

LM-79-08 TEST REPORT

for

GREEN CREATIVE LTD

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

LED Lamp

Model: 9.5PLO/827/DIR

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ19120026e

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

Review by:



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Dec. 27, 2019

Approved by:



Manager: Jim Zhang

Dec. 27, 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: **9.5PLO/827/DIR**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)/2	Power Factor
105.1	1260.3	11.99	0.9949
CCT (K)	CRI	Stabilization Time (Light & Power)	
2716	81.7	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	: Dec. 19, 2019
Date of Test	: Dec. 25, 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

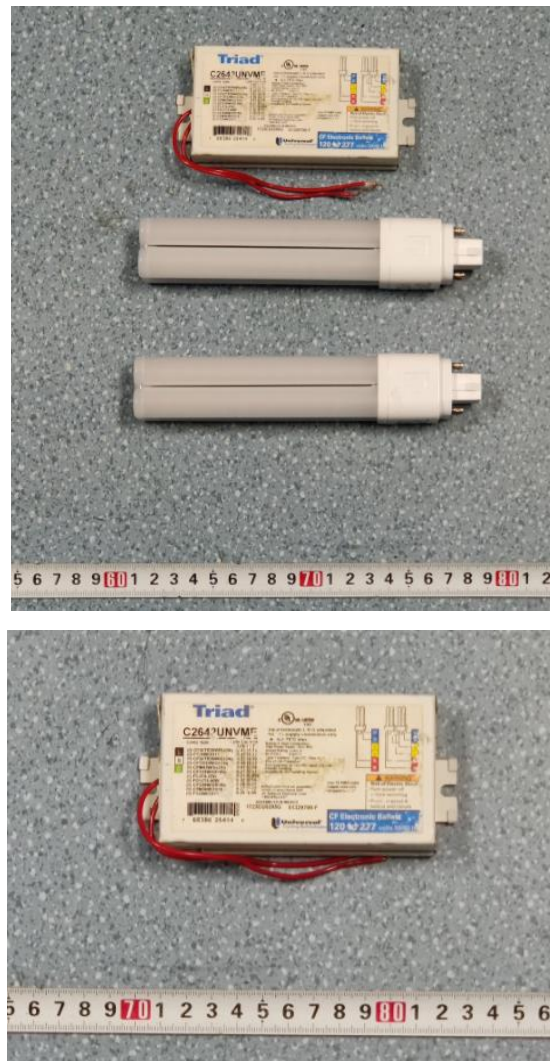


Figure 1- Overview of the sample

Equipment Under Test(EUT)

Name	: LED Lamp
Model	: 9.5PLO/827/DIR
Electrical Ratings	: 120-277V, 50/60Hz, 9.5W
Product Description	: 2700K LED lamps supplied by a high frequency fluorescent lamp ballast: C2642UNVME
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)	0.201	0.089
Power Factor	0.9949	0.9781
Test Power (W)/2	11.99	12.06
THD A%	8.07	8.31
Luminous Efficacy (lm/W)	105.1	104.5
Total Luminous Flux (lm)	1260.3	1259.7
Color Rendering Index (CRI)	81.7	
R9	2.6	
Correlated Color Temperature (CCT)(K)	2716	
Chromaticity Chroma x	0.4593	
Chromaticity Chroma y	0.4120	
Chromaticity Chroma u	0.2615	
Chromaticity Chroma v	0.3519	
Duv	0.0006	
Chromaticity Chroma u'	0.2615	
Chromaticity Chroma v'	0.5278	

Special Color Rendering Indices	
R1	79.7
R2	90.3
R3	96.3
R4	80.3
R5	80.2
R6	89.5
R7	81.4
R8	55.7
R9	2.6
R10	79
R11	80.6
R12	75.9
R13	82.1
R14	98.5

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 24.9 °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)	0.201
Power Factor	0.9954
Power (W)/2	12.00
Luminous Efficacy (lm/W)	105.5
Total Luminous Flux (lm)	1265.5
Beam Angle (°)	331.4 (0°-180°) / 335.9 (90°-270°)
Center Beam Candle Power (cd)	10.6
Maximum Beam Candle Power (cd)	143.2 (At: C=290.0, Gamma=87.5)
Spacing Criteria	4.93 (0°-180°) / 5.03 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	19.33%
Zonal Lumens in the 60 °-90 °Zone	32.63%
Zonal Lumens in the 90 °-120 °Zone	31.54%
Zonal Lumens in the 120 °-180 °Zone	16.50%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

