LM-79-08 Test Report

for

GREEN CREATIVE LTD

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

LED Lamp

Model: 19.5PAR30HO/940FL40/277V/R

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.: HZ18120026b

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. 24, 2018

Approved by: Jim Zhang

Manager: Jim Zhang
Dec. 24, 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: 19.5PAR30HO/940FL40/277V/R

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
113.2	2132.0	18.83	0.9933

CCT (K)	CRI	Stabilization Time (Light & Power)
3956	90.2	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. 18, 2018
Date of Test	: Dec. 20, 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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Sample Photos

Figure 1- Overview of the sample

Equipment Under Test (EUT)	
Name	: LED Lamp
Model	: 19.5PAR30HO/940FL40/277V/R
Electrical Ratings	: 120-277V, 50/60Hz, 19.5W
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 Light down. 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)	0.158	0.076
Power Factor	0.9933	0.9124
Test Power (W)	18.83	19.08
THD A%	6.12	25.89
Luminous Efficacy (lm/W)	113.2	133.7
Total Luminous Flux (lm)	2132.0	2170.0
Color Rendering Index (CRI)	90.2	
R9	54.4	
Correlated Color Temperature (CCT)(K)	3956	
Chromaticity Chroma x	0.3846	
Chromaticity Chroma y	0.3860	
Chromaticity Chroma u	0.2241	
Chromaticity Chroma v	0.3375	
Duv	0.0030	
Chromaticity Chroma u ’	0.2241	
Chromaticity Chroma v’	0.5062	

Special Color Rendering Indices	
R1	89.4
R2	92.3
R3	94.4
R4	90.7
R5	88.9
R6	89.2
R7	94
R8	82.9
R9	54.4
R10	81.6
R11	90.2
R12	71.6
R13	89.9
R14	96.7
Rf	90
Rg	98

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 24.9℃.

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)	0.159
Power Factor	0.9936
Test Power (W)	18.96
Luminous Efficacy (lm/W)	115.0
Total Luminous Flux (lm)	2179.7
Beam Angle (°)	33.5
Center Beam Candle Power (cd)	4724
Spacing Criteria	0.51 (0°-180°)/ 0.53 (90°-270°)
Zonal Lumens in the 0°-60° Zone	96.33%
Zonal Lumens in the 60°-90° Zone	3.54%
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

