

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: 13BR40DIM/930

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ21120007n

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: **13BR40DIM/930**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
114.3	1386.5	12.13	0.9485
CCT (K)	CRI	Stabilization Time (Light & Power)	
3032	95.8	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	: 13BR40DIM/930
Electrical Ratings	: 120V, 60Hz, 13W
Product Description	: 3000K
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)	0.107
Power Factor	0.9485
Test Power (W)	12.13
THD A%	18.62
Luminous Efficacy (lm/W)	114.3
Total Luminous Flux (lm)	1386.5
Color Rendering Index (CRI)	95.8
R9	73.3
Correlated Color Temperature (CCT)(K)	3032
Chromaticity Chroma x	0.4327
Chromaticity Chroma y	0.3993
Chromaticity Chroma u	0.2499
Chromaticity Chroma v	0.3459
Duv	-0.0013
Chromaticity Chroma u'	0.2499
Chromaticity Chroma v'	0.5188

Special Color Rendering Indices	
R1	98.3
R2	98.1
R3	95.4
R4	97.3
R5	97.4
R6	96.5
R7	94.3
R8	89.1
R9	73.3
R10	92.7
R11	96.4
R12	82.8
R13	98.4
R14	95.9

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)	0.107
Power Factor	0.9491
Power (W)	12.16
Luminous Efficacy (lm/W)	116.9
Total Luminous Flux (lm)	1421.9
Beam Angle (°)	107.6 (0°-180°) /108.0 (90°-270°)
Center Beam Candle Power (cd)	465
Maximum Beam Candle Power (cd)	465.7 (At: C=290.0, Gamma=1.5)
Spacing Criteria	1.22 (0°-180°) / 1.22 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	69.90%
Zonal Lumens in the 60 °-90 °Zone	24.57%
Zonal Lumens in the 90 °-120 °Zone	4.81%
Zonal Lumens in the 120 °-180 °Zone	0.73%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

