

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: 9BR30DIM/940

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ21120007f

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: **9BR30DIM/940**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
112.4	944.4	8.40	0.8261
CCT (K)	CRI	Stabilization Time (Light & Power)	
3858	96.3	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

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	16
TEST METHODS	16
Seasoning of SSL Product.....	16
Sphere-Spectroradiometer Method- Photometric and Electrical Measurements.....	16
Goniophotometer Method	17
Photometric and Electrical Measurements	17
Color Characteristics Measurements.....	17
Color Spatial Uniformity	17

SAMPLE PHOTO



Figure 1- Overview of the sample

Equipment Under Test(EUT)

Name	: LED Lamp
Model	: 9BR30DIM/940
Electrical Ratings	: 120V, 60Hz, 9W
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)	0.085
Power Factor	0.8261
Test Power (W)	8.40
THD A%	55.93
Luminous Efficacy (lm/W)	112.4
Total Luminous Flux (lm)	944.4
Color Rendering Index (CRI)	96.3
R9	82.6
Correlated Color Temperature (CCT)(K)	3858
Chromaticity Chroma x	0.3884
Chromaticity Chroma y	0.3859
Chromaticity Chroma u	0.2267
Chromaticity Chroma v	0.3378
Duv	0.0020
Chromaticity Chroma u'	0.2267
Chromaticity Chroma v'	0.5067

Special Color Rendering Indices	
R1	98.6
R2	96.7
R3	92.5
R4	98
R5	96.6
R6	95.1
R7	98.1
R8	94.8
R9	82.6
R10	89.2
R11	96.1
R12	74
R13	97.8
R14	94.6

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)	0.085
Power Factor	0.8232
Power (W)	8.43
Luminous Efficacy (lm/W)	114.9
Total Luminous Flux (lm)	968.2
Beam Angle (°)	109.3 (0°-180°) / 109.3 (90°-270°)
Center Beam Candle Power (cd)	308
Maximum Beam Candle Power (cd)	308.2 (At: C=280.0, Gamma=2.5)
Spacing Criteria	1.23 (0°-180°) / 1.27 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	69.17%
Zonal Lumens in the 60 °-90 °Zone	24.95%
Zonal Lumens in the 90 °-120 °Zone	5.10%
Zonal Lumens in the 120 °-180 °Zone	0.78%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

