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: 11BR30DIM/940

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ21120007i

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

Review by: April Zou

Engineer: April Zou

Dec. 15, 2021

Approved by: Jim Zhang

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: **11BR30DIM/940**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
99.8	1032.3	10.34	0.8150

CCT (K)	CRI	Stabilization Time (Light & Power)
3950	93.0	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	: Dec. 03, 2021
Date of Test	: Dec. 08, 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

SAMPLE PHOTO

Figure 1- Overview of the sample

Equipment Under Test(EUT)	
Name	: LED Lamp
Model	: 11BR30DIM/940
Electrical Ratings	: 120V, 60Hz, 11W
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 ℃.

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)	0.106
Power Factor	0.8150
Test Power (W)	10.34
THD A%	57.57
Luminous Efficacy (lm/W)	99.8
Total Luminous Flux (lm)	1032.3
Color Rendering Index (CRI)	93
R9	65.1
Correlated Color Temperature (CCT)(K)	3950
Chromaticity Chroma x	0.3809
Chromaticity Chroma y	0.3722
Chromaticity Chroma u	0.2273
Chromaticity Chroma v	0.3331
Duv	-0.0023
Chromaticity Chroma u ’	0.2273
Chromaticity Chroma v’	0.4996

Special Color Rendering Indices	
R1	94.5
R2	95.6
R3	94
R4	93.8
R5	93.3
R6	92.6
R7	93.7
R8	86.6
R9	65.1
R10	87
R11	93.4
R12	73.4
R13	94.9
R14	95.8

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 ℃.

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)	0.106
Power Factor	0.8123
Power (W)	10.36
Luminous Efficacy (lm/W)	102.2
Total Luminous Flux (lm)	1058.9
Beam Angle (°)	110.8 (0^o-180^o) / 194.6 (90^o-270^o)
Center Beam Candle Power (cd)	342
Maximum Beam Candle Power (cd)	341.8 (At: C=270.0, Gamma=0.5)
Spacing Criteria	1.24 (0^o-180^o) / 1.23 (90^o-270^o)
Zonal Lumens in the 0 °-60 °Zone	70.04%
Zonal Lumens in the 60 °-90 °Zone	24.48%
Zonal Lumens in the 90 °-120 °Zone	4.78%
Zonal Lumens in the 120 °-180 °Zone	0.70%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

