LM-79-08 Test Report

for

GREEN CREATIVE LTD

756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai

LED Lamp

Model: 25PAR38HO/940FL40/277V

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

3rd Floor, Bld. 2, NO. 96 Longchuanwu Rd Qianjiang Economy Dev. Zone, Yuhang Dist,
Hangzhou, Zhejiang Province, China 311100
Tel: +86 571 86376106
www.ledtestlab.com

Report No.: HZ18120013d

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

Review by: April Zou

Engineer: April Zou
Dec. 18, 2018

Approved by: Jim Zhang

Manager: Jim Zhang
Dec. 18, 2018

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: **25PAR38HO/940FL40/277V**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
107.7	2699.0	25.07	0.9955

CCT (K)	CRI	Stabilization Time (Light & Power)
3989	92.5	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. 12, 2018
Date of Test	: Dec. 13, 2018
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

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Figure 1- Overview of the sample

Equipment Under Test (EUT)	
Name	: LED Lamp
Model	: 25PAR38HO/940FL40/277V
Electrical Ratings	: 120-277V, 50/60Hz
Product Description	: 4000K
Manufacturer	: GREEN CREATIVE LTD
Address	: 756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai

TEST RESULTS

Test ambient temperature was 25.0℃.

Base orientation was Base up. 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 70 minutes.

Sphere-Spectroradiometer Method

Parameter	Result	
Test Voltage (V)	120.0	277.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.210	0.098
Power Factor	0.9955	0.9345
Test Power (W)	25.07	25.47
THD A%	6.12	17.91
Luminous Efficacy (lm/W)	107.7	107.7
Total Luminous Flux (lm)	2699.0	2744.0
Color Rendering Index (CRI)	92.5	
R9	62.1	
Correlated Color Temperature (CCT)(K)	3989	
Chromaticity Chroma x	0.3812	
Chromaticity Chroma y	0.3785	
Chromaticity Chroma u	0.2249	
Chromaticity Chroma v	0.3350	
Duv	0.0006	
Chromaticity Chroma u ’	0.2249	
Chromaticity Chroma v’	0.5025	

Special Color Rendering Indices	
R1	93.1
R2	97.9
R3	97.9
R4	89.9
R5	91.7
R6	95
R7	91.5
R8	83.4
R9	62.1
R10	93.6
R11	90.5
R12	72.7
R13	94.9
R14	99.5
Rf	88
Rg	96

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 25.0℃.

The photometric distance is 2.47m.

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)	0.211
Power Factor	0.9953
Test Power (W)	25.24
Luminous Efficacy (lm/W)	109.6
Total Luminous Flux (lm)	2765.6
Beam Angle (°)	35.5
Center Beam Candle Power (cd)	5500
Spacing Criteria	0.56 (0 °-180 °)/ 0.58 (90 °-270 °)
Zonal Lumens in the 0 °-60 °Zone	96.14%
Zonal Lumens in the 60 °-90 °Zone	3.73%
Zonal Lumens in the 90 °-120 °Zone	0.00%
Zonal Lumens in the 120 °-180 °Zone	0.13%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

