

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/940

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ21120007at

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: 10FA19DIM/940

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
151.4	1335.4	8.82	0.9761
CCT (K)	CRI	Stabilization Time (Light & Power)	
4033	93.2	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	: 10FA19DIM/940
Electrical Ratings	: 120V, 60Hz, 10W
Product Description	: 4000K
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)	0.075
Power Factor	0.9761
Test Power (W)	8.82
THD A%	16.92
Luminous Efficacy (lm/W)	151.4
Total Luminous Flux (lm)	1335.4
Color Rendering Index (CRI)	93.2
R9	66.8
Correlated Color Temperature (CCT)(K)	4033
Chromaticity Chroma x	0.3787
Chromaticity Chroma y	0.3752
Chromaticity Chroma u	0.2246
Chromaticity Chroma v	0.3338
Duv	-0.0002
Chromaticity Chroma u'	0.2246
Chromaticity Chroma v'	0.5007

Special Color Rendering Indices	
R1	93.7
R2	96.3
R3	96.5
R4	92.7
R5	92.4
R6	93.1
R7	94.3
R8	86.6
R9	66.8
R10	89.5
R11	92.6
R12	71.7
R13	94.8
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 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)	0.076
Power Factor	0.9772
Power (W)	8.86
Luminous Efficacy (lm/W)	153.0
Total Luminous Flux (lm)	1355.9
Beam Angle (°)	313.8 (0°-180°) / 313.2(90°-270°)
Center Beam Candle Power (cd)	50.3
Maximum Beam Candle Power (cd)	151.6 (At: C=157.5, Gamma=82.0)
Spacing Criteria	2.74 (0°-180°) / 2.71 (90°-270°)
Zonal Lumens in the 0°-60° Zone	23.67%
Zonal Lumens in the 60°-90° Zone	31.45%
Zonal Lumens in the 90°-120° Zone	29.48%
Zonal Lumens in the 120°-180° Zone	15.39%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