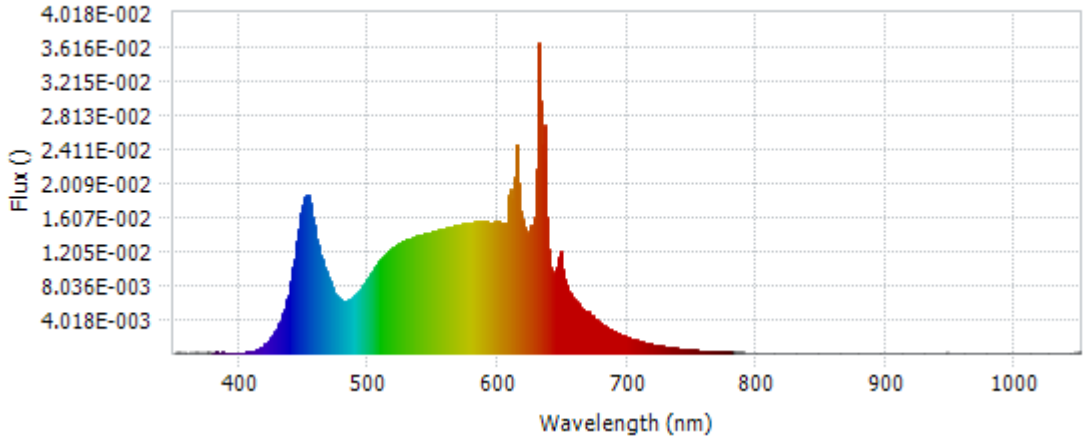
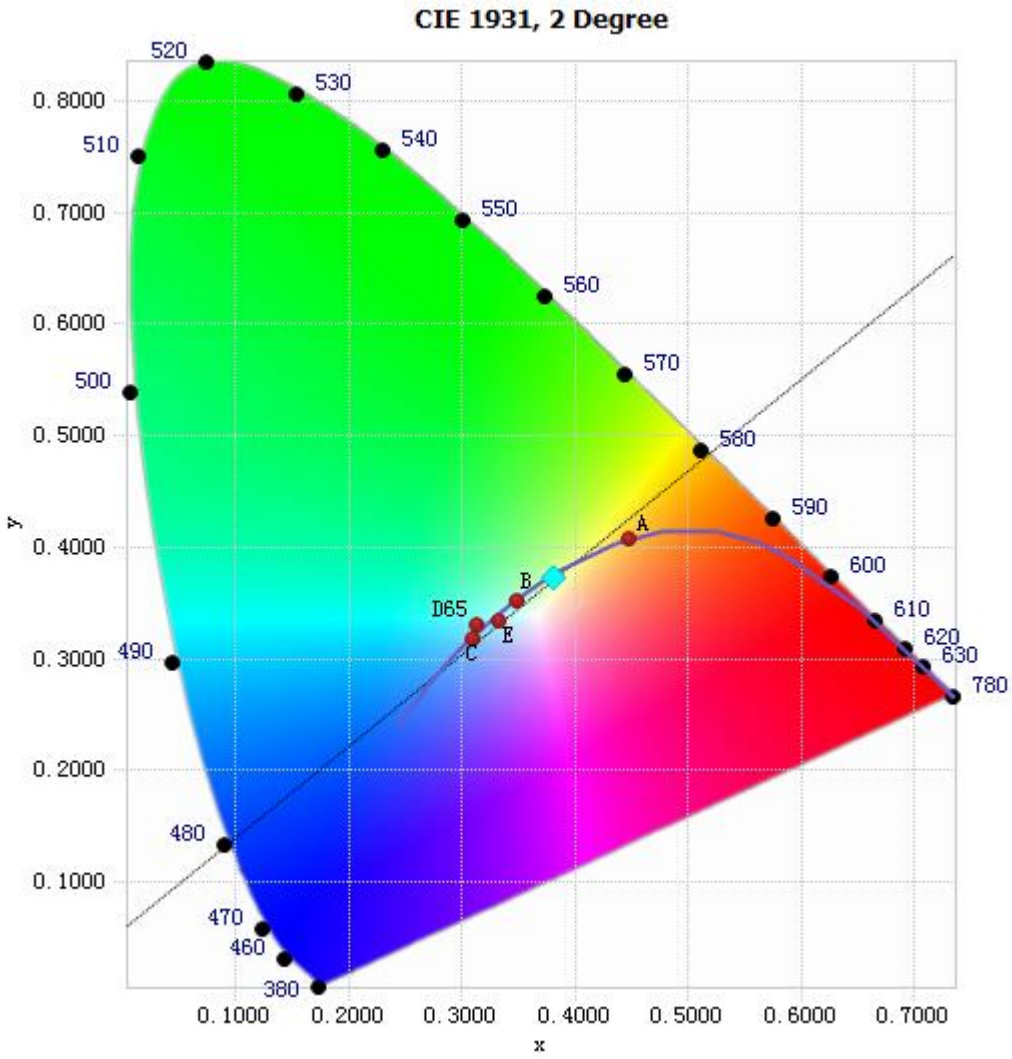


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.15E-04	485	6.31E-03	590	1.56E-02	695	2.25E-03
385	1.01E-04	490	6.91E-03	595	1.54E-02	700	1.93E-03
390	1.27E-04	495	7.80E-03	600	1.57E-02	705	1.65E-03
395	9.24E-05	500	8.95E-03	605	1.53E-02	710	1.42E-03
400	1.20E-04	505	1.01E-02	610	1.93E-02	715	1.23E-03
405	1.48E-04	510	1.11E-02	615	2.45E-02	720	1.06E-03
410	2.48E-04	515	1.20E-02	620	1.56E-02	725	9.17E-04
415	5.57E-04	520	1.26E-02	625	1.45E-02	730	7.85E-04
420	1.08E-03	525	1.31E-02	630	2.17E-02	735	6.66E-04
425	1.87E-03	530	1.35E-02	635	2.46E-02	740	5.64E-04
430	3.19E-03	535	1.37E-02	640	1.09E-02	745	4.89E-04
435	5.25E-03	540	1.39E-02	645	9.41E-03	750	4.28E-04
440	8.43E-03	545	1.42E-02	650	9.88E-03	755	3.57E-04
445	1.34E-02	550	1.44E-02	655	7.31E-03	760	3.12E-04
450	1.81E-02	555	1.46E-02	660	6.25E-03	765	2.70E-04
455	1.77E-02	560	1.48E-02	665	5.32E-03	770	2.31E-04
460	1.36E-02	565	1.49E-02	670	4.87E-03	775	2.06E-04
465	1.07E-02	570	1.52E-02	675	4.09E-03	780	1.69E-04
470	8.58E-03	575	1.53E-02	680	3.50E-03		
475	6.91E-03	580	1.54E-02	685	3.03E-03		
480	6.27E-03	585	1.56E-02	690	2.60E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3809, 0.3722)