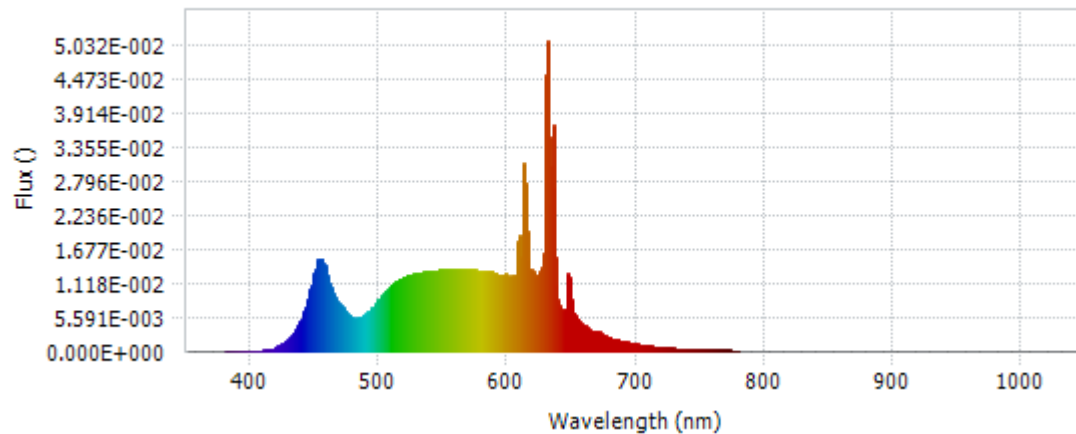
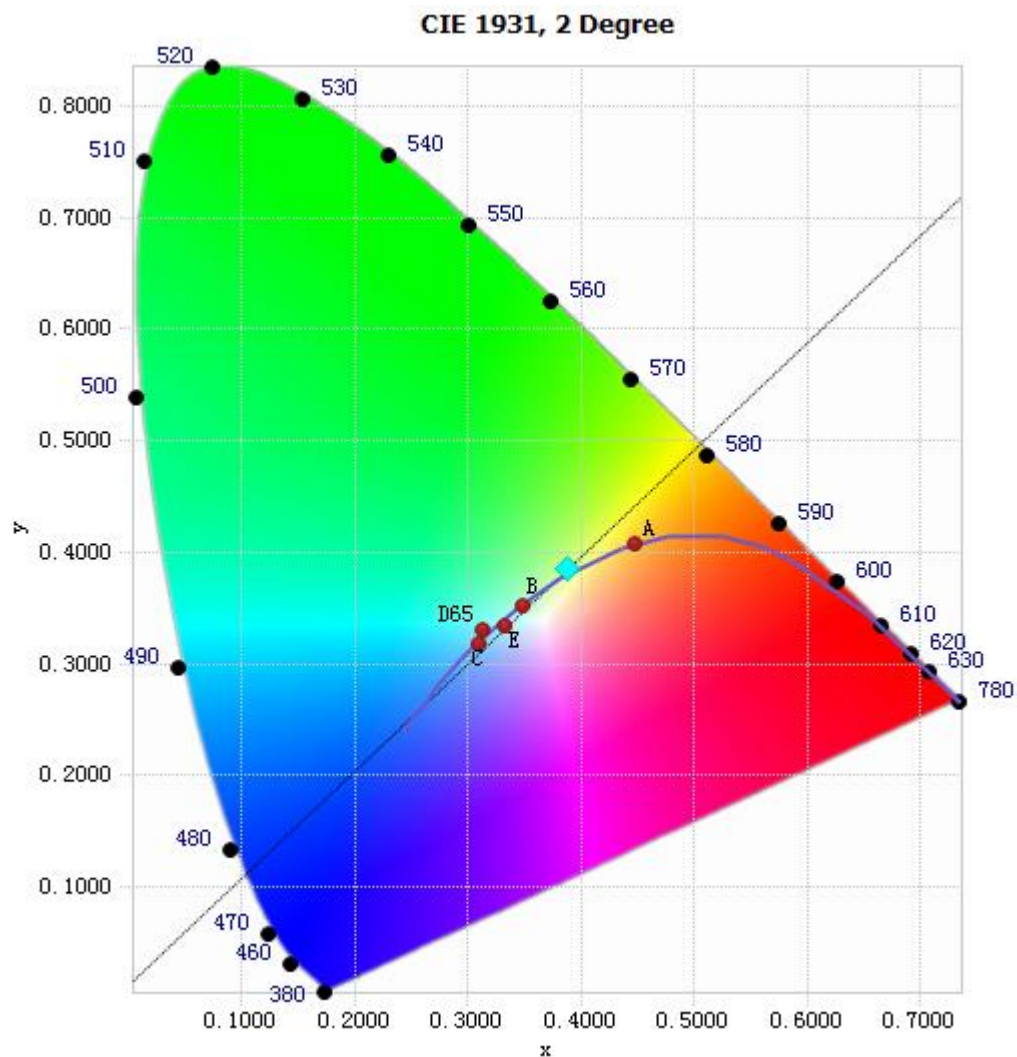


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	3.94E-05	485	5.53E-03	590	1.27E-02	695	1.35E-03
385	7.26E-05	490	6.32E-03	595	1.23E-02	700	1.14E-03
390	5.77E-05	495	7.33E-03	600	1.23E-02	705	9.87E-04
395	5.53E-05	500	8.65E-03	605	1.23E-02	710	8.28E-04
400	6.22E-05	505	9.93E-03	610	1.56E-02	715	7.26E-04
405	7.79E-05	510	1.09E-02	615	1.98E-02	720	6.21E-04
410	1.35E-04	515	1.17E-02	620	1.30E-02	725	5.31E-04
415	3.32E-04	520	1.22E-02	625	1.31E-02	730	4.52E-04
420	7.01E-04	525	1.25E-02	630	4.54E-02	735	3.87E-04
425	1.32E-03	530	1.28E-02	635	3.72E-02	740	3.30E-04
430	2.25E-03	535	1.30E-02	640	7.67E-03	745	2.90E-04
435	3.73E-03	540	1.31E-02	645	6.89E-03	750	2.49E-04
440	5.93E-03	545	1.32E-02	650	6.82E-03	755	2.14E-04
445	9.26E-03	550	1.33E-02	655	5.13E-03	760	1.83E-04
450	1.36E-02	555	1.34E-02	660	4.17E-03	765	1.62E-04
455	1.50E-02	560	1.35E-02	665	3.35E-03	770	1.37E-04
460	1.18E-02	565	1.35E-02	670	3.28E-03	775	1.20E-04
465	8.93E-03	570	1.34E-02	675	2.54E-03	780	1.01E-04
470	7.45E-03	575	1.33E-02	680	2.15E-03		
475	6.13E-03	580	1.32E-02	685	1.84E-03		
480	5.38E-03	585	1.31E-02	690	1.58E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3884, 0.3859)