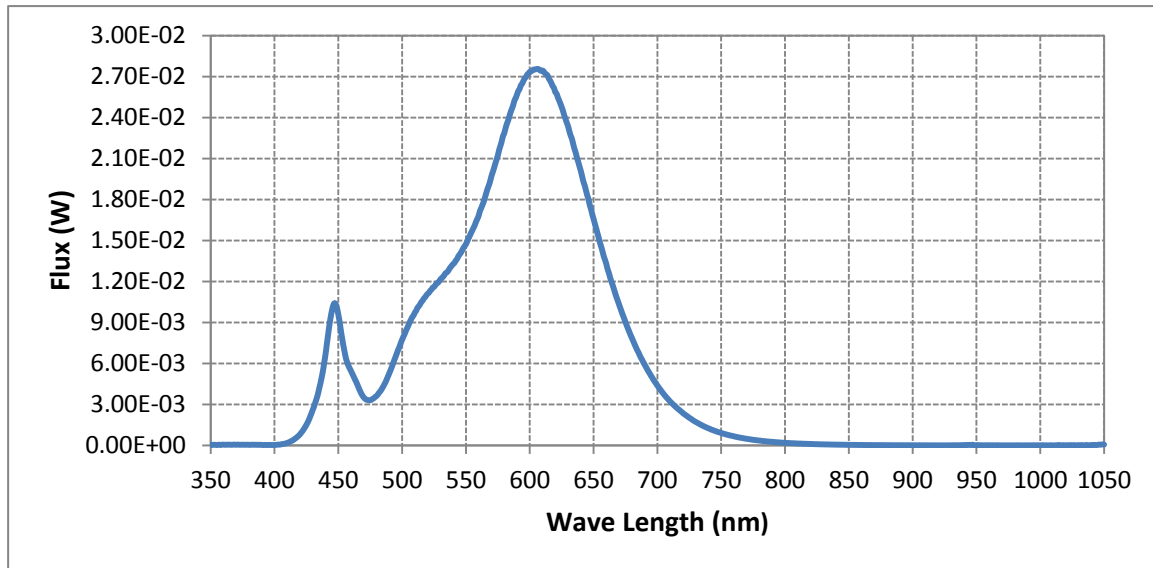
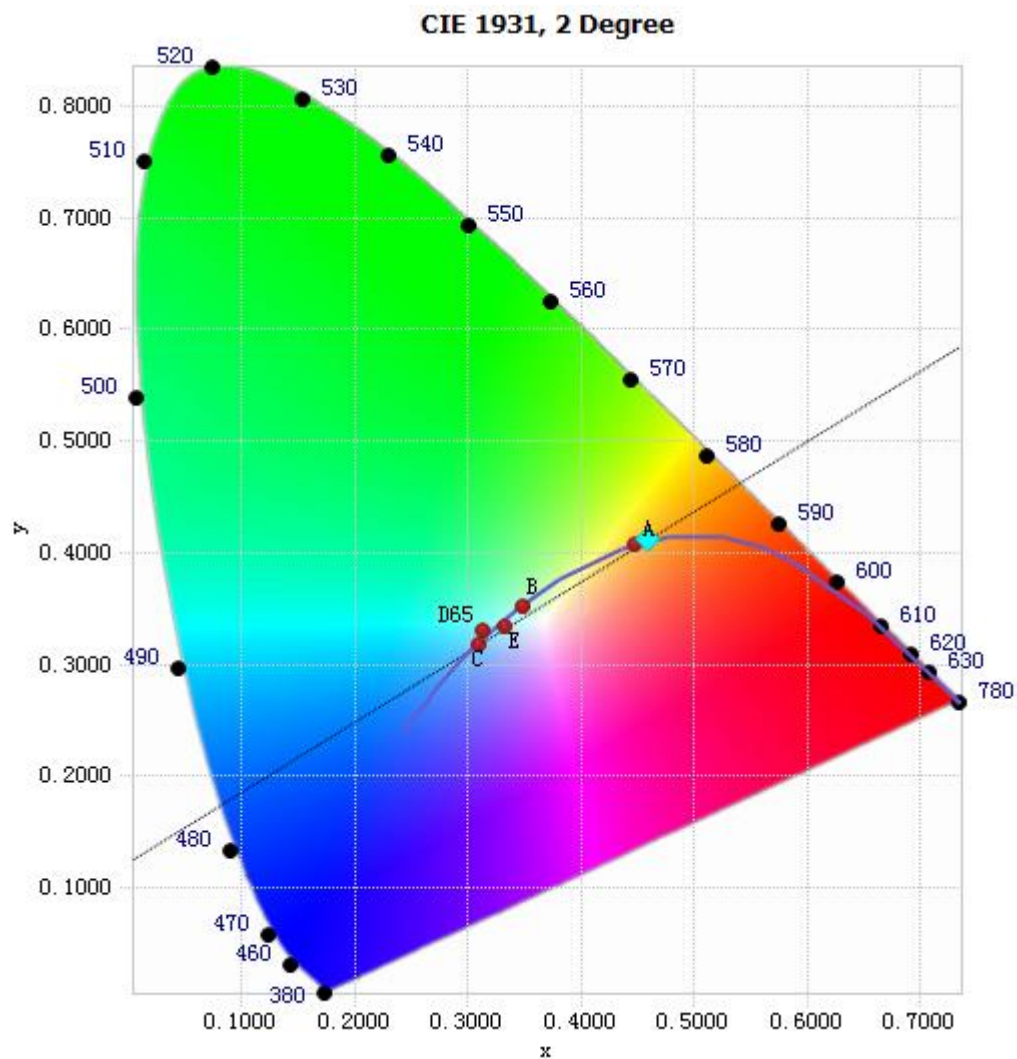