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

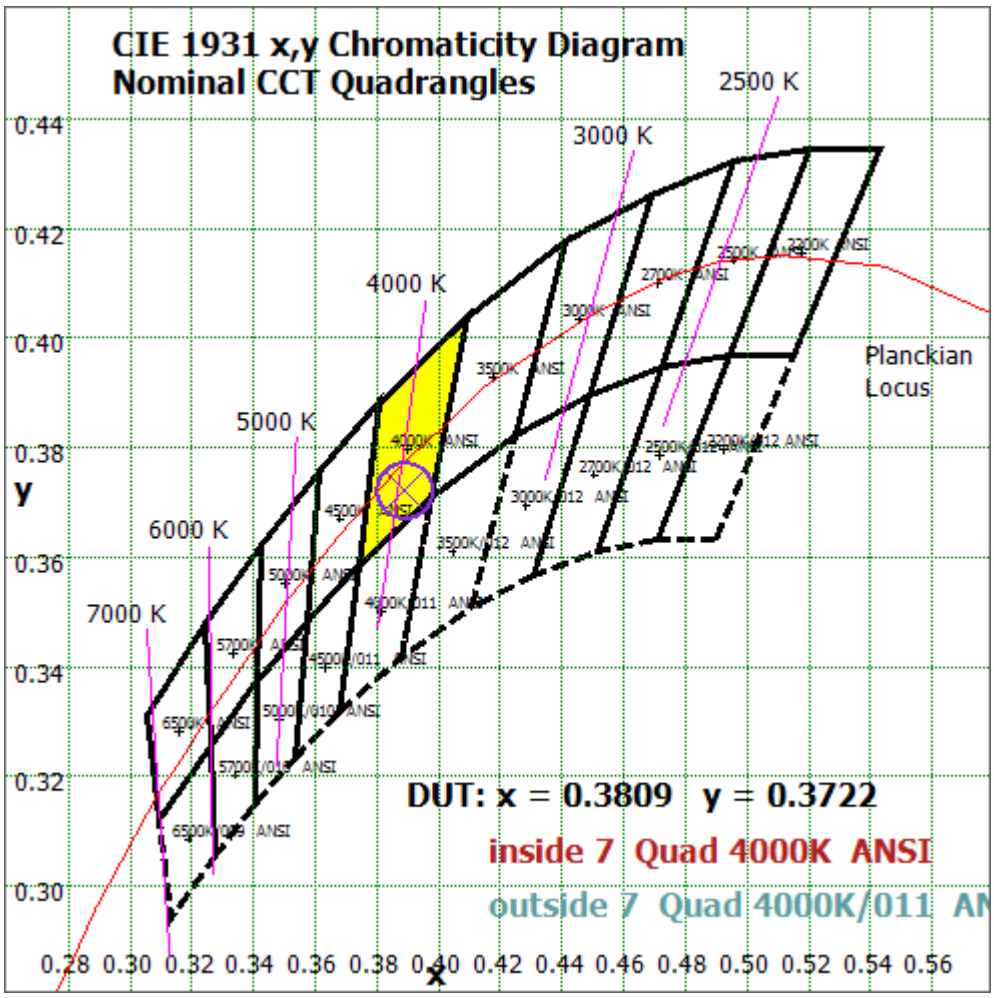


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

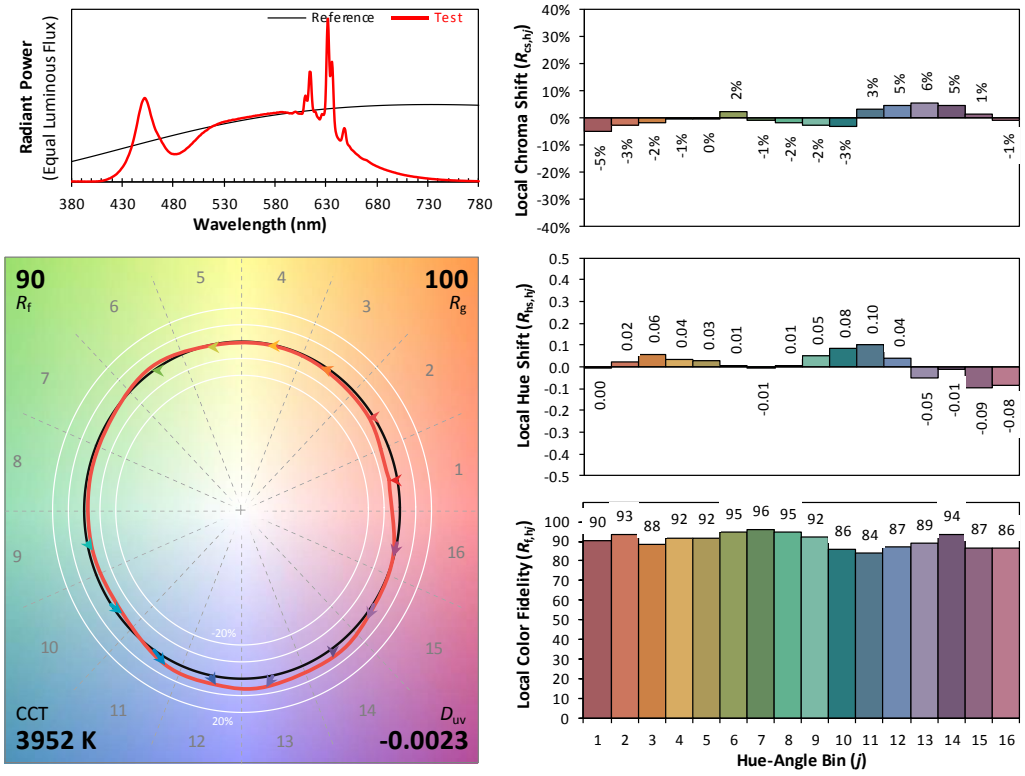
Quality Assured

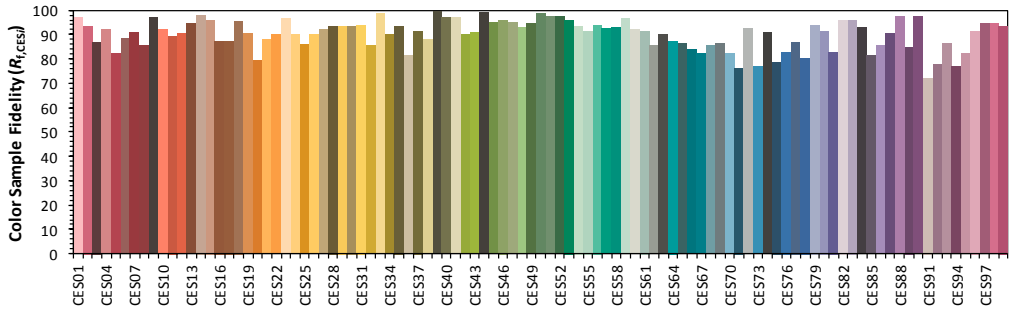
Color Rendition Report – Sphere Spectroradiometer Method

ANSI/IES TM-30-18 Color Rendition Report

Source: LED **Manufacturer:** GREEN CREATIVE LTD

Date: 2021/12/08 **Model:** 11BR30DIM/940





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

x	0.3809
y	0.3722
u'	0.2273
v'	0.4996

CIE 13.3-1995 (CRI)

R_a	93
R_9	65

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

γ(°)	Lumens	% Total
0- 10	32.253	3.05%
10- 20	91.889	8.68%
20- 30	137.774	13.01%
30- 40	163.416	15.43%
40- 50	166.488	15.72%
50- 60	149.865	14.15%
60- 70	120.529	11.38%
70- 80	85.535	8.08%
80- 90	53.203	5.02%
90-100	28.544	2.70%
100-110	14.316	1.35%
110-120	7.745	0.73%
120-130	4.144	0.39%
130-140	2.005	0.19%
140-150	0.818	0.08%
150-160	0.266	0.03%
160-170	0.1	0.01%
170-180	0.034	0.00%
Total	1058.9	100%

γ(°)	Lumens	% Total
0- 60	741.685	70.04%
60- 90	259.267	24.48%
0-90	1000.95	94.53%
90- 180	57.972	5.47%
0- 180	1058.9	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

