

LM-79-08 TEST REPORT

for

GREEN CREATIVE LTD

Room 3603, Level 36, Tower 1, Enterprise Square Five, 38 Wang Chiu Road, Kowloon Bay, KL,
Hong Kong

LED Lamp

Model: 9FA19DIM/927/RC

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ21120007ap

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

Review by:



Engineer: April Zou
Feb. 17, 2022

Approved by:



Manager: Jim Zhang
Feb. 17, 2022

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: 9FA19DIM/927/RC

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
112.3	888.2	7.91	0.8118
CCT (K)	CRI	Stabilization Time (Light & Power)	
2692	93.6	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. 03, 2021
Date of Test	: Feb. 15, 2022
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	: 9FA19DIM/927/RC
Electrical Ratings	: 120V, 60Hz, 9W
Product Description	: 2700K
Manufacturer	: GREEN CREATIVE LTD
Address	: Room 3603, Level 36, Tower 1, Enterprise Square Five, 38 Wang Chiu Road, Kowloon Bay, KL, Hong Kong

TEST RESULTS

Test ambient temperature was 26.0 °C.

Base orientation was horizontal. 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	0.8118
Test Power (W)	7.91
THD A%	57.84
Luminous Efficacy (lm/W)	112.3
Total Luminous Flux (lm)	888.2
Color Rendering Index (CRI)	93.6
R9	61.6
Correlated Color Temperature (CCT)(K)	2692
Chromaticity Chroma x	0.4568
Chromaticity Chroma y	0.4048
Chromaticity Chroma u	0.2631
Chromaticity Chroma v	0.3498
Duv	-0.0019
Chromaticity Chroma u'	0.2631
Chromaticity Chroma v'	0.5247

Special Color Rendering Indices	
R1	95.2
R2	99.1
R3	97.3
R4	94.1
R5	95.5
R6	96.3
R7	90.1
R8	81.2
R9	61.6
R10	97.4
R11	96.2
R12	87.3
R13	96.7
R14	99.5

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 25.1 °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	0.8138
Power (W)	7.93
Luminous Efficacy (lm/W)	113.7
Total Luminous Flux (lm)	901.3
Beam Angle (°)	313.3 (0°-180°) / 315.6 (90°-270°)
Center Beam Candle Power (cd)	34.3
Maximum Beam Candle Power (cd)	108.0 (At: C=45.0, Gamma=83.0)
Spacing Criteria	2.56 (0°-180°) / 2.52 (90°-270°)
Zonal Lumens in the 0°-60° Zone	23.82%
Zonal Lumens in the 60°-90° Zone	31.52%
Zonal Lumens in the 90°-120° Zone	29.32%
Zonal Lumens in the 120°-180° Zone	15.34%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