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	4.84E-05	485	4.29E-03	590	2.57E-02	695	5.11E-03
385	5.08E-05	490	5.31E-03	595	2.67E-02	700	4.39E-03
390	4.23E-05	495	6.52E-03	600	2.74E-02	705	3.76E-03
395	3.76E-05	500	7.74E-03	605	2.75E-02	710	3.22E-03
400	3.62E-05	505	8.81E-03	610	2.75E-02	715	2.77E-03
405	7.94E-05	510	9.73E-03	615	2.68E-02	720	2.37E-03
410	1.91E-04	515	1.05E-02	620	2.59E-02	725	2.03E-03
415	4.20E-04	520	1.11E-02	625	2.48E-02	730	1.73E-03
420	8.19E-04	525	1.16E-02	630	2.34E-02	735	1.47E-03
425	1.52E-03	530	1.22E-02	635	2.17E-02	740	1.25E-03
430	2.62E-03	535	1.27E-02	640	2.01E-02	745	1.07E-03
435	4.16E-03	540	1.33E-02	645	1.83E-02	750	9.17E-04
440	6.69E-03	545	1.40E-02	650	1.66E-02	755	7.79E-04
445	9.87E-03	550	1.47E-02	655	1.49E-02	760	6.73E-04
450	1.1E-02	555	1.57E-02	660	1.33E-02	765	5.69E-04
455	6.81E-03	560	1.68E-02	665	1.17E-02	770	4.86E-04
460	5.44E-03	565	1.82E-02	670	1.03E-02	775	4.16E-04
465	4.44E-03	570	1.97E-02	675	9.03E-03	780	3.59E-04
470	3.51E-03	575	2.12E-02	680	7.88E-03		
475	3.31E-03	580	2.29E-02	685	6.84E-03		
480	3.63E-03	585	2.44E-02	690	5.92E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4593, 0.4120)

