

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/927FL40

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ22090009a

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

Review by:



Engineer: April Zou
Sep. 21, 2022

Approved by:



Manager: Jim Zhang
Sep. 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/927FL40**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
106.1	532.5	5.02	0.9371
CCT (K)	CRI	Stabilization Time (Light & Power)	
2792	94.8	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	: Sep. 16, 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/927FL40
Electrical Ratings	: 120V, 60Hz, 5.5W
Product Description	: 2700K
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)	0.045
Power Factor	0.9371
Test Power (W)	5.02
THD A%	26.92
Luminous Efficacy (lm/W)	106.1
Total Luminous Flux (lm)	532.5
Color Rendering Index (CRI)	94.8
R9	61.3
Correlated Color Temperature (CCT)(K)	2792
Chromaticity Chroma x	0.4537
Chromaticity Chroma y	0.4113
Chromaticity Chroma u	0.2582
Chromaticity Chroma v	0.3511
Duv	0.0008
Chromaticity Chroma u'	0.2582
Chromaticity Chroma v'	0.5267

Special Color Rendering Indices	
R1	96.6
R2	97.9
R3	97.6
R4	97.1
R5	96.1
R6	97.2
R7	92.3
R8	83.3
R9	61.3
R10	92.8
R11	98.2
R12	86
R13	97
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)	0.045
Power Factor	0.9343
Power (W)	5.03
Luminous Efficacy (lm/W)	106.6
Total Luminous Flux (lm)	536.3
Beam Angle (°)	36.1 (0°-180°) / 36.3 (90°-270°)
Center Beam Candle Power (cd)	937
Maximum Beam Candle Power (cd)	942.1 (At: C=300.0, Gamma=1.0)
Spacing Criteria	0.55 (0°-180°) / 0.62 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	96.53%
Zonal Lumens in the 60 °-90 °Zone	3.38%
Zonal Lumens in the 90 °-120 °Zone	0.00%
Zonal Lumens in the 120 °-180 °Zone	0.09%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