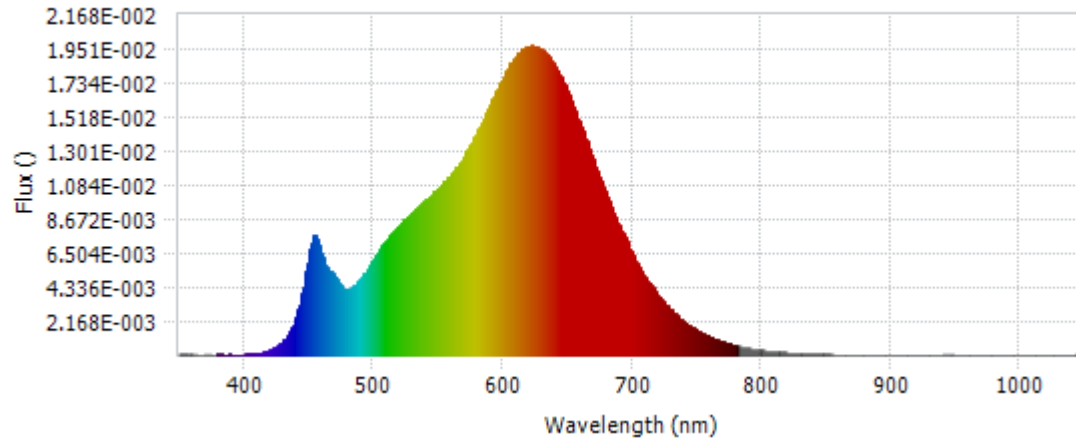
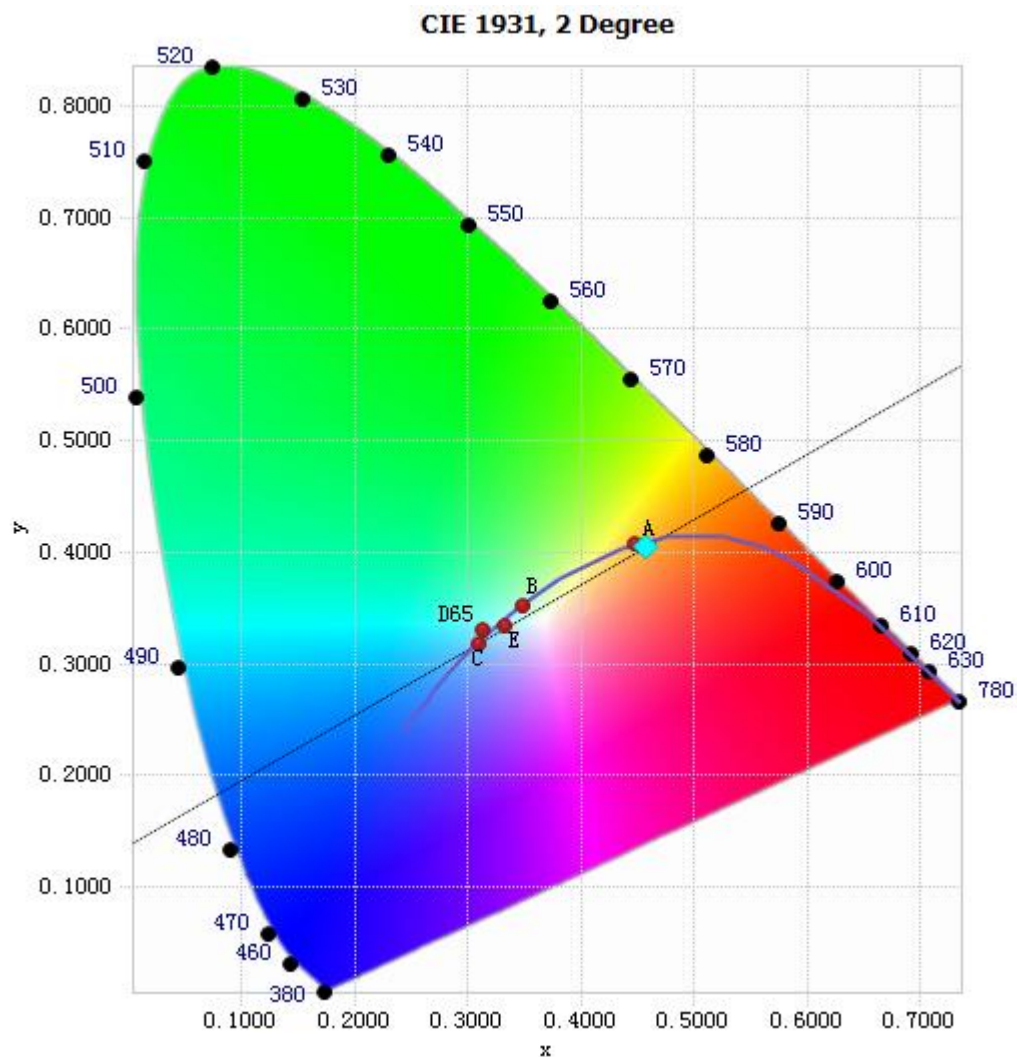