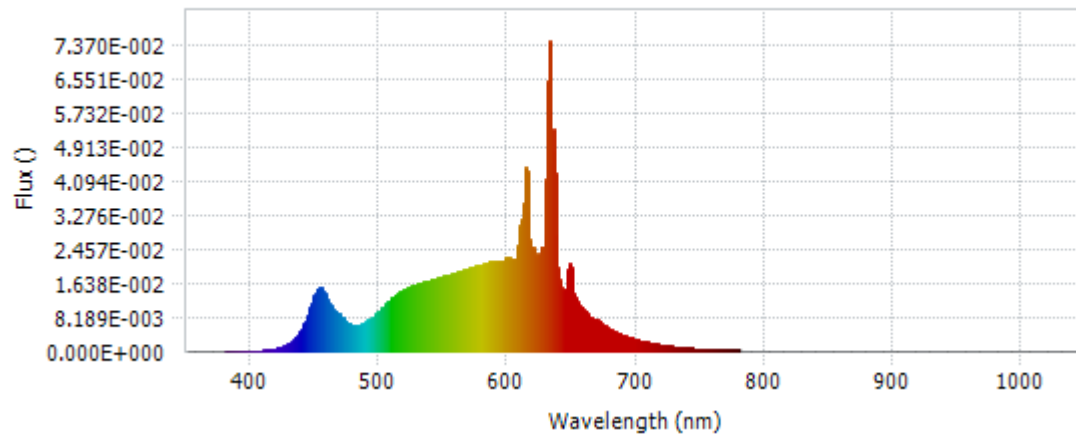
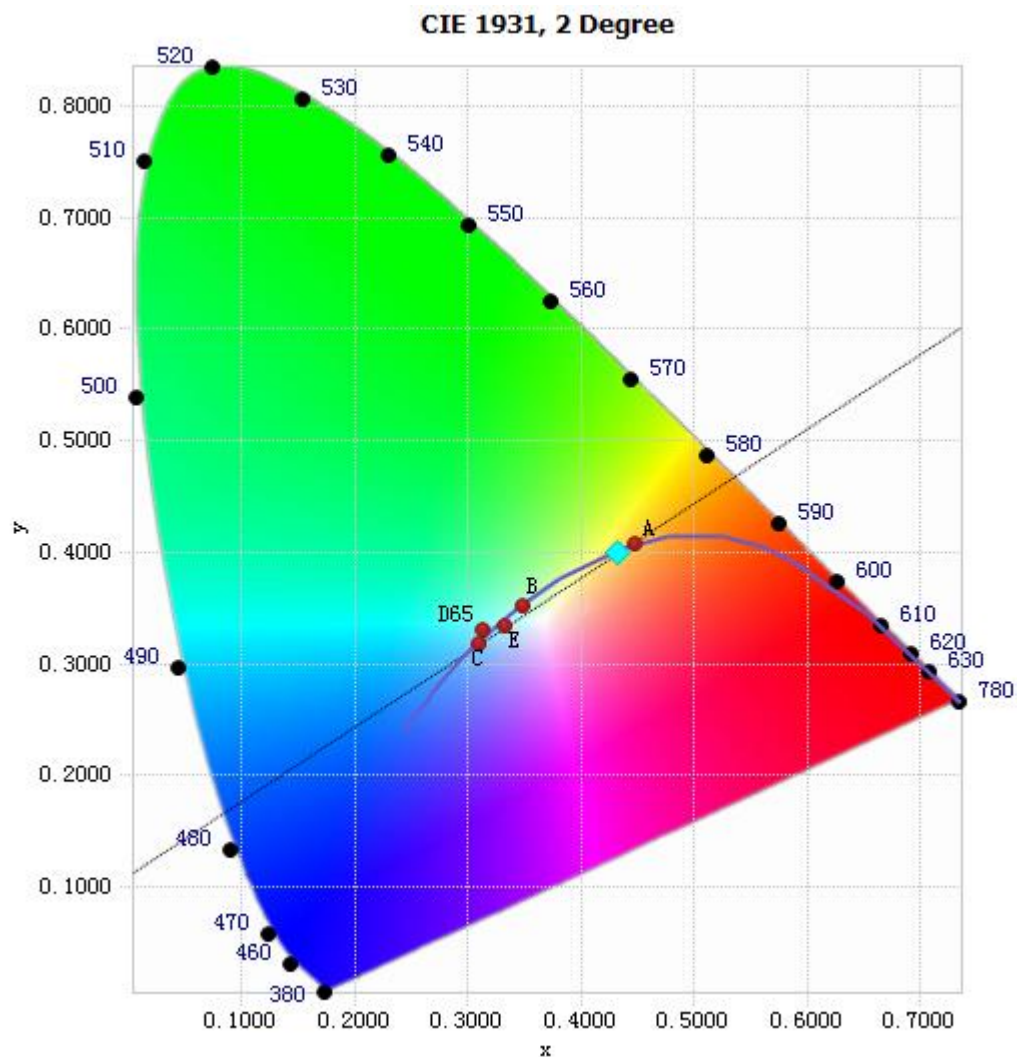


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	8.41E-05	485	6.48E-03	590	2.17E-02	695	3.37E-03
385	8.09E-05	490	7.25E-03	595	2.15E-02	700	2.89E-03
390	9.71E-05	495	8.38E-03	600	2.27E-02	705	2.44E-03
395	8.47E-05	500	9.85E-03	605	2.24E-02	710	2.11E-03
400	7.88E-05	505	1.14E-02	610	3.16E-02	715	1.81E-03
405	1.16E-04	510	1.28E-02	615	4.35E-02	720	1.55E-03
410	2.38E-04	515	1.40E-02	620	2.50E-02	725	1.33E-03
415	4.26E-04	520	1.49E-02	625	2.36E-02	730	1.12E-03
420	7.35E-04	525	1.57E-02	630	4.12E-02	735	9.60E-04
425	1.25E-03	530	1.62E-02	635	4.77E-02	740	8.11E-04
430	2.13E-03	535	1.67E-02	640	1.74E-02	745	6.94E-04
435	3.48E-03	540	1.71E-02	645	1.50E-02	750	5.97E-04
440	5.84E-03	545	1.77E-02	650	1.65E-02	755	5.00E-04
445	9.82E-03	550	1.81E-02	655	1.15E-02	760	4.40E-04
450	1.42E-02	555	1.85E-02	660	9.62E-03	765	3.72E-04
455	1.50E-02	560	1.90E-02	665	8.09E-03	770	3.18E-04
460	1.20E-02	565	1.94E-02	670	7.50E-03	775	2.77E-04
465	9.80E-03	570	2.00E-02	675	6.23E-03	780	2.35E-04
470	8.30E-03	575	2.05E-02	680	5.30E-03		
475	6.84E-03	580	2.09E-02	685	4.53E-03		
480	6.28E-03	585	2.15E-02	690	3.89E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4327, 0.3993)

