

LM-79-19 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: 5.5PAR20DIM/930FL40

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ22090009b

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

Review by:



Engineer: April Zou
Oct. 21, 2022

Approved by:



Manager: Jim Zhang
Oct. 21, 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: **5.5PAR20DIM/930FL40**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
110.8	549.5	4.96	0.9352
CCT (K)	CRI	Stabilization Time (Light & Power)	
3163	94.3	50	

Table 1: Executive Data Summary

Note: The above results are recorded/ derived from measurements made using an Integrating Sphere.

Test specifications:

Date of Receipt	: Sep. 08, 2022
Date of Test	: Oct. 19, 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-79-2019 Approved Method: 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	: 5.5PAR20DIM/930FL40
Electrical Ratings	: 120V, 60Hz, 5.5W
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 base up. Test was conducted without a dimmer in the circuit.

The stabilization time of the sample was 50 minutes, and the total operating time including stabilization was 55 minutes.

Sphere-Spectroradiometer Method

Parameter	Result
Test Voltage (V)	120.0
Voltage frequency (Hz)	60
Test Current (A)	0.044
Power Factor	0.9352
Test Power (W)	4.96
THD A%	27.56
Luminous Efficacy (lm/W)	110.8
Total Luminous Flux (lm)	549.5
Color Rendering Index (CRI)	94.3
R9	62.3
Correlated Color Temperature (CCT)(K)	3163
Chromaticity Chroma x	0.4293
Chromaticity Chroma y	0.4081
Chromaticity Chroma u	0.2440
Chromaticity Chroma v	0.3479
Duv	0.0027
Chromaticity Chroma u'	0.2440
Chromaticity Chroma v'	0.5218

Special Color Rendering Indices	
R1	95.5
R2	96.8
R3	97
R4	95.7
R5	94.3
R6	96.9
R7	93.5
R8	84.6
R9	62.3
R10	90.5
R11	97.3
R12	79
R13	95.8
R14	97.1

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 24.8 °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)	0.044
Power Factor	0.9334
Power (W)	4.97
Luminous Efficacy (lm/W)	111.5
Total Luminous Flux (lm)	554.2
Beam Angle (°)	36.9 (0°-180°) / 37.2 (90°-270°)
Center Beam Candle Power (cd)	948
Maximum Beam Candle Power (cd)	951.1 (At: C=190.0, Gamma=1.5)
Spacing Criteria	0.63 (0°-180°) / 0.62 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	96.50%
Zonal Lumens in the 60 °-90 °Zone	3.40%
Zonal Lumens in the 90 °-120 °Zone	0.00%
Zonal Lumens in the 120 °-180 °Zone	0.10%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