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	7.38E-05	485	4.43E-03	590	1.59E-02	695	7.47E-03
385	6.31E-05	490	4.85E-03	595	1.68E-02	700	6.49E-03
390	6.40E-05	495	5.42E-03	600	1.76E-02	705	5.70E-03
395	6.62E-05	500	6.09E-03	605	1.84E-02	710	5.02E-03
400	6.50E-05	505	6.73E-03	610	1.90E-02	715	4.42E-03
405	9.47E-05	510	7.30E-03	615	1.95E-02	720	3.84E-03
410	1.35E-04	515	7.85E-03	620	1.96E-02	725	3.34E-03
415	2.15E-04	520	8.32E-03	625	1.97E-02	730	2.90E-03
420	3.30E-04	525	8.69E-03	630	1.95E-02	735	2.50E-03
425	5.55E-04	530	9.09E-03	635	1.91E-02	740	2.16E-03
430	8.88E-04	535	9.47E-03	640	1.85E-02	745	1.85E-03
435	1.48E-03	540	9.85E-03	645	1.77E-02	750	1.61E-03
440	2.40E-03	545	1.02E-02	650	1.68E-02	755	1.39E-03
445	3.98E-03	550	1.06E-02	655	1.58E-02	760	1.20E-03
450	6.38E-03	555	1.10E-02	660	1.47E-02	765	1.02E-03
455	7.64E-03	560	1.15E-02	665	1.36E-02	770	8.78E-04
460	6.50E-03	565	1.20E-02	670	1.25E-02	775	7.53E-04
465	5.50E-03	570	1.27E-02	675	1.13E-02	780	6.41E-04
470	5.03E-03	575	1.34E-02	680	1.03E-02		
475	4.48E-03	580	1.42E-02	685	9.24E-03		
480	4.19E-03	585	1.51E-02	690	8.24E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4568, 0.4048)