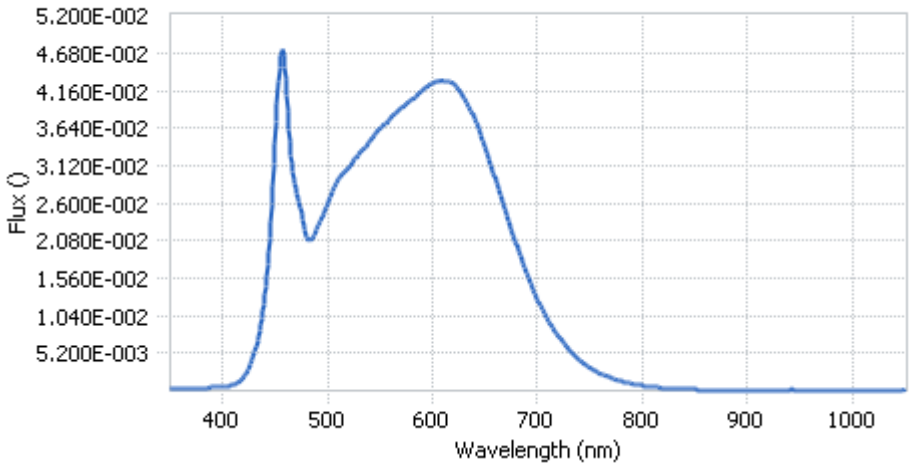
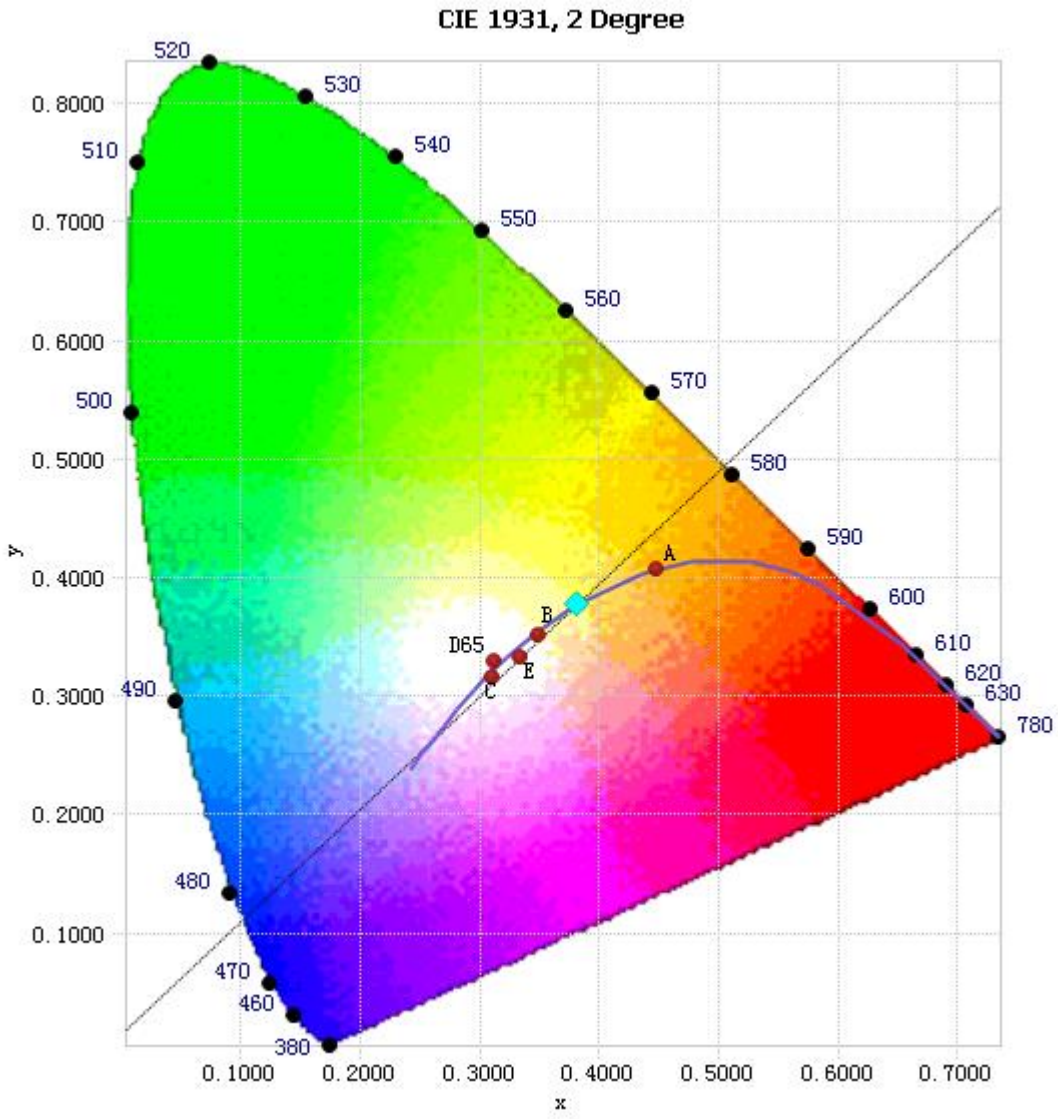