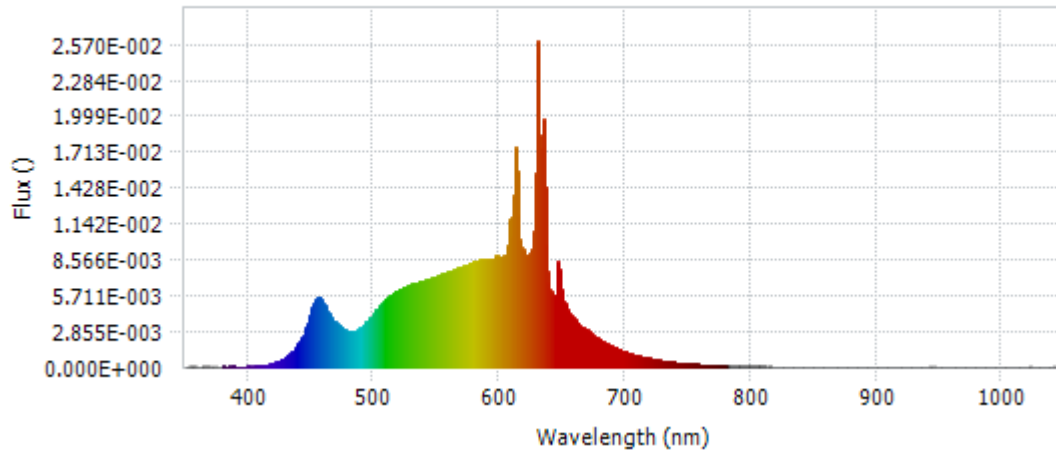
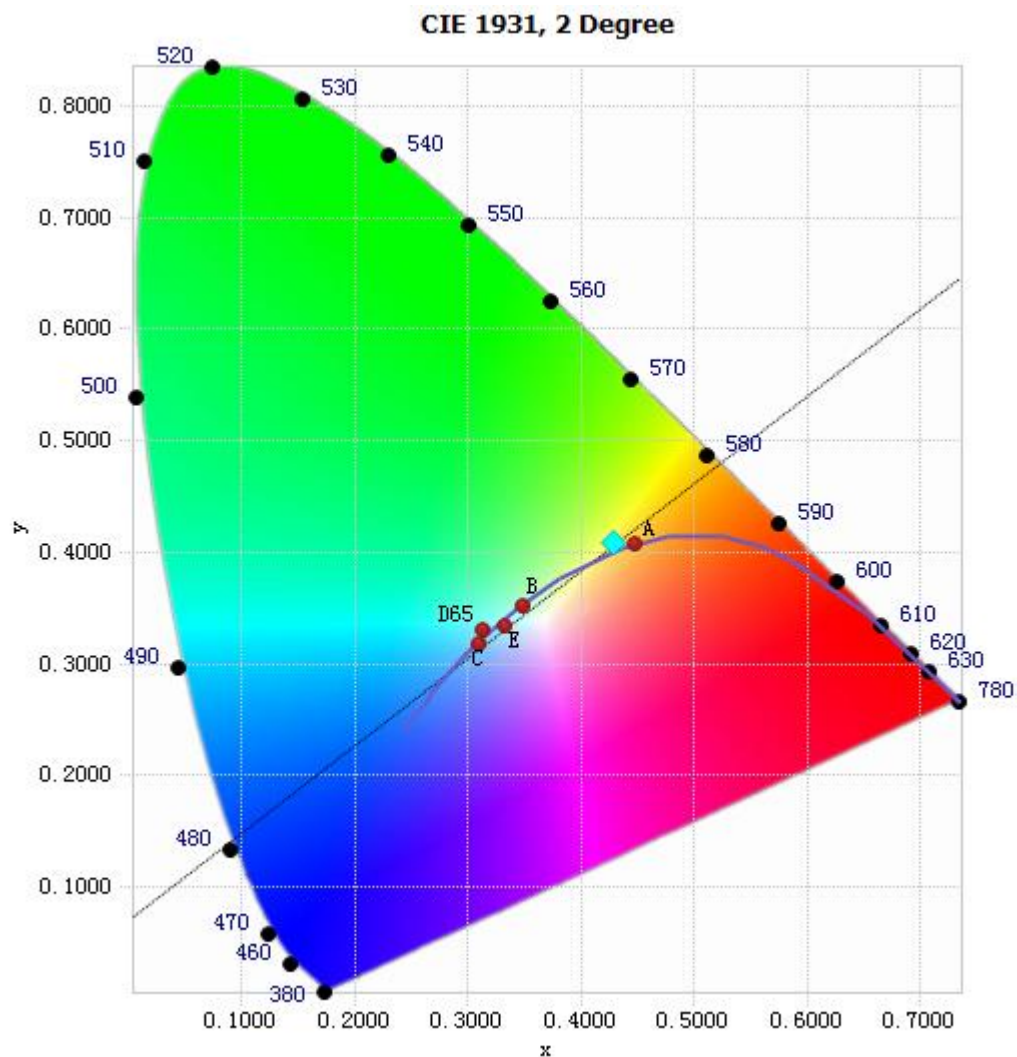