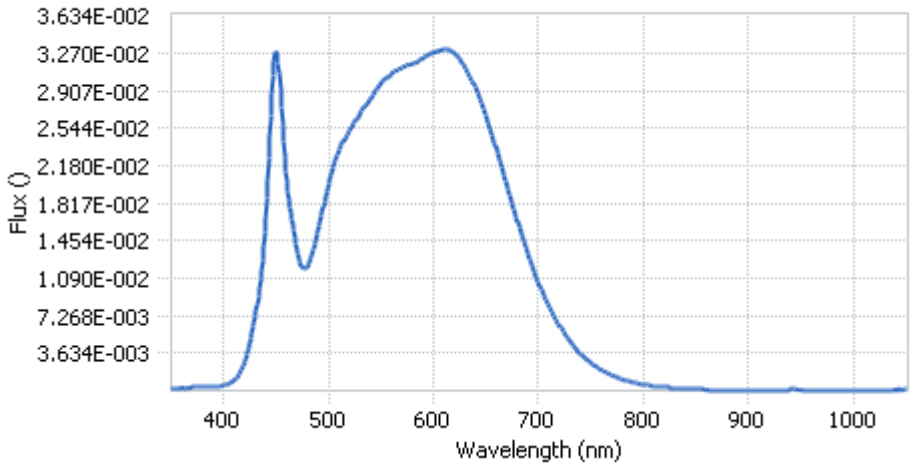
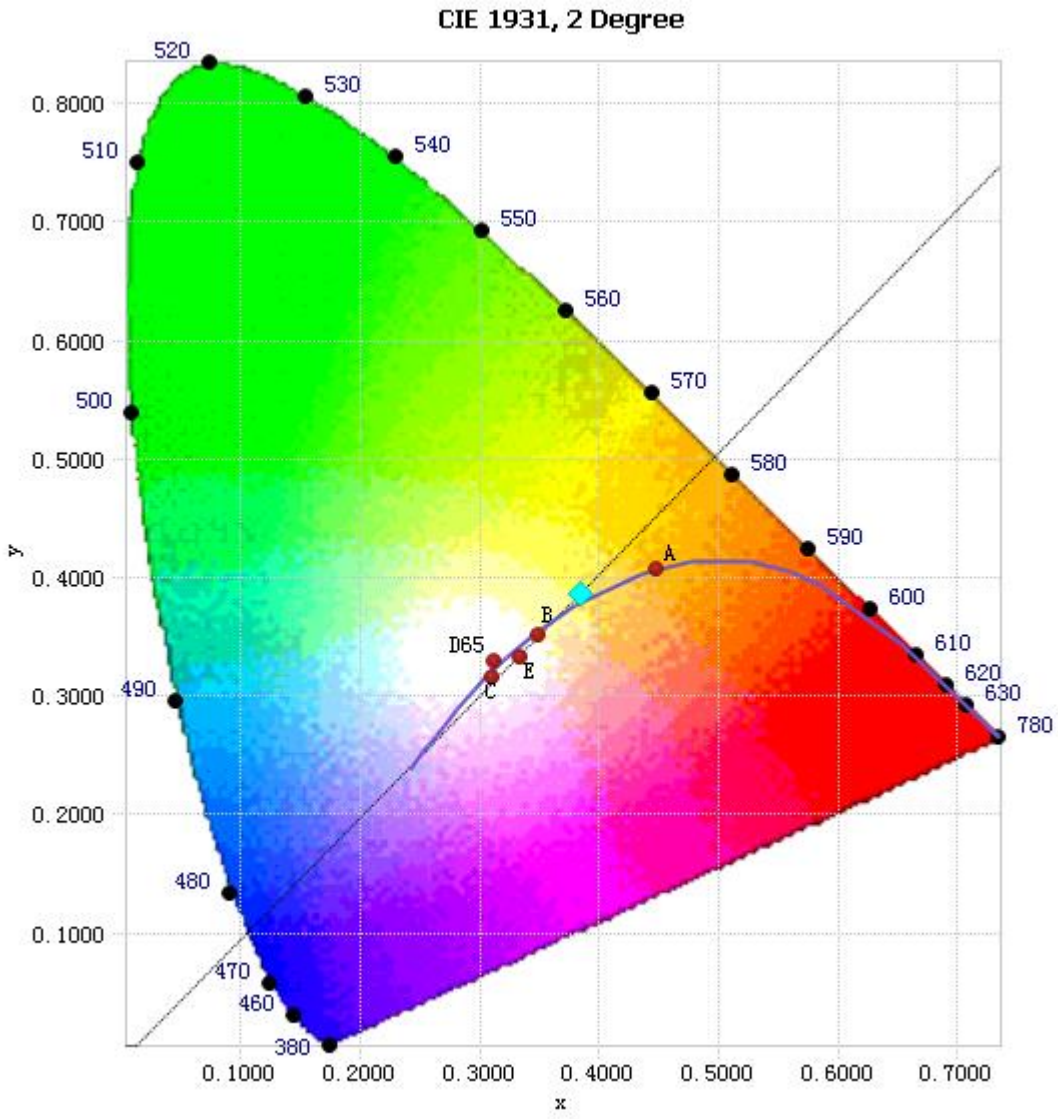


