

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: 11BR40DIM/940

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ211200071

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

Review by:



Engineer: April Zou

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: **11BR40DIM/940**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
117.2	1163.6	9.93	0.8179
CCT (K)	CRI	Stabilization Time (Light & Power)	
3865	95.2	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	: 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

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SAMPLE PHOTO



Figure 1- Overview of the sample

Equipment Under Test(EUT)

Name	: LED Lamp
Model	: 11BR40DIM/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 °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)	0.101
Power Factor	0.8179
Test Power (W)	9.93
THD A%	57.17
Luminous Efficacy (lm/W)	117.2
Total Luminous Flux (lm)	1163.6
Color Rendering Index (CRI)	95.2
R9	77.6
Correlated Color Temperature (CCT)(K)	3865
Chromaticity Chroma x	0.3892
Chromaticity Chroma y	0.3894
Chromaticity Chroma u	0.2258
Chromaticity Chroma v	0.3389
Duv	0.0034
Chromaticity Chroma u'	0.2258
Chromaticity Chroma v'	0.5083

Special Color Rendering Indices	
R1	97
R2	95.3
R3	92
R4	97.2
R5	95
R6	93.9
R7	97.8
R8	93
R9	77.6
R10	86.6
R11	95.9
R12	72.6
R13	96.1
R14	94.5

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)	0.102
Power Factor	0.8122
Power (W)	9.96
Luminous Efficacy (lm/W)	119.8
Total Luminous Flux (lm)	1193.6
Beam Angle (°)	107.1 (0°-180°) / 107.2 (90°-270°)
Center Beam Candle Power (cd)	391
Maximum Beam Candle Power (cd)	391.2 (At: C=180.0, Gamma=0.5)
Spacing Criteria	1.21 (0°-180°) / 1.21 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	69.56%
Zonal Lumens in the 60 °-90 °Zone	24.75%
Zonal Lumens in the 90 °-120 °Zone	4.94%
Zonal Lumens in the 120 °-180 °Zone	0.75%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