Chart 1: Spectral Power Distribution

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	2.83E-03	590	8.60E-03	695	1.38E-03
385	4.40E-05	490	3.19E-03	595	8.59E-03	700	1.19E-03
390	2.97E-05	495	3.68E-03	600	8.76E-03	705	1.01E-03
395	2.55E-05	500	4.27E-03	605	8.85E-03	710	8.72E-04
400	4.14E-05	505	4.90E-03	610	1.03E-02	715	7.55E-04
405	3.26E-05	510	5.39E-03	615	1.21E-02	720	6.48E-04
410	8.25E-05	515	5.85E-03	620	9.18E-03	725	5.58E-04
415	1.71E-04	520	6.14E-03	625	9.22E-03	730	4.77E-04
420	2.88E-04	525	6.35E-03	630	2.49E-02	735	4.06E-04
425	4.89E-04	530	6.58E-03	635	1.97E-02	740	3.46E-04
430	7.79E-04	535	6.69E-03	640	6.23E-03	745	3.00E-04
435	1.19E-03	540	6.88E-03	645	5.74E-03	750	2.59E-04
440	1.84E-03	545	7.04E-03	650	5.41E-03	755	2.22E-04
445	2.86E-03	550	7.20E-03	655	4.45E-03	760	1.90E-04
450	4.39E-03	555	7.39E-03	660	3.79E-03	765	1.63E-04
455	5.51E-03	560	7.58E-03	665	3.22E-03	770	1.41E-04
460	5.07E-03	565	7.78E-03	670	3.00E-03	775	1.22E-04
465	4.04E-03	570	8.01E-03	675	2.49E-03	780	1.04E-04
470	3.49E-03	575	8.16E-03	680	2.14E-03		
475	3.11E-03	580	8.39E-03	685	1.86E-03		
480	2.77E-03	585	8.55E-03	690	1.60E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4293, 0.4081)