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	4.67E-04	485	2.15E-02	590	4.24E-02	695	1.47E-02
385	4.52E-04	490	2.30E-02	595	4.30E-02	700	1.30E-02
390	5.02E-04	495	2.47E-02	600	4.35E-02	705	1.14E-02
395	5.13E-04	500	2.66E-02	605	4.37E-02	710	1.00E-02
400	5.88E-04	505	2.85E-02	610	4.38E-02	715	8.83E-03
405	6.69E-04	510	2.97E-02	615	4.38E-02	720	7.76E-03
410	8.83E-04	515	3.09E-02	620	4.34E-02	725	6.78E-03
415	1.28E-03	520	3.17E-02	625	4.26E-02	730	5.86E-03
420	2.02E-03	525	3.25E-02	630	4.14E-02	735	5.06E-03
425	3.28E-03	530	3.35E-02	635	4.00E-02	740	4.35E-03
430	5.32E-03	535	3.44E-02	640	3.84E-02	745	3.76E-03
435	8.55E-03	540	3.53E-02	645	3.65E-02	750	3.29E-03
440	1.35E-02	545	3.63E-02	650	3.44E-02	755	2.83E-03
445	2.15E-02	550	3.72E-02	655	3.22E-02	760	2.46E-03
450	3.48E-02	555	3.79E-02	660	2.99E-02	765	2.13E-03
455	4.75E-02	560	3.85E-02	665	2.75E-02	770	1.84E-03
460	4.40E-02	565	3.93E-02	670	2.52E-02	775	1.58E-03
465	3.33E-02	570	3.99E-02	675	2.28E-02	780	1.38E-03
470	2.86E-02	575	4.05E-02	680	2.06E-02		
475	2.50E-02	580	4.12E-02	685	1.85E-02		
480	2.17E-02	585	4.19E-02	690	1.65E-02		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3812, 0.3785)