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

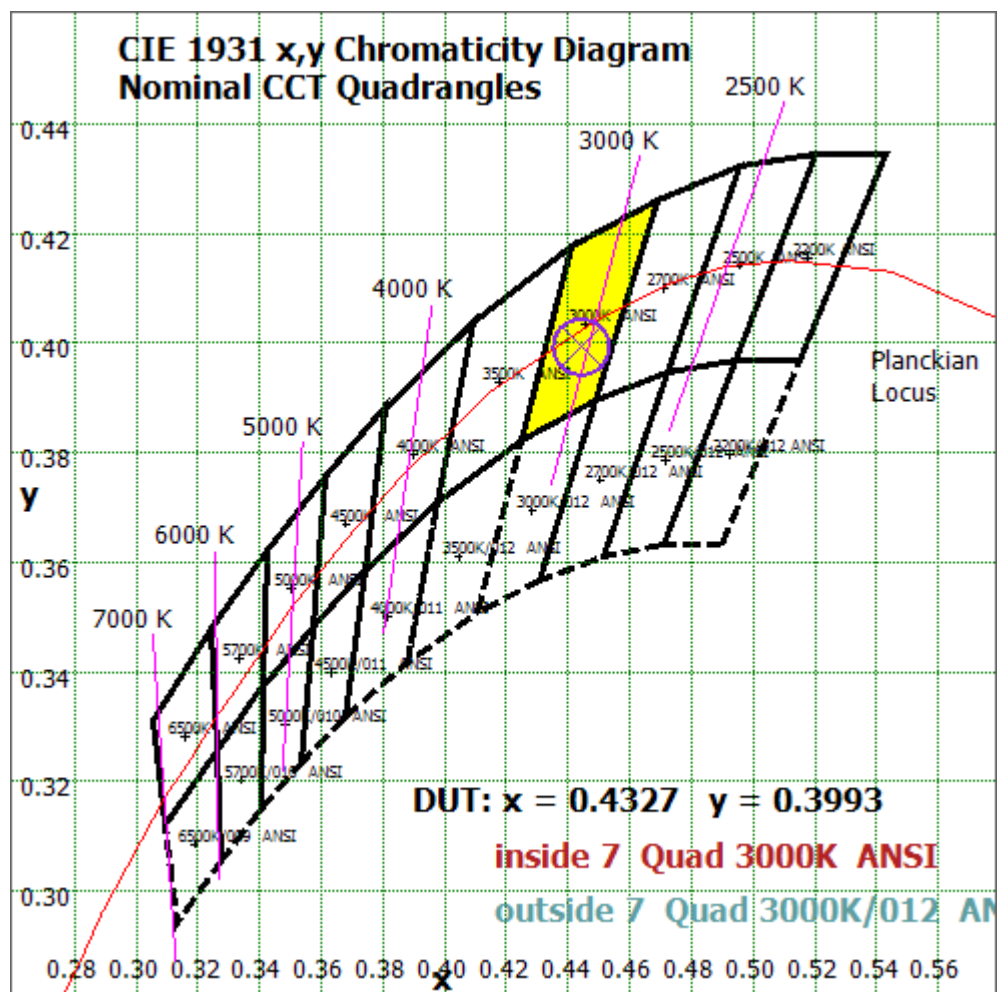


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

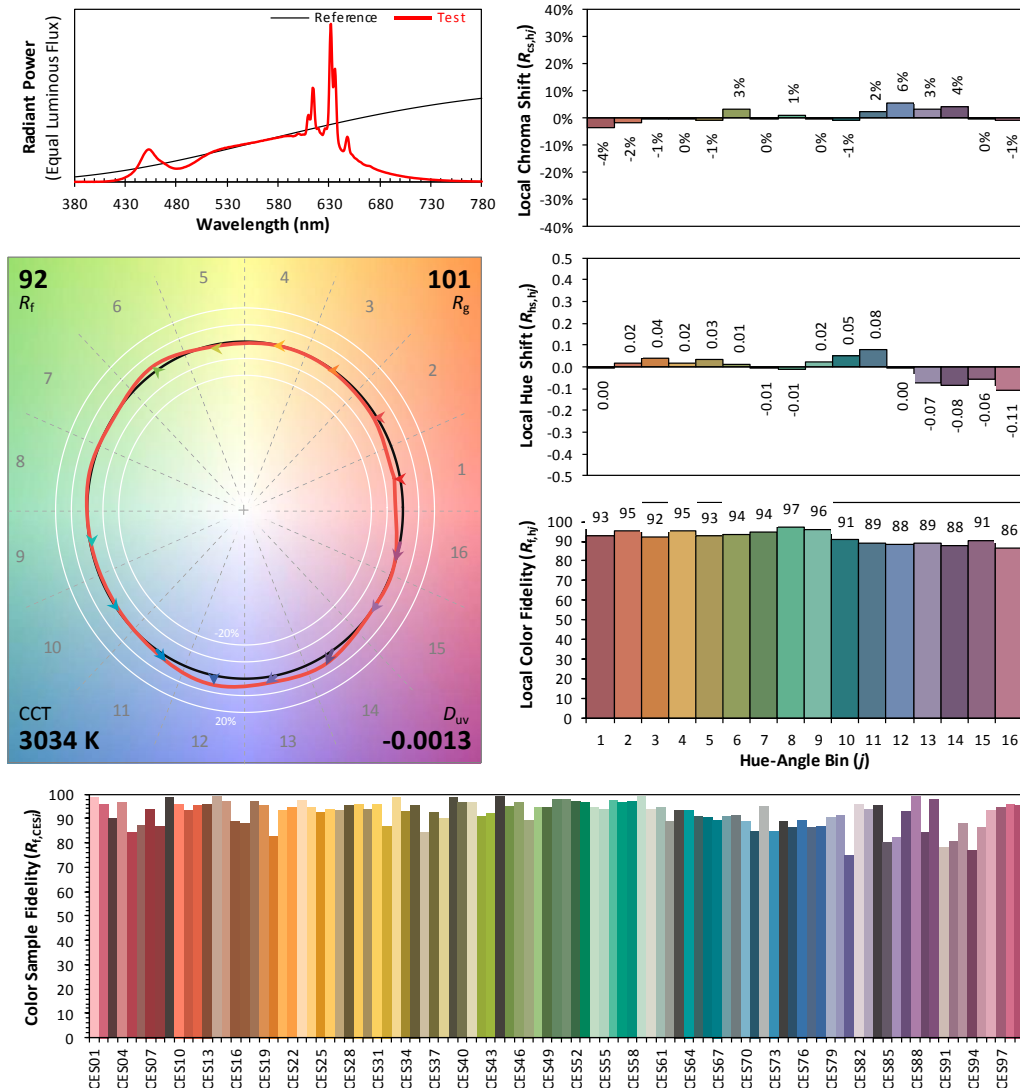
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2021/12/09

Model: 13BR40DIM/930



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

x 0.4327
 y 0.3993
 u' 0.2499
 v' 0.5188

CIE 13.3-1995
(CRI)
 R_a 96
 R_g 74

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	43.869	3.09%
10- 20	124.206	8.74%
20- 30	184.45	12.97%
30- 40	217.323	15.28%
40- 50	221.984	15.61%
50- 60	202.017	14.21%
60- 70	163.456	11.50%
70- 80	115.553	8.13%
80- 90	70.35	4.95%
90-100	37.807	2.66%
100-110	19.949	1.40%
110-120	10.596	0.75%
120-130	5.531	0.39%
130-140	2.812	0.20%
140-150	1.291	0.09%
150-160	0.49	0.03%
160-170	0.162	0.01%
170-180	0.049	0.00%
Total	1421.9	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	993.849	69.90%
60- 90	349.359	24.57%
0-90	1343.21	94.47%
90- 180	78.687	5.53%
0- 180	1421.9	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