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

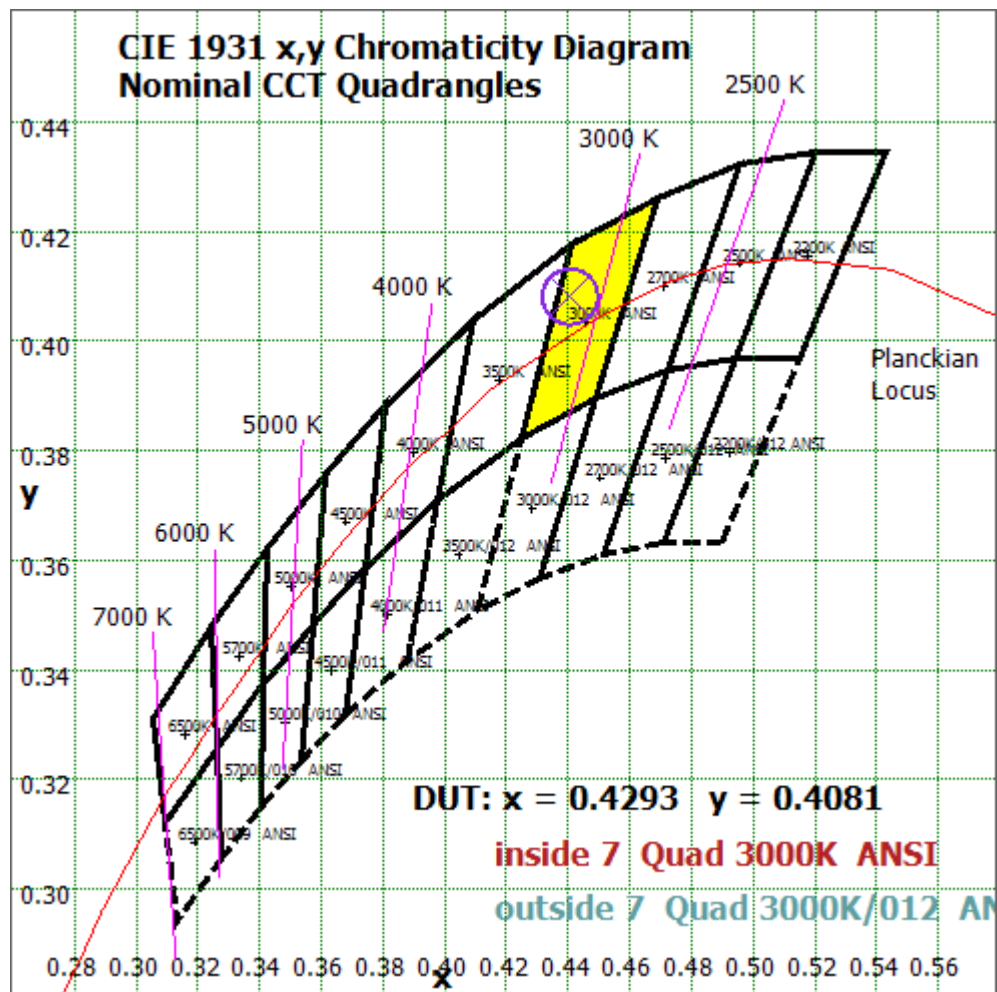


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

