

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: 10FA19DIM/950

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ21120007x

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

Review by:



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Dec. 15, 2021

Approved by:



Manager: Jim Zhang

Dec. 15, 2021

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: 10FA19DIM/950

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
157.7	1414.3	8.97	0.9784
CCT (K)	CRI	Stabilization Time (Light & Power)	
5160	91.9	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	: Dec. 03, 2021
Date of Test	: Dec. 09, 2021
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

TABLE OF CONTENT

LM-79-08 TEST REPORT	1
TEST SUMMARY	2
SAMPLE PHOTO	4
TEST RESULTS	5
Sphere-Spectroradiometer Method.....	5
Goniophotometer Method	6
Spectral Power Distribution - Sphere Spectroradiometer Method	7
Chromaticity Diagram - Sphere Spectroradiometer Method.....	8
Nominal CCT Quadrangles – Sphere Spectroradiometer Method	9
Color Rendition Report – Sphere Spectroradiometer Method	10
Zonal Lumen Tabulation- Goniophotometer Method	11
Illuminance Plots- Goniophotometer Method	12
Luminous Intensity Distribution Plots- Goniophotometer Method.....	13
Luminous Intensity Data- Goniophotometer Method	14
EQUIPMENT LIST	15
TEST METHODS	15
Seasoning of SSL Product.....	15
Sphere-Spectroradiometer Method- Photometric and Electrical Measurements.....	15
Goniophotometer Method	16
Photometric and Electrical Measurements	16
Color Characteristics Measurements.....	16
Color Spatial Uniformity	16

SAMPLE PHOTO



Figure 1- Overview of the sample

Equipment Under Test(EUT)

Name	: LED Lamp
Model	: 10FA19DIM/950
Electrical Ratings	: 120V, 60Hz, 10W
Product Description	: 5000K
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)	0.076
Power Factor	0.9784
Test Power (W)	8.97
THD A%	16.07
Luminous Efficacy (lm/W)	157.7
Total Luminous Flux (lm)	1414.3
Color Rendering Index (CRI)	91.9
R9	69.9
Correlated Color Temperature (CCT)(K)	5160
Chromaticity Chroma x	0.3411
Chromaticity Chroma y	0.3556
Chromaticity Chroma u	0.2072
Chromaticity Chroma v	0.3240
Duv	0.0036
Chromaticity Chroma u'	0.2072
Chromaticity Chroma v'	0.4860

Special Color Rendering Indices	
R1	95.1
R2	98.3
R3	94.6
R4	86.9
R5	91.9
R6	95.4
R7	88.4
R8	84.4
R9	69.9
R10	98.1
R11	89.4
R12	71.3
R13	98.3
R14	97.5

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)	0.077
Power Factor	0.9775
Power (W)	8.99
Luminous Efficacy (lm/W)	159.8
Total Luminous Flux (lm)	1436.3
Beam Angle (°)	302.7 (0°-180°) / 303.4 (90°-270°)
Center Beam Candle Power (cd)	74.1
Maximum Beam Candle Power (cd)	156.3 (At: C=337.5, Gamma=84.0)
Spacing Criteria	2.13 (0°-180°) / 2.17 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	24.96%
Zonal Lumens in the 60 °-90 °Zone	31.33%
Zonal Lumens in the 90 °-120 °Zone	28.99%
Zonal Lumens in the 120 °-180 °Zone	14.71%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