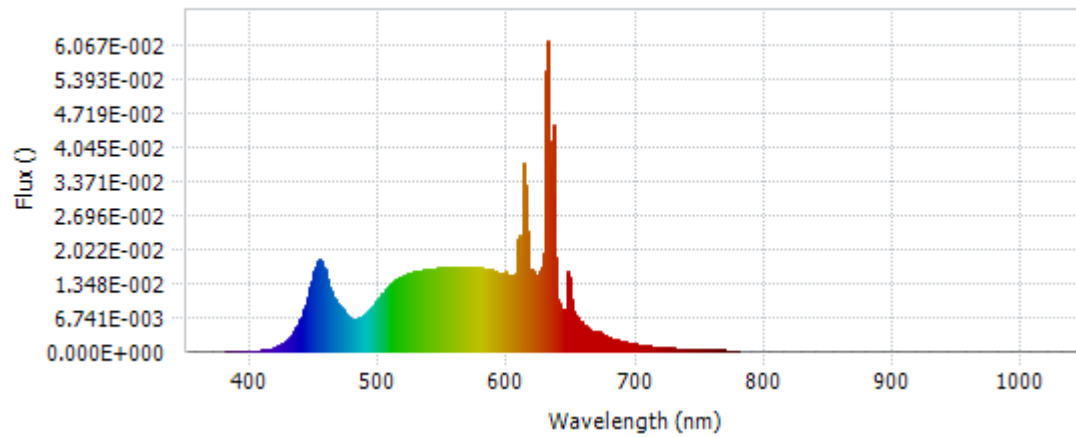
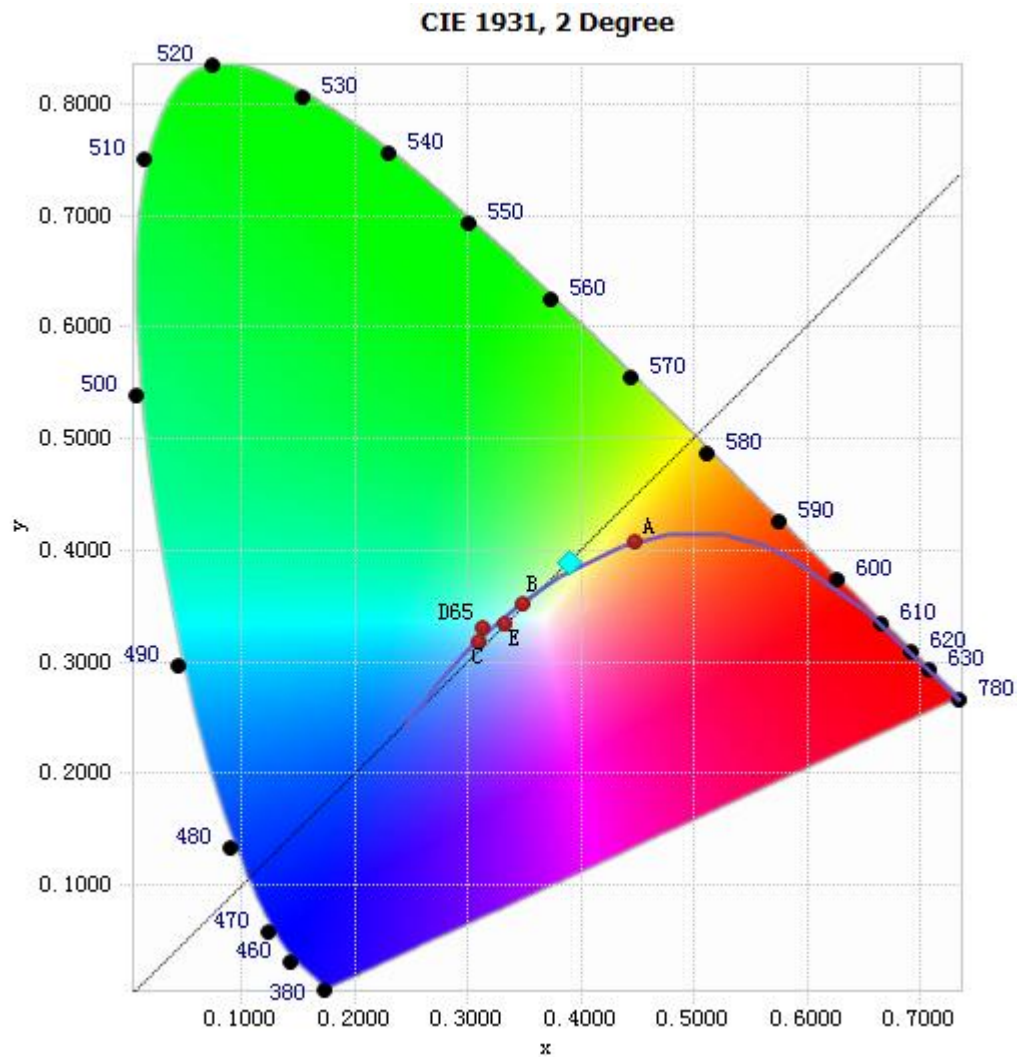


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.21E-04	485	6.68E-03	590	1.58E-02	695	1.64E-03
385	8.76E-05	490	7.69E-03	595	1.52E-02	700	1.38E-03
390	9.53E-05	495	8.99E-03	600	1.52E-02	705	1.20E-03
395	7.57E-05	500	1.07E-02	605	1.51E-02	710	1.01E-03
400	7.65E-05	505	1.23E-02	610	1.87E-02	715	8.68E-04
405	1.15E-04	510	1.35E-02	615	2.36E-02	720	7.53E-04
410	2.38E-04	515	1.45E-02	620	1.58E-02	725	6.41E-04
415	4.82E-04	520	1.51E-02	625	1.60E-02	730	5.52E-04
420	8.80E-04	525	1.55E-02	630	5.54E-02	735	4.73E-04
425	1.63E-03	530	1.58E-02	635	4.49E-02	740	4.00E-04
430	2.85E-03	535	1.61E-02	640	9.37E-03	745	3.44E-04
435	4.67E-03	540	1.62E-02	645	8.48E-03	750	2.97E-04
440	7.49E-03	545	1.65E-02	650	8.29E-03	755	2.55E-04
445	1.16E-02	550	1.65E-02	655	6.21E-03	760	2.25E-04
450	1.66E-02	555	1.66E-02	660	5.10E-03	765	1.91E-04
455	1.76E-02	560	1.67E-02	665	4.08E-03	770	1.64E-04
460	1.34E-02	565	1.67E-02	670	4.00E-03	775	1.41E-04
465	1.03E-02	570	1.66E-02	675	3.09E-03	780	1.27E-04
470	8.56E-03	575	1.66E-02	680	2.59E-03		
475	7.02E-03	580	1.63E-02	685	2.22E-03		
480	6.28E-03	585	1.63E-02	690	1.91E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3892, 0.3894)