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

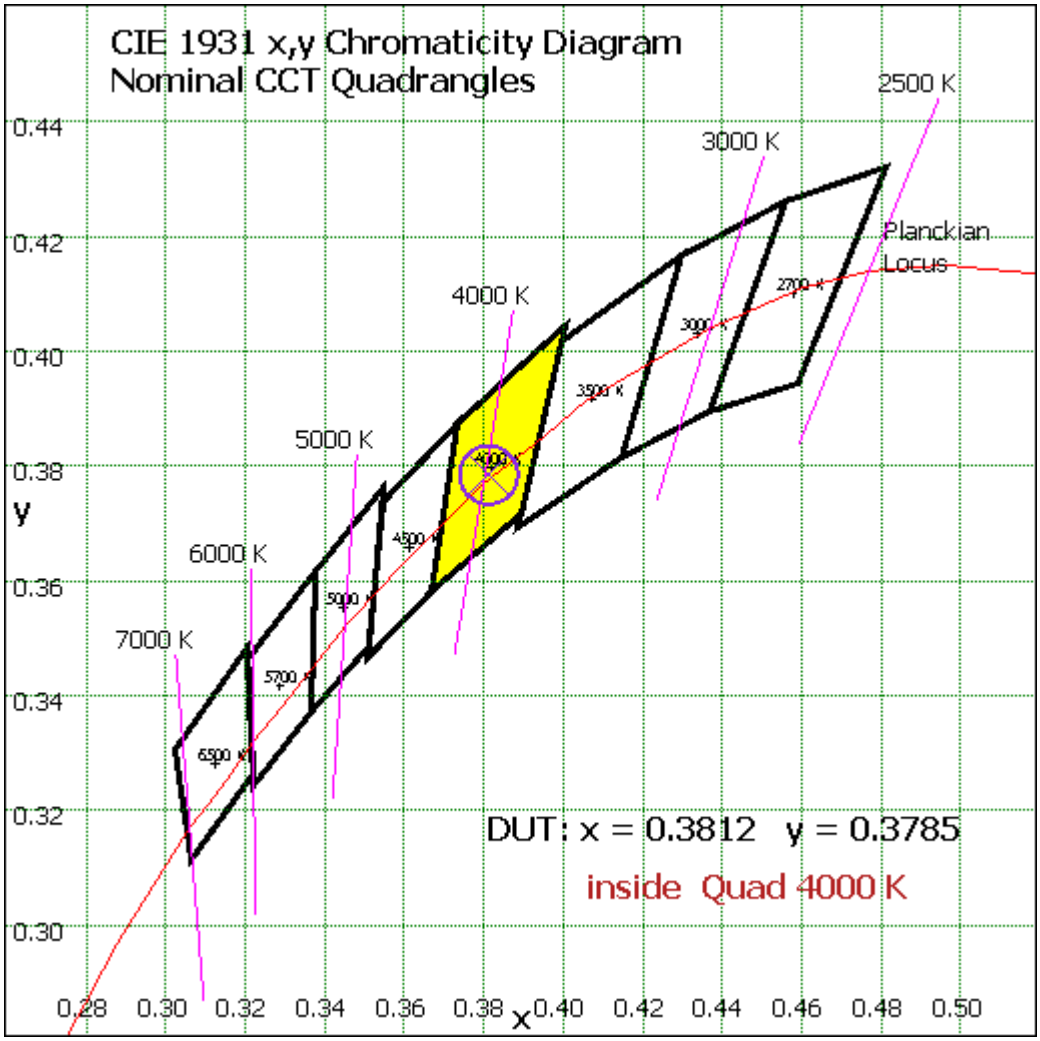


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Zonal Lumen Tabulation- Goniophotometer Method

γ(°)	Lumens	% Total
0- 10	470.966	17.03%
10- 20	915.468	33.10%
20- 30	683.018	24.70%
30- 40	338.922	12.25%
40- 50	154.947	5.60%
50- 60	95.484	3.45%
60- 70	62.464	2.26%
70- 80	32.842	1.19%
80- 90	7.818	0.28%
90-100	0.023	0.00%
100-110	0.037	0.00%
110-120	0.073	0.00%
120-130	0.18	0.01%
130-140	0.483	0.02%
140-150	0.861	0.03%
150-160	1.002	0.04%
160-170	0.771	0.03%
170-180	0.259	0.01%
Total	2765.6	100%

γ(°)	Lumens	% Total
0- 60	2658.805	96.14%
60- 90	103.124	3.73%
0-90	2761.929	99.87%
90- 180	3.689	0.13%
0- 180	2765.6	100%