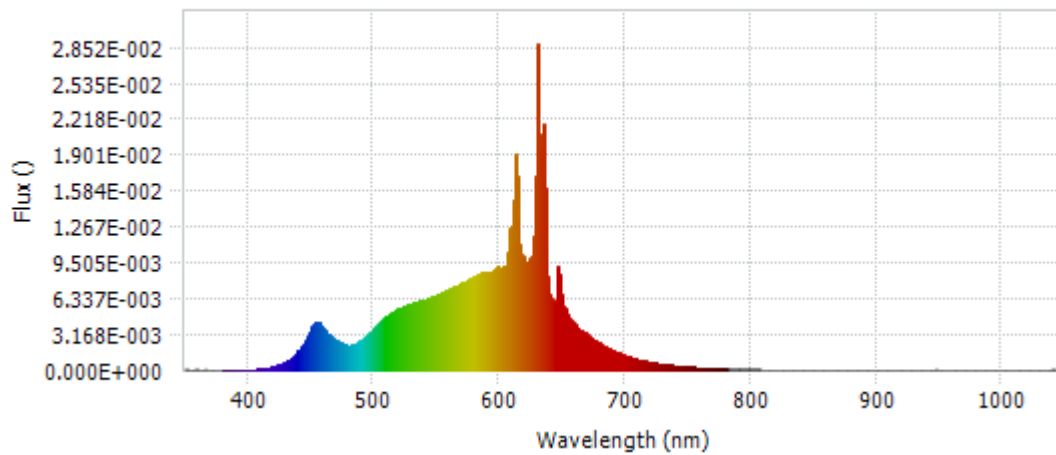
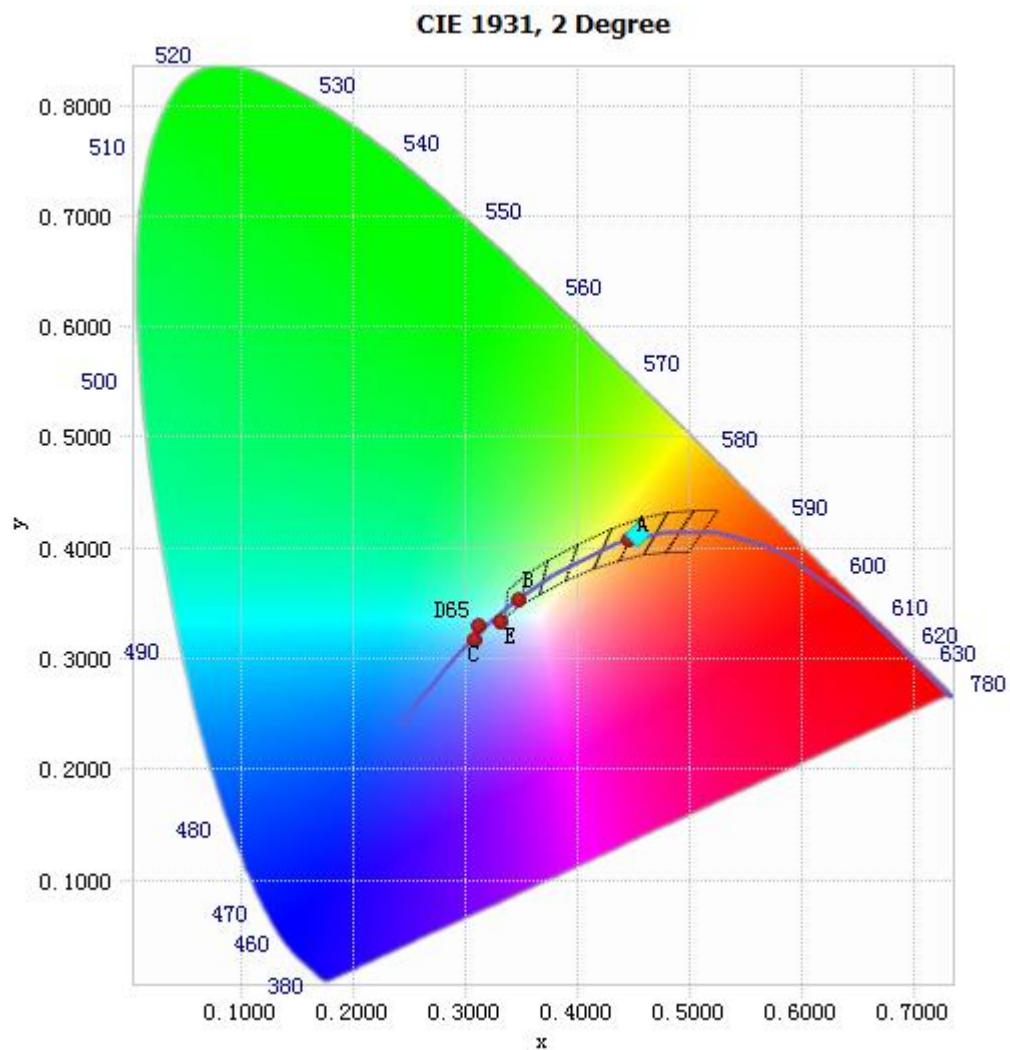


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.39E-05	485	2.27E-03	590	8.64E-03	695	1.48E-03
385	1.66E-05	490	2.61E-03	595	8.73E-03	700	1.26E-03
390	3.93E-05	495	3.09E-03	600	9.01E-03	705	1.09E-03
395	1.90E-05	500	3.66E-03	605	9.25E-03	710	9.33E-04
400	3.03E-05	505	4.21E-03	610	1.11E-02	715	8.02E-04
405	4.71E-05	510	4.70E-03	615	1.34E-02	720	6.92E-04
410	8.77E-05	515	5.12E-03	620	9.87E-03	725	5.91E-04
415	1.77E-04	520	5.43E-03	625	9.95E-03	730	5.08E-04
420	2.86E-04	525	5.67E-03	630	2.74E-02	735	4.38E-04
425	4.62E-04	530	5.88E-03	635	2.18E-02	740	3.76E-04
430	7.27E-04	535	6.05E-03	640	6.68E-03	745	3.21E-04
435	1.10E-03	540	6.24E-03	645	6.18E-03	750	2.73E-04
440	1.65E-03	545	6.42E-03	650	5.84E-03	755	2.34E-04
445	2.44E-03	550	6.62E-03	655	4.75E-03	760	2.02E-04
450	3.59E-03	555	6.86E-03	660	4.06E-03	765	1.80E-04
455	4.21E-03	560	7.10E-03	665	3.42E-03	770	1.56E-04
460	3.68E-03	565	7.40E-03	670	3.19E-03	775	1.27E-04
465	2.98E-03	570	7.68E-03	675	2.65E-03	780	1.09E-04
470	2.62E-03	575	7.93E-03	680	2.28E-03		
475	2.31E-03	580	8.20E-03	685	1.97E-03		
480	2.15E-03	585	8.56E-03	690	1.71E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4537, 0.4113)