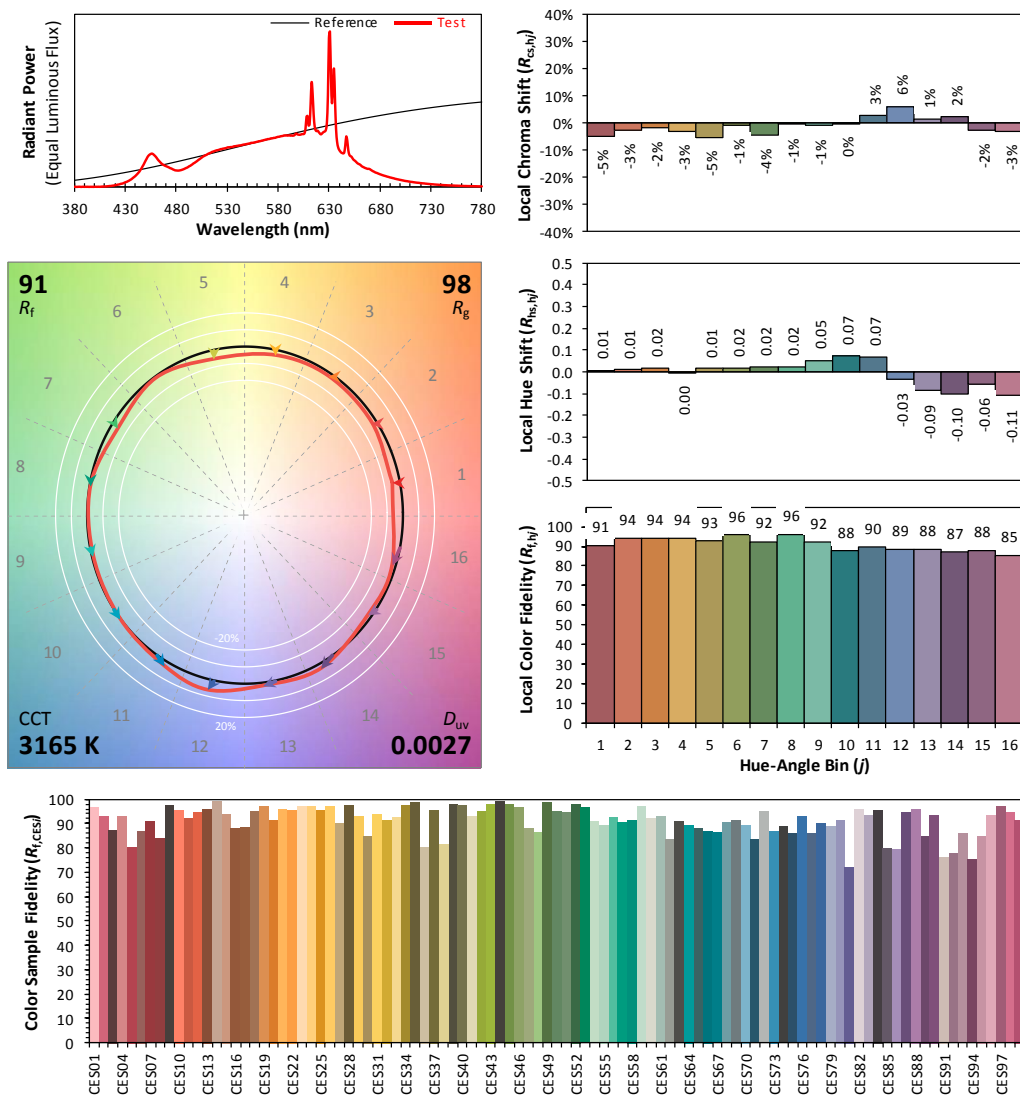
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2022/10/19