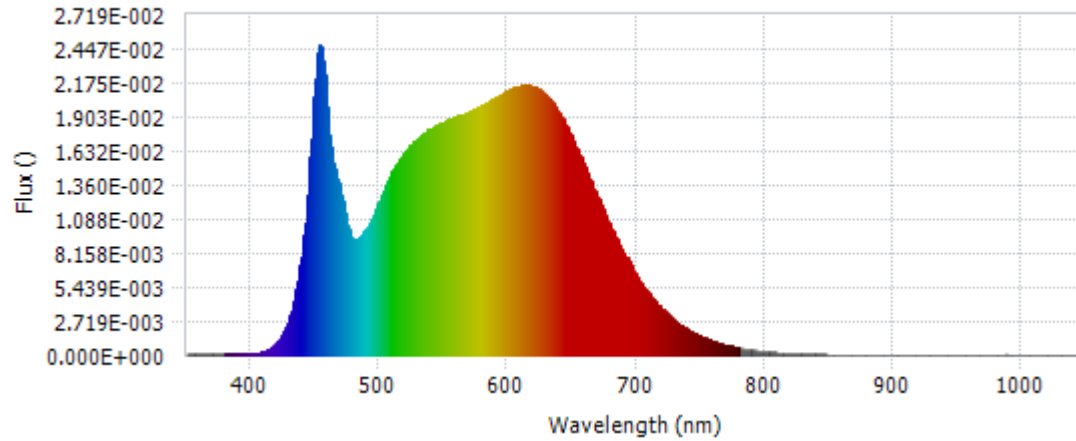
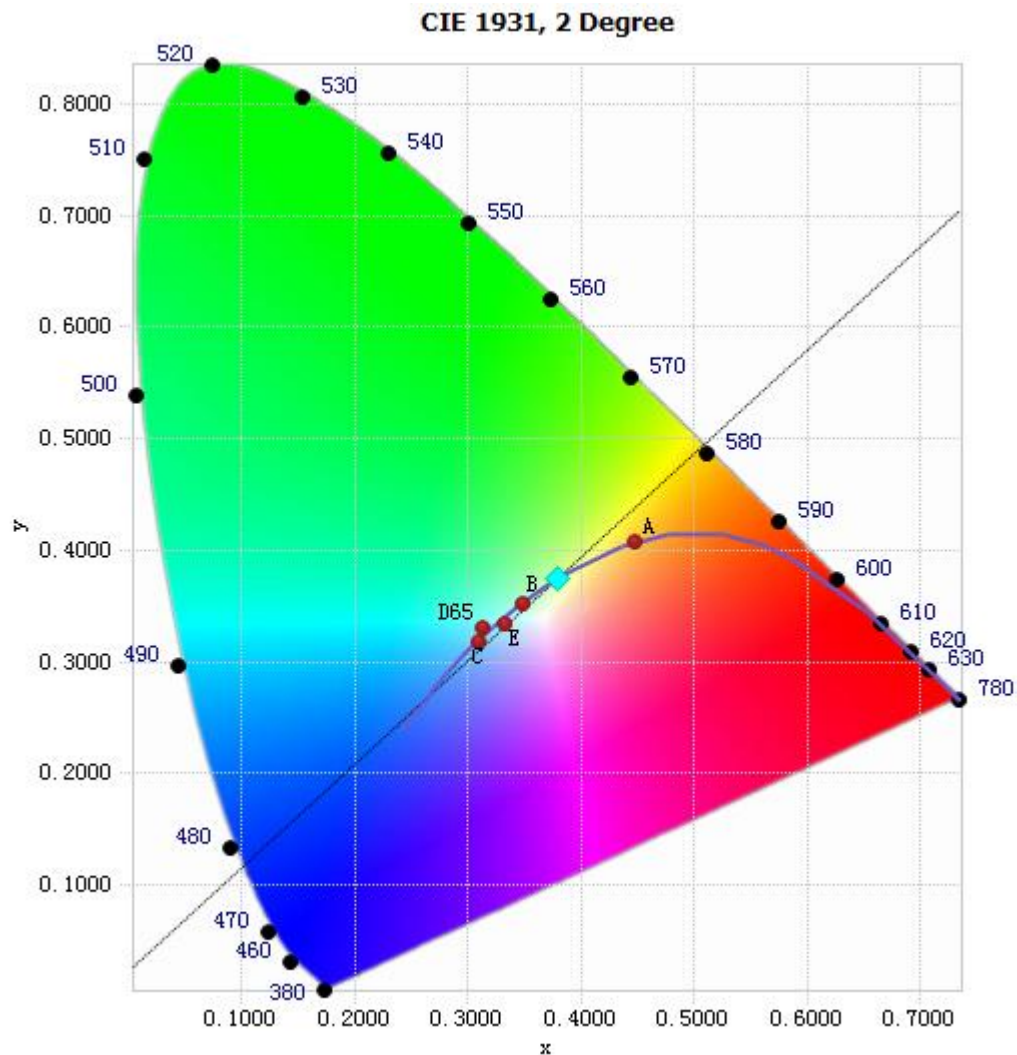


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.18E-04	485	9.52E-03	590	2.05E-02	695	7.48E-03
385	1.26E-04	490	1.01E-02	595	2.08E-02	700	6.42E-03
390	1.26E-04	495	1.12E-02	600	2.12E-02	705	5.63E-03
395	1.38E-04	500	1.24E-02	605	2.14E-02	710	4.91E-03
400	1.41E-04	505	1.36E-02	610	2.15E-02	715	4.31E-03
405	2.05E-04	510	1.47E-02	615	2.16E-02	720	3.74E-03
410	3.39E-04	515	1.55E-02	620	2.14E-02	725	3.25E-03
415	6.03E-04	520	1.63E-02	625	2.12E-02	730	2.78E-03
420	1.05E-03	525	1.68E-02	630	2.07E-02	735	2.41E-03
425	1.84E-03	530	1.73E-02	635	2.01E-02	740	2.07E-03
430	3.18E-03	535	1.77E-02	640	1.94E-02	745	1.77E-03
435	5.31E-03	540	1.81E-02	645	1.84E-02	750	1.54E-03
440	8.74E-03	545	1.84E-02	650	1.74E-02	755	1.31E-03
445	1.42E-02	550	1.86E-02	655	1.62E-02	760	1.14E-03
450	2.20E-02	555	1.89E-02	660	1.51E-02	765	9.62E-04
455	2.43E-02	560	1.90E-02	665	1.39E-02	770	8.28E-04
460	1.87E-02	565	1.92E-02	670	1.26E-02	775	7.07E-04
465	1.49E-02	570	1.95E-02	675	1.15E-02	780	6.04E-04
470	1.28E-02	575	1.97E-02	680	1.03E-02		
475	1.04E-02	580	2.00E-02	685	9.25E-03		
480	9.32E-03	585	2.03E-02	690	8.22E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3787, 0.3752)