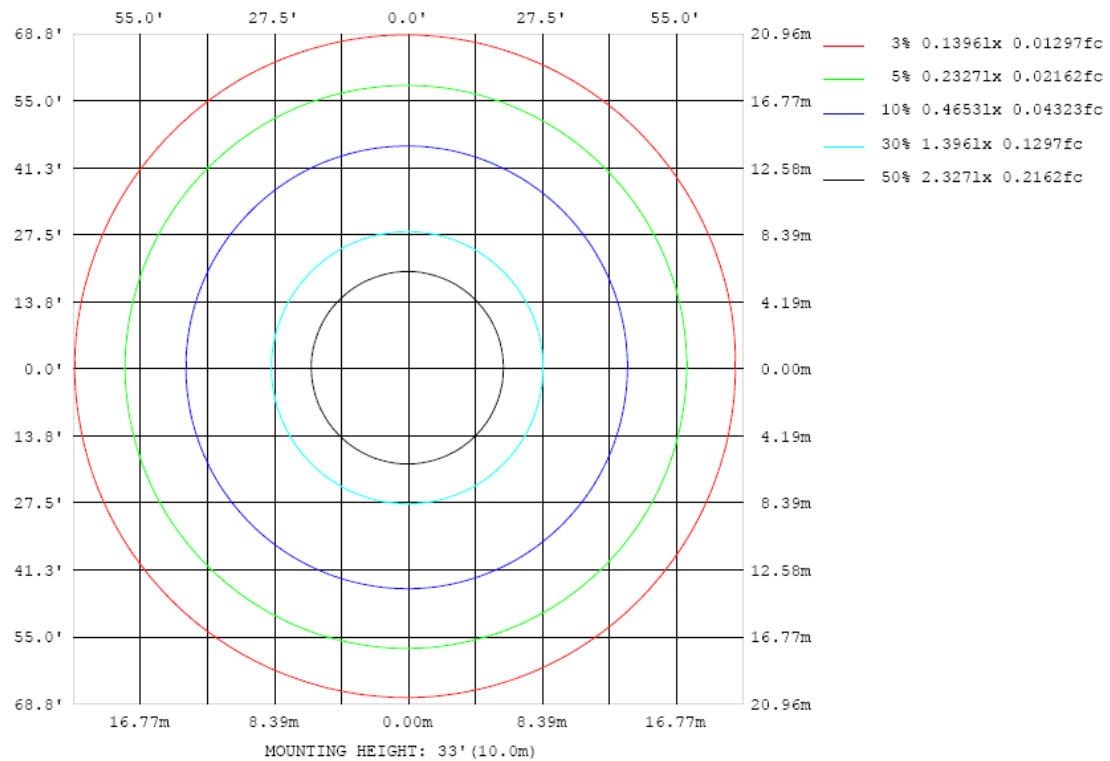


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

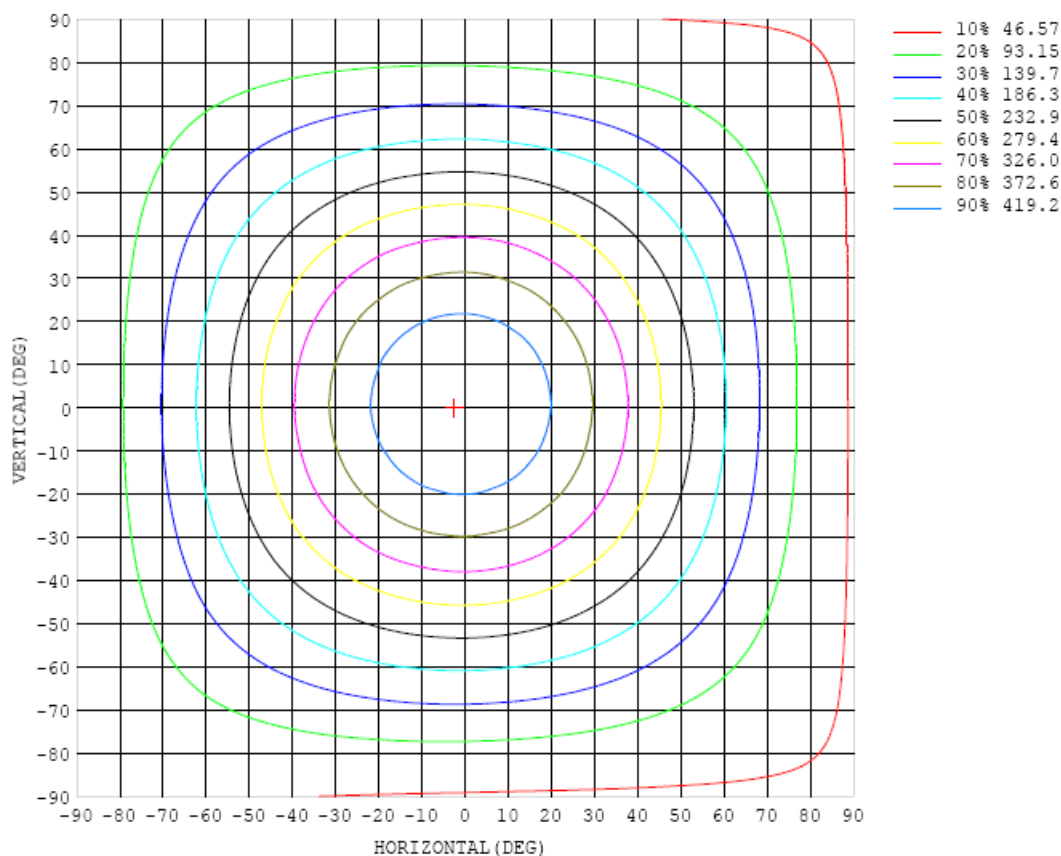


Chart 6: Isocandela Plot

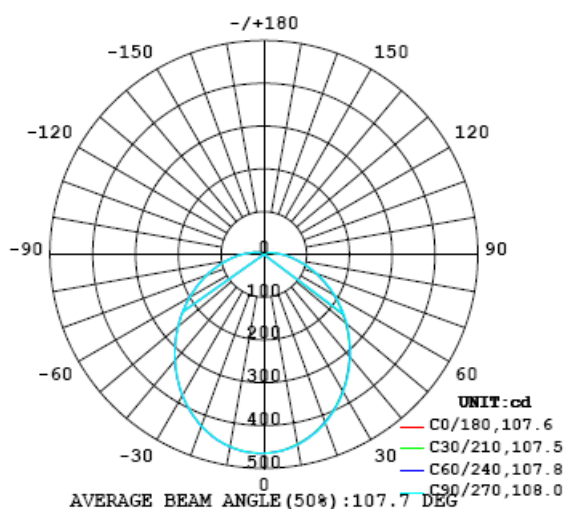


Chart 7: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1

UNIT: cd

C (DEG) γ (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	465	465	465	465	465	465	465	465	465	465	465	465	465	465	465	465	465	465	465
5	461	461	461	460	461	461	461	461	461	461	461	463	463	462	463	462	463	464	464
10	453	451	451	450	452	451	451	452	451	452	452	454	454	454	454	455	455	456	456
15	437	437	437	436	437	437	436	437	437	438	438	440	440	440	442	442	442	444	444
20	419	418	418	416	418	418	418	418	419	419	419	421	423	422	424	424	425	426	426
25	395	396	395	394	395	395	395	395	396	397	397	399	400	399	401	402	402	404	405
30	370	370	369	368	370	370	370	371	370	371	372	373	374	374	376	377	377	379	380
35	342	342	341	340	342	342	341	342	343	343	344	346	347	346	349	349	350	351	353
40	312	312	311	311	312	313	313	313	313	315	314	316	317	317	319	319	320	322	323
45	282	281	282	281	282	282	282	283	283	284	285	286	287	287	288	290	291	292	293
50	251	250	250	250	251	251	252	252	253	254	254	255	256	257	258	259	259	261	262