Model: 5.5PAR20DIM/930FL40



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

x 0.4293
 y 0.4081
 u' 0.2440
 v' 0.5218

CIE 13.3-1995
(CRI)
 R_a 94
 R_9 63

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	80.841	14.59%
10- 20	163.223	29.45%
20- 30	135.075	24.37%
30- 40	83.946	15.15%
40- 50	48.344	8.72%
50- 60	23.429	4.23%
60- 70	11.532	2.08%
70- 80	5.933	1.07%
80- 90	1.363	0.25%
90-100	0.001	0.00%
100-110	0	0.00%
110-120	0.007	0.00%
120-130	0.031	0.01%
130-140	0.081	0.01%
140-150	0.131	0.02%
150-160	0.148	0.03%
160-170	0.117	0.02%
170-180	0.042	0.01%
Total	554.2	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	534.858	96.50%
60- 90	18.828	3.40%
0-90	553.686	99.90%
90- 180	0.558	0.10%
0- 180	554.2	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

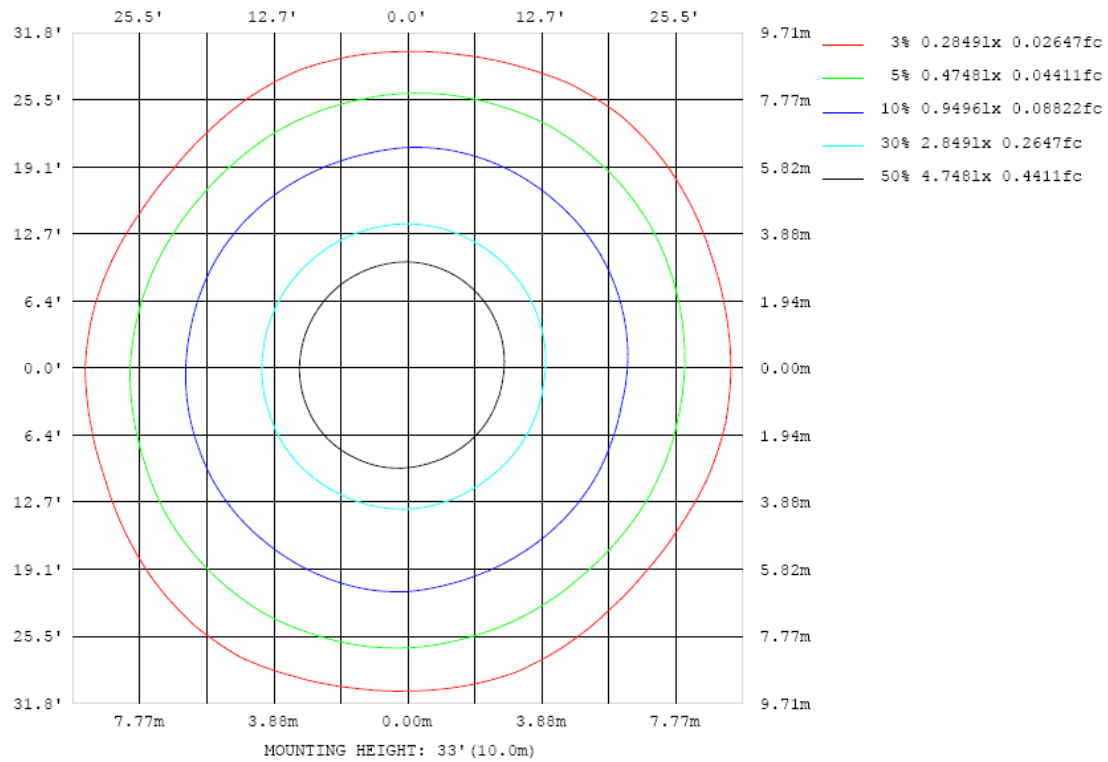


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

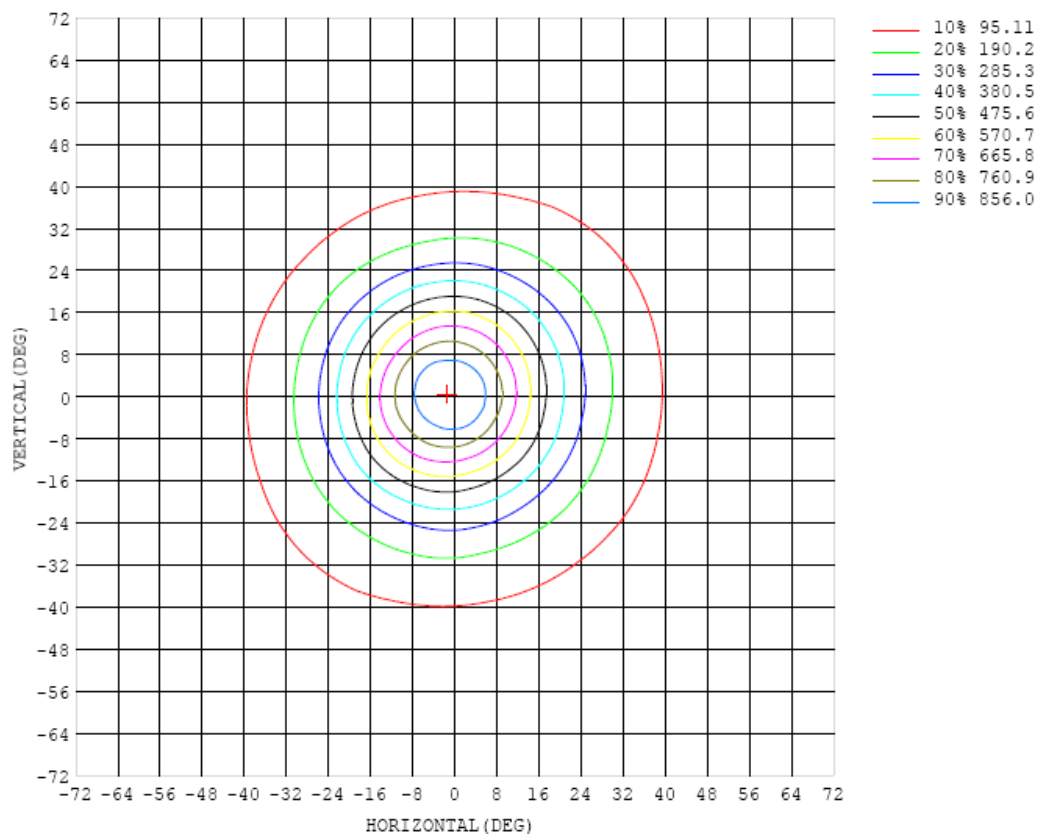


Chart 6: Isocandela Plot

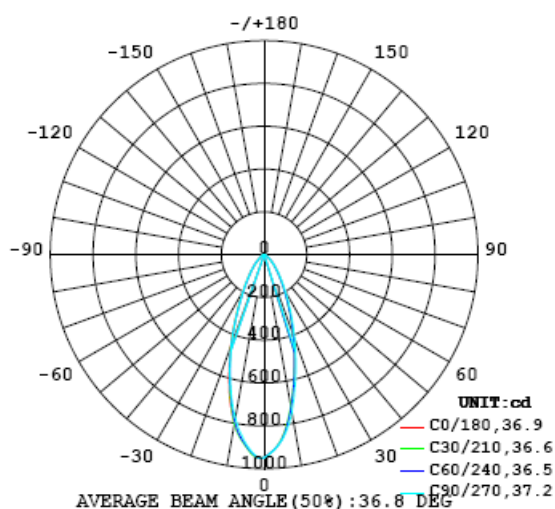


Chart 7: Polar Candela Distribution

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	948	948	948	948	948	948	948	948	948	948	948	948	948	948	948	948	948	948	948
5	875	875	876	875	876	875	879	878	879	879	882	884	886	890	894	897	901	904	905
10	727	723	719	719	719	723	727	733	738	748	754	761	768	774	779	784	792	796	798
15	550	545	544	546	547	548	551	556	562	574	584	593	604	613	622	628	633	636	636
20	400	397	397	397	397	397	400	405	411	418	426	431	438	445	454	457	456	457	458
25	281	275	272	271	271	272	274	281	287	295	297	298	299	302	306	307	307	307	307
30	190	185	184	184	184	185	186	189	193	200	203	203	203	204	205	204	203	201	199
35	131	127	126	127	126	126	126	128	132	138	141	141	141	140	141	141	138	137	134
40	91.4	89.8	88.6	86.1	83.9	84.3	87.0	89.4	91.2	93.6	95.7	97.4	99.8	99.4	98.7	97.2	93.7	92.6	92.0
45	64.2	63.8	60.5	56.4	55.6	57.7	61.0	64.3	63.8	63.3	64.6	67.9	72.1	72.7	69.9	66.5	62.9	62.8	63.1
50	43.0	41.2	37.7	35.2	35.1	35.8	37.4	40.6	41.9	42.3	43.9	46.9	49.5	50.9	48.7	44.9	42.7	42.1	41.3