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

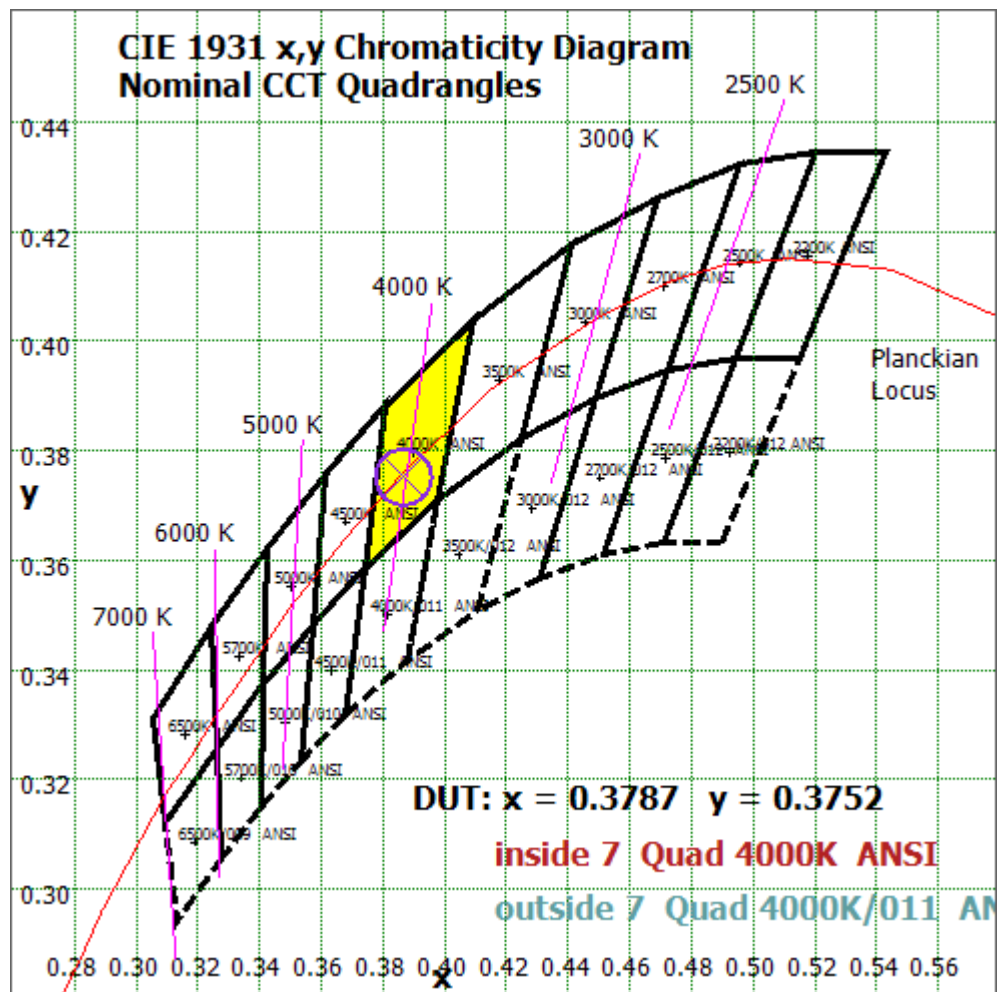


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

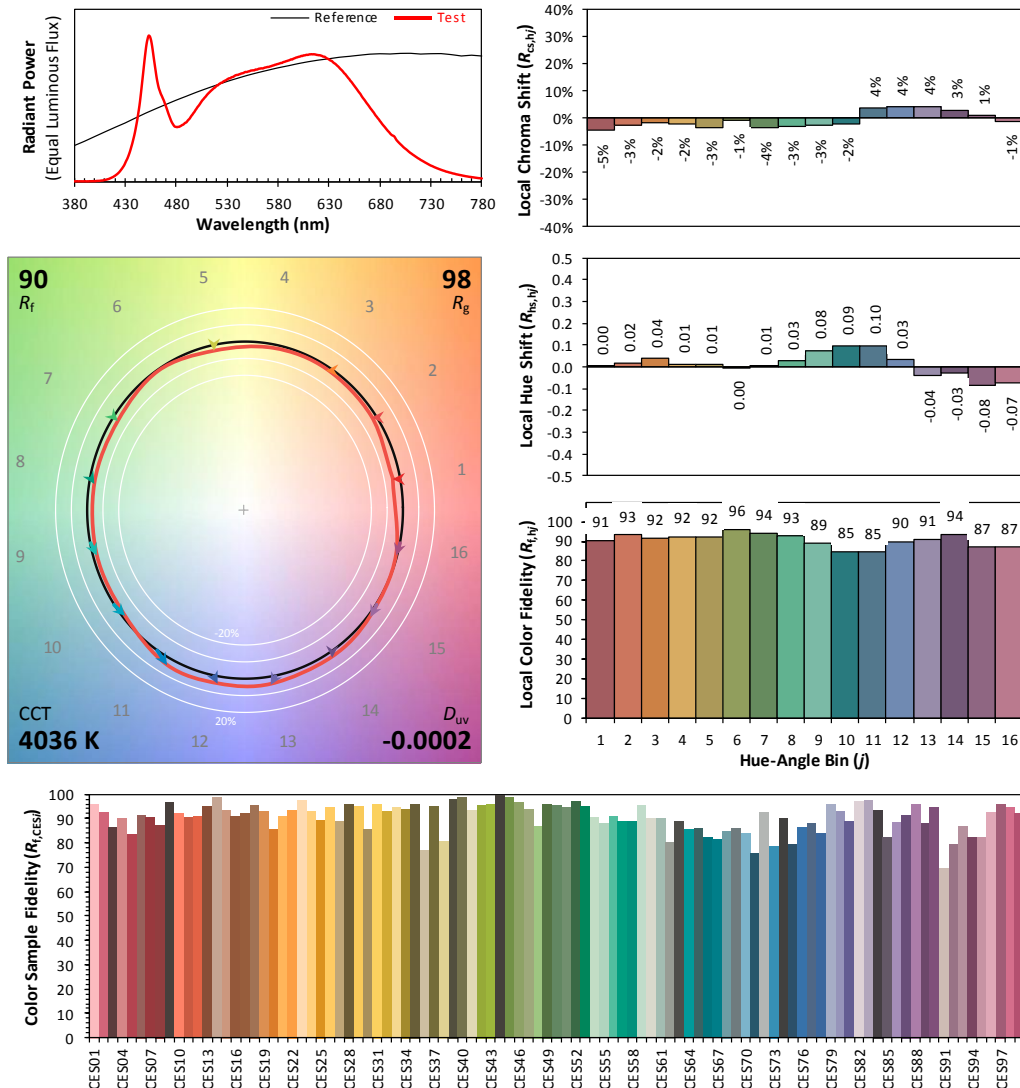
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2022/02/15

Model: 10FA19DIM/940



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

x 0.3787
 y 0.3752
 u' 0.2246
 v' 0.5007

CIE 13.3-1995
(CRI)
 R_a 93
 R_g 67

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	5.042	0.37%
10- 20	17.652	1.30%
20- 30	37.563	2.77%
30- 40	62.596	4.62%
40- 50	87.481	6.45%
50- 60	110.656	8.16%
60- 70	130.619	9.63%
70- 80	144.979	10.69%
80- 90	150.872	11.13%
90-100	147.326	10.87%
100-110	135.574	10.00%
110-120	116.844	8.62%
120-130	92.289	6.81%
130-140	64.177	4.73%
140-150	36.859	2.72%
150-160	13.486	0.99%
160-170	1.832	0.14%
170-180	0.017	0.00%
Total	1355.9	100%