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

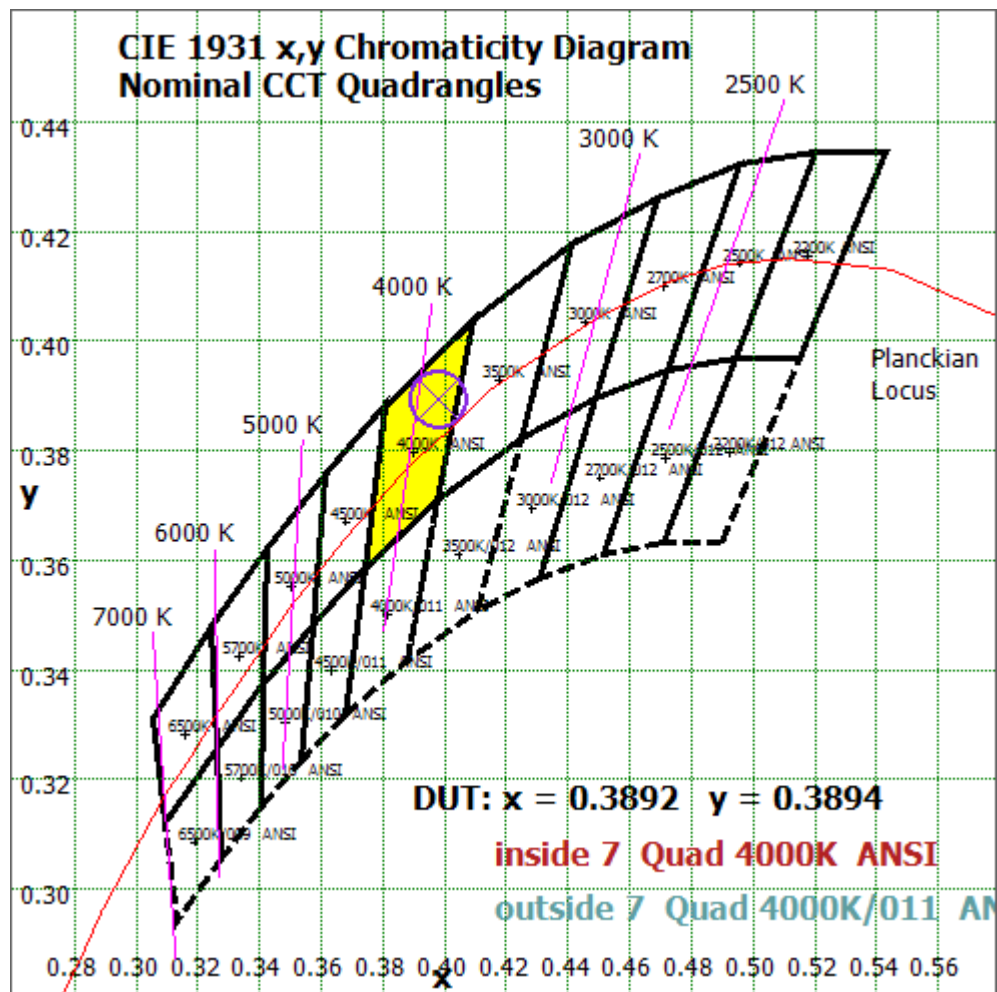


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

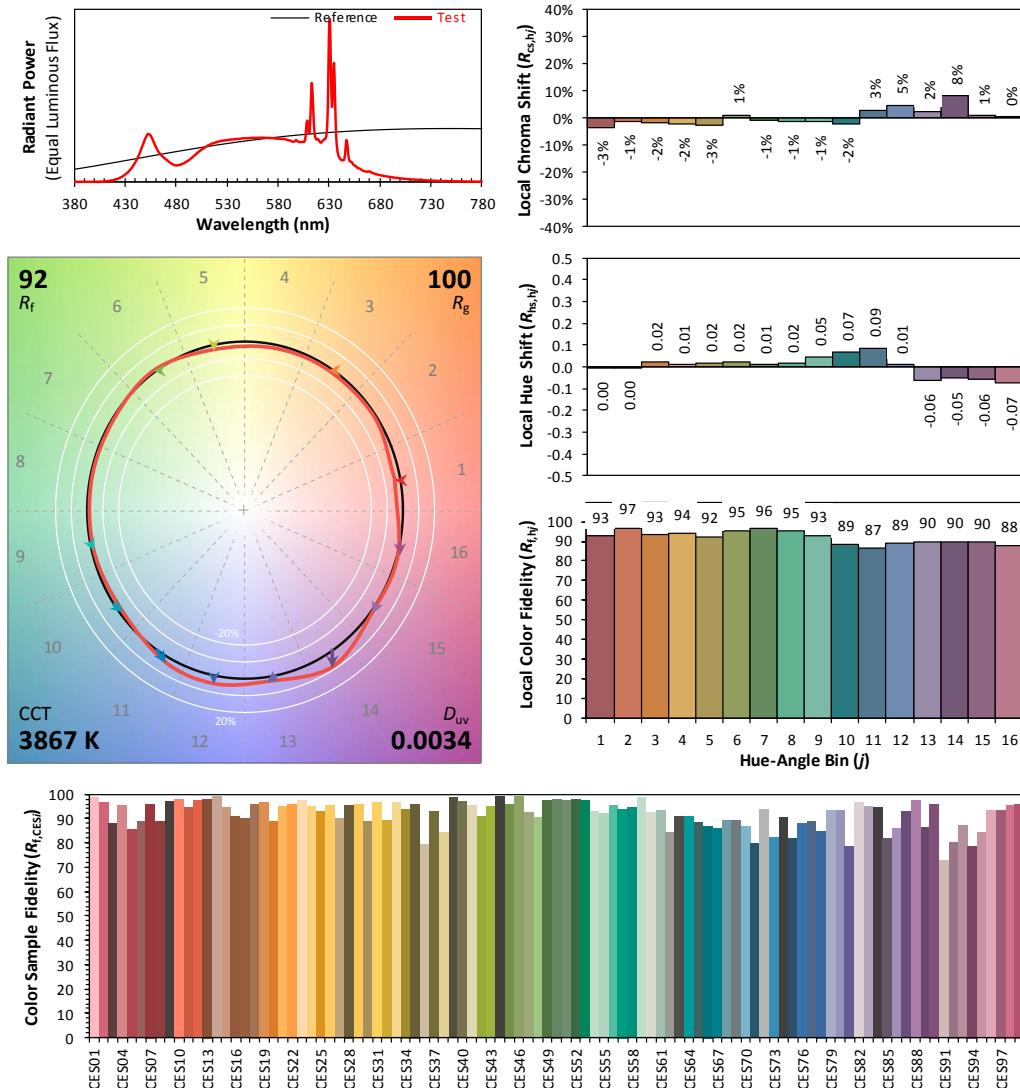
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2021/12/09

Model: 11BR40DIM/940



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

x 0.3892
 y 0.3894
 u' 0.2258
 v' 0.5083

CIE 13.3-1995
(CRI)
 R_a 95
 R_g 78

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	36.86	3.09%
10- 20	104.179	8.73%
20- 30	154.338	12.93%
30- 40	181.384	15.20%
40- 50	184.932	15.49%
50- 60	168.569	14.12%
60- 70	137.371	11.51%
70- 80	97.749	8.19%
80- 90	60.237	5.05%
90-100	32.581	2.73%
100-110	17.253	1.45%
110-120	9.185	0.77%
120-130	4.79	0.40%
130-140	2.432	0.20%
140-150	1.112	0.09%
150-160	0.416	0.03%
160-170	0.133	0.01%
170-180	0.039	0.00%
Total	1193.6	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	830.262	69.56%
60- 90	295.357	24.75%
0-90	1125.62	94.31%
90- 180	67.941	5.69%
0- 180	1193.6	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