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

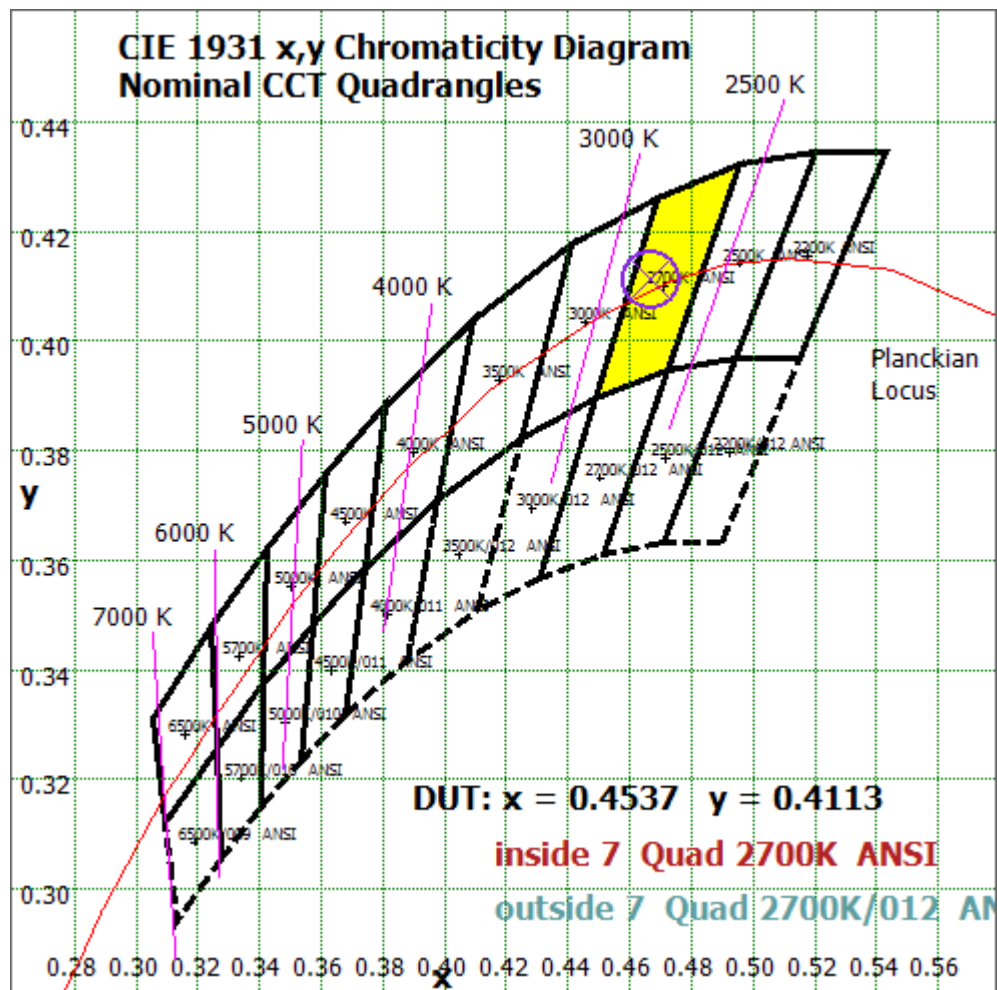


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

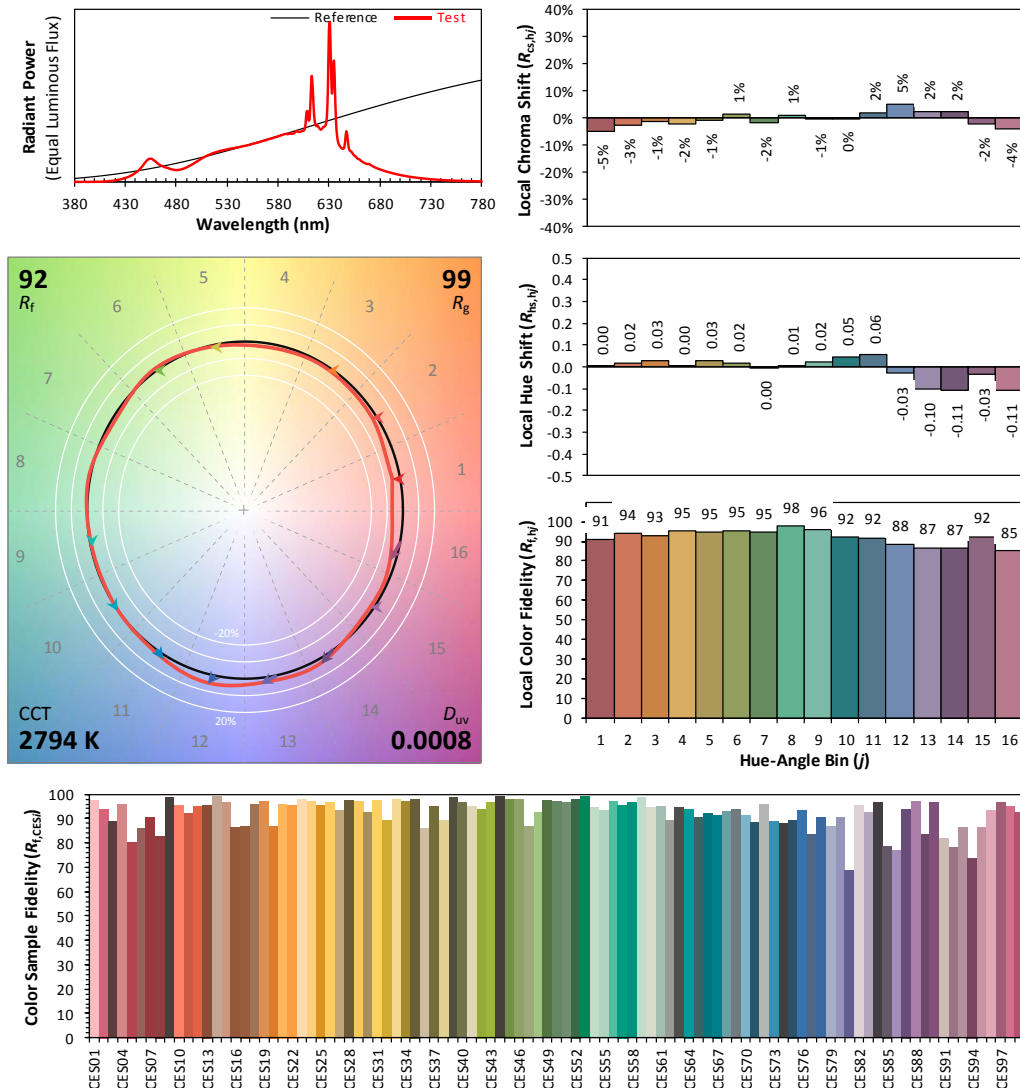
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2022/09/16