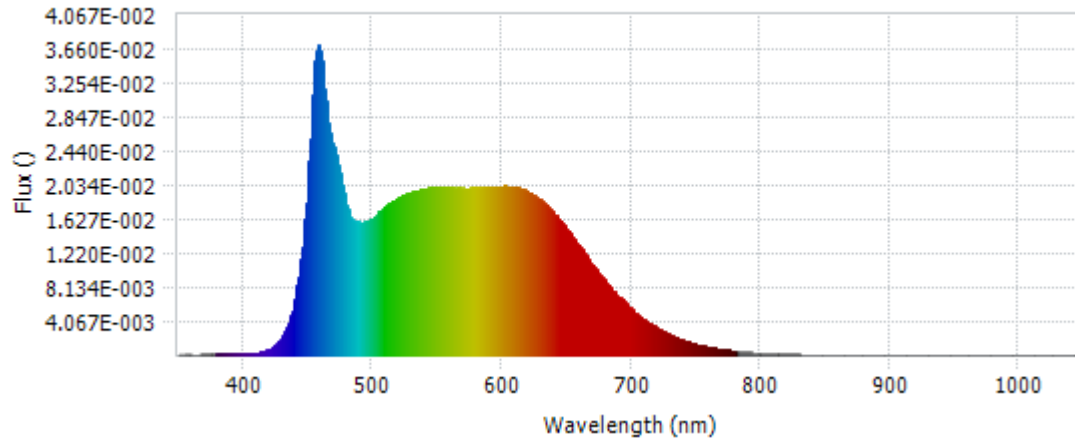
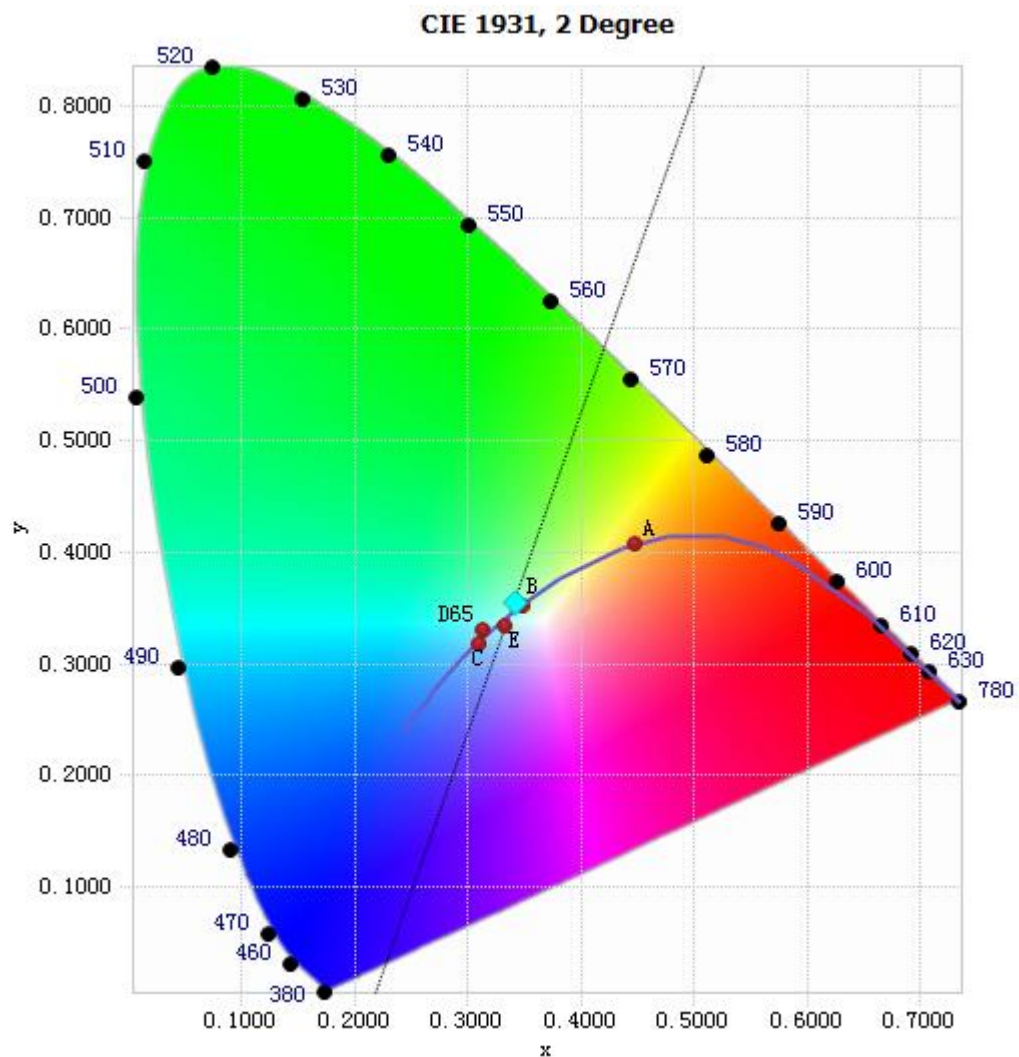