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

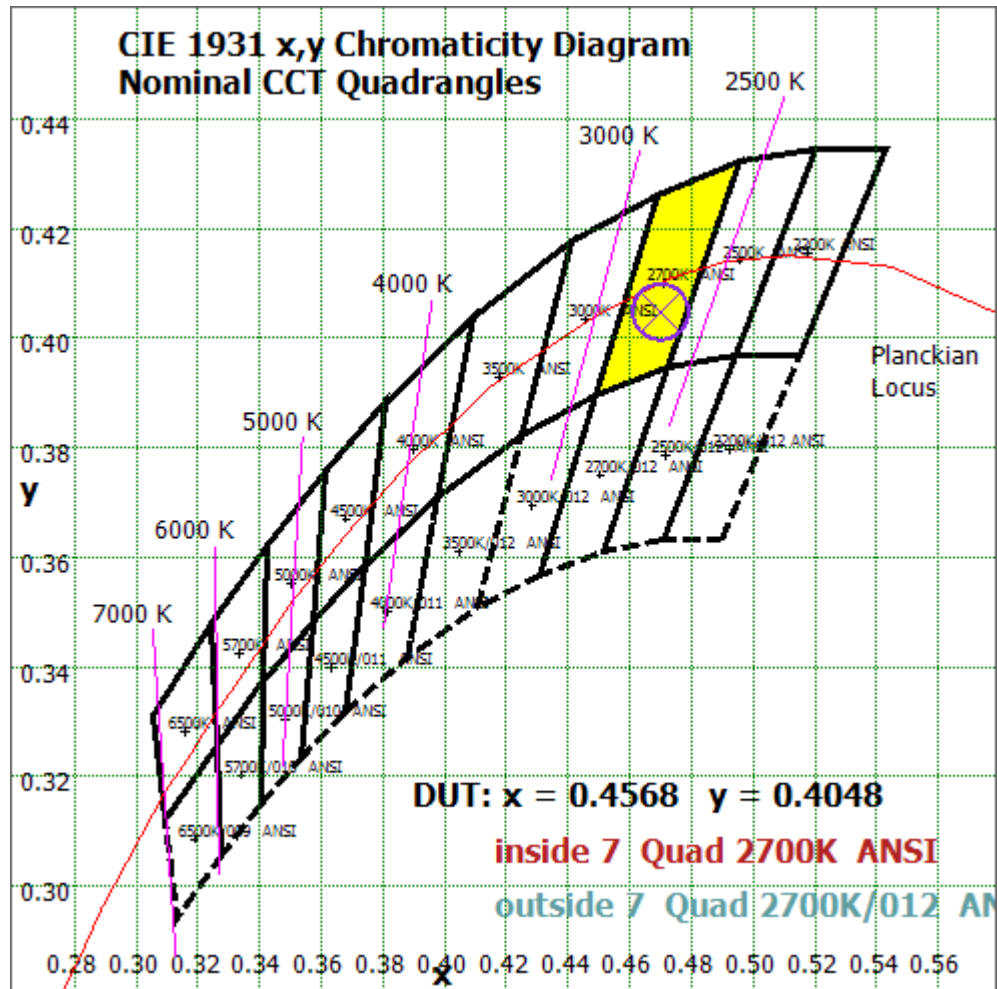


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

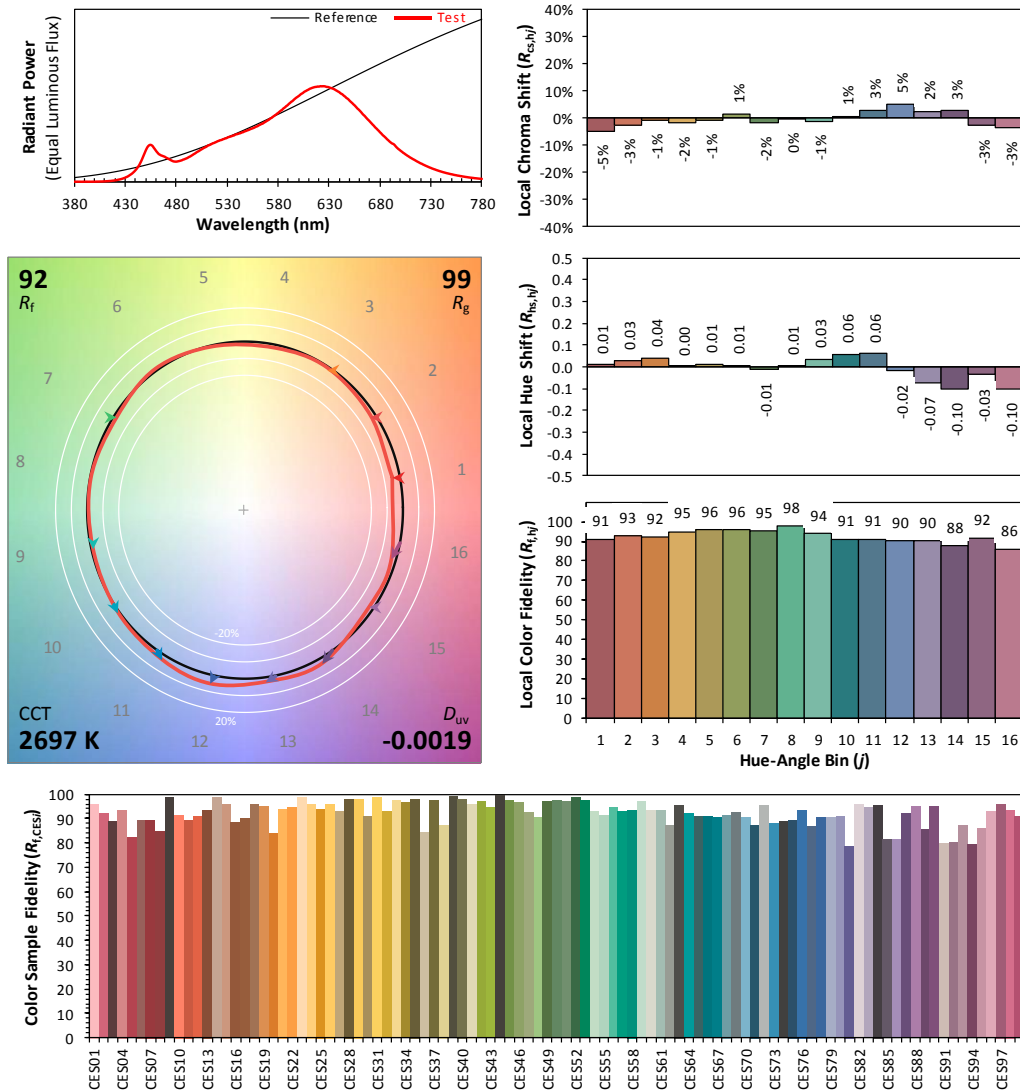
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2022/12/15

Model: 9FA19DIM/927/RC



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

x 0.4568
 y 0.4048
 u' 0.2631
 v' 0.5247

CIE 13.3-1995
(CRI)
 R_a 94
 R_g 62

Colors are for visual orientation purposes only. Created with the ANSI/IES TM-30-18 Calculator Version 2.00.