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	3.74E-04	485	1.35E-02	590	3.22E-02	695	1.18E-02
385	3.70E-04	490	1.55E-02	595	3.25E-02	700	1.05E-02
390	4.07E-04	495	1.78E-02	600	3.28E-02	705	9.24E-03
395	4.57E-04	500	2.01E-02	605	3.29E-02	710	8.14E-03
400	5.33E-04	505	2.20E-02	610	3.30E-02	715	7.17E-03
405	6.93E-04	510	2.33E-02	615	3.30E-02	720	6.32E-03
410	1.06E-03	515	2.45E-02	620	3.26E-02	725	5.53E-03
415	1.69E-03	520	2.53E-02	625	3.22E-02	730	4.81E-03
420	2.85E-03	525	2.61E-02	630	3.14E-02	735	4.13E-03
425	4.70E-03	530	2.69E-02	635	3.04E-02	740	3.58E-03
430	7.22E-03	535	2.76E-02	640	2.93E-02	745	3.10E-03
435	1.08E-02	540	2.84E-02	645	2.80E-02	750	2.72E-03
440	1.68E-02	545	2.92E-02	650	2.66E-02	755	2.36E-03
445	2.67E-02	550	2.99E-02	655	2.50E-02	760	2.04E-03
450	3.29E-02	555	3.03E-02	660	2.33E-02	765	1.77E-03
455	2.75E-02	560	3.07E-02	665	2.16E-02	770	1.52E-03
460	2.02E-02	565	3.11E-02	670	1.98E-02	775	1.31E-03
465	1.66E-02	570	3.13E-02	675	1.81E-02	780	1.14E-03
470	1.37E-02	575	3.15E-02	680	1.64E-02		
475	1.19E-02	580	3.17E-02	685	1.48E-02		
480	1.21E-02	585	3.20E-02	690	1.32E-02		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3846, 0.3860)