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.39E-04	485	1.61E-02	590	2.01E-02	695	6.45E-03
385	1.36E-04	490	1.59E-02	595	2.01E-02	700	5.55E-03
390	1.71E-04	495	1.60E-02	600	2.01E-02	705	4.85E-03
395	1.61E-04	500	1.64E-02	605	2.02E-02	710	4.25E-03
400	1.76E-04	505	1.71E-02	610	2.01E-02	715	3.75E-03
405	2.26E-04	510	1.78E-02	615	1.99E-02	720	3.28E-03
410	2.91E-04	515	1.84E-02	620	1.95E-02	725	2.84E-03
415	4.45E-04	520	1.88E-02	625	1.91E-02	730	2.45E-03
420	7.40E-04	525	1.91E-02	630	1.86E-02	735	2.10E-03
425	1.28E-03	530	1.95E-02	635	1.79E-02	740	1.81E-03
430	2.21E-03	535	1.96E-02	640	1.71E-02	745	1.57E-03
435	3.83E-03	540	1.98E-02	645	1.61E-02	750	1.36E-03
440	6.66E-03	545	2.00E-02	650	1.51E-02	755	1.16E-03
445	1.15E-02	550	2.00E-02	655	1.41E-02	760	9.96E-04
450	2.05E-02	555	2.00E-02	660	1.30E-02	765	8.60E-04
455	3.34E-02	560	2.00E-02	665	1.20E-02	770	7.40E-04
460	3.64E-02	565	2.00E-02	670	1.09E-02	775	6.38E-04
465	2.89E-02	570	2.00E-02	675	9.85E-03	780	5.43E-04
470	2.48E-02	575	2.00E-02	680	8.86E-03		
475	2.19E-02	580	2.00E-02	685	7.92E-03		
480	1.79E-02	585	2.00E-02	690	7.06E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3411, 0.3556)