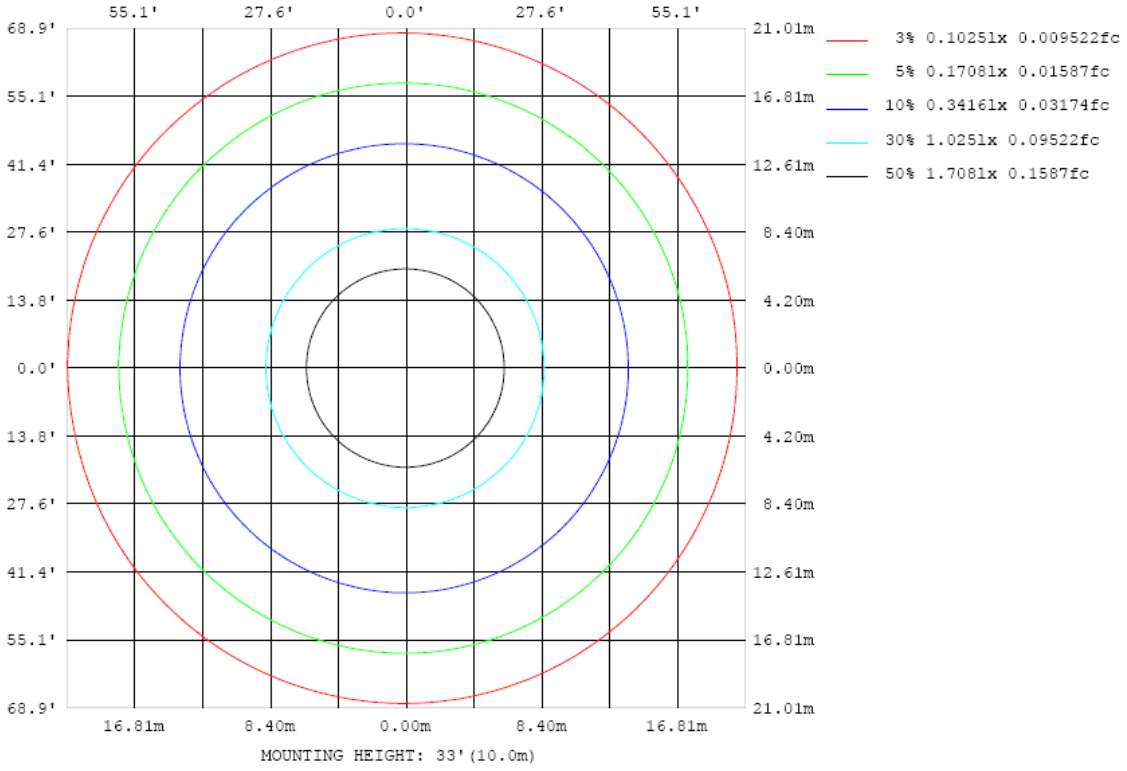


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

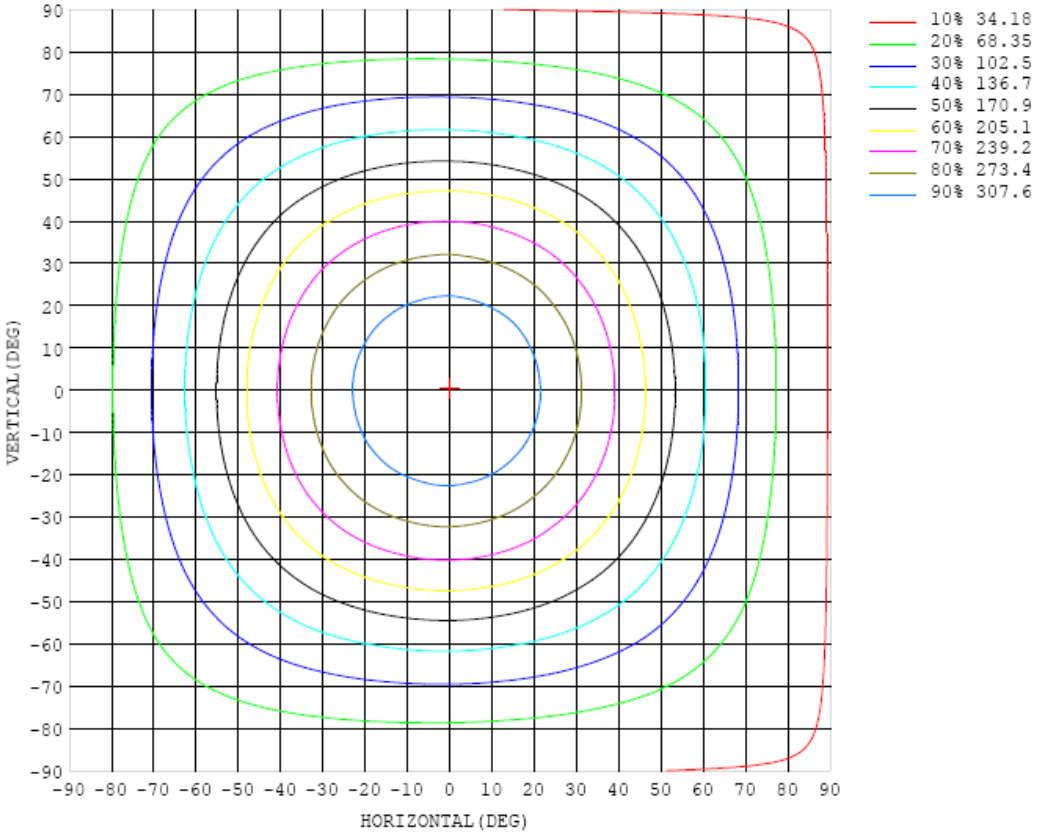


Chart 6: Isocandela Plot

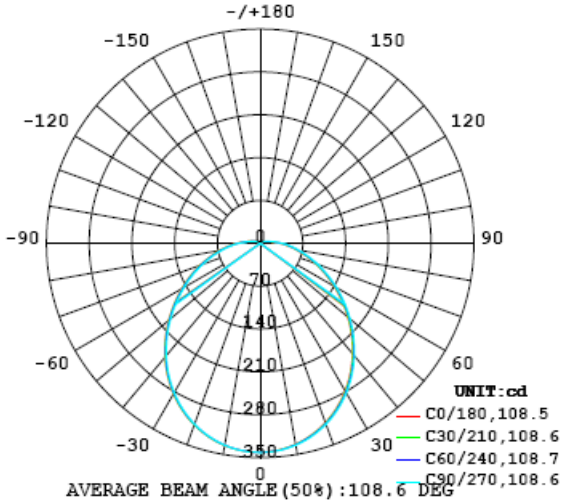


Chart 7: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1 UNIT: cd

γ (DEG) \ C (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	342	342	342	342	342	342	342	342	342	342	342	342	342	342	342	342	342	342	342
5	339	339	339	339	339	339	340	339	340	340	340	340	340	340	340	340	340	340	340
10	333	333	333	334	334	334	334	335	334	335	335	335	336	335	335	335	335	335	335
15	324	324	324	325	325	325	325	326	326	327	327	327	327	327	327	327	327	327	327
20	312	312	312	313	313	313	314	314	314	315	315	315	315	316	316	316	316	316	316
25	296	297	297	297	298	298	299	299	299	300	300	300	301	301	302	302	301	301	301
30	278	279	279	279	280	280	281	281	282	282	283	283	283	284	284	284	284	284	284
35	257	258	258	259	260	260	261	261	262	262	263	263	263	264	264	265	264	264	265
40	235	236	236	236	237	238	238	239	239	240	241	241	242	242	243	243	243	243	243
45	211	212	212	213	214	214	215	216	216	217	217	217	218	219	219	220	220	220	220
50	187	187	188	189	189	190	191	191	192	193	193	193	194	195	195	196	196	196	196