55	220	219	219	219	219	220	221	221	222	223	223	224	225	226	227	228	229	230	231
60	189	188	188	188	189	189	190	191	191	192	192	194	195	195	196	197	198	199	200
65	159	158	158	157	158	159	159	160	160	161	162	163	164	165	166	167	168	169	170
70	129	129	128	128	129	129	129	130	131	132	133	134	135	136	137	138	139	140	142
75	103	102	102	101	101	102	102	103	104	105	105	107	108	109	110	111	112	113	115
80	78.8	78.0	77.4	77.1	77.5	77.9	78.3	79.0	79.6	80.4	81.4	82.3	83.4	84.3	85.6	86.5	87.2	88.0	89.9
85	59.2	58.6	58.1	57.7	58.1	58.3	58.7	59.4	59.7	60.6	61.3	62.4	63.3	64.1	65.0	66.2	66.6	67.3	68.5
90	43.0	42.4	42.1	41.8	42.0	42.2	42.5	42.9	43.4	44.1	44.7	45.5	46.4	46.9	47.9	48.7	49.3	49.9	50.6
95	30.9	30.6	30.3	30.1	30.2	30.4	30.6	30.8	31.2	31.6	32.2	32.8	33.5	34.0	34.7	35.2	35.8	36.2	36.8
100	22.6	22.3	22.2	22.0	22.0	22.2	22.3	22.6	22.8	23.2	23.5	23.9	24.4	24.7	25.3	25.7	26.0	26.4	26.8
105	16.9	16.7	16.6	16.5	16.5	16.6	16.7	16.9	17.1	17.3	17.6	17.9	18.2	18.5	18.9	19.2	19.4	19.7	20.1
110	12.7	12.6	12.4	12.4	12.4	12.4	12.5	12.7	12.8	13.0	13.2	13.4	13.7	13.9	14.2	14.4	14.6	14.9	15.2
115	9.58	9.44	9.34	9.30	9.31	9.36	9.43	9.54	9.65	9.78	9.93	10.2	10.3	10.5	10.7	10.9	11.0	11.2	11.3