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

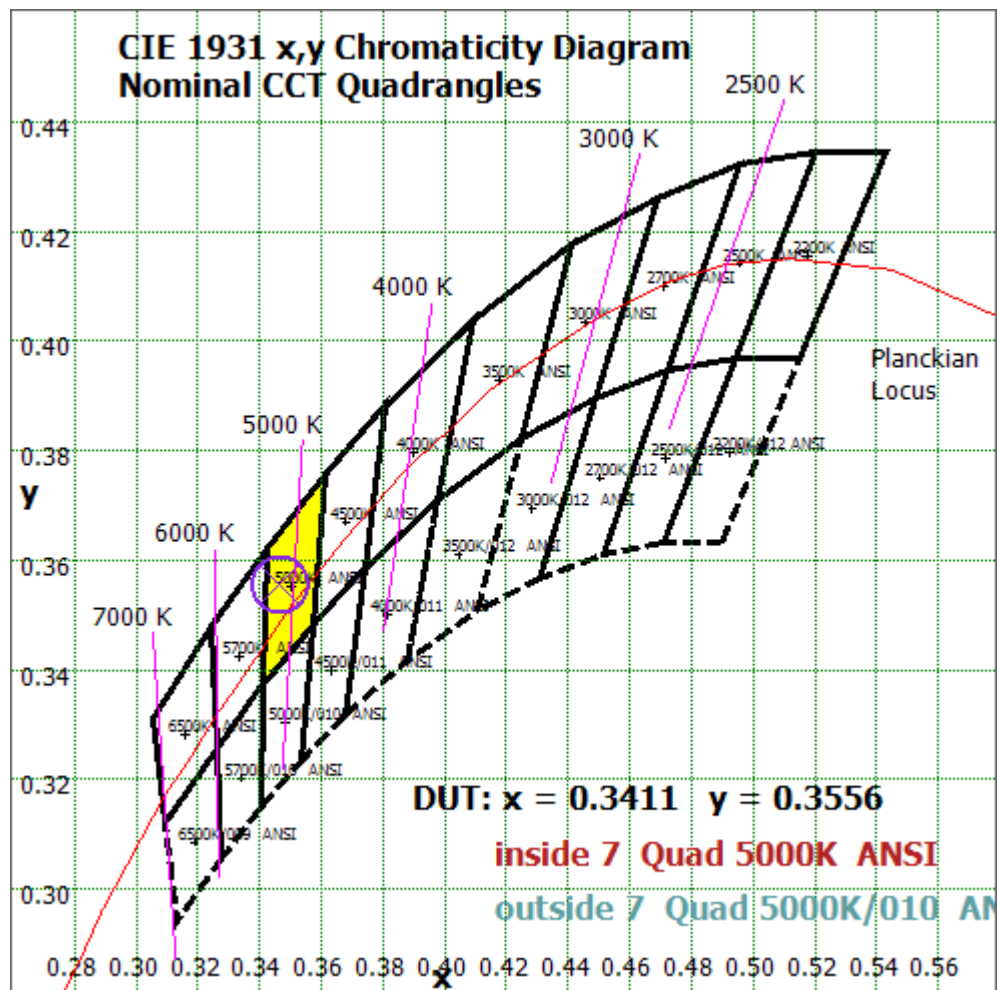


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

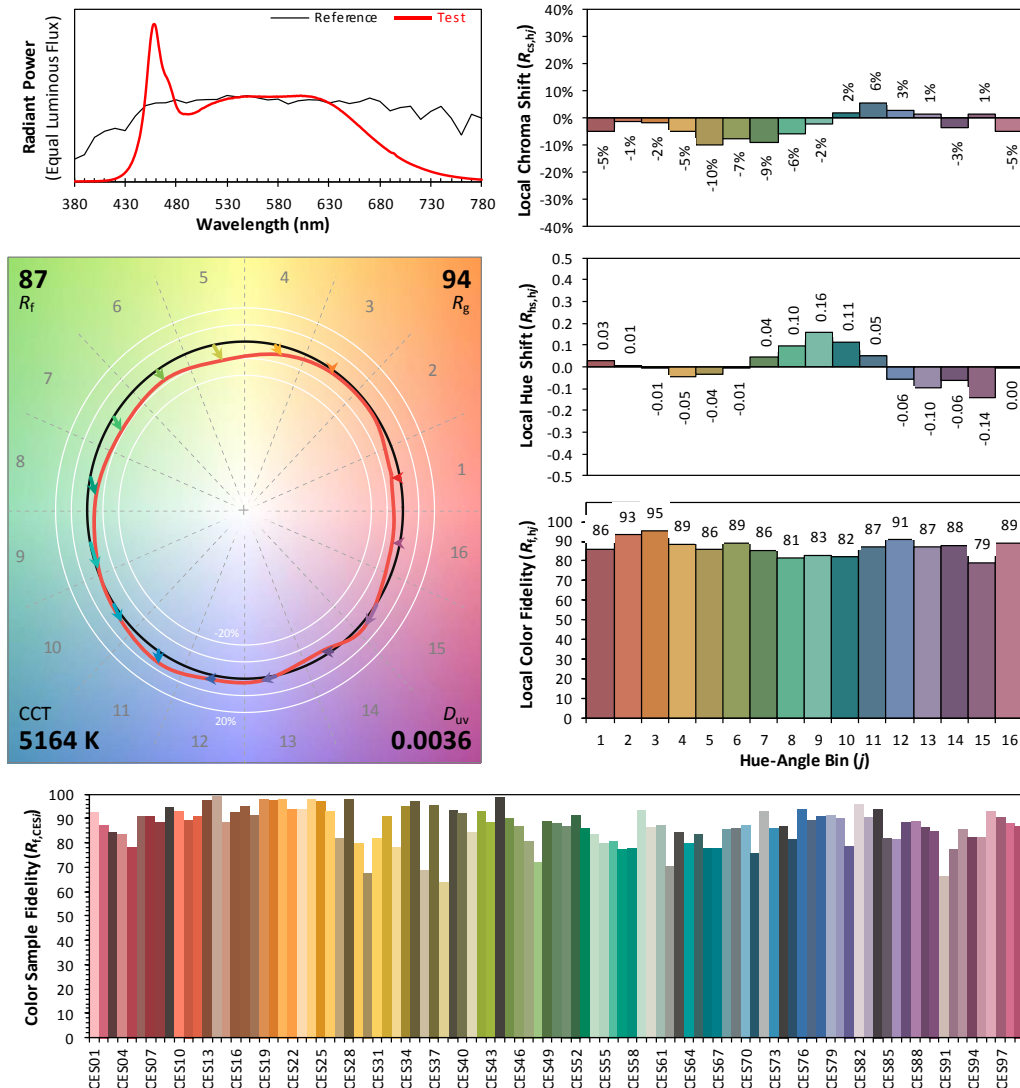
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2021/12/09