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	3.402	0.38%
10- 20	11.721	1.30%
20- 30	24.828	2.75%
30- 40	41.69	4.63%
40- 50	58.778	6.52%
50- 60	74.263	8.24%
60- 70	87.241	9.68%
70- 80	96.441	10.70%
80- 90	100.393	11.14%
90-100	97.908	10.86%
100-110	89.673	9.95%
110-120	76.693	8.51%
120-130	60.289	6.69%
130-140	42.288	4.69%
140-150	25.037	2.78%
150-160	9.396	1.04%
160-170	1.253	0.14%
170-180	0.01	0.00%
Total	901.3	100%

$\gamma(^{\circ})$	Lumens	% Total
0-130	823.32	91.35%
130-180	77.984	8.65%
0-180	901.3	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

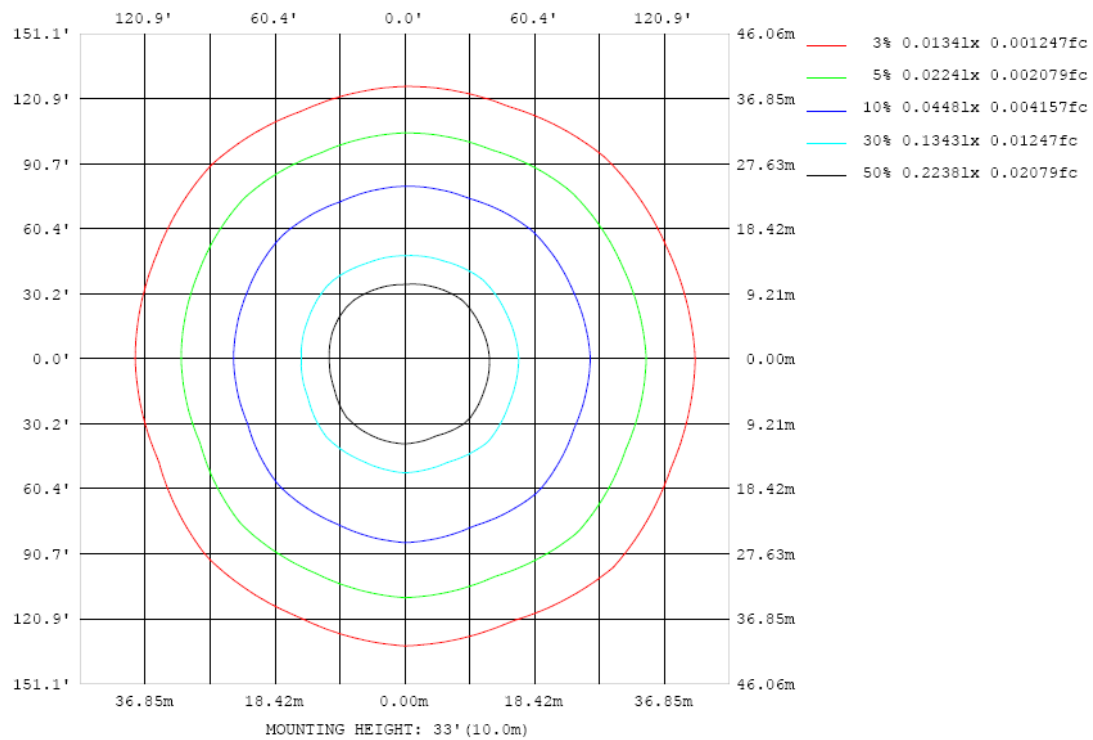


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

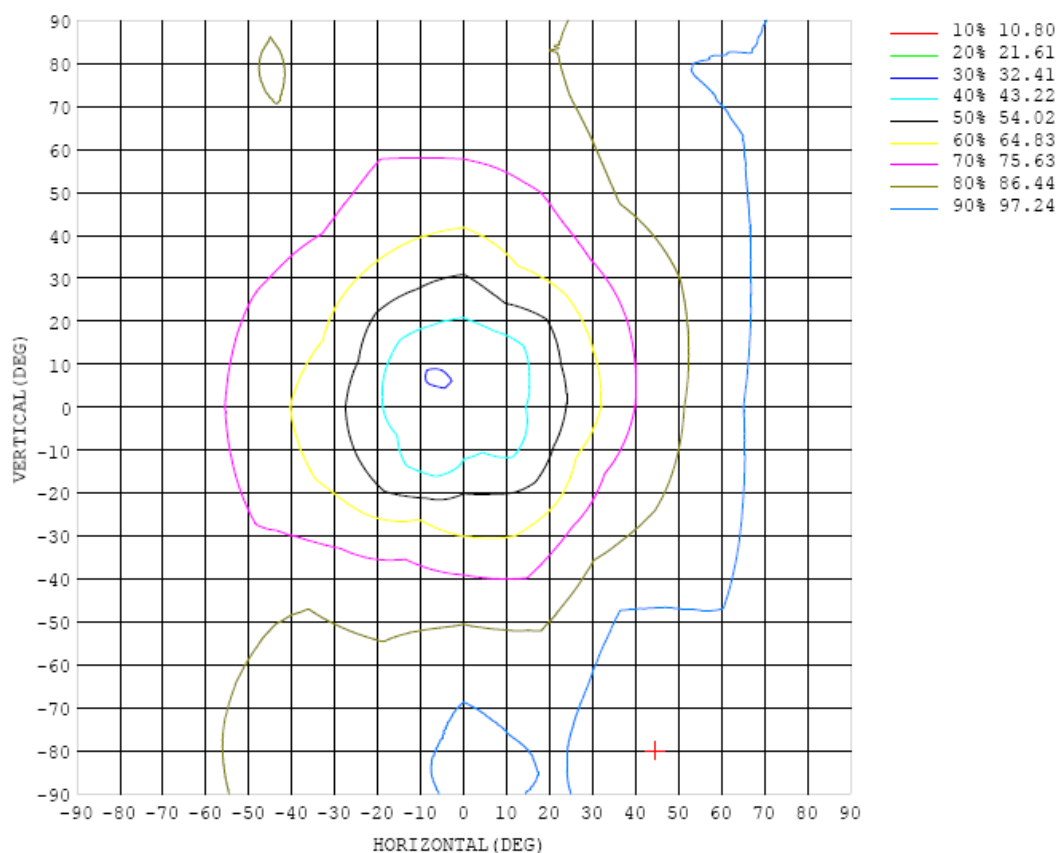


Chart 6: Isocandela Plot

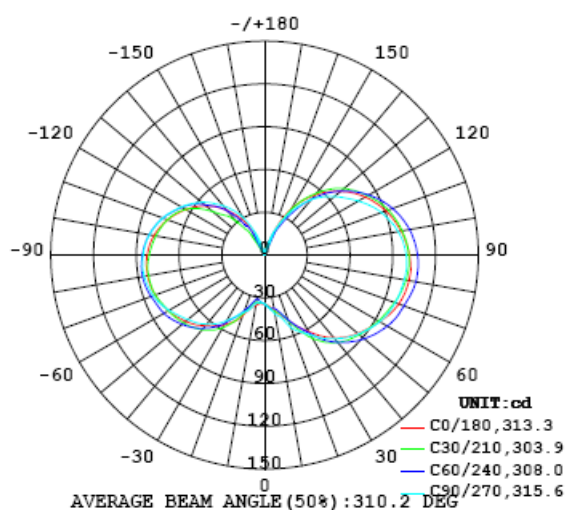


Chart 7: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1 UNIT: cd

C (DEG) γ (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	34.3	34.3	34.3	34.3	34.3	34.3	34.3	34.3	34.3	34.3	34.3	34.3	34.3	34.3	34.3	34.3			
5	36.0	36.7	37.3	37.6	37.3	36.6	35.6	34.7	34.1	33.7	33.0	32.9	33.1	33.7	34.4	35.2			
10	39.3	39.8	37.9	41.6	41.7	37.7	36.2	36.9	35.9	33.5	31.2	33.2	34.4	35.6	35.7	37.5			
15	43.7	42.5	41.7	47.5	45.7	40.1	39.0	41.4	38.8	36.7	35.5	37.2	39.0	38.7	37.4	41.6			
20	48.7	49.2	48.2	52.6	53.9	48.2	44.4	46.4	45.0	43.3	41.4	42.9	42.7	44.6	43.5	47.7			