Table 5: Zonal Lumen Data

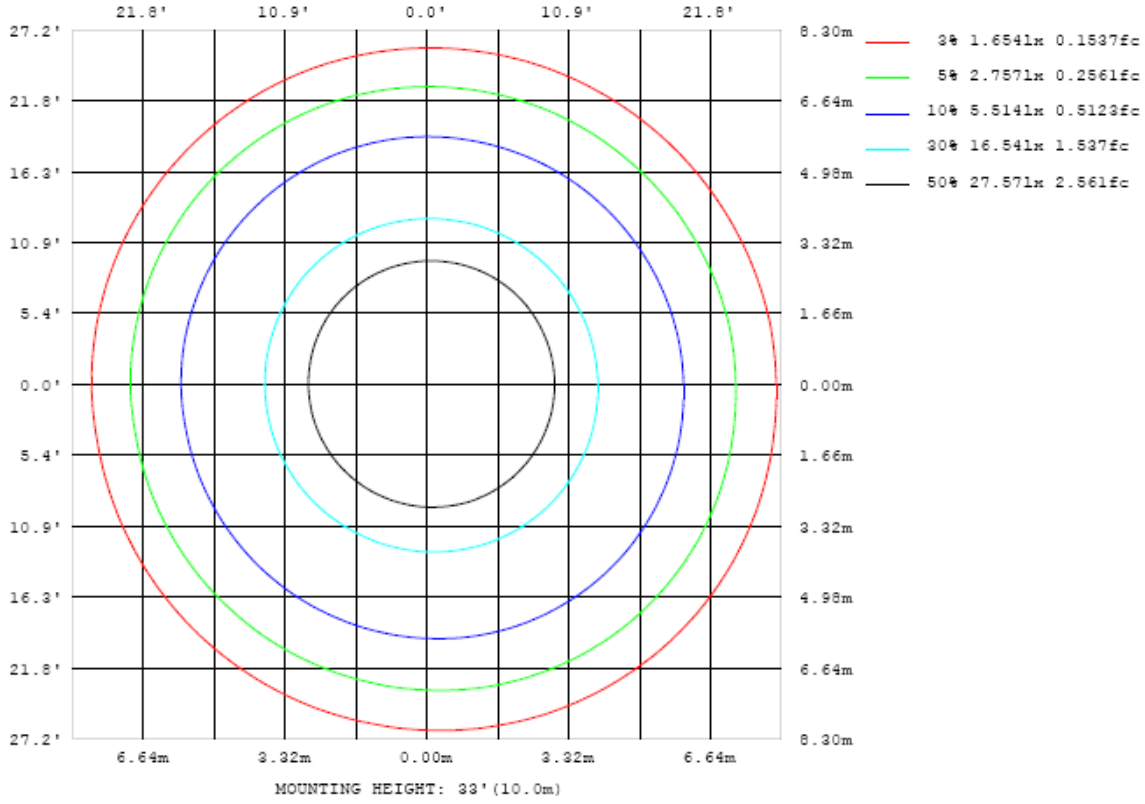


Chart 4: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

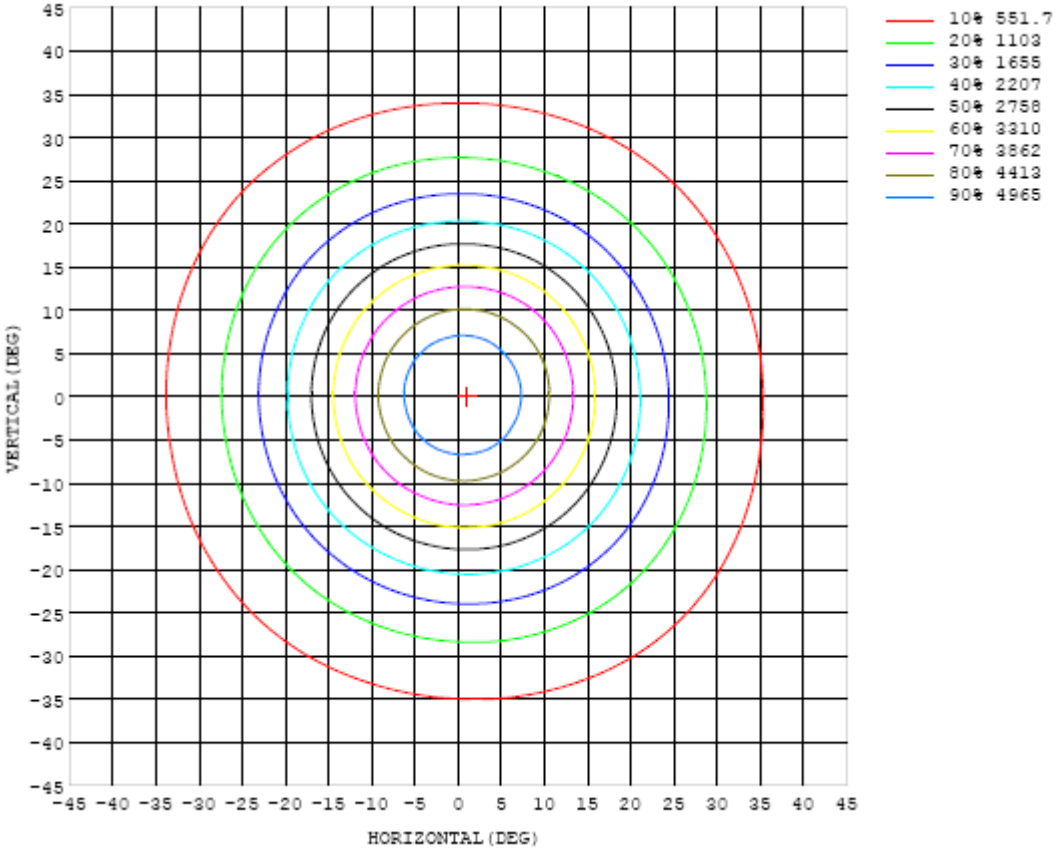


Chart 5: Isocandela Plot

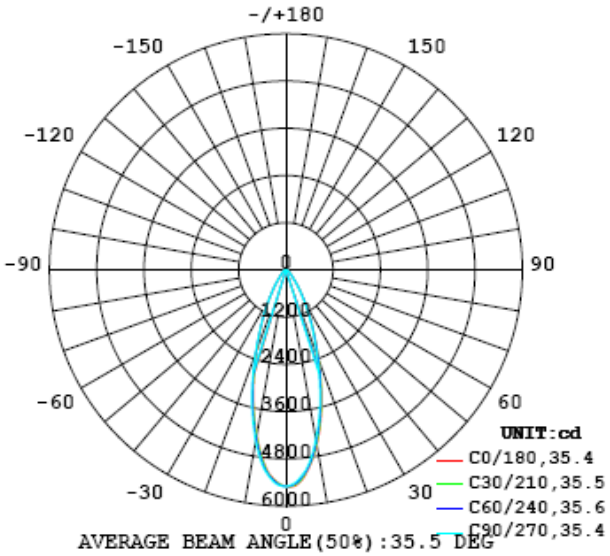


Chart 6: Polar Candela Distribution

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	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500
5	5281	5265	5259	5248	5232	5219	5211	5195	5184	5178	5173	5168	5166	5160	5161	5150	5148	5144	5158
10	4516	4503	4499	4484	4465	4441	4421	4396	4380	4360	4337	4320	4299	4282	4274	4269	4264	4258	4264
15	3502	3497	3494	3480	3464	3446	3423	3392	3366	3335	3305	3274	3251	3230	3221	3204	3199	3195	3200
20	2409	2421	2428	2427	2421	2407	2388	2361	2329	2298	2267	2234	2213	2196	2184	2176	2169	2162	2169
25	1565	1583	1596	1603	1603	1593	1579	1559	1535	1510	1480	1459	1436	1417	1404	1396	1391	1388	1402
30	972	989	1001	1009	1014	1009	997	985	962	937	915	895	880	864	852	842	837	835	843
35	574	585	594	604	606	603	592	581	568	548	533	519	511	500	493	486	484	480	487
40	330	337	344	348	350	347	341	334	324	316	308	302	297	291	287	283	280	278	281
45	206	210	213	214	214	212	210	206	200	196	193	191	189	187	186	185	184	183	184
50	148	150	151	151	151	150	148	146	142	140	137	136	136	135	135	134	133	132	134
55	110	111	112	113	112	112	111	110	108	106	105	104	104	103	103	102	102	101	102
60	85.1	85.9	86.2	86.6	86.3	86.3	85.7	84.7	83.4	82.3	81.4	81.0	80.5	79.9	79.3	78.7	78.3	78.3	79.3
65	66.1	66.1	66.4	66.5	66.2	66.0	65.8	64.8	63.9	63.2	62.4	62.0	61.6	61.0	60.5	60.1	60.0	60.0	60.5
70	48.8	48.9	49.0	49.0	48.8	48.5	48.0	47.4	46.6	46.0	45.4	45.0	44.7	44.3	43.9	43.7	43.6	43.6	43.9
75	33.1	33.2	33.2	33.2	33.0	32.7	32.3	31.8	31.2	30.7	30.2	29.7	29.3	28.9	28.6	28.4	28.3	28.3	28.6
80	19.2	19.3	19.2	19.1	18.9	18.7	18.4	18.0	17.5	17.1	16.7	16.3	16.0	15.8	15.6	15.4	15.3	15.3	15.6