55	163	163	164	164	165	166	167	167	168	168	169	169	170	171	171	171	172	172	172
60	139	139	140	140	141	142	143	143	144	145	145	145	146	147	147	148	148	148	148
65	117	117	117	118	119	119	120	121	121	122	122	123	123	124	125	125	125	125	126
70	95.5	95.7	96.1	96.6	97.5	98.1	98.9	99.5	100	101	101	102	102	103	103	104	104	104	105
75	76.3	76.4	76.8	77.4	78.1	78.7	79.4	80.0	80.7	81.3	81.7	82.3	82.8	83.3	83.8	84.1	84.3	84.3	85.2
80	59.6	60.2	60.1	60.6	61.2	61.6	62.4	62.4	63.3	64.0	64.4	64.8	65.4	65.8	66.3	66.5	66.7	66.7	67.4
85	45.0	45.2	45.7	46.0	46.6	47.1	47.8	48.3	48.9	49.5	49.9	50.3	50.8	51.2	51.6	51.8	52.0	51.9	51.8
90	32.8	33.0	33.4	33.7	34.2	34.7	35.2	35.6	36.1	36.7	37.1	37.5	37.9	38.3	38.5	38.7	38.8	38.8	38.7
95	23.4	23.6	23.8	24.1	24.5	24.8	25.2	25.6	26.0	26.4	26.8	27.1	27.5	27.8	28.0	28.1	28.2	28.1	28.1
100	16.6	16.7	16.9	17.1	17.4	17.6	18.0	18.3	18.6	18.9	19.1	19.4	19.6	19.9	20.0	20.1	20.1	20.1	20.1
105	12.0	12.1	12.2	12.4	12.5	12.7	12.9	13.2	13.4	13.6	13.8	13.9	14.1	14.3	14.4	14.5	14.5	14.5	14.5
110	9.07	9.13	9.18	9.30	9.40	9.54	9.70	9.84	10.0	10.2	10.3	10.4	10.6	10.7	10.8	10.8	10.8	10.8	10.8
115	7.00	7.03	7.08	7.17	7.28	7.38	7.50	7.62	7.76	7.89	8.00	8.11	8.20	8.30	8.36	8.41	8.44	8.45	8.41