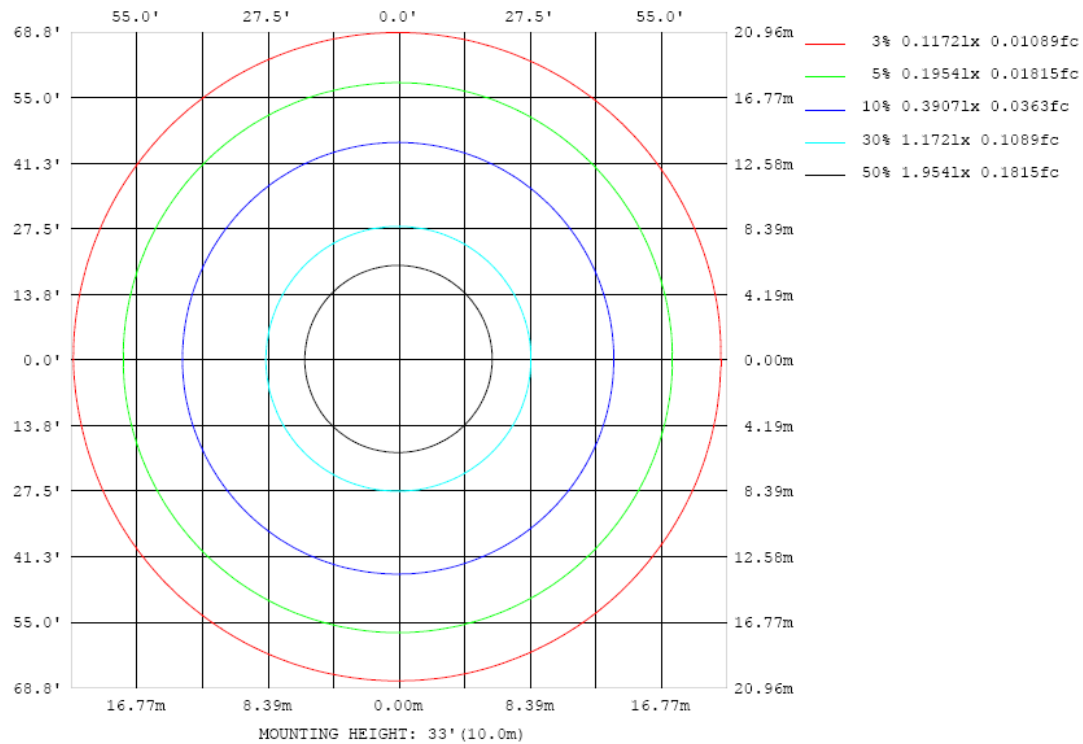


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

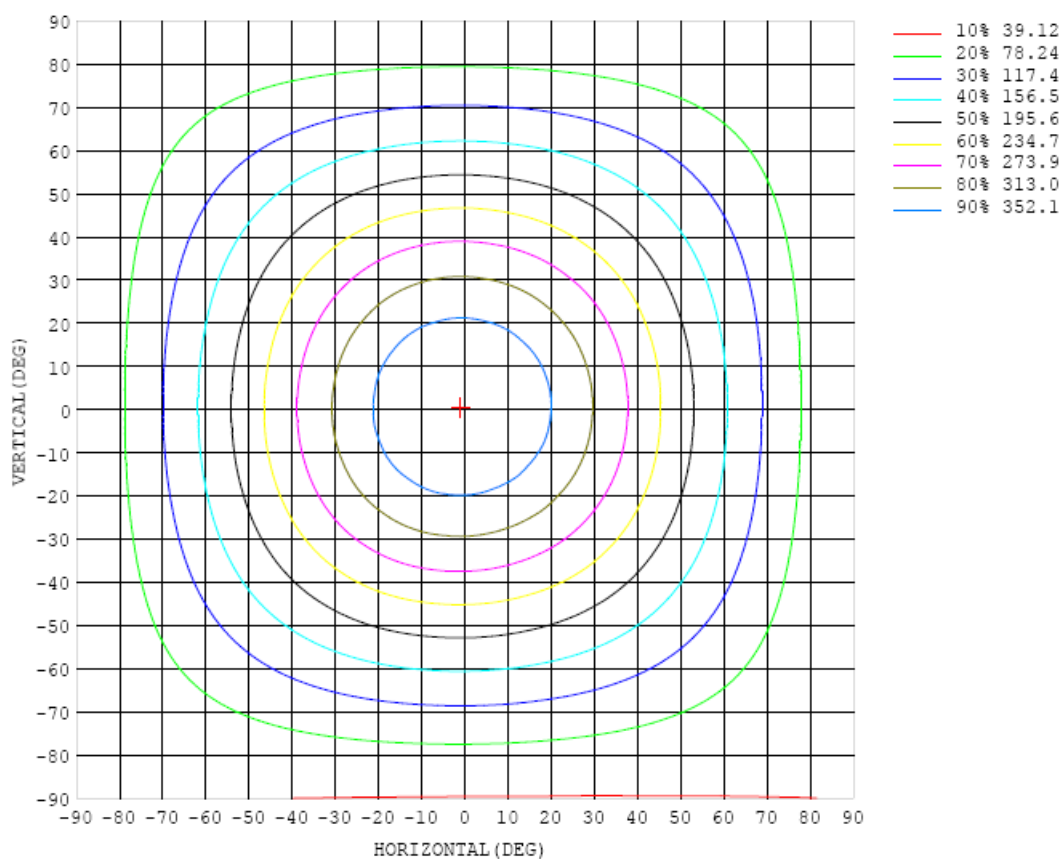


Chart 6: Isocandela Plot

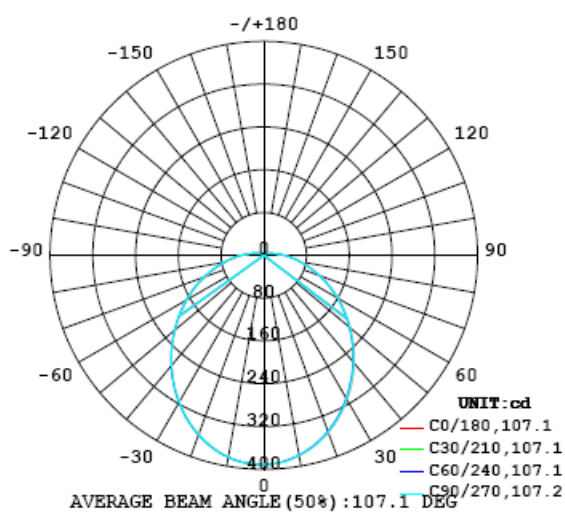


Chart 7: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1 UNIT: cd

C (DEG) γ (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	391	391	391	391	391	391	391	391	391	391	391	391	391	391	391	391	391	391	391
5	388	388	388	388	387	388	388	388	388	388	388	388	388	388	389	389	389	389	389
10	380	380	380	380	379	379	379	380	380	380	380	381	381	381	382	382	382	383	383
15	368	367	367	367	367	366	367	367	367	368	368	369	369	370	370	371	371	372	372
20	352	351	351	351	350	350	350	351	351	352	352	353	354	354	355	356	356	356	357
25	333	332	332	331	331	331	330	331	331	332	333	334	335	336	336	337	337	338	338
30	311	310	310	309	309	309	308	309	309	310	311	312	313	314	315	316	316	316	317
35	288	287	286	286	285	285	284	285	285	286	287	288	290	291	292	292	293	293	293
40	263	262	261	261	260	260	260	260	260	261	262	264	265	266	267	267	268	268	268
45	237	236	236	235	235	234	234	234	235	236	237	238	239	240	241	241	242	242	243
50	211	211	210	210	209	209	209	209	210	210	211	212	213	214	215	215	216	216	217