85	7.86	7.81	7.72	7.60	7.45	7.24	7.07	6.87	6.60	6.07	5.98	5.73	5.48	5.35	5.01	4.90	4.84	4.82	4.78
90	0.53	0.50	0.43	0.37	0.29	0.19	0.12	0.08	0.05	0.03	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
95	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	0.01	0.02	0.02	0.02	0.02	0.02
100	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	0.02	0.02	0.02	0.02	0.03
105	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	0.03	0.03	0.03	0.04
110	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	0.05	0.05	0.05	0.06
115	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.07	0.07	0.07	0.07	0.08
120	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.10	0.10	0.10	0.10	0.10	0.10	0.13
125	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.16	0.16	0.16	0.16	0.24
130	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.26	0.26	0.26	0.27	0.27	0.27	0.28	0.45
135	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.44	0.44	0.44	0.44	0.45	0.45	0.46	0.46	0.47	0.47	0.48	0.83
140	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.68	0.68	0.69	0.69	0.70	0.70	0.71	0.71	0.72	0.72	0.73	1.31
145	0.94	0.94	0.94	0.94	0.94	0.95	0.95	0.95	0.96	0.96	0.97	0.97	0.98	0.99	0.99	1.00	1.01	1.02	1.86
150	1.25	1.25	1.25	1.24	1.25	1.25	1.25	1.26	1.26	1.27	1.27	1.28	1.29	1.30	1.31	1.31	1.32	1.33	2.39
155	1.59	1.59	1.59	1.59	1.59	1.59	1.60	1.60	1.61	1.61	1.62	1.63	1.64	1.64	1.65	1.66	1.67	1.67	2.82
160	1.94	1.94	1.93	1.93	1.93	1.93	1.93	1.94	1.94	1.95	1.96	1.97	1.98	1.98	1.99	2.00	2.00	2.01	3.13
165	2.22	2.21	2.21	2.20	2.20	2.20	2.20	2.21	2.21	2.22	2.22	2.23	2.24	2.24	2.25	2.25	2.26	2.26	3.30
170	2.34	2.33	2.33	2.33	2.33	2.32	2.32	2.32	2.33	2.33	2.34	2.34	2.35	2.35	2.36	2.37	2.37	2.37	3.24
175	2.42	2.42	2.42	2.42	2.41	2.41	2.41	2.41	2.42	2.42	2.42	2.43	2.43	2.43	2.44	2.45	2.45	2.45	2.85
180	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.59	2.59	2.59	2.59	2.59	2.59	2.59

