.2	25.1	25.0	24.9	24.9	24.9	25.0	25.1	25.1
150	23.1	23.3	23.3	23.2	23.0	22.8	22.6	22.4	22.2	22.0	21.8	21.7	21.6	21.5	21.4	21.4	21.4	21.5	21.6	21.6
155	18.4	19.6	20.0	19.8	19.6	19.5	19.3	19.1	18.9	18.7	18.6	18.5	18.4	18.3	18.2	18.2	18.1	18.2	18.3	18.3
160	15.1	16.4	16.6	16.5	16.3	16.1	16.1	15.9	15.7	15.4	15.3	15.2	15.1	15.0	14.9	14.9	14.8	14.6	14.8	14.8
165	12.0	12.4	12.9	12.8	12.6	12.5	12.4	12.3	12.0	11.8	11.8	11.7	11.5	11.4	11.2	11.1	11.0	10.7	10.9	10.9
170	7.57	8.06	8.35	8.23	7.97	8.03	8.06	8.00	7.78	7.33	7.16	7.08	6.94	6.74	6.47	6.04	5.60	5.65	5.81	5.81
175	0.04	0.07	0.11	0.16	0.19	0.20	0.21	0.18	0.14	0.10	0.07	0.05	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03
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	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	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114		
5	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114		
10	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114		
15	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114		
20	113	113	113	114	114	114	114	114	114	114	114	114	114	114	114	114	114		
25	113	113	113	113	113	113	114	114	114	114	114	114	114	113	114	113	113		
30	113	113	113	113	113	113	113	113	113	113	113	113	113	113	113	113	113		
35	112	112	112	112	112	112	112	112	113	113	113	113	113	113	113	112	112		
40	110	110	111	111	111	111	111	111	112	112	112	112	112	111	111	111	111		
45	109	109	109	109	109	110	110	110	110	110	110	110	110	110	110	110	110		
50	107	107	107	107	107	107	108	108	108	108	108	108	108	108	108	108	108		
55	104	104	104	104	105	105	105	106	106	106	106	106	106	106	106	106	106		
60	101	101	101	101	102	102	102	103	103	103	103	103	103	103	103	103	103		
65	97.7	97.7	97.9	98.2	98.3	98.8	99.0	99.5	99.8	100.0	100	100	100	100.0	100.0	99.9	99.6		
70	94.0	94.0	94.2	94.5	94.7	95.1	95.5	95.8	96.2	96.4	96.4	96.5	96.5	96.5	96.3	96.3	96.2		
75	89.9	89.8	90.1	90.4	90.6	91.1	91.5	91.9	92.2	92.5	92.6	92.6	92.6	92.4	92.5	92.4	92.4		
80	85.6	85.5	85.8	86.1	86.3	86.8	87.2	87.6	88.0	88.2	88.4	88.4	88.4	88.1	88.3	88.3	88.1		
85	81.0	81.0	81.1	81.5	81.9	82.3	82.8	83.2	83.5	83.8	83.8	84.0	84.0	83.8	83.9	83.9	83.8		
90	76.2	76.2	76.5	76.9	77.1	77.5	78.1	78.4	78.8	79.0	79.2	79.4	79.3	79.1	79.2	79.1	79.2		
95	71.3	71.4	71.6	72.0	72.3	72.8	73.2	73.7	74.0	74.3	74.4	74.5	74.4	74.3	74.4	74.3	74.2		
100	66.3	66.4	66.6	67.0	67.4	67.8	68.3	68.8	69.0	69.3	69.5	69.5	69.5	69.4	69.4	69.4	69.3		
105	61.3	61.4	61.7	62.1	62.4	62.9	63.3	63.7	64.0	64.3	64.4	64.5	64.5	64.4	64.4	64.3	64.3		
110	56.2	56.4	56.7	57.1	57.4	57.8	58.3	58.6	59.0	59.3	59.4	59.5	59.5	59.3	59.4	59.3	59.2		
115	51.4	51.5	51.8	52.2	52.5	53.0	53.3	53.7	54.0	54.2	54.4	54.5	54.5	54.4	54.3	54.3	54.2		
120	46.5	46.6	46.9	47.3	47.6	48.0	48.4	48.8	49.1	49.3	49.5	49.6	49.6	49.5	49.5	49.4	49.4		
125	41.8	42.0	42.3	42.6	42.9	43.3	43.6	44.0	44.3	44.5	44.6	44.8	44.8	44.7	44.7	44.6	44.5		
130	37.3	37.5	37.7	38.0	38.3	38.7	39.0	39.3	39.6	39.8	40.0	40.1	40.1	40.1	40.1	40.0	39.8		
135	33.0	33.2	33.4	33.7	34.0	34.3	34.5	34.8	35.1	35.3	35.5	35.6	35.6	35.6	35.6	35.5	35.4		
140	29.0	29.1	29.3	29.6	29.8	30.1	30.3	30.5	30.8	31.0	31.2	31.2	30.9	31.4	31.4	31.1	30.8		
145	25.2	25.3	25.5	25.7	26.0	26.2	26.4	26.5	26.8	27.0	27.3	26.9	26.1	27.3	27.4	26.7	26.4		
150	21.7	21.8	21.9	22.2	22.4	22.6	22.8	22.8	23.1	23.3	23.5	22.9	21.5	22.2	22.4	22.1	22.2		
155	18.4	18.4	18.5	18.8	18.9	19.1	19.3	19.4	19.5	19.6	19.5	18.9	17.8	17.4	17.8	18.0	18.2		
160	14.8	14.7	14.8	15.1	15.3	15.4	15.6	15.7	15.6	15.1	14.0	13.8	13.6	11.3	10.4	10.0	11.7		
165	11.1	10.8	10.6	11.0	11.1	11.3	11.5	11.1	10.2	9.56	8.33	4.95	2.53	3.60	7.63	8.37	10.7		
170	5.82	5.82	5.23	5.08	5.17	5.40	5.38	5.14	4.34	4.06	3.92	3.93	4.55	4.12	3.77	5.20	6.85		
175	0.03	0.03	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04		
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 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 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° 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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