Model: 5.5PAR20DIM/927FL40



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

x 0.4537
 y 0.4113
 u' 0.2582
 v' 0.5267

CIE 13.3-1995
(CRI)
 R_a 95
 R_g 62

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	79.331	14.79%
10- 20	158.757	29.60%
20- 30	127.686	23.81%
30- 40	80.773	15.06%
40- 50	47.673	8.89%
50- 60	23.51	4.38%
60- 70	11.207	2.09%
70- 80	5.626	1.05%
80- 90	1.269	0.24%
90-100	0.001	0.00%
100-110	0.002	0.00%
110-120	0.009	0.00%
120-130	0.027	0.01%
130-140	0.07	0.01%
140-150	0.113	0.02%
150-160	0.126	0.02%
160-170	0.1	0.02%
170-180	0.036	0.01%
Total	536.3	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	517.73	96.53%
60- 90	18.102	3.38%
0-90	535.832	99.91%
90- 180	0.484	0.09%
0- 180	536.3	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

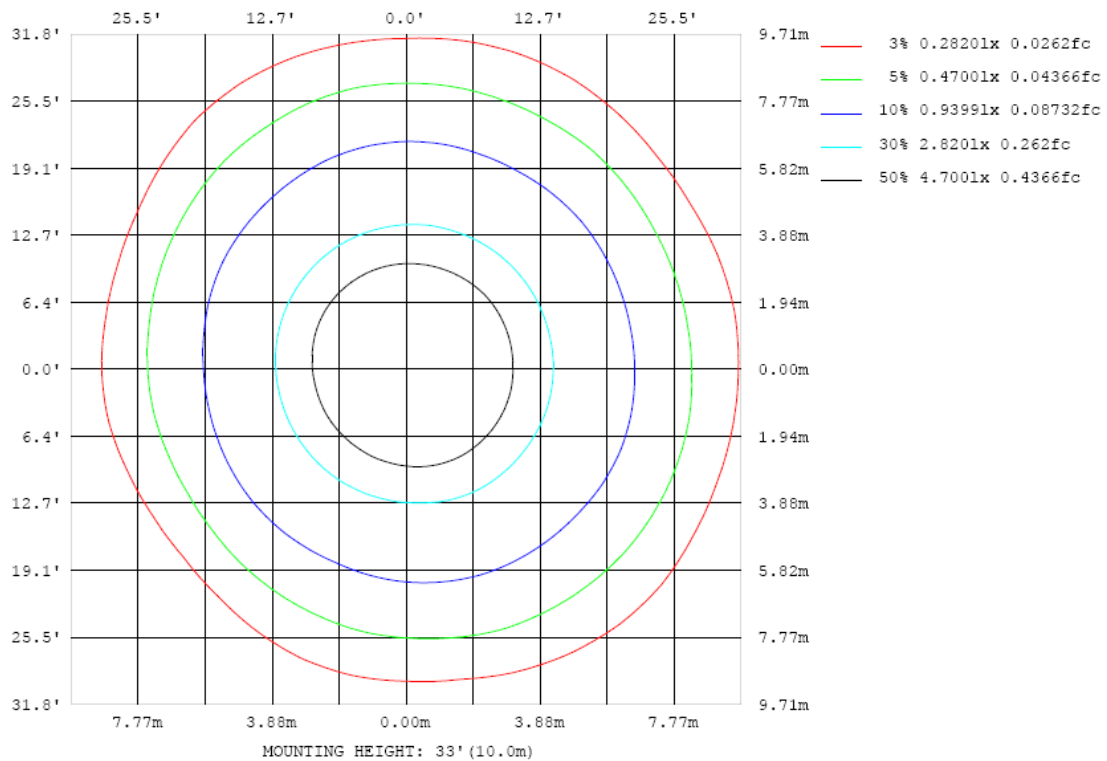


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

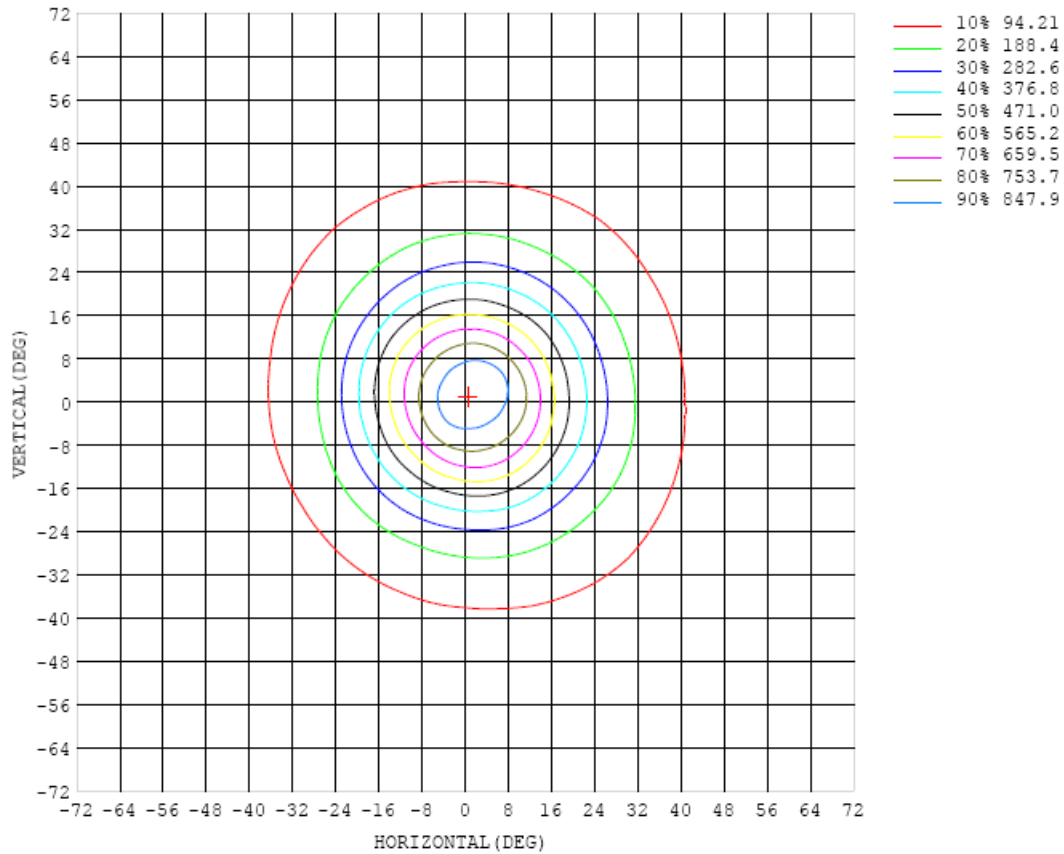


Chart 6: Isocandela Plot

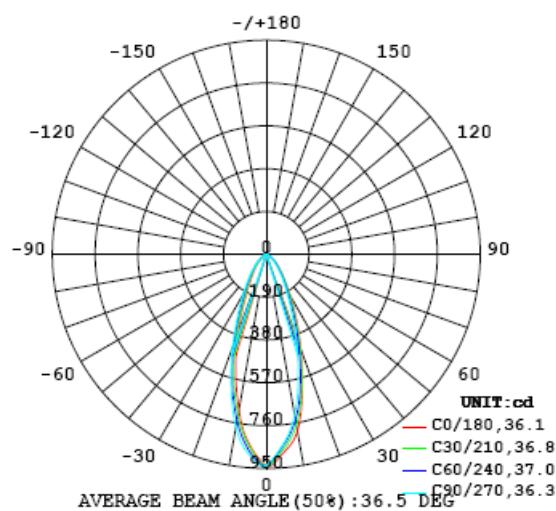


Chart 7: Polar Candela Distribution

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	937	937	937	937	937	937	937	937	937	937	937	937	937	937	937	937	937	937	937
5	883	876	873	868	863	858	853	851	847	847	847	847	846	847	847	846	846	848	849
10	796	787	779	769	760	753	746	739	734	724	718	710	704	697	692	691	692	696	701