120	5.34	5.36	5.41	5.47	5.56	5.64	5.75	5.85	5.96	6.07	6.17	6.24	6.33	6.43	6.49	6.54	6.57	6.58	6.56
125	4.02	4.04	4.07	4.12	4.19	4.27	4.36	4.45	4.54	4.63	4.71	4.79	4.86	4.93	5.00	5.05	5.07	5.06	5.07
130	2.98	2.99	3.00	3.05	3.11	3.18	3.26	3.33	3.41	3.48	3.55	3.62	3.69	3.75	3.81	3.85	3.88	3.88	3.88
135	2.15	2.15	2.15	2.19	2.25	2.30	2.37	2.44	2.51	2.57	2.62	2.68	2.74	2.80	2.86	2.90	2.92	2.92	2.93
140	1.48	1.48	1.48	1.51	1.55	1.60	1.66	1.72	1.77	1.83	1.87	1.93	1.98	2.03	2.09	2.13	2.15	2.15	2.17
145	0.97	0.96	0.96	0.98	1.02	1.06	1.11	1.15	1.20	1.24	1.28	1.33	1.37	1.43	1.47	1.50	1.52	1.53	1.55
150	0.59	0.58	0.59	0.60	0.62	0.65	0.69	0.72	0.76	0.80	0.83	0.87	0.91	0.95	0.99	1.02	1.03	1.04	1.07
155	0.35	0.36	0.36	0.37	0.37	0.38	0.40	0.43	0.46	0.49	0.52	0.55	0.58	0.61	0.64	0.66	0.68	0.69	0.71
160	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.32	0.34	0.36	0.37	0.38	0.40	0.42	0.44	0.45	0.46	0.48
165	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.31	0.31	0.31	0.32	0.33	0.33	0.35
170	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.31	0.31	0.32	0.32	0.32	0.32	0.32	0.32	0.33	0.33
175	0.35	0.35	0.34	0.34	0.34	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.34	0.34	0.34	0.35
180	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37