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

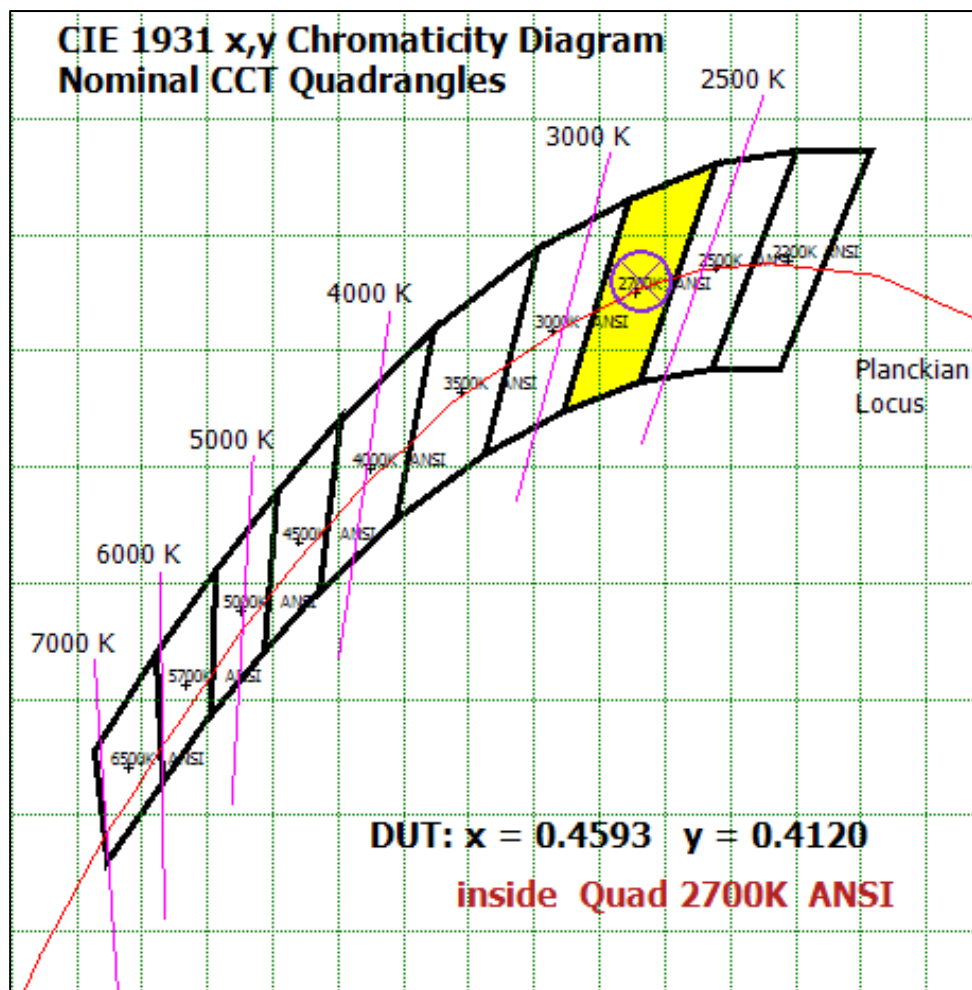
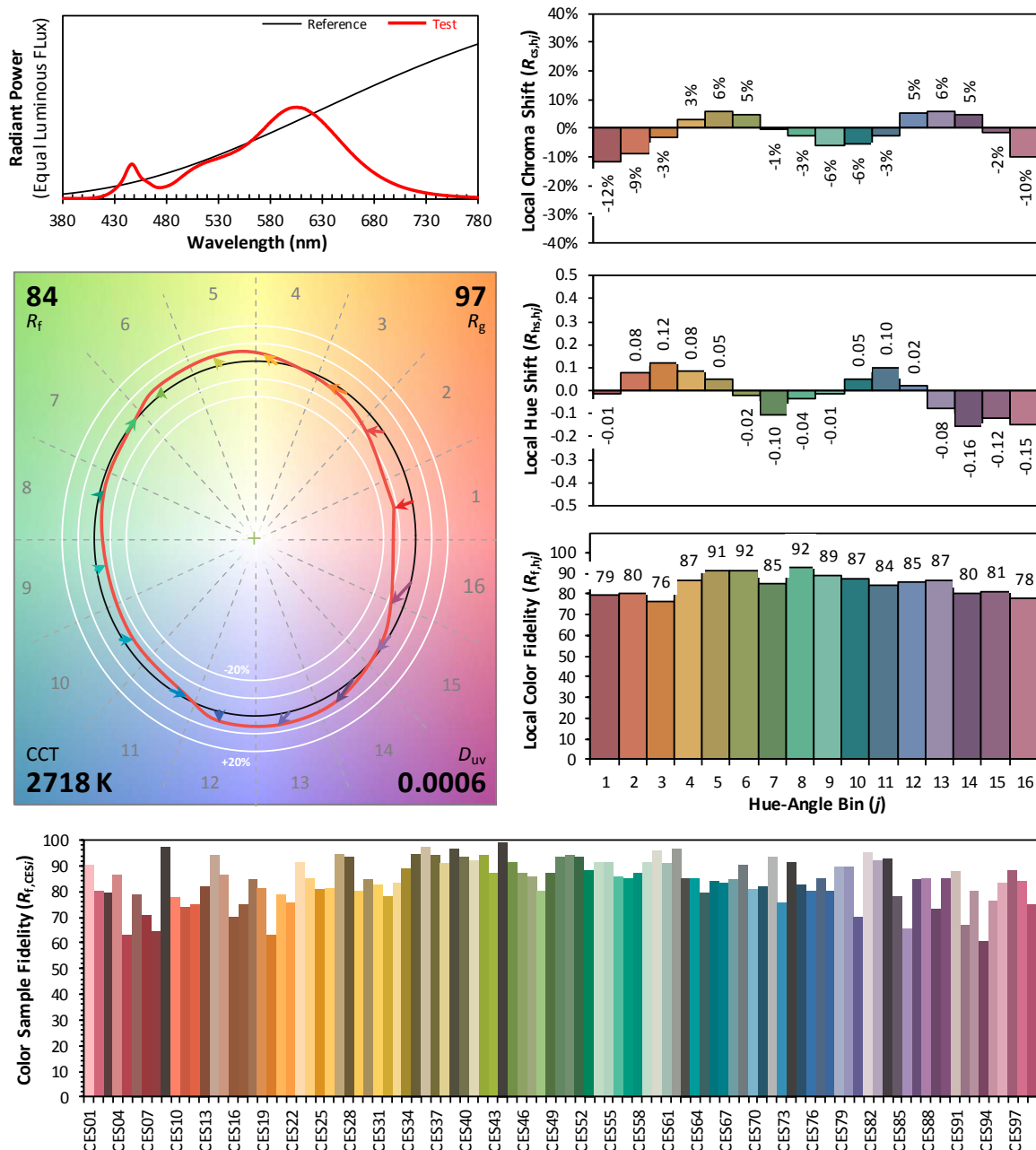


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method



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

x 0.4593
 y 0.4120
 u' 0.2615
 v' 0.5278

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	1.501	0.12%
10- 20	8.622	0.68%
20- 30	23.171	1.83%
30- 40	44.294	3.50%
40- 50	69.935	5.53%
50- 60	97.111	7.67%
60- 70	122.046	9.64%
70- 80	140.81	11.13%
80- 90	150.135	11.86%
90-100	148.422	11.73%
100-110	135.835	10.73%
110-120	114.883	9.08%
120-130	88.905	7.03%
130-140	61.729	4.88%
140-150	37.037	2.93%
150-160	17.431	1.38%
160-170	3.638	0.29%
170-180	0.022	0.00%
Total	1265.5	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	244.634	19.33%
60- 90	412.991	32.63%
0-90	657.625	51.96%
90- 180	607.902	48.04%
0- 180	1265.5	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