$\gamma(^{\circ})$	Lumens	% Total
0-130	1239.49	91.42%
130-180	116.371	8.58%
0-180	1355.9	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

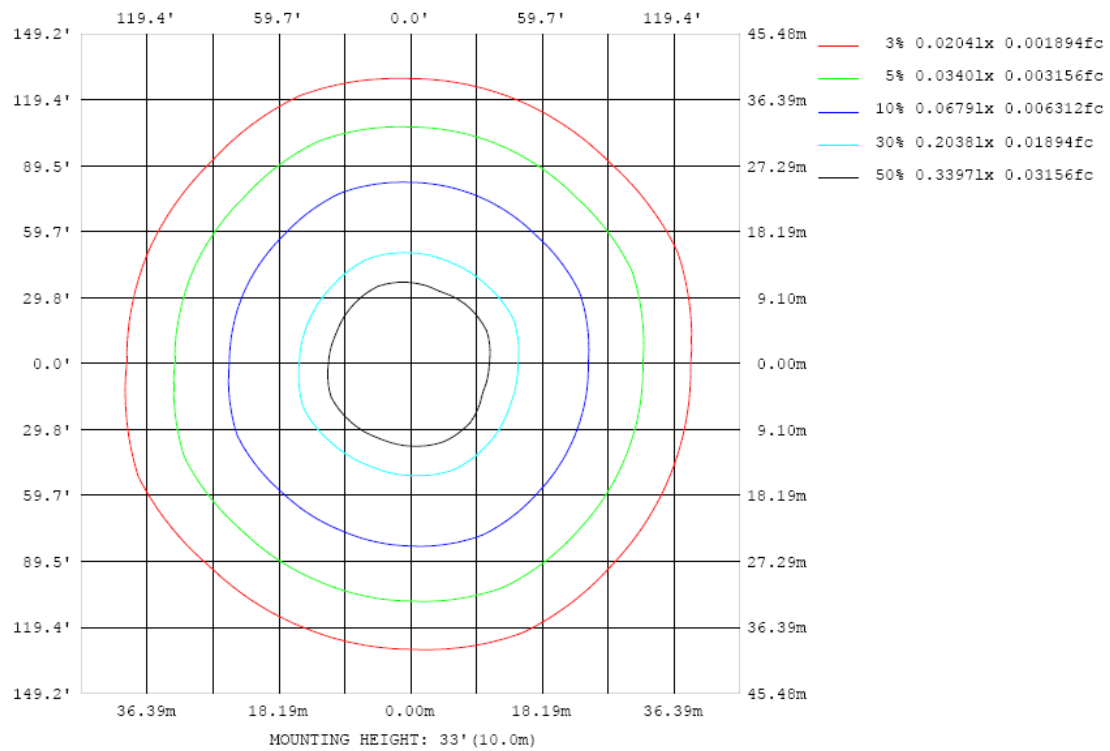


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

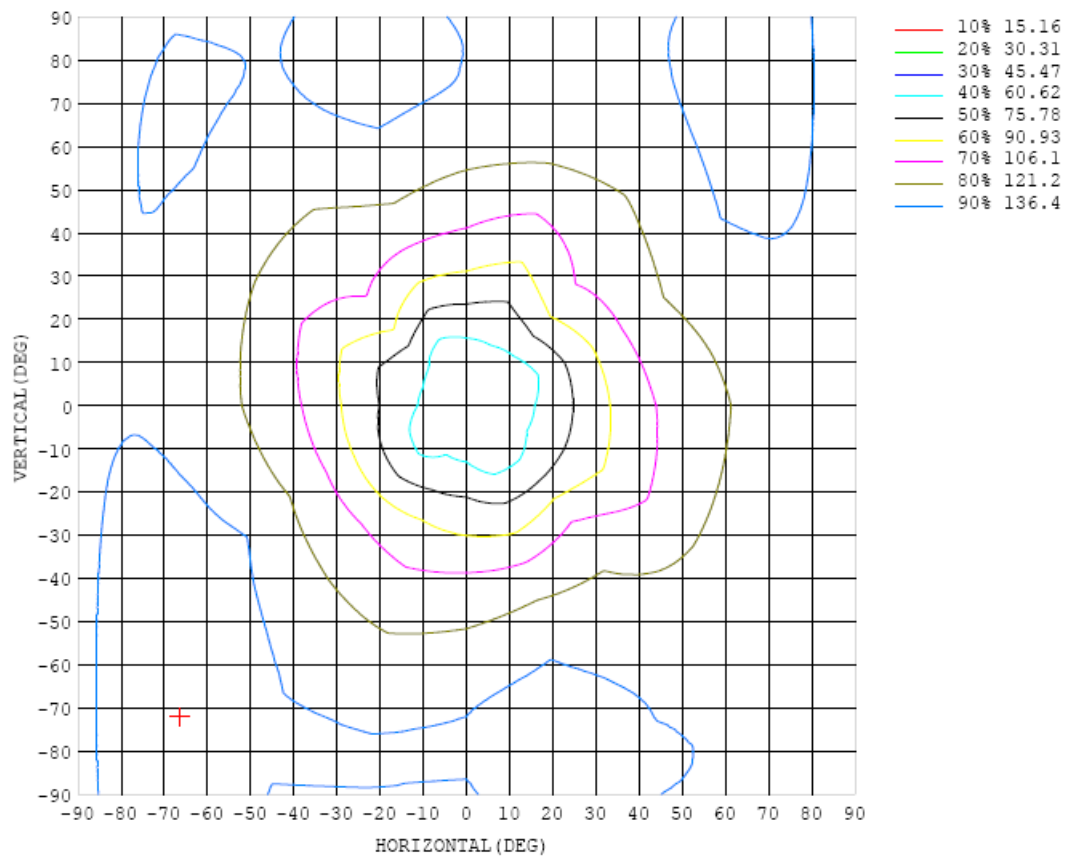


Chart 6: Isocandela Plot

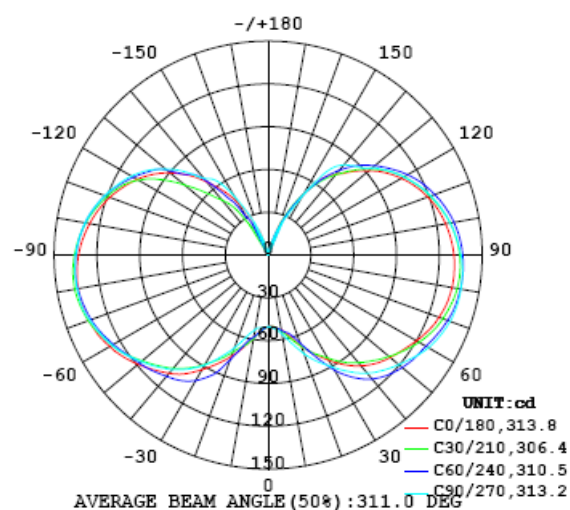


Chart 7: Polar Candela Distribution

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	50.3	50.3	50.3	50.3	50.3	50.3	50.3	50.3	50.3	50.3	50.3	50.3	50.3	50.3	50.3	50.3			
5	50.7	50.6	50.9	51.4	51.9	52.5	52.8	52.6	52.9	53.1	53.1	52.2	51.1	50.7	50.6	50.5			
10	53.2	54.0	53.5	52.3	56.5	57.6	54.7	55.0	58.7	59.2	58.3	52.4	53.0	54.3	55.0	53.3			
15	59.1	60.4	57.0	56.8	64.0	64.0	59.3	61.7	66.9	65.8	65.1	57.3	59.5	60.6	59.3	55.3			
20	67.9	67.9	65.6	66.5	73.5	73.3	69.9	72.1	75.5	72.3	78.1	67.9	69.2	67.4	70.3	65.0			
25	76.3	76.2	78.4	77.4	82.5	85.2	81.8	83.3	84.0	80.3	92.7	78.5	78.8	74.7	83.4	76.4			
30	85.1	83.2	93.1	87.9	90.7	93.5	94.4	94.5	92.7	88.5	102	90.1	88.9	82.7	95.6	86.9			
35	93.8	91.5	105	99.0	99.8	101	104	105	102	96.5	107	99.8	97.5	90.4	104	97.5			
40	101	98.5	113	109	108	107	111	114	108	104	111	108	105	97.4	108	107			