120	7.24	7.16	7.08	7.04	7.05	7.07	7.13	7.20	7.30	7.41	7.53	7.67	7.80	7.92	8.08	8.21	8.35	8.50	8.62
125	5.51	5.43	5.38	5.33	5.36	5.37	5.40	5.47	5.54	5.62	5.71	5.83	5.92	6.01	6.14	6.23	6.34	6.44	6.58
130	4.22	4.16	4.13	4.10	4.09	4.10	4.13	4.18	4.23	4.29	4.36	4.46	4.54	4.61	4.70	4.78	4.86	4.95	5.06
135	3.22	3.17	3.13	3.11	3.11	3.12	3.12	3.16	3.20	3.26	3.32	3.40	3.47	3.52	3.60	3.67	3.73	3.81	3.91
140	2.40	2.37	2.35	2.32	2.32	2.32	2.32	2.34	2.38	2.43	2.48	2.55	2.61	2.65	2.71	2.77	2.83	2.90	3.00
145	1.75	1.73	1.71	1.69	1.68	1.67	1.67	1.69	1.72	1.76	1.81	1.87	1.91	1.95	2.00	2.05	2.11	2.16	2.27
150	1.23	1.22	1.20	1.19	1.18	1.16	1.16	1.17	1.20	1.24	1.28	1.33	1.36	1.39	1.43	1.47	1.52	1.57	1.67
155	0.85	0.83	0.82	0.81	0.80	0.78	0.78	0.79	0.81	0.84	0.88	0.91	0.94	0.96	0.99	1.03	1.06	1.11	1.19
160	0.59	0.57	0.55	0.54	0.53	0.52	0.53	0.54	0.55	0.57	0.59	0.62	0.63	0.65	0.68	0.71	0.73	0.76	0.84
165	0.46	0.44	0.42	0.42	0.42	0.42	0.43	0.43	0.43	0.43	0.43	0.44	0.46	0.48	0.50	0.52	0.53	0.54	0.62
170	0.46	0.46	0.45	0.44	0.44	0.44	0.44	0.44	0.45	0.44	0.44	0.44	0.45	0.45	0.46	0.47	0.48	0.48	0.55
175	0.51	0.50	0.49	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.49	0.50	0.51	0.51	0.51	0.51	0.55
180	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.50	0.51