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

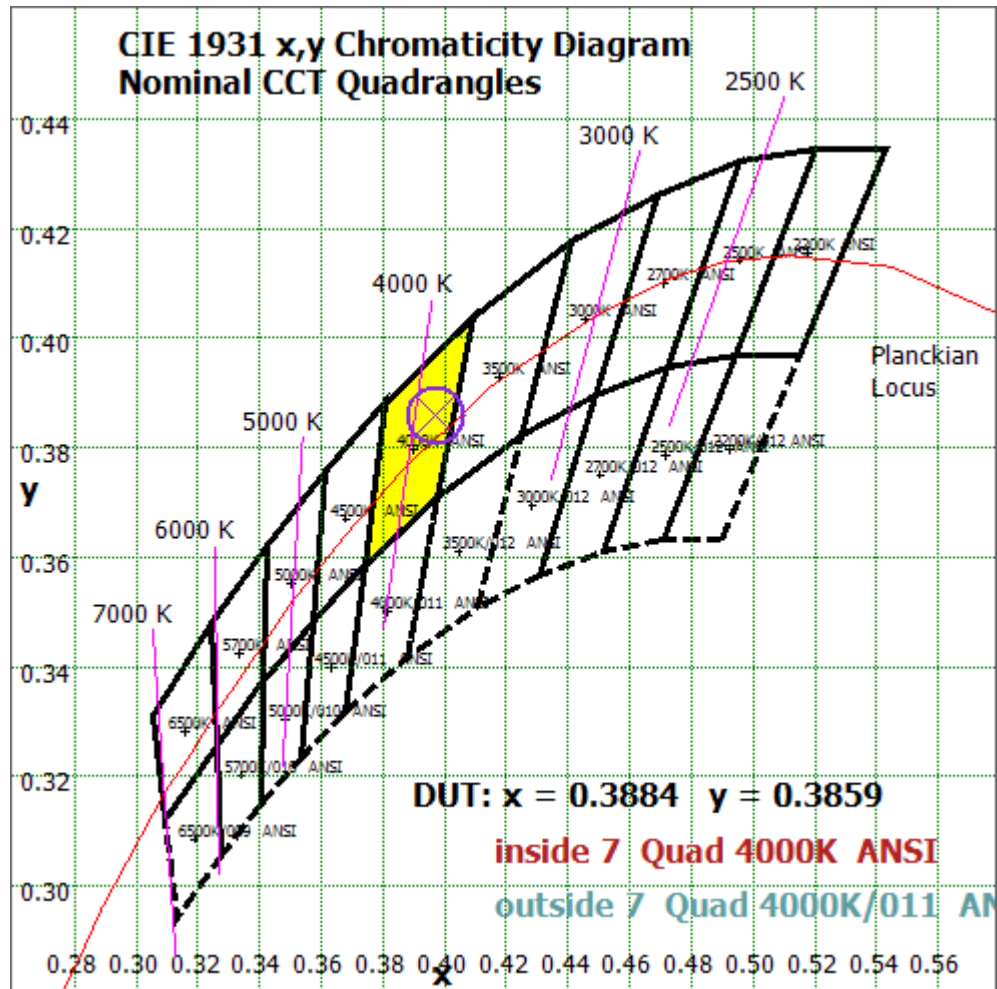


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

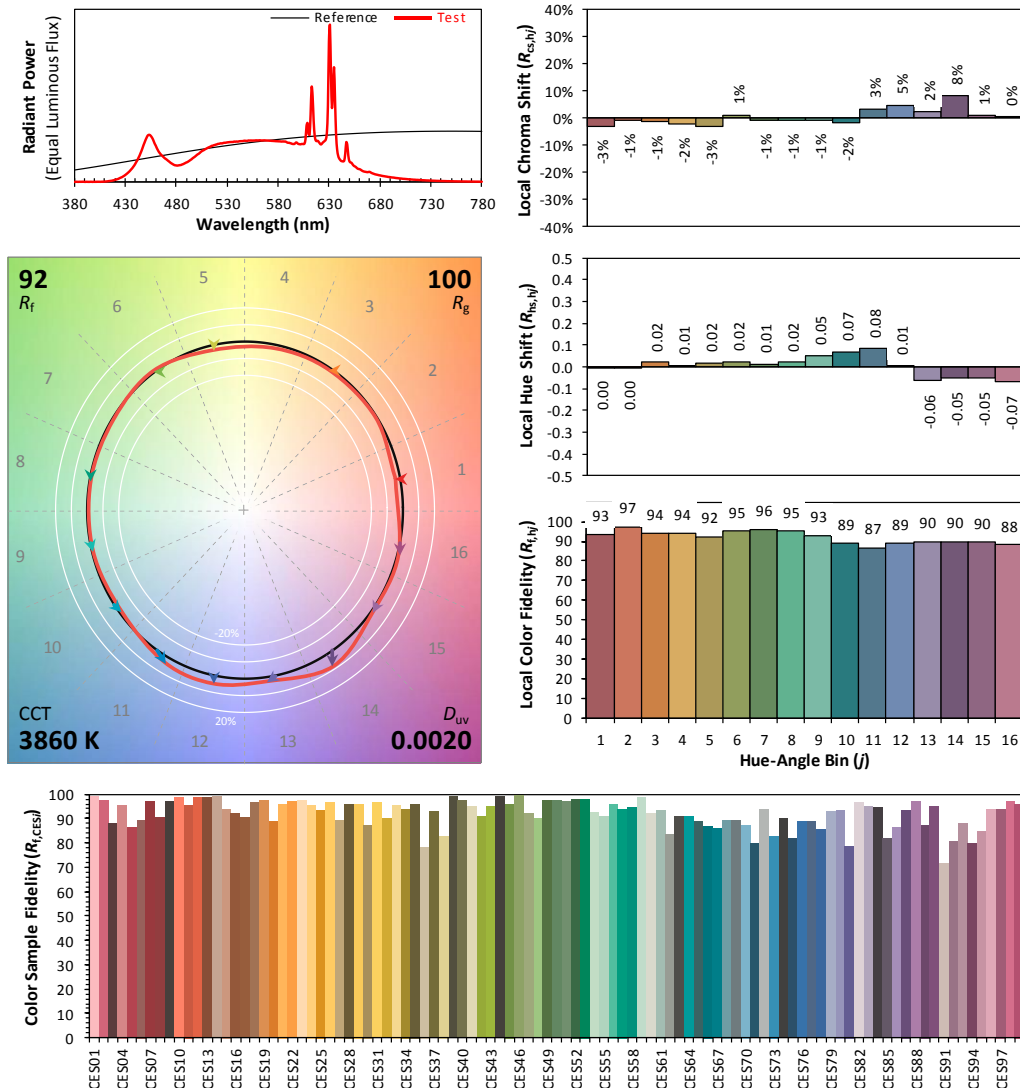
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2021/12/08

Model: 9BR30DIM/940



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

x 0.3884
 y 0.3859
 u' 0.2267
 v' 0.5067

CIE 13.3-1995
(CRI)
 R_a 96
 R_g 83

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	29.053	3.00%
10- 20	82.712	8.54%
20- 30	123.91	12.80%
30- 40	147.056	15.19%
40- 50	150.398	15.53%
50- 60	136.568	14.11%
60- 70	111.057	11.47%
70- 80	80.031	8.27%
80- 90	50.506	5.22%
90-100	27.556	2.85%
100-110	14.071	1.45%
110-120	7.715	0.80%
120-130	4.204	0.43%
130-140	2.074	0.21%
140-150	0.863	0.09%
150-160	0.282	0.03%
160-170	0.096	0.01%
170-180	0.032	0.00%
Total	968.2	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	669.697	69.17%
60- 90	241.594	24.95%
0-90	911.291	94.12%
90- 180	56.893	5.88%
0- 180	968.2	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