55	26.5	24.3	22.6	21.6	21.0	20.6	21.1	23.3	25.9	28.0	29.8	30.5	29.6	30.1	30.2	29.9	29.5	27.9	25.5
60	16.6	15.3	14.6	14.3	14.0	13.8	14.0	14.8	16.3	18.0	18.8	18.4	17.6	17.6	18.3	19.1	19.3	18.0	16.4
65	11.3	10.8	10.5	10.4	10.3	10.2	10.3	10.6	11.3	12.1	12.4	12.2	11.9	11.9	12.3	12.8	12.8	12.2	11.4
70	8.08	7.72	7.58	7.52	7.47	7.44	7.47	7.65	7.99	8.47	8.73	8.63	8.47	8.53	8.77	9.03	9.02	8.70	8.31
75	5.40	5.15	5.04	5.02	5.01	5.01	5.03	5.13	5.33	5.65	5.83	5.84	5.76	5.81	5.99	6.15	6.13	5.96	5.78
80	2.83	2.73	2.68	2.67	2.67	2.68	2.70	2.77	2.91	3.08	3.18	3.19	3.20	3.27	3.40	3.47	3.47	3.42	3.39
85	0.82	0.80	0.78	0.77	0.77	0.78	0.81	0.84	0.88	0.93	0.99	1.04	1.09	1.14	1.19	1.24	1.28	1.29	1.34
90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.04	0.05	0.09
95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
105	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
110	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
115	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.01	0.01
120	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02
125	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
130	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.06
135	0.09	0.09	0.09	0.09	0.09	0.09	0.08	0.08	0.08	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.09	0.09	0.10
140	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.15
145	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.17	0.20
150	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.22	0.25
155	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.28	0.27	0.28	0.28	0.28	0.28	0.28	0.27	0.29
160	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.33	0.33	0.33	0.33	0.33
165	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.37	0.37	0.36	0.36	0.37	0.37	0.37	0.37	0.37	0.36
170	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
175	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.42
180	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47