45	107	105	119	118	114	112	117	121	114	110	115	116	111	104	112	114			
50	112	111	123	125	120	117	122	128	119	115	118	122	116	111	116	120			
55	116	117	126	131	125	121	126	134	124	121	121	128	122	117	119	126			
60	120	122	128	136	130	126	129	139	128	126	125	132	126	123	123	130			
65	124	127	131	139	133	130	133	143	132	130	129	136	130	128	127	134			
70	127	130	134	143	136	133	135	147	134	134	132	139	133	132	130	138			
75	130	133	136	145	137	136	137	150	135	136	134	142	136	135	133	142			
80	131	135	137	146	137	137	138	151	135	138	135	144	136	136	135	144			
85	131	135	137	147	137	137	137	151	134	137	136	144	136	136	136	145			
90	130	134	136	145	135	136	136	149	133	136	135	142	135	135	135	144			
95	129	132	135	143	133	134	134	147	130	133	133	140	133	132	133	142			
100	126	130	132	139	130	130	131	143	127	130	130	137	130	129	131	138			
105	123	126	129	135	126	126	128	138	123	125	127	133	127	125	128	134			
110	119	121	124	130	121	121	124	132	118	120	122	128	122	121	124	129			
115	114	116	119	124	116	115	118	125	112	114	116	121	117	116	118	123			
120	108	110	113	117	110	109	112	117	106	105	109	114	111	110	111	116			
125	101	103	105	108	103	101	103	107	98.7	92.5	102	105	104	102	103	108			