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		465	465	465	465	465	465	465	465	465	465	465	465	465	465	465	465	465		
5		464	463	463	465	464	463	464	462	463	462	464	464	462	463	462	461	462		
10		457	456	456	457	457	457	457	456	456	455	456	456	454	454	453	452	452		
15		445	445	444	446	445	444	444	444	444	443	443	442	440	441	439	437	439		
20		427	428	426	428	428	427	428	426	427	426	426	425	423	422	421	419	419		
25		406	406	405	407	407	406	406	405	405	404	404	403	400	400	398	397	397		
30		381	381	381	382	382	381	381	380	380	379	379	378	376	374	373	371	371		
35		354	354	353	354	354	353	353	352	352	351	350	350	347	346	345	343	343		
40		324	324	323	325	324	324	324	323	323	322	321	320	318	317	315	314	314		
45		293	293	293	294	294	293	293	293	293	291	291	289	288	286	285	283	283		
50		262	263	262	263	263	262	262	262	262	260	260	259	257	256	254	253	252		
55		231	231	231	232	232	231	231	231	230	229	229	227	226	224	223	221	221		
60		200	200	200	201	201	201	201	200	200	198	198	197	195	194	192	191	190		
65		170	170	170	171	171	171	170	170	170	168	168	167	165	164	162	161	161		
70		142	142	142	143	143	143	143	142	142	140	139	138	137	136	134	133	132		
75		115	115	115	116	116	116	116	115	114	113	113	111	110	109	107	106	105		
80		90.1	90.5	90.5	91.0	91.1	90.9	90.7	90.1	89.5	88.5	87.8	86.6	85.2	84.1	82.8	81.7	81.0		
85		68.8	69.0	69.1	69.5	69.4	69.2	69.1	68.6	68.0	67.2	66.3	65.5	64.1	63.2	62.1	61.1	60.3		
90		51.0	51.3	51.4	51.6	51.6	51.4	51.2	50.7	50.3	49.5	48.9	48.1	47.1	46.2	45.3	44.5	43.8		
95		37.1	37.4	37.4	37.6	37.6	37.5	37.3	36.9	36.5	35.9	35.5	34.8	34.0	33.4	32.7	32.1	31.6		
100		27.1	27.2	27.3	27.5	27.5	27.4	27.2	27.0	26.6	26.3	25.9	25.4	24.8	24.4	23.9	23.4	23.1		
105		20.2	20.3	20.4	20.5	20.5	20.4	20.4	20.2	19.9	19.6	19.3	19.0	18.6	18.3	17.9	17.5	17.3		
110		15.3	15.4	15.4	15.5	15.5	15.4	15.4	15.2	15.0	14.8	14.5	14.2	13.9	13.6	13.4	13.1	12.9		
115		11.5	11.5	11.6	11.6	11.6	11.6	11.5	11.4	11.2	11.1	10.9	10.7	10.5	10.3	10.1	9.89	9.73		
120		8.69	8.75	8.78	8.84	8.82	8.77	8.71	8.62	8.50	8.39	8.26	8.13	7.96	7.82	7.66	7.50	7.38		
125		6.64	6.69	6.72	6.74	6.75	6.70	6.66	6.59	6.51	6.41	6.32	6.21	6.08	5.97	5.85	5.73	5.63		
130		5.11	5.15	5.18	5.21	5.20	5.16	5.13	5.07	5.01	4.93	4.86	4.78	4.68	4.60	4.50	4.41	4.33		
135		3.96	3.99	4.01	4.04	4.03	4.00	3.97	3.92	3.88	3.82	3.76	3.69	3.61	3.55	3.47	3.38	3.32		
140		3.04	3.08	3.08	3.11	3.10	3.07	3.04	3.00	2.96	2.92	2.87	2.82	2.75	2.69	2.63	2.56	2.50		
145		2.30	2.33	2.34	2.35	2.34	2.31	2.29	2.26	2.23	2.19	2.16	2.11	2.06	2.01	1.96	1.90	1.85		
150		1.70	1.72	1.74	1.75	1.73	1.71	1.68	1.66	1.64	1.61	1.58	1.55	1.50	1.47	1.42	1.37	1.32		
155		1.22	1.24	1.25	1.25	1.24	1.23	1.20	1.18	1.17	1.15	1.13	1.10	1.07	1.04	1.00	0.97	0.93		
160		0.85	0.88	0.88	0.89	0.88	0.87	0.86	0.84	0.83	0.82	0.80	0.79	0.76	0.74	0.72	0.69	0.67		
165		0.63	0.64	0.65	0.65	0.65	0.65	0.65	0.64	0.63	0.62	0.61	0.60	0.59	0.58	0.56	0.55	0.55		
170		0.55	0.55	0.55	0.55	0.56	0.56	0.56	0.56	0.56	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.54		
175		0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.55	0.55	0.55	0.56	0.55	0.55	0.55	0.55	0.55		
180		0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51		

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

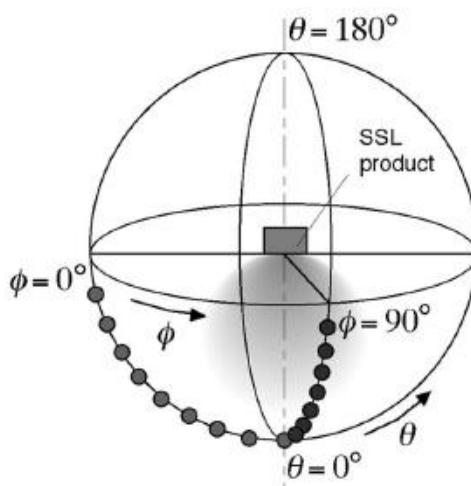
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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