25	55.5	58.2	55.4	56.9	59.4	59.0	51.0	51.4	51.5	51.8	47.7	48.8	47.4	52.4	50.3	54.5			
30	61.9	67.3	63.5	62.3	64.7	67.1	59.8	57.4	56.4	58.7	54.7	54.7	53.0	60.2	57.6	61.2			
35	69.3	74.5	72.5	68.7	71.0	72.9	66.9	62.5	60.5	64.1	61.5	60.3	58.7	64.9	65.2	67.7			
40	75.8	79.9	79.8	73.7	76.7	77.6	72.9	66.5	64.5	68.1	67.0	64.9	63.3	68.6	71.2	73.5			
45	81.1	83.8	85.9	78.6	81.7	81.1	78.0	70.3	68.9	71.3	71.7	68.5	67.2	71.4	76.5	78.1			
50	85.4	86.8	91.3	83.1	86.0	84.0	82.1	73.6	72.3	74.0	75.4	71.6	70.4	74.2	81.1	81.7			
55	89.4	89.6	95.7	86.9	89.8	85.9	85.5	76.2	75.4	76.3	78.9	73.6	73.7	77.0	85.0	85.4			
60	93.3	92.3	99.5	89.8	93.4	87.4	88.1	78.2	78.0	78.1	81.6	75.8	77.4	79.4	88.4	89.2			
65	97.1	94.7	102	92.0	95.9	89.1	89.7	79.5	80.3	79.7	83.2	77.9	80.8	81.4	91.1	92.2			
70	100	97.1	104	93.9	97.7	90.7	90.9	80.0	81.8	81.7	84.8	79.8	83.2	83.5	93.4	94.5			
75	102	99.3	106	95.2	98.7	91.3	92.0	80.5	83.0	82.4	86.3	81.3	84.8	85.2	95.4	96.3			
80	103	101	108	96.1	99.4	91.9	92.8	80.6	83.3	82.7	87.0	82.1	85.8	86.2	96.7	97.4			
85	103	101	108	96.4	100	91.7	92.7	80.3	83.3	82.4	86.9	81.6	85.9	86.4	97.1	97.4			
90	102	101	107	96.0	99.4	90.9	91.8	79.3	82.5	81.1	85.9	80.5	85.2	85.5	96.4	96.5			
95	99.7	100	106	94.7	97.8	89.6	90.0	77.9	81.0	79.4	84.4	78.8	84.1	84.2	94.9	94.9			
100	97.3	98.0	103	92.5	95.1	87.5	87.8	76.1	78.9	77.6	82.3	76.5	82.2	82.5	92.6	92.5			