55	186	185	185	184	184	184	184	184	184	185	185	186	187	188	189	189	190	191	191
60	160	160	160	159	159	159	159	159	159	160	160	161	162	162	163	164	164	165	166
65	136	135	135	135	134	134	134	134	134	135	135	136	136	137	138	138	139	140	142
70	112	112	111	111	110	110	110	110	110	111	111	112	112	113	113	114	115	115	117
75	89.8	89.4	89.0	88.6	88.4	88.2	88.0	88.2	88.2	88.5	88.7	89.2	89.8	90.3	90.8	91.3	92.0	92.8	94.5
80	70.0	69.5	69.1	68.7	68.5	68.4	68.3	68.3	68.4	68.5	68.6	69.1	69.5	70.1	70.6	71.0	71.7	72.4	73.8
85	53.5	53.1	52.7	52.4	52.1	52.0	52.0	51.9	51.9	52.1	52.2	52.5	52.9	53.4	53.8	54.3	54.9	55.5	56.0
90	39.4	39.1	38.8	38.5	38.3	38.1	38.1	38.1	38.1	38.2	38.3	38.5	38.8	39.1	39.5	39.9	40.4	40.8	41.3
95	28.6	28.3	28.1	28.0	27.8	27.7	27.6	27.6	27.6	27.7	27.8	27.9	28.1	28.3	28.6	28.9	29.2	29.6	29.9
100	20.9	20.8	20.6	20.5	20.4	20.3	20.3	20.3	20.3	20.3	20.4	20.5	20.6	20.8	20.9	21.2	21.4	21.6	21.8
105	15.7	15.6	15.5	15.4	15.3	15.3	15.2	15.3	15.3	15.3	15.3	15.4	15.5	15.6	15.7	15.9	16.0	16.2	16.3
110	11.8	11.8	11.7	11.6	11.6	11.5	11.5	11.5	11.5	11.5	11.6	11.6	11.7	11.8	11.9	12.0	12.1	12.2	12.2
115	8.92	8.86	8.82	8.76	8.72	8.70	8.68	8.68	8.68	8.70	8.73	8.77	8.81	8.86	8.95	9.02	9.10	9.19	9.25