15	619	617	614	608	603	597	587	577	566	552	538	531	523	518	516	517	517	521	529
20	449	448	445	439	432	426	418	408	393	381	372	366	361	358	355	354	355	359	366
25	315	313	308	300	292	286	280	271	261	251	245	240	237	234	231	230	228	229	232
30	213	214	211	206	199	194	189	184	178	172	165	158	155	154	152	150	148	149	152
35	145	147	147	144	139	136	133	130	125	119	114	108	105	102	99.0	97.3	98.5	101	104
40	99.7	102	102	101	99.5	97.0	93.8	90.5	84.9	81.4	79.5	76.1	71.5	67.0	64.2	65.1	67.9	71.7	74.1
45	70.1	69.0	68.4	69.7	71.8	71.1	67.9	62.8	57.1	55.8	55.3	52.5	47.6	42.7	42.0	43.1	44.4	47.3	49.9
50	48.3	46.3	46.6	48.7	50.5	50.6	47.3	42.7	39.7	37.9	35.5	32.2	28.8	26.6	26.1	25.4	25.3	26.9	29.7
55	30.2	31.0	32.2	32.8	31.4	30.5	29.3	28.1	27.3	25.2	22.0	19.3	17.8	17.1	16.7	16.2	16.1	16.6	18.1
60	18.4	20.1	20.9	20.1	18.4	17.4	17.4	17.7	17.4	16.1	14.3	13.0	12.4	12.2	12.0	11.8	11.7	11.9	12.4
65	12.1	13.0	13.3	12.8	11.9	11.5	11.5	11.7	11.6	10.9	10.1	9.47	9.21	9.10	9.01	8.94	8.92	9.00	9.19
70	8.46	8.93	9.07	8.76	8.31	8.07	8.04	8.15	8.03	7.68	7.21	6.87	6.69	6.63	6.63	6.56	6.55	6.60	6.75
75	5.74	5.94	6.03	5.87	5.60	5.43	5.38	5.40	5.33	5.13	4.85	4.63	4.52	4.49	4.47	4.45	4.45	4.47	4.58
80	3.31	3.39	3.38	3.26	3.09	2.97	2.93	2.91	2.84	2.74	2.61	2.51	2.49	2.49	2.43	2.38	2.38	2.40	2.47
85	1.22	1.21	1.17	1.12	1.05	1.00	0.95	0.90	0.86	0.83	0.82	0.79	0.75	0.73	0.71	0.70	0.71	0.73	0.75