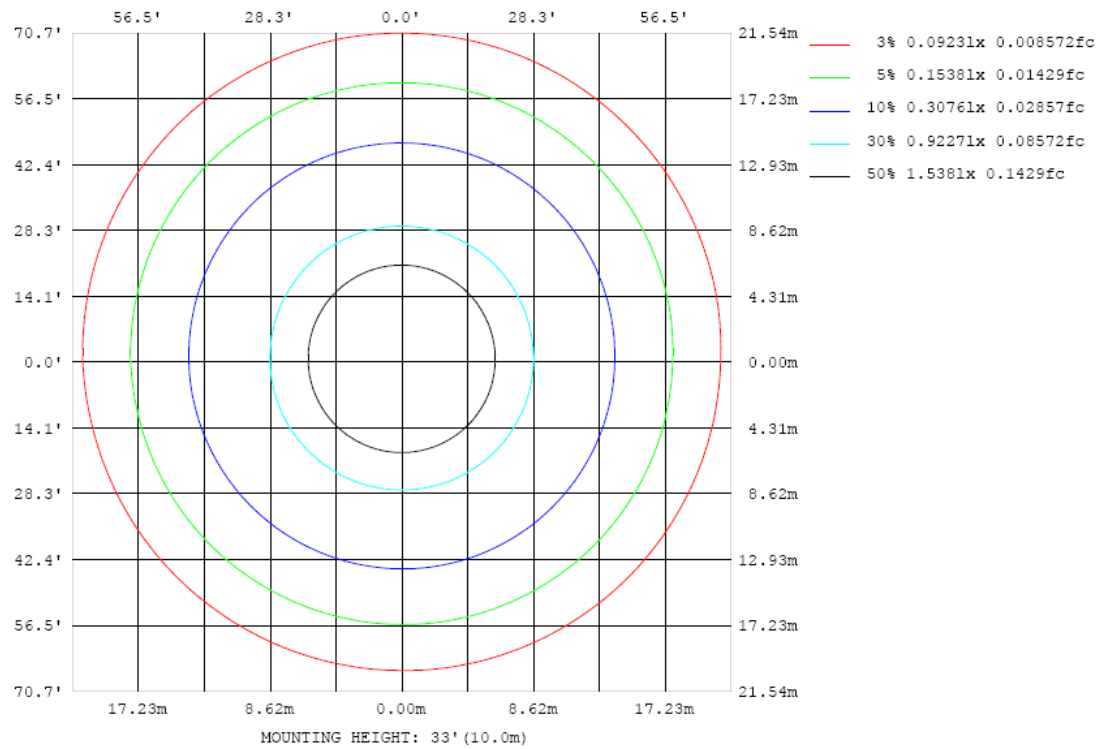


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

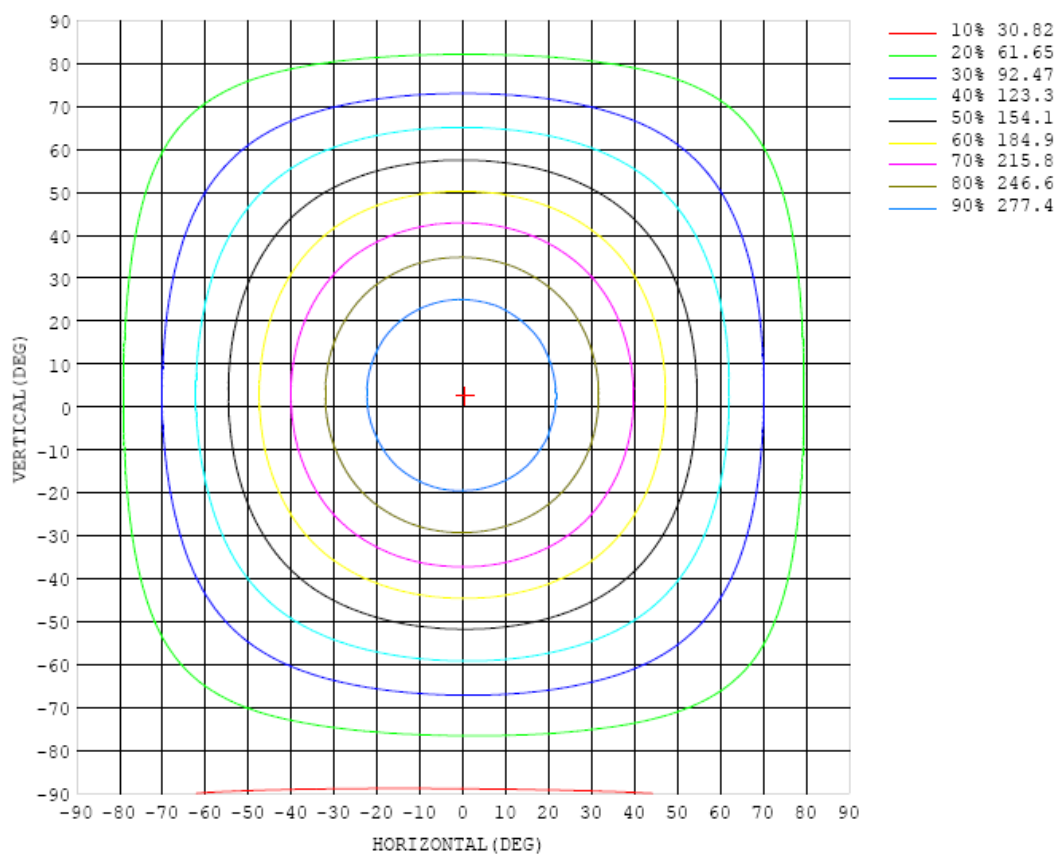


Chart 6: Isocandela Plot

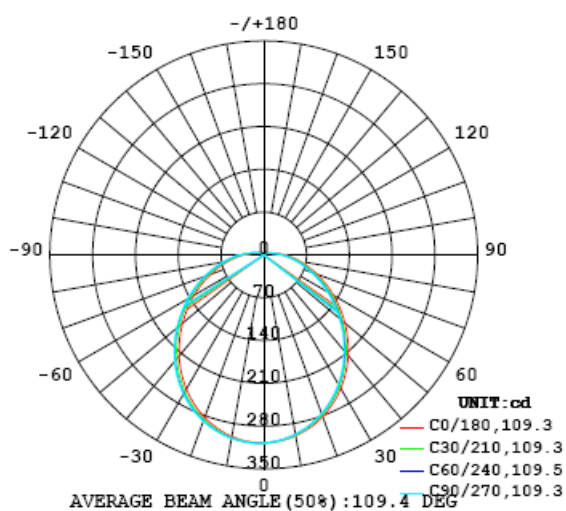


Chart 7: Polar Candela Distribution

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	308	308	308	308	308	308	308	308	308	308	308	308	308	308	308	308	308	308	308
5	305	305	305	305	305	305	304	304	304	304	304	304	305	305	305	305	306	306	306
10	300	300	299	299	299	298	298	298	298	298	298	298	299	299	299	300	301	301	302
15	292	292	291	290	290	289	289	288	288	288	289	289	290	290	291	292	292	293	294
20	281	280	279	279	278	277	277	276	276	276	276	277	277	278	279	280	281	282	283
25	268	267	265	264	263	263	262	261	261	261	262	262	262	263	265	266	267	268	269
30	252	251	249	248	246	246	245	244	244	244	244	245	245	246	248	249	251	252	254
35	234	233	231	229	228	227	226	226	225	225	225	226	226	228	229	230	232	234	235
40	214	213	211	209	208	207	206	205	205	204	205	205	206	207	209	210	212	214	216
45	194	192	190	189	187	186	185	184	184	183	183	184	185	186	188	189	191	193	195
50	173	171	169	168	166	165	164	163	162	162	162	162	163	164	166	168	170	172	174
55	152	150	148	147	145	144	143	142	141	140	141	141	142	143	145	146	148	150	153