Model: 10FA19DIM/950



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

x 0.3411
 y 0.3556
 u' 0.2072
 v' 0.4860

CIE 13.3-1995
(CRI)
 R_a 92
 R_g 70

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	7.303	0.51%
10- 20	23.099	1.61%
20- 30	44.47	3.10%
30- 40	69.924	4.87%
40- 50	95.234	6.63%
50- 60	118.501	8.25%
60- 70	138.257	9.63%
70- 80	152.628	10.63%
80- 90	159.147	11.08%
90-100	154.935	10.79%
100-110	141.379	9.84%
110-120	120.138	8.36%
120-130	94.075	6.55%
130-140	65.293	4.55%
140-150	36.46	2.54%
150-160	13.673	0.95%
160-170	1.806	0.13%
170-180	0.016	0.00%
Total	1436.3	100%

$\gamma(^{\circ})$	Lumens	% Total
0-130	1319.09	91.84%
130-180	117.248	8.16%
0-180	1436.3	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

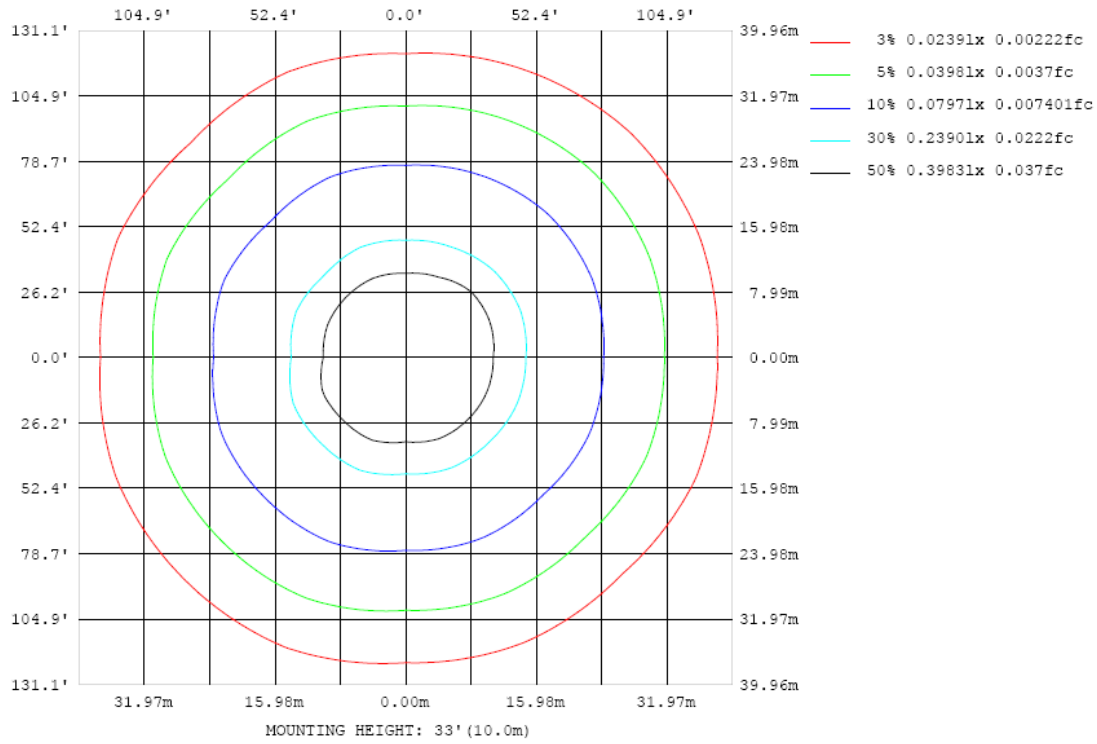


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

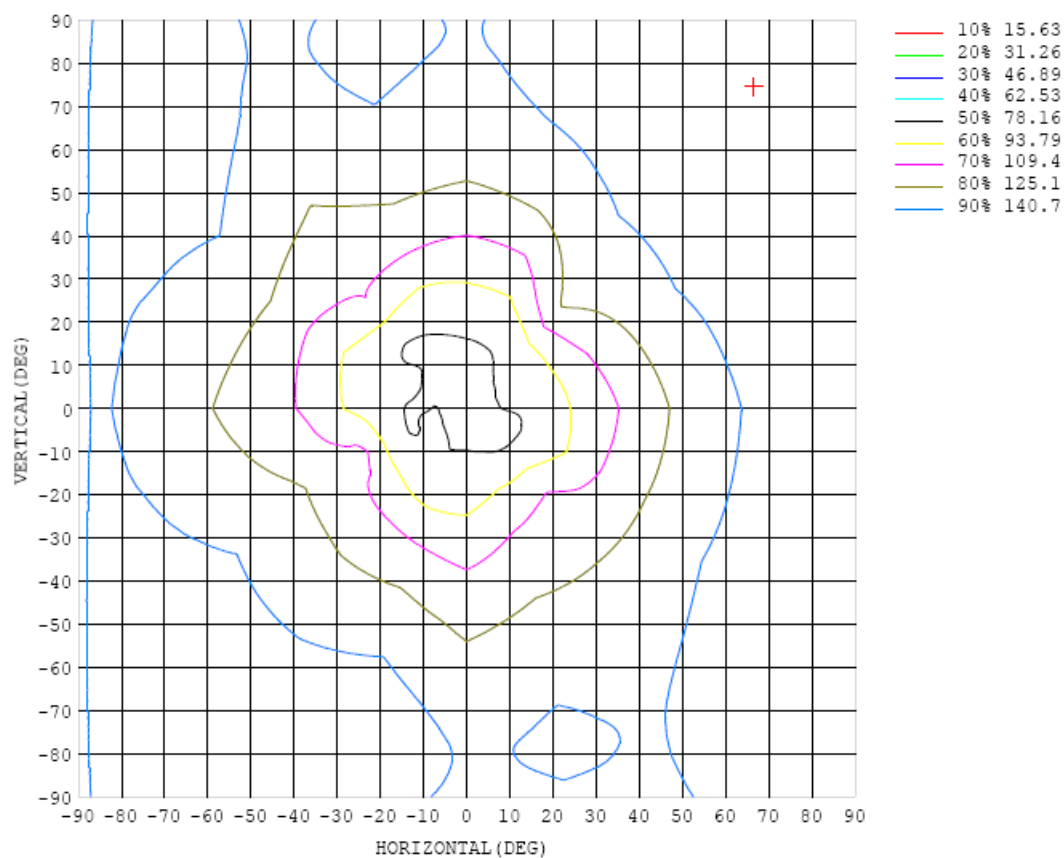


Chart 6: Isocandela Plot

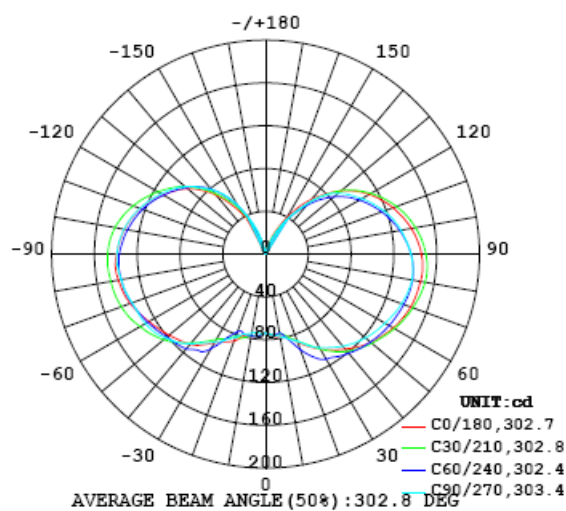


Chart 7: Polar Candela Distribution

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	74.1	74.1	74.1	74.1	74.1	74.1	74.1	74.1	74.1	74.1	74.1	74.1	74.1	74.1	74.1	74.1			
5	76.5	76.2	75.9	75.7	75.8	75.9	76.3	76.8	77.0	76.7	76.8	76.2	74.1	73.2	75.0	76.4			
10	78.7	75.7	75.0	77.6	78.4	78.0	80.1	79.9	77.4	77.3	77.4	75.2	74.9	75.3	79.4	80.6			
15	80.2	80.0	82.6	84.5	82.0	79.8	82.3	78.7	78.6	81.1	77.3	75.8	77.4	78.5	81.4	84.3			