120	6.73	6.68	6.64	6.62	6.57	6.55	6.56	6.55	6.56	6.58	6.60	6.64	6.67	6.71	6.77	6.82	6.90	6.96	7.02
125	5.10	5.07	5.04	5.02	5.01	4.99	5.00	5.01	5.02	5.03	5.05	5.06	5.09	5.12	5.16	5.20	5.26	5.30	5.37
130	3.90	3.87	3.85	3.83	3.83	3.83	3.83	3.85	3.86	3.87	3.88	3.89	3.91	3.94	3.96	4.00	4.04	4.07	4.13
135	2.97	2.95	2.93	2.91	2.91	2.91	2.92	2.94	2.95	2.96	2.97	2.98	2.99	3.02	3.04	3.07	3.11	3.14	3.20
140	2.22	2.20	2.18	2.17	2.17	2.18	2.20	2.21	2.23	2.23	2.23	2.25	2.26	2.28	2.30	2.33	2.36	2.38	2.45
145	1.61	1.60	1.58	1.57	1.58	1.59	1.61	1.63	1.64	1.65	1.65	1.65	1.66	1.68	1.70	1.73	1.75	1.77	1.84
150	1.12	1.11	1.09	1.09	1.10	1.13	1.15	1.17	1.17	1.18	1.18	1.18	1.19	1.20	1.22	1.24	1.27	1.28	1.34
155	0.74	0.73	0.72	0.73	0.75	0.77	0.80	0.81	0.82	0.82	0.82	0.82	0.82	0.84	0.85	0.87	0.89	0.91	0.95
160	0.46	0.45	0.47	0.49	0.51	0.53	0.54	0.55	0.56	0.57	0.57	0.57	0.57	0.57	0.58	0.60	0.61	0.62	0.66
165	0.35	0.35	0.36	0.37	0.38	0.38	0.38	0.39	0.40	0.41	0.42	0.42	0.42	0.42	0.42	0.41	0.42	0.42	0.49
170	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.44
175	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.44
180	0.42	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.42	0.43	0.42	0.43	0.42	0.43	0.42	0.42	0.42	0.42	0.42