60	131	130	128	126	125	123	122	121	120	120	120	120	121	122	124	126	127	129	132
65	111	110	108	107	105	104	102	102	101	101	100	101	101	103	104	106	107	109	112
70	92.6	91.2	89.5	88.1	86.6	85.5	84.1	83.5	82.8	82.4	82.2	82.4	83.1	84.1	85.3	86.8	88.4	90.1	92.9
75	75.3	74.0	72.4	71.1	69.8	68.6	67.7	67.0	66.4	66.0	65.8	66.1	66.5	67.2	68.4	69.7	71.1	72.5	75.0
80	60.2	59.1	57.7	56.6	55.4	54.4	53.4	52.8	52.2	51.9	51.8	51.9	52.3	53.0	54.0	55.1	56.3	57.6	59.0
85	46.4	45.4	44.2	43.2	42.2	41.3	40.6	40.0	39.5	39.2	39.1	39.2	39.6	40.1	40.9	41.7	42.8	43.8	45.0
90	34.7	33.8	32.9	32.1	31.3	30.5	29.9	29.4	29.0	28.8	28.7	28.7	29.1	29.5	30.0	30.7	31.5	32.3	33.3
95	25.3	24.6	23.9	23.3	22.6	22.0	21.5	21.2	20.8	20.7	20.6	20.7	20.9	21.2	21.5	22.0	22.6	23.2	24.0
100	18.2	17.7	17.2	16.7	16.3	15.9	15.5	15.2	15.0	14.9	14.8	14.9	15.0	15.2	15.4	15.8	16.2	16.6	17.1
105	13.3	13.0	12.6	12.3	12.0	11.8	11.5	11.3	11.2	11.1	11.0	11.0	11.1	11.2	11.3	11.6	11.8	12.1	12.4
110	10.2	9.97	9.72	9.52	9.32	9.14	8.99	8.80	8.69	8.61	8.56	8.55	8.57	8.62	8.71	8.84	9.01	9.19	9.35
115	8.02	7.87	7.68	7.52	7.35	7.21	7.06	6.94	6.84	6.76	6.71	6.68	6.70	6.73	6.80	6.92	7.03	7.15	7.28
120	6.29	6.16	6.01	5.88	5.75	5.63	5.51	5.41	5.32	5.26	5.21	5.18	5.18	5.21	5.26	5.33	5.42	5.51	5.63