20	87.5	86.4	94.9	93.8	86.8	85.8	90.8	91.6	86.4	81.9	77.4	79.4	82.5	81.0	91.5	91.6			
25	95.2	93.6	106	103	94.1	94.8	99.4	110	90.3	87.3	87.0	85.9	88.6	89.7	107	99.3			
30	102	102	113	109	101	104	108	116	95.7	92.1	102	94.1	94.9	97.4	122	109			
35	109	111	117	115	107	113	118	119	103	100	110	104	101	105	129	117			
40	116	118	121	120	112	120	123	124	110	109	115	112	109	113	133	124			
45	123	124	125	124	117	127	126	129	114	117	118	119	116	121	136	131			
50	128	130	128	128	122	132	130	133	118	124	121	126	122	127	138	136			
55	133	134	131	132	126	137	135	137	122	131	124	131	127	132	141	142			
60	138	139	133	135	129	141	139	141	126	136	127	135	130	135	145	146			
65	142	143	136	139	132	144	143	144	131	140	130	137	131	139	148	149			
70	144	147	138	141	135	147	146	147	135	144	133	140	133	143	152	152			
75	146	149	139	142	138	149	148	149	138	146	136	142	136	145	154	154			
80	147	151	139	143	139	150	149	150	140	147	137	144	137	147	155	156			
85	148	152	139	141	138	151	149	150	141	148	138	146	139	148	156	156			
90	146	150	136	139	136	149	147	149	139	148	137	145	139	148	154	155			
95	143	147	132	135	133	146	144	147	137	146	134	144	137	146	151	152			
100	138	142	127	131	129	141	140	143	134	143	131	141	135	144	147	148			
105	133	137	122	125	124	136	135	139	130	138	127	137	130	140	142	144			
110	127	130	116	119	118	130	130	133	125	132	123	132	125	136	136	138			