90	0.06	0.04	0.03	0.02	0.01	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
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	0.01
115	0.00	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
120	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
125	0.02	0.02	0.03	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
130	0.04	0.04	0.04	0.04	0.04	0.04	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	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.09	0.10
140	0.10	0.10	0.11	0.11	0.11	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	0.15
145	0.13	0.13	0.14	0.14	0.14	0.15	0.15	0.16	0.16	0.16	0.16	0.17	0.17	0.17	0.17	0.17	0.17	0.16	0.20
150	0.17	0.17	0.17	0.17	0.18	0.18	0.18	0.19	0.19	0.19	0.20	0.20	0.20	0.20	0.20	0.21	0.21	0.20	0.24
155	0.21	0.21	0.21	0.21	0.21	0.22	0.22	0.22	0.23	0.23	0.24	0.24	0.24	0.24	0.25	0.25	0.25	0.24	0.27
160	0.25	0.25	0.25	0.25	0.25	0.26	0.26	0.26	0.26	0.27	0.27	0.28	0.28	0.29	0.29	0.29	0.29	0.29	0.30
165	0.28	0.28	0.28	0.28	0.28	0.29	0.29	0.29	0.30	0.30	0.30	0.31	0.31	0.31	0.32	0.32	0.32	0.32	0.32
170	0.31	0.31	0.31	0.31	0.31	0.31	0.32	0.32	0.32	0.32	0.33	0.33	0.33	0.34	0.34	0.34	0.35	0.35	0.35
175	0.33	0.32	0.32	0.32	0.32	0.32	0.33	0.33	0.33	0.33	0.34	0.34	0.34	0.34	0.35	0.35	0.35	0.36	0.37
180	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41