125	4.91	4.80	4.67	4.56	4.45	4.35	4.26	4.17	4.09	4.03	3.99	3.95	3.95	3.97	4.01	4.07	4.14	4.20	4.29
130	3.78	3.69	3.58	3.49	3.40	3.32	3.24	3.18	3.10	3.04	2.99	2.96	2.95	2.96	3.00	3.05	3.11	3.15	3.23
135	2.86	2.78	2.69	2.61	2.54	2.47	2.41	2.36	2.29	2.24	2.19	2.16	2.14	2.15	2.18	2.22	2.27	2.30	2.37
140	2.12	2.04	1.97	1.90	1.85	1.79	1.74	1.69	1.64	1.59	1.55	1.51	1.49	1.50	1.53	1.56	1.59	1.62	1.68
145	1.51	1.45	1.39	1.34	1.29	1.25	1.21	1.17	1.13	1.09	1.04	1.00	0.98	0.99	1.01	1.03	1.05	1.08	1.14
150	1.04	0.99	0.95	0.90	0.87	0.84	0.81	0.77	0.73	0.70	0.66	0.62	0.61	0.60	0.61	0.63	0.65	0.67	0.74
155	0.69	0.66	0.63	0.60	0.57	0.54	0.52	0.49	0.46	0.43	0.40	0.39	0.38	0.36	0.34	0.35	0.37	0.40	0.47
160	0.46	0.45	0.44	0.42	0.40	0.38	0.36	0.33	0.31	0.30	0.30	0.29	0.28	0.28	0.27	0.27	0.27	0.28	0.33
165	0.33	0.34	0.33	0.33	0.33	0.32	0.31	0.30	0.29	0.29	0.29	0.29	0.28	0.28	0.27	0.27	0.27	0.27	0.32
170	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.31	0.30	0.30	0.30	0.30	0.29	0.29	0.29	0.29	0.29	0.29	0.33
175	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.33	0.33	0.33	0.32	0.32	0.31	0.34
180	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.33	0.34	0.33	0.34