Table 6: Luminous Intensity Data

Table--2 UNIT: cd

γ (DEG) \ C (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	342	342	342	342	342	342	342	342	342	342	342	342	342	342	342	342	342		
5	340	340	340	340	340	340	340	340	340	340	339	339	339	339	339	339	339		
10	335	335	335	335	335	335	334	334	335	334	334	333	333	334	333	333	333		
15	327	327	327	327	327	326	326	325	326	325	325	325	325	325	324	324	324		
20	316	316	315	315	315	315	314	314	314	313	313	312	312	312	312	312	312		
25	301	301	301	301	300	300	299	299	299	298	298	297	297	297	297	297	296		
30	284	284	284	283	283	283	282	282	282	281	280	279	279	279	279	278	278		
35	264	264	264	264	263	263	262	262	261	260	259	259	259	258	258	258	257		
40	243	242	242	242	241	241	240	239	239	238	237	237	237	236	235	235	235		
45	219	219	219	219	218	217	217	216	215	215	214	213	213	212	212	212	211		
50	195	195	195	194	194	193	193	192	191	190	189	189	188	188	187	187	187		
55	172	171	171	170	170	169	168	167	167	166	165	164	164	163	163	163	163		
60	148	148	147	147	146	146	145	144	144	143	142	142	141	141	140	140	140		
65	126	126	125	125	124	124	123	122	121	120	119	119	119	118	118	118	117		
70	105	104	104	103	103	102	101	100	99.6	98.8	98.0	97.5	97.1	96.7	96.4	96.3	96.1		
75	84.9	84.6	84.1	83.7	82.9	82.3	81.5	80.7	80.0	79.3	78.5	78.1	77.7	77.2	77.0	76.8	76.7		
80	67.1	66.8	66.4	65.9	65.2	64.6	63.9	63.2	62.5	61.9	61.2	60.8	60.4	60.0	59.8	59.6	59.5		
85	51.6	51.3	50.9	50.4	49.9	49.3	48.6	48.0	47.4	46.8	46.2	45.9	45.5	45.2	44.9	44.8	44.8		
90	38.5	38.2	37.8	37.5	36.9	36.4	35.9	35.3	34.8	34.3	33.8	33.5	33.2	32.9	32.7	32.7	32.6		
95	27.9	27.6	27.4	27.1	26.6	26.2	25.7	25.3	24.9	24.5	24.1	23.8	23.6	23.4	23.3	23.2	23.2		
100	19.9	19.8	19.5	19.3	19.0	18.7	18.3	18.0	17.7	17.4	17.1	16.9	16.7	16.5	16.5	16.4	16.5		
105	14.4	14.3	14.1	14.0	13.7	13.5	13.2	13.0	12.7	12.5	12.3	12.1	12.0	11.9	11.9	11.8	11.9		
110	10.7	10.7	10.6	10.5	10.3	10.1	9.99	9.82	9.67	9.51	9.36	9.25	9.16	9.07	9.02	9.00	9.00		
115	8.37	8.31	8.24	8.16	8.04	7.93	7.80	7.67	7.53	7.41	7.28	7.18	7.10	7.03	6.98	6.96	6.96		
120	6.53	6.48	6.42	6.36	6.27	6.17	6.07	5.95	5.84	5.73	5.62	5.53	5.45	5.39	5.36	5.34	5.33		
125	5.05	5.01	4.96	4.91	4.84	4.76	4.67	4.57	4.48	4.37	4.28	4.20	4.14	4.08	4.05	4.03	4.02		
130	3.86	3.83	3.79	3.75	3.69	3.63	3.55	3.47	3.39	3.30	3.21	3.14	3.08	3.04	3.01	3.00	2.98		
135	2.92	2.89	2.85	2.82	2.77	2.72	2.67	2.60	2.52	2.44	2.37	2.30	2.25	2.22	2.20	2.18	2.16		
140	2.16	2.13	2.10	2.07	2.04	2.00	1.95	1.90	1.84	1.77	1.70	1.64	1.59	1.57	1.55	1.53	1.51		
145	1.55	1.53	1.50	1.48	1.45	1.42	1.39	1.34	1.29	1.23	1.17	1.12	1.08	1.06	1.04	1.02	1.00		
150	1.08	1.06	1.03	1.02	1.00	0.98	0.96	0.92	0.88	0.83	0.78	0.74	0.71	0.68	0.66	0.65	0.62		
155	0.73	0.72	0.70	0.69	0.67	0.66	0.64	0.61	0.58	0.55	0.51	0.49	0.47	0.45	0.42	0.40	0.38		
160	0.51	0.51	0.51	0.50	0.49	0.47	0.45	0.43	0.41	0.39	0.38	0.38	0.37	0.36	0.35	0.34	0.31		
165	0.42	0.42	0.42	0.42	0.41	0.41	0.40	0.38	0.37	0.37	0.36	0.36	0.36	0.36	0.35	0.35	0.31		
170	0.36	0.39	0.39	0.39	0.39	0.39	0.39	0.38	0.38	0.38	0.38	0.38	0.37	0.37	0.37	0.35	0.33		
175	0.35	0.36	0.39	0.39	0.38	0.38	0.39	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.36	0.36	0.35		
180	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37		

Table 7: 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 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.

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The uncertainty of integrating sphere system reported in this document is expended 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 expended uncertainty is 2.3% with a coverage factor k=2.

Color Characteristics Measurements

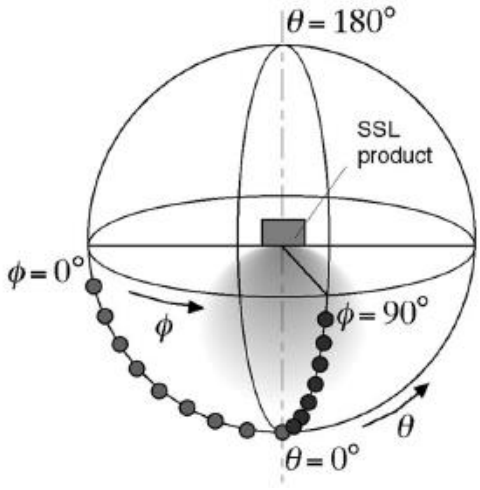
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as 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°/180° and C=90°/270°) 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, Δu'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 ***