Table 6: Luminous Intensity Data

Table--2 UNIT: cd

γ (DEG) \ C (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500		
5	5165	5174	5188	5197	5197	5208	5213	5226	5234	5247	5265	5279	5282	5290	5292	5296	5291		
10	4274	4279	4295	4312	4335	4357	4384	4416	4436	4461	4484	4501	4514	4531	4529	4528	4526		
15	3203	3221	3233	3254	3272	3294	3309	3333	3361	3386	3413	3439	3463	3482	3485	3496	3503		
20	2174	2182	2198	2211	2224	2235	2247	2258	2275	2285	2308	2326	2347	2367	2377	2393	2405		
25	1402	1409	1417	1420	1423	1429	1434	1440	1443	1451	1462	1476	1492	1503	1521	1540	1558		
30	845	847	852	853	856	857	859	860	862	863	869	882	893	908	922	939	960		
35	487	489	489	490	489	490	491	491	492	495	501	508	515	525	537	550	564		
40	281	281	280	278	279	279	279	279	280	283	288	292	297	304	311	319	327		
45	185	184	184	184	184	184	183	183	183	184	186	188	190	193	197	201	204		
50	133	133	133	133	133	133	133	132	132	133	135	136	138	140	142	144	147		
55	102	102	102	101	102	102	102	102	102	102	104	104	105	106	107	108	110		
60	79.0	78.9	79.0	78.8	79.2	79.4	79.6	79.7	80.1	80.7	81.4	81.9	82.3	82.7	83.3	84.0	85.1		
65	60.3	60.1	60.3	60.4	60.6	60.9	61.0	61.4	61.9	62.4	63.1	63.5	63.7	64.1	64.5	65.0	65.7		
70	43.8	43.9	43.9	44.2	44.5	44.8	45.1	45.3	45.8	46.3	46.9	47.4	47.5	47.8	48.1	48.3	48.8		
75	28.7	28.8	29.0	29.3	29.6	29.8	30.2	30.5	30.8	31.3	31.8	32.2	32.5	32.7	32.8	33.0	33.3		
80	15.7	15.8	16.0	16.2	16.4	16.6	16.9	17.1	17.4	17.8	18.2	18.6	18.9	19.1	19.2	19.3	19.4		
85	4.81	4.87	4.95	5.09	5.26	5.47	5.69	5.96	6.29	6.61	7.02	7.39	7.68	7.85	7.94	8.00	8.03		
90	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.08	0.17	0.28	0.40	0.51	0.60	0.64	0.66		
95	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	0.02	0.02	0.02		
100	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02		
105	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		
110	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		
115	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.07	0.07	0.07	0.07	0.07		
120	0.13	0.14	0.14	0.14	0.14	0.13	0.13	0.13	0.13	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12		
125	0.24	0.24	0.25	0.25	0.24	0.24	0.24	0.23	0.23	0.23	0.22	0.22	0.21	0.21	0.21	0.21	0.21		
130	0.46	0.46	0.46	0.46	0.46	0.46	0.45	0.44	0.44	0.43	0.42	0.42	0.41	0.41	0.41	0.40	0.40		
135	0.83	0.84	0.84	0.84	0.83	0.83	0.82	0.81	0.80	0.79	0.78	0.77	0.76	0.75	0.75	0.75	0.74		
140	1.32	1.32	1.32	1.32	1.31	1.30	1.29	1.28	1.27	1.25	1.24	1.23	1.22	1.21	1.20	1.20	1.20		
145	1.87	1.87	1.87	1.86	1.85	1.84	1.83	1.82	1.80	1.79	1.78	1.76	1.75	1.74	1.73	1.73	1.73		
150	2.40	2.40	2.39	2.39	2.38	2.37	2.36	2.34	2.33	2.31	2.30	2.29	2.28	2.27	2.26	2.26	2.25		
155	2.83	2.83	2.83	2.82	2.81	2.80	2.79	2.78	2.77	2.76	2.75	2.74	2.73	2.73	2.72	2.71	2.71		
160	3.15	3.15	3.15	3.14	3.14	3.13	3.13	3.12	3.11	3.11	3.10	3.10	3.09	3.09	3.08	3.08	3.08		
165	3.32	3.32	3.31	3.31	3.31	3.31	3.31	3.30	3.30	3.30	3.31	3.31	3.31	3.31	3.30	3.30	3.30		
170	3.27	3.26	3.26	3.26	3.26	3.26	3.26	3.27	3.27	3.27	3.28	3.29	3.29	3.30	3.30	3.30	3.31		
175	2.89	2.88	2.88	2.88	2.88	2.88	2.88	2.88	2.88	2.89	2.90	2.91	2.92	2.93	2.93	2.93	2.94		
180	2.59	2.59	2.59	2.59	2.59	2.59	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58		