105	94.2	95.5	99.9	90.0	91.6	84.8	84.7	73.8	76.0	75.3	79.5	73.8	79.4	80.1	89.5	89.5			
110	90.7	92.4	95.7	87.3	87.3	81.6	80.8	71.3	72.5	72.5	75.9	70.7	76.0	77.1	85.7	85.7			
115	86.4	88.3	90.5	84.0	82.0	77.9	75.8	68.2	68.4	69.0	71.6	67.0	71.9	73.4	81.0	81.1			
120	81.6	83.4	84.3	79.3	75.9	73.7	70.5	64.9	64.0	64.1	67.1	63.2	67.6	69.2	76.0	76.1			
125	76.1	78.3	77.5	73.4	69.7	69.0	64.8	60.8	59.1	57.1	62.2	58.6	62.9	64.7	70.5	70.8			
130	69.7	72.6	69.8	67.1	63.9	63.7	58.6	55.3	53.8	47.5	54.9	53.5	57.7	59.9	64.3	64.7			
135	62.6	65.4	61.3	60.3	57.7	57.7	52.2	50.2	47.9	39.5	48.6	47.4	51.4	54.2	57.1	58.3			
140	55.1	56.7	51.3	56.1	50.8	50.7	45.6	47.0	40.8	30.6	40.2	40.4	45.1	47.7	49.4	52.3			
145	46.7	47.4	40.3	50.0	42.2	41.3	37.0	44.9	33.8	21.6	30.4	35.9	38.4	39.7	40.4	50.1			
150	37.0	36.0	28.6	35.5	33.0	30.1	26.7	33.2	26.1	10.0	22.8	32.4	30.3	29.2	29.8	40.5			
155	25.3	22.3	19.0	23.6	23.3	19.5	15.4	18.4	17.0	7.81	12.7	20.6	21.1	18.3	19.3	25.7			
160	13.8	11.6	12.1	14.7	14.6	9.89	9.14	9.51	10.2	6.53	6.56	9.96	12.2	10.6	11.6	14.6			
165	3.16	3.71	3.70	2.86	2.44	2.01	1.95	1.63	2.62	0.69	1.20	0.80	2.36	2.54	3.04	3.46			
170	0.21	0.22	0.25	0.27	0.24	0.21	0.19	0.18	0.17	0.16	0.16	0.15	0.14	0.15	0.17	0.21			
175	0.06	0.06	0.06	0.06	0.06	0.07	0.08	0.08	0.07	0.08	0.08	0.08	0.08	0.07	0.07	0.06			
180	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.05	0.05	0.05	0.06	0.05	0.05	0.05	0.05	0.05			