115	120	123	109	111	111	122	124	126	119	125	117	125	119	130	128	130			
120	112	114	101	103	104	113	116	117	111	116	110	118	113	123	120	121			
125	103	104	93.0	94.4	96.4	104	108	108	103	108	104	110	106	114	111	111			
130	92.0	92.3	83.3	84.3	88.5	94.5	98.2	98.6	95.2	98.4	96.9	100	97.9	104	102	101			
135	79.5	77.9	72.1	71.2	77.8	81.8	87.6	87.2	84.4	87.0	89.2	90.0	88.2	92.6	90.6	89.5			
140	66.8	62.1	59.5	58.6	63.2	67.6	75.8	72.6	72.2	74.6	79.2	78.6	78.7	79.7	79.5	76.5			
145	53.0	46.5	46.4	43.9	47.2	53.9	59.8	56.6	57.4	61.8	66.7	65.7	67.9	64.9	67.7	62.0			
150	38.2	34.1	32.2	28.9	32.7	39.0	39.9	40.3	43.7	48.8	52.4	50.7	53.0	50.6	54.3	44.7			
155	26.0	22.3	16.8	17.0	20.2	22.4	23.5	27.8	29.6	34.1	36.2	35.0	37.3	38.0	37.3	29.4			
160	14.4	13.1	4.66	6.08	9.87	10.9	14.6	17.7	18.5	20.7	19.8	22.2	24.5	25.2	22.4	19.3			
165	2.22	0.79	0.60	0.36	0.72	0.64	1.10	2.52	4.05	4.73	4.78	5.25	7.20	7.48	5.97	3.97			
170	0.24	0.20	0.17	0.14	0.16	0.19	0.22	0.26	0.30	0.33	0.35	0.34	0.39	0.38	0.36	0.30			
175	0.12	0.12	0.13	0.12	0.12	0.13	0.13	0.13	0.13	0.13	0.13	0.14	0.14	0.13	0.13	0.12			
180	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12			

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

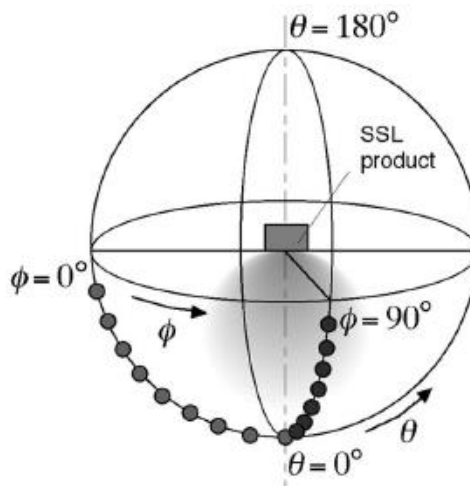
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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

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