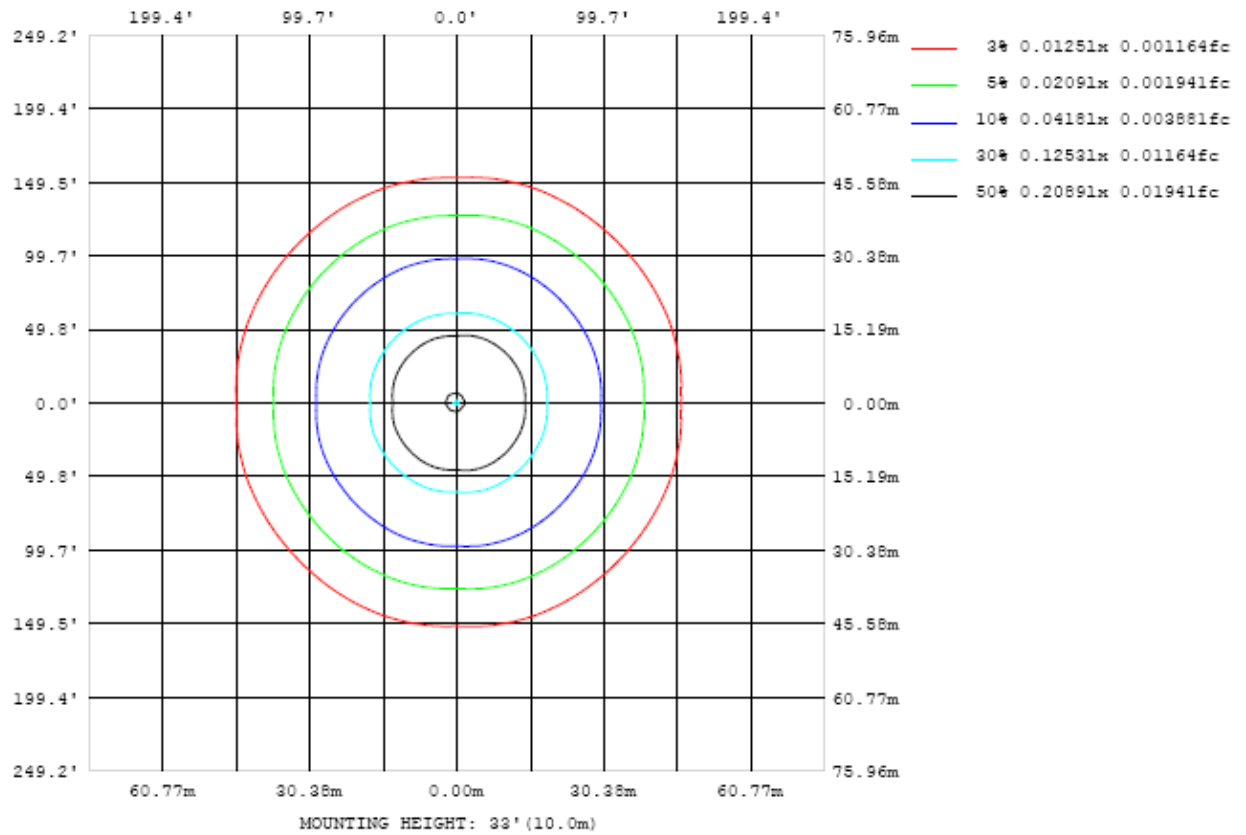


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

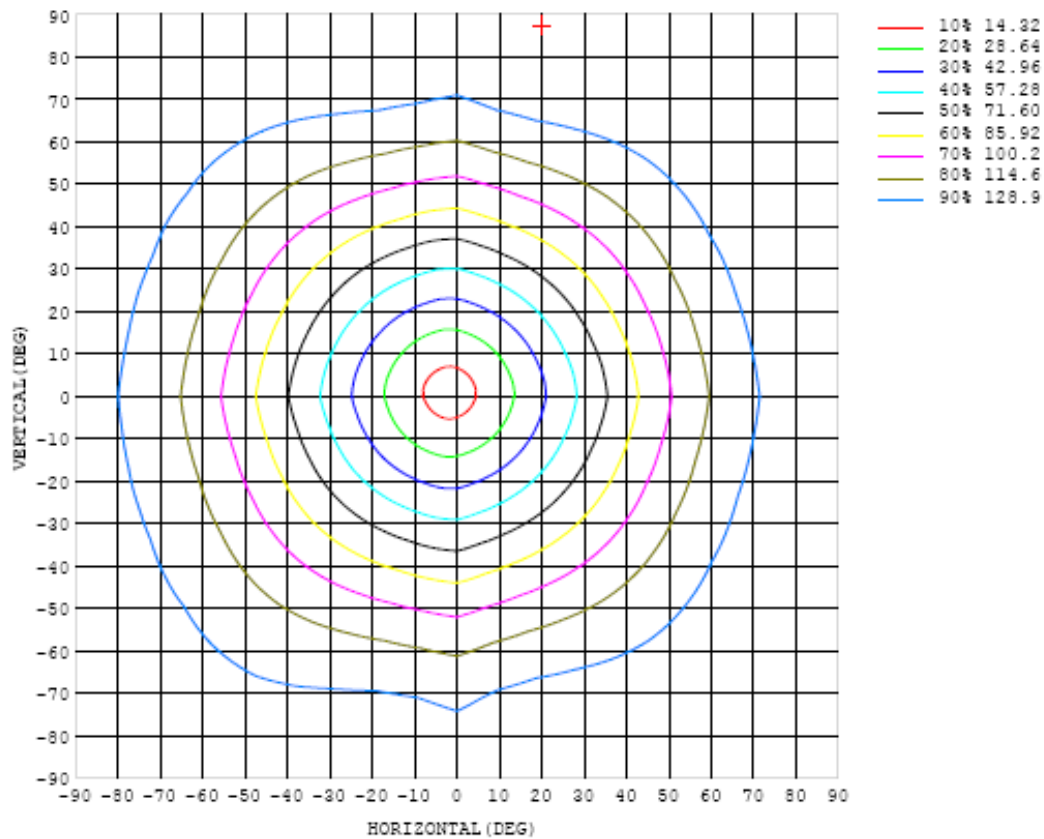


Chart 6: Isocandela Plot

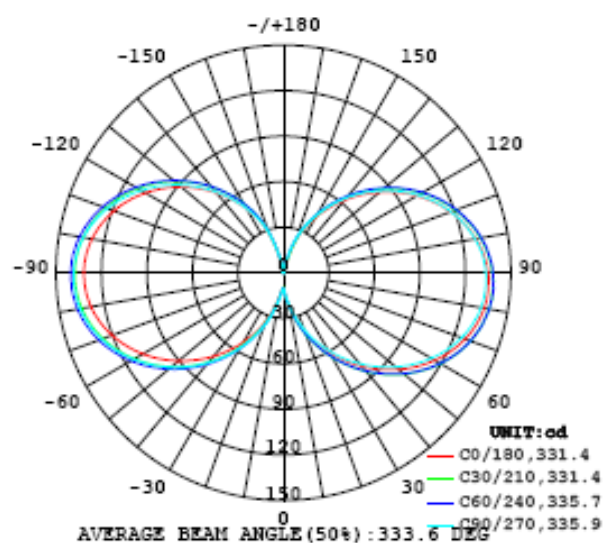


Chart 7: Polar Candela Distribution

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	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6
5	15.0	15.2	15.3	15.4	15.4	15.3	15.2	15.0	14.7	14.3	13.9	13.5	13.2	12.9	12.6	12.2	12.0	11.7	11.4
10	22.5	23.0	23.3	23.5	23.5	23.4	23.1	22.7	22.1	21.4	20.7	20.5	20.1	19.7	19.2	18.6	18.1	17.6	16.9
15	31.4	32.2	32.7	33.1	33.1	33.0	32.6	32.1	31.2	30.1	29.5	29.4	29.1	28.6	28.0	27.3	26.6	25.8	24.8
20	41.0	42.0	42.9	43.3	43.4	43.3	42.9	42.2	41.1	39.5	39.1	39.3	39.1	38.6	37.9	37.1	36.2	35.2	33.7
25	50.8	52.2	53.2	53.8	54.0	53.8	53.3	52.5	51.1	49.1	49.1	49.5	49.4	48.9	48.2	47.3	46.3	45.0	43.2
30	60.7	62.4	63.7	64.3	64.5	64.4	63.9	62.9	61.3	58.9	59.2	59.8	59.8	59.3	58.5	57.6	56.5	54.9	52.8
35	70.6	72.6	74.1	74.7	74.9	74.8	74.3	73.2	71.4	68.6	69.2	70.0	70.0	69.5	68.8	67.8	66.7	64.9	62.4
40	80.4	82.7	84.2	84.9	85.1	84.9	84.4	83.4	81.4	78.2	79.2	80.1	80.1	79.5	78.7	77.8	76.6	74.7	71.9
45	90.0	92.5	94.0	94.6	94.8	94.7	94.2	93.2	91.1	87.6	88.9	89.8	89.7	89.1	88.3	87.4	86.3	84.3	81.3
50	99.1	102	103	104	104	104	103	102	100	96.6	98.2	99.1	98.9	98.2	97.4	96.5	95.6	93.6	90.4
55	108	110	112	112	112	112	112	111	109	105	107	108	107	107	106	105	104	102	99.0
60	115	118	120	120	119	119	119	119	117	113	115	116	115	114	113	113	112	110	107
65	122	125	126	126	126	126	126	126	124	119	122	123	122	121	120	120	119	118	114
70	128	131	132	131	131	131	131	131	129	125	128	128	127	126	125	125	125	124	120
75	132	135	136	135	135	135	135	135	133	129	132	133	132	130	130	130	130	129	125
80	134	137	138	138	137	137	138	138	136	132	135	136	134	133	132	133	133	132	129