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	937	937	937	937	937	937	937	937	937	937	937	937	937	937	937	937	937		
5	852	856	859	863	869	875	880	886	891	895	899	901	902	902	898	891	888		
10	709	718	725	732	740	749	758	767	778	788	795	800	805	808	808	806	802		
15	540	552	562	573	581	588	594	600	605	610	615	619	622	624	625	624	622		
20	374	383	393	403	413	421	428	434	439	443	445	448	453	455	454	451	450		
25	238	246	253	259	269	278	287	294	302	307	308	311	313	314	314	313	314		
30	157	164	170	175	180	188	196	201	206	208	208	208	209	210	210	210	211		
35	108	113	119	123	127	131	137	142	143	144	142	142	145	147	146	144	144		
40	74.7	76.9	80.6	86.0	91.1	93.9	97.4	99.9	99.9	100	100	100	102	100	98.2	98.5	99.0		
45	50.3	51.3	54.8	60.5	66.0	69.0	69.3	68.1	68.1	70.4	71.9	71.4	68.3	66.0	66.7	69.6	71.1		
50	32.1	34.4	37.4	40.3	43.4	46.8	47.1	46.0	46.4	48.6	49.5	47.7	43.5	42.6	44.1	46.0	48.4		
55	20.2	22.3	23.9	24.4	25.1	27.4	29.7	31.1	31.8	31.5	30.6	28.6	26.7	26.2	25.9	26.1	28.2		
60	13.4	14.4	15.2	15.3	15.5	16.5	18.3	20.1	20.7	19.6	18.2	17.2	16.8	16.4	16.0	15.9	16.7		
65	9.67	10.2	10.6	10.6	10.7	11.1	12.0	12.9	13.3	12.7	11.9	11.5	11.5	11.4	11.1	11.1	11.3		
70	7.05	7.39	7.63	7.68	7.75	7.94	8.40	8.94	9.12	8.84	8.45	8.28	8.27	8.25	8.16	8.08	8.14		
75	4.78	4.99	5.17	5.25	5.29	5.41	5.69	6.04	6.19	6.04	5.82	5.73	5.73	5.74	5.70	5.63	5.63		
80	2.57	2.67	2.77	2.83	2.89	2.99	3.16	3.34	3.44	3.39	3.33	3.32	3.35	3.38	3.38	3.33	3.29		
85	0.77	0.81	0.86	0.91	0.95	1.00	1.07	1.14	1.19	1.21	1.23	1.25	1.28	1.28	1.27	1.25	1.23		
90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.04	0.06	0.07	0.08	0.08	0.08	0.08	0.07		
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	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	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	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01		
125	0.03	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02		
130	0.06	0.06	0.07	0.07	0.07	0.07	0.07	0.06	0.06	0.06	0.06	0.06	0.05	0.05	0.05	0.05	0.05		
135	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.10	0.10	0.10	0.09	0.09	0.09	0.09	0.09	0.08		
140	0.17	0.17	0.17	0.17	0.16	0.16	0.16	0.16	0.15	0.15	0.15	0.14	0.14	0.14	0.14	0.14	0.12		
145	0.24	0.23	0.23	0.23	0.22	0.22	0.22	0.21	0.21	0.21	0.20	0.20	0.20	0.20	0.20	0.20	0.17		
150	0.30	0.29	0.29	0.29	0.28	0.28	0.28	0.27	0.27	0.27	0.26	0.26	0.26	0.26	0.26	0.26	0.21		
155	0.34	0.34	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.32	0.32	0.32	0.32	0.31	0.32	0.24		
160	0.38	0.38	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.38	0.38	0.38	0.25		
165	0.39	0.42	0.42	0.43	0.43	0.44	0.44	0.45	0.45	0.45	0.45	0.45	0.44	0.44	0.44	0.40	0.28		
170	0.35	0.42	0.42	0.43	0.43	0.44	0.45	0.45	0.46	0.46	0.47	0.47	0.46	0.46	0.46	0.30	0.31		
175	0.38	0.39	0.39	0.40	0.39	0.39	0.41	0.42	0.44	0.45	0.45	0.45	0.42	0.36	0.35	0.35	0.34		
180	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41		

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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