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	948	948	948	948	948	948	948	948	948	948	948	948	948	948	948	948	948		
5	907	908	909	908	908	905	901	899	898	895	892	887	884	884	883	881	878		
10	802	803	803	801	796	792	785	780	776	769	762	757	752	745	741	735	732		
15	633	629	624	621	620	618	616	616	613	608	602	595	587	579	571	564	557		
20	456	455	454	453	450	448	447	445	445	442	438	433	429	423	417	412	407		
25	306	304	302	299	296	295	295	295	296	296	292	291	290	290	291	289	285		
30	197	196	196	194	191	189	188	189	193	195	195	196	196	198	199	197	194		
35	131	129	128	126	124	124	124	126	131	133	135	136	136	137	138	137	135		
40	89.4	85.9	81.8	79.3	80.3	83.4	85.4	85.9	87.3	88.9	91.1	94.9	95.7	96.1	95.7	93.9	92.5		
45	60.8	56.2	52.0	51.4	53.1	55.6	58.5	58.2	57.6	58.3	61.7	66.2	69.0	68.5	65.7	63.1	63.4		
50	38.5	34.9	32.7	32.4	32.3	32.9	35.4	37.0	37.7	39.4	41.7	43.6	45.8	45.7	43.9	42.7	43.0		
55	23.1	21.4	20.7	20.1	19.7	19.9	21.0	22.9	24.6	26.1	26.6	26.3	26.9	27.7	28.5	29.0	28.3		
60	15.3	14.7	14.4	14.1	13.8	13.9	14.4	15.2	16.3	17.0	16.9	16.5	16.5	17.1	18.2	18.8	18.0		
65	11.0	10.8	10.7	10.6	10.5	10.6	10.7	11.0	11.5	11.8	11.7	11.5	11.5	11.7	12.2	12.4	12.0		
70	8.11	8.02	8.02	7.97	7.94	7.91	7.96	8.12	8.41	8.59	8.56	8.38	8.30	8.38	8.62	8.74	8.49		
75	5.67	5.63	5.64	5.63	5.60	5.57	5.56	5.62	5.77	5.91	5.91	5.82	5.72	5.73	5.86	5.88	5.71		
80	3.36	3.36	3.38	3.36	3.34	3.31	3.29	3.30	3.34	3.35	3.28	3.18	3.11	3.07	3.10	3.08	2.99		
85	1.35	1.35	1.36	1.34	1.32	1.30	1.28	1.26	1.24	1.19	1.13	1.07	1.02	0.98	0.95	0.91	0.88		
90	0.09	0.10	0.10	0.09	0.08	0.07	0.06	0.04	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00		
95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
105	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
110	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
115	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		
120	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02		
125	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04		
130	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.07		
135	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.12		
140	0.18	0.17	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.17		
145	0.24	0.24	0.24	0.24	0.24	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.26	0.26	0.26	0.26	0.22		
150	0.32	0.31	0.31	0.31	0.31	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.33	0.33	0.33	0.33	0.26		
155	0.38	0.37	0.37	0.38	0.38	0.38	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.38	0.38	0.29		
160	0.42	0.44	0.44	0.44	0.45	0.45	0.46	0.46	0.46	0.46	0.45	0.45	0.45	0.45	0.44	0.43	0.32		
165	0.42	0.49	0.49	0.50	0.51	0.51	0.51	0.51	0.52	0.51	0.51	0.50	0.50	0.49	0.50	0.44	0.36		
170	0.39	0.47	0.51	0.51	0.51	0.51	0.52	0.52	0.52	0.52	0.51	0.51	0.50	0.50	0.47	0.38	0.39		
175	0.43	0.43	0.44	0.44	0.46	0.46	0.47	0.48	0.50	0.49	0.47	0.46	0.44	0.44	0.44	0.43	0.42		
180	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47		

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, 2022	Aug. 04, 2023
Digital Power Meter	PF2010A	HZTE028-01	Aug. 05, 2022	Aug. 04, 2023
AC Power Supply	DPS1060	HZTE001-06	Aug. 05, 2022	Aug. 04, 2023
DC Power Supply	WY12010	HZTE004-03	Aug. 05, 2022	Aug. 04, 2023
Temperature recorder	JM624U	HZTE018-08	Aug. 05, 2022	Aug. 04, 2023
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 05, 2022	Aug. 04, 2023
Standard source	D908	HZTE012-01	Aug. 05, 2022	Aug. 04, 2023
Integrate Sphere system	3M	HZTE015-04	Aug. 05, 2022	Aug. 04, 2023
Digital Power Meter	WT210	HZTE008-01	Aug. 05, 2022	Aug. 04, 2023
AC Power Supply	PCR 500L	HZTE001-07	Aug. 05, 2022	Aug. 04, 2023
DC Power Supply	IT6154	HZTE004-04	Aug. 05, 2022	Aug. 04, 2023
Standard source	SCL-1400	HZTE012-02	Aug. 05, 2022	Aug. 04, 2023
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 05, 2022	Aug. 04, 2023
Temperature Meter	TES1310	HZTE017-01	Aug. 05, 2022	Aug. 04, 2023

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 3 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 20 min, taken 10 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 20 min, taken 10 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.

*** End of Report ***

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