Table 7: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Aug. 14, 2018	Aug. 13, 2019
Digital Power Meter	PF2010A	HZTE028-01	Sep. 12, 2018	Sep. 11, 2019
AC Power Supply	DPS1060	HZTE001-06	Aug. 09, 2018	Aug. 08, 2019
DC Power Supply	WY12010	HZTE004-03	Aug. 09, 2018	Aug. 08, 2019
Temperature recorder	JM624U	HZTE018-08	Aug. 09, 2018	Aug. 08, 2019
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 09, 2018	Aug. 08, 2019
Standard source	D908	HZTE012-01	Aug. 14, 2018	Aug. 13, 2019
Integrate Sphere system	3M	HZTE015-04	Aug. 16, 2018	Aug. 15, 2019
Digital Power Meter	WT210	HZTE008-01	Aug. 02, 2018	Aug. 01, 2019
AC Power Supply	PCR 500L	HZTE001-07	Aug. 09, 2018	Aug. 08, 2019
DC Power Supply	IT6154	HZTE004-04	Aug. 09, 2018	Aug. 08, 2019
Standard source	SCL-1400	HZTE012-02	Aug. 16, 2018	Aug. 15, 2019
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 09, 2018	Aug. 08, 2019
Temperature Meter	TES1310	HZTE017-01	Aug. 09, 2018	Aug. 08, 2019

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.

3rd Floor, Bld. 2, NO. 96 Longchuanwu Rd Qianjiang Economy Dev. Zone, Yuhang Dist,
Hangzhou, Zhejiang Province, China 311100
Tel: +86 571 86376106 www.ledtestlab.com

The uncertainty of integrating sphere system reported in this document is expended 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 expended uncertainty is 2.3% with a coverage factor k=2.

Color Characteristics Measurements

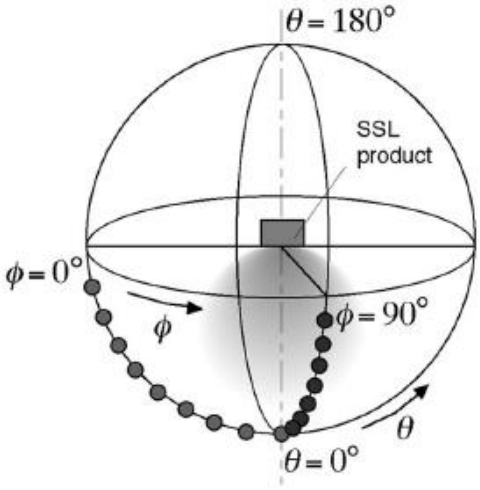
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as 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°/180° and C=90°/270°) 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, Δu'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 ***