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	308	308	308	308	308	308	308	308	308	308	308	308	308	308	308	308	308		
5	306	307	307	307	308	308	308	308	308	308	307	307	307	307	307	306	306		
10	302	303	303	304	304	304	305	305	305	304	304	304	303	303	303	302	301		
15	295	295	296	297	298	298	298	298	298	298	298	297	297	296	295	294	293		
20	285	285	287	287	289	289	289	289	290	289	288	288	287	286	285	284	282		
25	271	272	274	275	276	277	277	277	278	277	276	276	274	273	272	271	269		
30	255	257	259	260	261	262	263	263	263	262	262	261	259	258	257	255	253		
35	237	239	241	243	244	245	246	246	246	245	245	243	242	241	239	237	236		
40	218	220	222	223	225	226	227	227	227	227	226	225	223	222	221	218	216		
45	197	199	201	203	205	206	207	207	207	207	205	205	203	201	200	198	196		
50	176	178	180	182	184	185	186	186	186	186	185	184	182	181	179	177	175		
55	155	157	159	160	162	163	164	165	165	164	163	162	161	160	158	156	154		
60	134	137	139	140	142	143	144	144	144	144	143	143	141	140	138	136	134		
65	114	116	118	120	121	122	123	124	124	123	123	122	121	119	118	116	114		
70	94.5	96.4	98.2	99.8	101	102	103	104	104	104	103	102	101	99.9	98.5	96.9	95.0		
75	76.6	78.3	79.9	81.5	82.9	83.8	84.6	85.1	85.1	85.0	84.6	84.0	83.0	81.9	80.6	79.1	77.7		
80	60.4	61.8	63.3	64.7	66.0	66.9	67.5	68.0	68.2	68.1	67.8	67.2	66.4	65.4	64.2	63.0	61.7		
85	46.3	47.4	48.7	49.9	51.0	51.8	52.4	52.9	53.1	53.0	52.8	52.3	51.6	50.8	49.9	48.8	47.6		
90	34.3	35.3	36.3	37.3	38.2	38.9	39.4	39.8	40.1	40.0	39.9	39.5	39.0	38.3	37.5	36.6	35.7		
95	24.8	25.5	26.3	27.1	27.7	28.3	28.7	29.1	29.3	29.3	29.2	28.9	28.6	28.0	27.5	26.8	26.0		
100	17.7	18.2	18.8	19.3	19.9	20.3	20.6	20.8	21.0	21.1	21.0	20.9	20.6	20.2	19.8	19.3	18.8		
105	12.7	13.1	13.5	13.9	14.3	14.6	14.8	15.0	15.2	15.2	15.2	15.1	14.9	14.7	14.4	14.1	13.7		
110	9.57	9.80	10.1	10.3	10.5	10.7	10.9	11.0	11.1	11.2	11.2	11.2	11.1	10.9	10.8	10.6	10.3		
115	7.45	7.61	7.80	7.96	8.14	8.28	8.42	8.52	8.61	8.68	8.70	8.69	8.63	8.55	8.46	8.32	8.15		
120	5.76	5.90	6.05	6.19	6.33	6.45	6.57	6.66	6.74	6.79	6.82	6.82	6.78	6.73	6.66	6.55	6.42		
125	4.40	4.51	4.63	4.76	4.88	4.98	5.07	5.15	5.22	5.27	5.30	5.31	5.29	5.25	5.20	5.12	5.01		
130	3.31	3.40	3.50	3.61	3.71	3.80	3.87	3.94	4.00	4.04	4.07	4.09	4.09	4.06	4.03	3.96	3.88		
135	2.43	2.51	2.60	2.69	2.78	2.85	2.92	2.97	3.02	3.06	3.09	3.10	3.11	3.10	3.07	3.03	2.96		
140	1.73	1.79	1.87	1.95	2.03	2.09	2.14	2.18	2.22	2.26	2.29	2.31	2.32	2.31	2.29	2.26	2.20		
145	1.18	1.23	1.29	1.36	1.42	1.47	1.52	1.55	1.58	1.61	1.64	1.66	1.67	1.68	1.66	1.63	1.59		
150	0.77	0.80	0.85	0.90	0.95	0.99	1.03	1.05	1.08	1.10	1.13	1.15	1.17	1.17	1.16	1.14	1.11		
155	0.49	0.51	0.53	0.56	0.60	0.63	0.66	0.68	0.70	0.72	0.75	0.77	0.78	0.79	0.78	0.77	0.75		
160	0.35	0.35	0.36	0.36	0.37	0.39	0.41	0.44	0.47	0.49	0.50	0.51	0.52	0.53	0.52	0.52	0.51		
165	0.32	0.32	0.32	0.32	0.32	0.32	0.33	0.35	0.36	0.37	0.38	0.38	0.38	0.38	0.38	0.38	0.38		
170	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.36	0.35		
175	0.35	0.35	0.34	0.35	0.35	0.35	0.35	0.35	0.35	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36		
180	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.33		

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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