85	135	139	139	138	138	138	139	139	137	133	136	137	136	135	134	135	135	134	131
90	135	138	139	138	137	137	138	139	137	133	136	137	136	134	134	135	136	134	132
95	133	136	136	136	135	135	136	136	135	132	135	135	134	133	133	134	134	134	131
100	129	132	132	132	131	132	132	133	132	128	131	132	131	130	130	131	132	131	128
105	124	126	128	127	126	127	128	128	126	124	127	128	127	126	126	127	128	127	124
110	117	120	121	121	121	121	121	122	120	117	121	122	121	121	121	122	122	121	119
115	110	112	114	113	114	114	114	114	113	111	113	115	115	114	115	115	116	115	113
120	101	104	105	105	105	105	106	106	104	102	105	107	107	107	107	108	108	107	105
125	92.5	94.5	95.8	96.1	96.3	96.7	96.7	96.7	95.4	93.6	96.5	97.9	98.5	98.8	99.0	99.6	99.6	98.4	96.9
130	82.6	84.6	86.1	86.4	86.8	87.0	87.2	86.9	85.7	84.1	86.9	88.6	89.2	89.7	89.9	90.5	90.4	89.4	88.0
135	72.6	74.1	75.5	76.1	76.5	76.8	77.0	76.6	75.3	74.3	77.0	78.7	79.5	80.1	80.4	80.8	80.8	79.6	78.5
140	62.3	63.6	65.0	65.7	66.1	66.3	66.5	66.1	65.0	64.3	66.7	68.4	69.5	70.2	70.5	70.9	70.6	69.5	68.7
145	52.0	53.0	54.1	54.9	55.3	55.6	55.7	55.3	54.4	54.2	56.4	58.0	59.1	59.7	60.1	60.5	60.2	59.4	58.8
150	41.9	42.4	43.5	44.1	44.5	44.8	44.9	44.6	44.1	44.1	46.0	47.2	48.5	49.3	49.6	49.7	49.9	49.2	48.8
155	32.0	32.2	32.8	33.4	33.9	34.2	34.3	34.2	33.8	34.2	35.4	36.3	36.6	36.6	37.8	39.0	39.2	38.9	38.8
160	21.7	20.3	19.2	19.9	21.9	23.4	23.7	23.8	23.9	23.9	23.8	23.6	23.0	23.3	24.6	25.5	26.1	26.2	26.3
165	5.09	2.53	0.84	3.48	7.76	10.2	11.2	11.7	12.4	11.8	11.4	10.6	10.1	9.97	10.8	11.6	12.1	12.4	12.4
170	0.18	0.18	0.16	0.13	0.11	0.32	1.05	0.97	0.49	0.34	0.32	0.43	0.37	0.35	0.60	0.58	0.17	0.12	0.23
175	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.09	0.10	0.11	0.11	0.13	0.14	0.14	0.12	0.15	0.15	0.15	0.17
180	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06