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

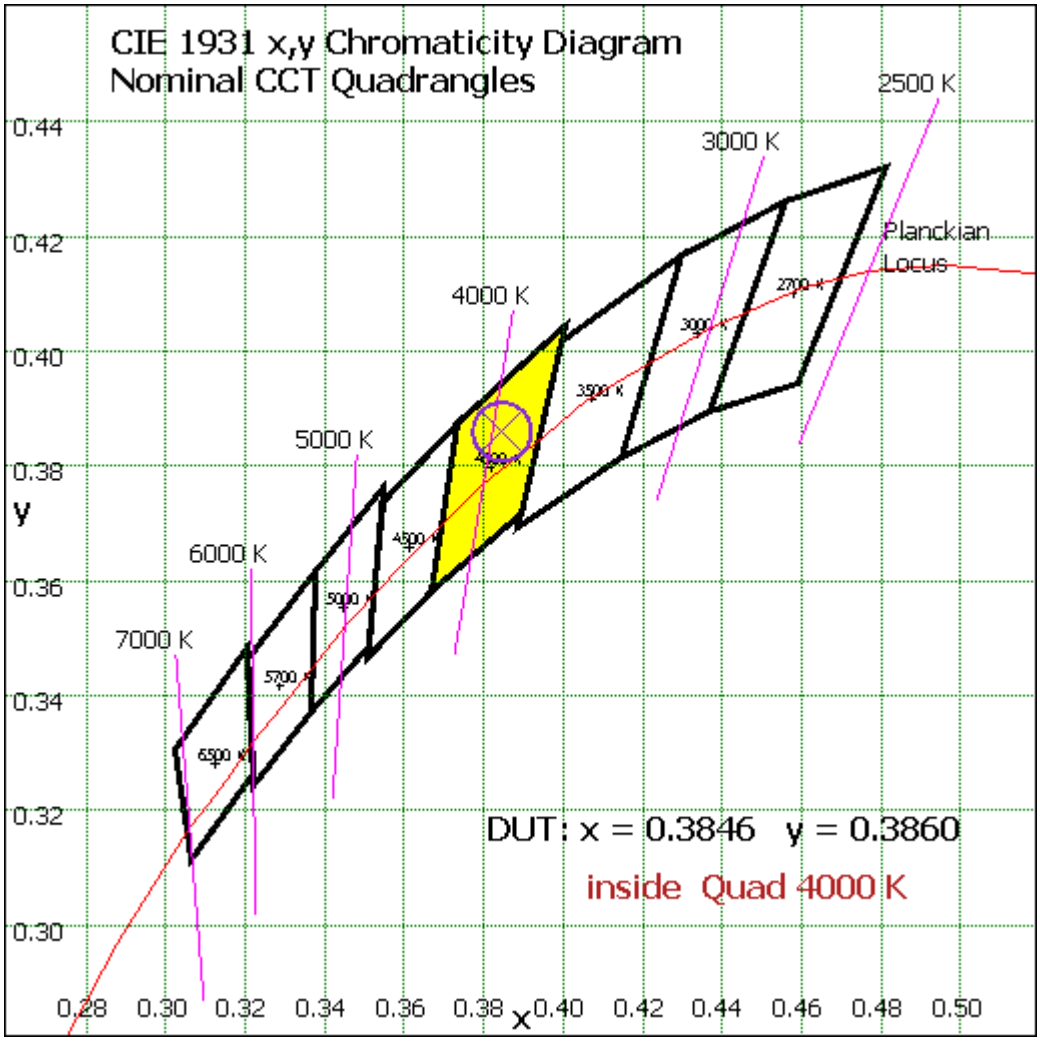


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Zonal Lumen Tabulation- Goniophotometer Method

γ(°)	Lumens	% Total
0- 10	393.566	18.06%
10- 20	739.114	33.91%
20- 30	526.482	24.15%
30- 40	252.957	11.61%
40- 50	115.78	5.31%
50- 60	71.744	3.29%
60- 70	46.941	2.15%
70- 80	24.403	1.12%
80- 90	5.793	0.27%
90-100	0.02	0.00%
100-110	0.024	0.00%
110-120	0.051	0.00%
120-130	0.137	0.01%
130-140	0.38	0.02%
140-150	0.685	0.03%
150-160	0.798	0.04%
160-170	0.606	0.03%
170-180	0.199	0.01%
Total	2179.7	100%

γ(°)	Lumens	% Total
0- 60	2099.643	96.33%
60- 90	77.137	3.54%
0-90	2176.78	99.87%
90- 180	2.9	0.13%
0- 180	2179.7	100%