Table 6: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Aug. 05, 2021	Aug. 04, 2022
Digital Power Meter	PF2010A	HZTE028-01	Aug. 05, 2021	Aug. 04, 2022
AC Power Supply	DPS1060	HZTE001-06	Aug. 05, 2021	Aug. 04, 2022
DC Power Supply	WY12010	HZTE004-03	Aug. 05, 2021	Aug. 04, 2022
Temperature recorder	JM624U	HZTE018-08	Aug. 05, 2021	Aug. 04, 2022
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 05, 2021	Aug. 04, 2022
Standard source	D908	HZTE012-01	Aug. 05, 2021	Aug. 04, 2022
Integrate Sphere system	3M	HZTE015-04	Aug. 05, 2021	Aug. 04, 2022
Digital Power Meter	WT210	HZTE008-01	Aug. 05, 2021	Aug. 04, 2022
AC Power Supply	PCR 500L	HZTE001-07	Aug. 05, 2021	Aug. 04, 2022
DC Power Supply	IT6154	HZTE004-04	Aug. 05, 2021	Aug. 04, 2022
Standard source	SCL-1400	HZTE012-02	Aug. 05, 2021	Aug. 04, 2022
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 05, 2021	Aug. 04, 2022
Temperature Meter	TES1310	HZTE017-01	Aug. 05, 2021	Aug. 04, 2022

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 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

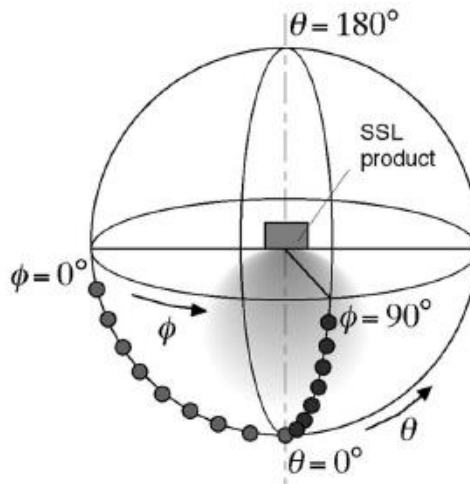
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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

This report is considered invalidated without the Special Seal for Inspection of the LTL. This report shall not be altered, increased or deleted. The results shown in this test report refer only to the sample(s) tested. Without written approval of LTL, this test report shall not be copied except in full and published as advertisement.