130	92.2	94.1	97.5	97.9	95.3	91.8	94.1	96.9	89.7	76.7	92.8	95.6	94.0	92.5	94.9	98.4			
135	82.8	84.1	88.7	86.8	87.9	82.0	83.8	84.9	79.4	62.0	80.1	83.8	82.6	81.3	85.0	86.9			
140	73.9	73.6	77.7	74.8	82.7	70.9	72.4	72.0	67.1	50.6	68.7	70.1	70.5	69.9	74.0	74.2			
145	65.3	62.4	64.6	60.5	71.4	58.3	59.3	57.7	55.1	38.7	49.0	54.0	63.9	58.9	61.1	58.8			
150	49.2	49.3	48.7	43.6	47.2	45.8	43.6	43.0	42.3	22.3	31.1	37.1	47.7	46.3	45.0	41.3			
155	32.5	34.8	32.4	28.6	28.9	32.3	27.9	24.8	29.1	18.4	19.6	21.8	29.8	31.3	27.6	27.3			
160	20.3	18.9	18.5	17.6	17.5	17.3	16.1	14.7	17.6	11.9	9.50	12.8	16.3	17.9	16.4	17.8			
165	3.31	4.72	5.79	5.34	4.41	4.54	2.42	1.99	3.15	2.48	0.99	2.10	3.15	4.13	4.54	4.57			
170	0.38	0.39	0.44	0.47	0.43	0.34	0.30	0.27	0.28	0.27	0.27	0.27	0.28	0.30	0.32	0.36			
175	0.10	0.10	0.10	0.10	0.10	0.12	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.12	0.11	0.10			
180	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.07	0.09	0.10	0.10	0.09	0.09	0.09	0.09	0.09			

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

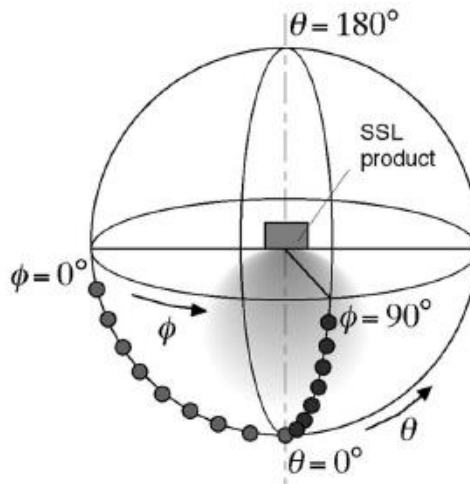
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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