Table 6: Luminous Intensity Data

Table--2 UNIT: cd

C (DEG) γ (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	391	391	391	391	391	391	391	391	391	391	391	391	391	391	391	391	391		
5	390	389	389	390	389	389	389	389	390	389	389	389	389	388	388	388	388		
10	383	383	383	383	383	383	383	383	383	382	382	382	381	381	381	381	380		
15	371	372	372	372	372	372	372	372	371	371	371	370	370	369	369	369	368		
20	356	357	357	357	357	357	357	357	356	356	355	355	354	354	353	353	352		
25	338	338	339	339	339	339	338	338	338	337	337	336	335	335	334	334	333		
30	317	317	318	318	318	318	318	317	317	316	315	314	314	313	313	312	312		
35	293	293	294	294	294	294	294	294	293	292	291	291	290	289	289	288	288		
40	268	268	269	269	269	270	270	269	268	268	267	266	265	265	264	263	263		
45	243	243	243	244	244	244	244	244	243	242	242	241	240	239	238	238	237		
50	217	217	218	218	218	219	219	218	218	217	216	215	214	213	212	212	211		
55	191	192	192	192	193	193	193	193	193	192	191	190	189	188	187	186	186		
60	166	166	167	167	167	168	168	167	167	167	166	165	164	163	162	161	161		
65	142	142	143	143	143	144	144	144	143	143	142	142	140	139	138	137	137		
70	118	118	119	119	119	119	120	119	119	119	118	117	116	115	114	114	113		
75	94.9	95.4	96.0	96.2	96.4	96.7	96.7	96.6	96.6	96.1	95.5	94.8	94.0	93.0	92.1	91.5	91.0		
80	74.3	74.7	75.2	75.4	75.7	75.9	76.0	76.0	75.8	75.5	75.0	74.4	73.7	72.8	72.0	71.5	71.0		
85	56.4	56.8	57.2	57.5	57.8	57.8	57.9	58.0	57.8	57.5	57.1	56.6	56.0	55.4	54.7	54.3	53.8		
90	41.6	42.0	42.3	42.5	42.7	42.9	42.9	43.0	42.9	42.6	42.3	41.9	41.5	40.9	40.5	40.1	39.7		
95	30.2	30.5	30.7	30.9	31.0	31.1	31.2	31.2	31.1	31.0	30.7	30.5	30.1	29.8	29.4	29.1	28.8		
100	22.0	22.2	22.4	22.5	22.6	22.6	22.7	22.7	22.7	22.5	22.4	22.2	22.0	21.7	21.5	21.3	21.1		
105	16.5	16.6	16.7	16.8	16.9	16.9	16.9	16.9	16.8	16.7	16.6	16.4	16.3	16.1	16.0	15.8			
110	12.3	12.4	12.5	12.6	12.6	12.7	12.7	12.6	12.6	12.6	12.5	12.4	12.3	12.2	12.1	12.0	11.9		
115	9.31	9.39	9.46	9.50	9.53	9.55	9.55	9.53	9.53	9.47	9.42	9.36	9.28	9.18	9.10	9.02	8.94		
120	7.07	7.12	7.17	7.20	7.22	7.24	7.23	7.23	7.22	7.17	7.12	7.08	7.01	6.94	6.88	6.82	6.77		
125	5.40	5.44	5.47	5.50	5.51	5.52	5.51	5.51	5.50	5.46	5.42	5.38	5.33	5.28	5.23	5.19	5.14		
130	4.16	4.18	4.21	4.22	4.23	4.24	4.24	4.23	4.22	4.19	4.16	4.12	4.08	4.04	4.00	3.97	3.93		
135	3.21	3.23	3.25	3.26	3.27	3.27	3.28	3.27	3.25	3.22	3.19	3.16	3.12	3.09	3.06	3.04	3.01		
140	2.46	2.47	2.48	2.49	2.49	2.50	2.50	2.50	2.48	2.45	2.42	2.39	2.36	2.33	2.31	2.29	2.27		
145	1.84	1.85	1.85	1.86	1.87	1.88	1.88	1.87	1.86	1.83	1.80	1.77	1.74	1.71	1.70	1.69	1.67		
150	1.35	1.35	1.35	1.35	1.37	1.38	1.38	1.37	1.36	1.33	1.30	1.27	1.23	1.22	1.21	1.19	1.18		
155	0.95	0.95	0.95	0.96	0.97	0.98	0.98	0.98	0.96	0.94	0.91	0.88	0.85	0.82	0.81	0.80	0.79		
160	0.66	0.66	0.67	0.68	0.69	0.69	0.69	0.69	0.68	0.66	0.64	0.61	0.59	0.57	0.54	0.52	0.51		
165	0.49	0.50	0.51	0.52	0.52	0.51	0.51	0.51	0.50	0.49	0.48	0.47	0.46	0.45	0.43	0.42	0.41		
170	0.44	0.45	0.45	0.45	0.45	0.45	0.45	0.44	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.42	0.42		
175	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.43	0.43		
180	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42		

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.

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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