Table 5: Zonal Lumen Data

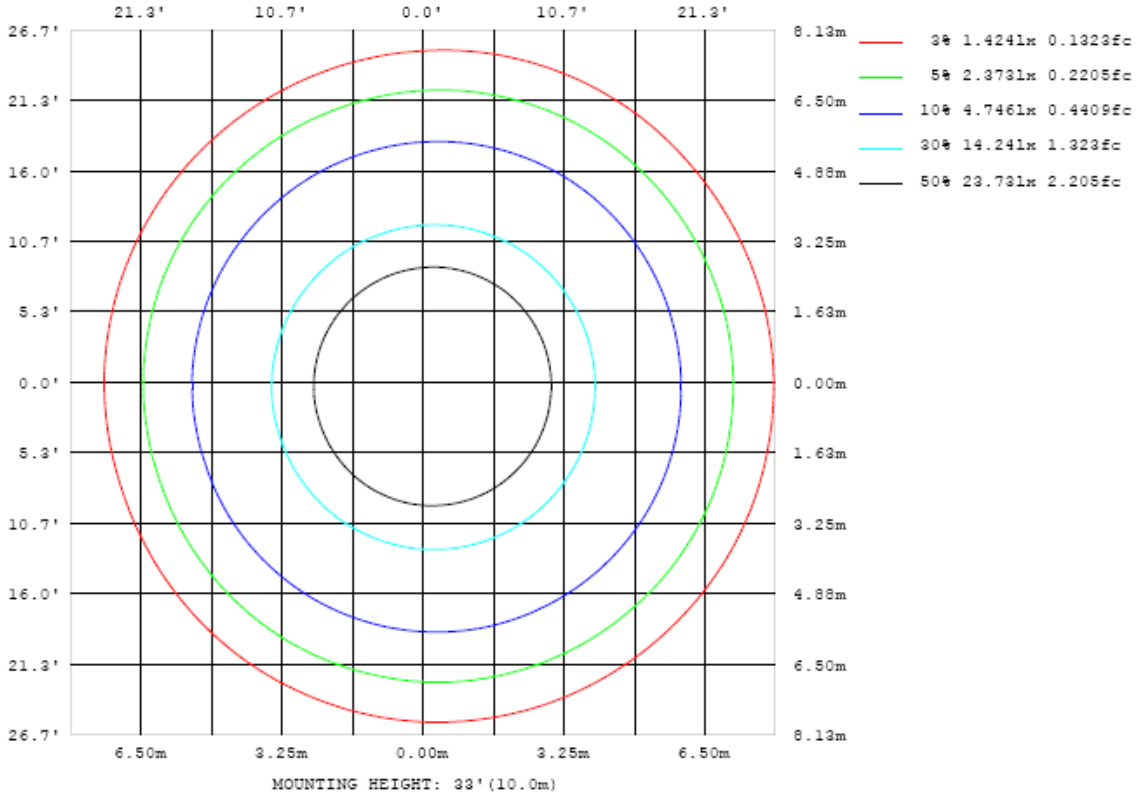


Chart 4: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

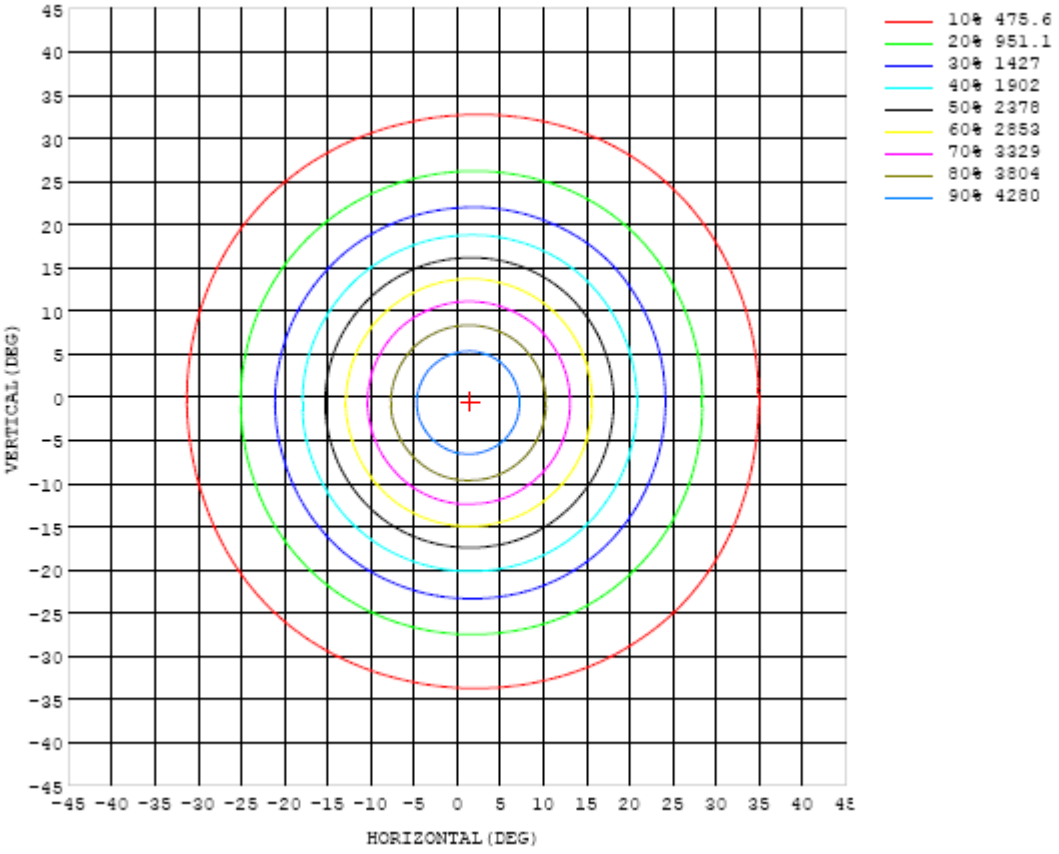


Chart 5: Isocandela Plot

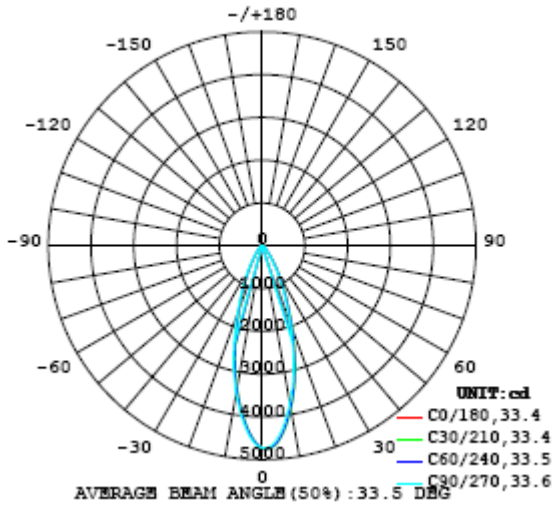


Chart 6: Polar Candela Distribution

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	4724	4724	4724	4724	4724	4724	4724	4724	4724	4724	4724	4724	4724	4724	4724	4724	4724	4724	4724
5	4543	4554	4560	4567	4561	4557	4539	4517	4492	4464	4432	4403	4370	4339	4310	4292	4266	4248	4235
10	3849	3867	3873	3879	3876	3859	3837	3806	3768	3730	3689	3643	3592	3546	3508	3472	3441	3420	3396
15	2973	2992	2998	3002	2993	2967	2948	2915	2873	2830	2782	2726	2674	2616	2562	2521	2483	2458	2435
20	2040	2057	2066	2070	2063	2047	2032	2001	1962	1919	1872	1824	1781	1733	1687	1649	1615	1595	1583
25	1313	1325	1328	1326	1321	1307	1295	1271	1243	1211	1177	1139	1103	1068	1037	1009	984	970	961
30	810	817	821	820	809	797	783	766	746	721	697	673	654	629	608	585	567	558	554