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	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6		
5	11.3	11.2	11.2	11.4	11.5	11.7	11.9	12.2	12.6	13.0	13.4	13.7	14.1	14.3	14.5	14.7	14.8		
10	16.7	16.9	17.1	17.3	17.5	17.8	18.0	18.3	19.0	19.7	20.4	21.0	21.6	21.9	22.2	22.3	22.3		
15	24.8	25.2	25.6	26.0	26.3	26.6	26.7	26.8	27.6	28.7	29.6	30.4	31.0	31.4	31.7	31.7	31.4		
20	34.1	34.9	35.4	35.9	36.2	36.5	36.7	36.5	37.2	38.6	39.9	40.8	41.4	41.8	42.0	41.8	41.2		
25	43.9	45.0	45.8	46.4	46.7	47.0	47.0	46.6	47.1	49.0	50.4	51.4	52.2	52.6	52.6	52.3	51.4		
30	53.9	55.3	56.3	57.0	57.4	57.7	57.7	57.0	57.2	59.5	61.2	62.2	63.0	63.4	63.4	62.9	61.6		
35	64.0	65.7	66.7	67.6	68.1	68.4	68.3	67.4	67.4	69.9	71.9	73.0	73.7	74.1	74.0	73.5	71.9		
40	74.0	75.8	77.0	77.9	78.5	78.8	78.8	77.8	77.4	80.3	82.4	83.4	84.2	84.5	84.4	83.8	82.1		
45	83.7	85.8	87.0	87.9	88.5	89.0	89.0	88.0	87.3	90.4	92.6	93.6	94.3	94.5	94.5	93.9	92.0		
50	93.1	95.3	96.5	97.5	98.1	98.7	98.9	97.8	96.8	100	102	103	104	104	104	103	101		
55	102	104	105	106	107	108	108	107	106	109	111	112	112	113	113	112	110		
60	110	112	114	114	115	116	117	116	114	118	120	120	120	120	121	120	118		
65	118	120	121	122	122	123	124	123	122	125	127	127	127	127	127	127	125		
70	124	126	127	127	128	130	130	130	128	132	133	133	133	133	133	133	131		
75	129	131	132	132	133	134	136	135	133	137	138	138	137	137	137	137	135		
80	133	135	135	136	136	138	139	139	136	140	141	141	140	140	140	140	138		
85	135	137	137	138	138	140	141	141	138	142	143	142	141	141	141	141	139		
90	136	137	138	138	139	140	142	141	138	142	143	142	141	141	141	141	139		
95	135	136	137	137	138	139	141	140	137	141	142	140	139	139	139	139	137		
100	132	134	134	135	135	137	138	137	134	137	138	137	136	135	135	135	133		
105	128	130	130	131	131	132	133	132	130	133	133	132	131	131	130	130	128		
110	123	124	125	125	126	127	128	127	124	127	127	127	125	125	124	124	121		
115	116	118	119	119	120	120	121	120	117	119	120	119	118	118	117	116	114		
120	109	110	111	112	112	113	113	112	108	111	112	111	110	110	109	108	105		
125	100	102	103	104	104	104	104	103	99.6	102	103	102	102	101	99.7	98.4	96.1		
130	90.9	92.8	93.8	94.4	94.6	94.7	94.4	92.9	90.0	91.8	92.8	92.6	91.8	90.9	89.8	88.5	86.2		
135	81.2	83.0	84.0	84.6	84.8	84.7	84.2	82.6	80.0	81.4	82.3	82.2	81.5	80.6	79.4	78.0	75.8		
140	71.1	72.8	73.8	74.4	74.5	74.3	73.7	72.2	69.7	70.7	71.5	71.4	70.8	70.0	68.7	67.4	65.2		
145	60.8	62.4	63.3	63.9	63.9	63.6	62.9	61.5	59.2	59.9	60.5	60.5	59.9	59.1	57.9	56.5	54.6		
150	50.5	51.8	52.7	53.1	53.1	52.8	52.1	50.8	48.9	49.1	49.6	49.5	48.9	48.1	47.0	45.7	44.1		
155	40.1	41.1	41.6	41.4	41.7	41.7	41.1	40.2	38.7	38.5	38.7	38.5	37.9	37.2	36.2	35.0	33.7		
160	26.7	27.3	28.1	28.5	28.8	29.1	29.0	28.4	27.5	27.4	27.2	26.4	25.9	25.7	25.3	24.5	23.6		
165	11.9	12.8	12.8	11.7	11.3	12.5	13.9	13.9	13.4	13.2	13.4	13.1	12.6	12.4	11.7	10.7	8.52		
170	0.27	0.99	2.02	2.39	2.58	2.48	1.68	1.91	1.78	1.46	0.54	0.77	0.80	1.38	0.93	0.18	0.18		
175	0.17	0.17	0.16	0.15	0.15	0.14	0.12	0.11	0.10	0.08	0.08	0.08	0.07	0.07	0.07	0.07	0.08		
180	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06		

Table 7: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Aug. 02, 2019	Aug. 01, 2020
Digital Power Meter	PF2010A	HZTE028-01	Aug. 02, 2019	Aug. 01, 2020
AC Power Supply	DPS1060	HZTE001-06	Aug. 02, 2019	Aug. 01, 2020
DC Power Supply	WY12010	HZTE004-03	Aug. 02, 2019	Aug. 01, 2020
Temperature recorder	JM624U	HZTE018-08	Aug. 02, 2019	Aug. 01, 2020
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 02, 2019	Aug. 01, 2020
Standard source	D908	HZTE012-01	Aug. 02, 2019	Aug. 01, 2020
Integrate Sphere system	3M	HZTE015-04	Aug. 02, 2019	Aug. 01, 2020
Digital Power Meter	WT210	HZTE008-01	Aug. 02, 2019	Aug. 01, 2020
AC Power Supply	PCR 500L	HZTE001-07	Aug. 02, 2019	Aug. 01, 2020
DC Power Supply	IT6154	HZTE004-04	Aug. 02, 2019	Aug. 01, 2020
Standard source	SCL-1400	HZTE012-02	Aug. 02, 2019	Aug. 01, 2020
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 02, 2019	Aug. 01, 2020
Temperature Meter	TES1310	HZTE017-01	Aug. 02, 2019	Aug. 01, 2020

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

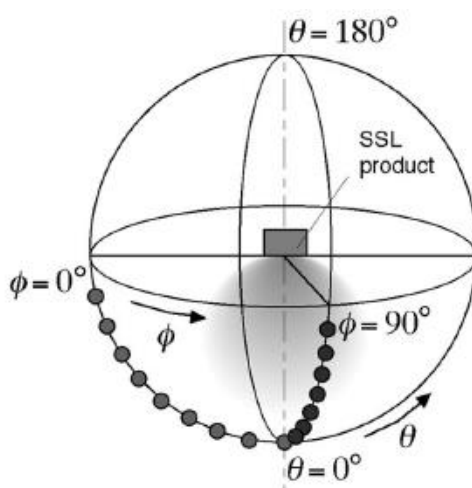
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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