35	472	474	475	472	466	456	447	434	422	408	394	381	367	353	340	329	320	317	317
40	270	272	273	271	266	262	257	251	245	238	230	222	216	208	201	196	191	189	189
45	163	164	164	163	162	161	159	156	153	149	146	142	138	135	131	129	127	126	128
50	113	114	115	114	113	112	111	109	108	106	104	102	100	98.3	96.5	95.0	93.9	93.8	94.8
55	85.6	86.0	86.4	86.1	85.3	84.5	84.0	83.2	82.2	80.9	79.4	77.9	76.7	75.6	74.5	73.8	73.0	72.9	73.8
60	66.8	67.4	67.2	66.8	66.1	65.7	65.4	64.6	63.7	62.5	61.6	60.4	59.7	58.9	58.1	57.5	57.0	56.9	57.3
65	51.2	51.4	51.4	51.3	50.9	50.5	50.1	49.5	48.6	47.9	47.1	46.3	45.7	45.1	44.5	44.1	43.8	43.7	43.7
70	37.8	38.0	38.1	38.1	37.9	37.6	37.2	36.7	36.0	35.4	34.9	34.2	33.7	33.1	32.5	32.1	31.8	31.6	31.6
75	25.6	25.8	26.0	26.0	25.8	25.6	25.3	24.8	24.3	23.7	23.2	22.6	22.2	21.7	21.2	20.9	20.5	20.3	20.3
80	14.9	15.1	15.2	15.2	15.1	15.0	14.8	14.4	14.0	13.6	13.2	12.8	12.4	12.0	11.7	11.4	11.2	10.9	10.8
85	6.40	6.54	6.62	6.66	6.62	6.50	6.35	6.06	5.75	5.42	5.06	4.85	4.35	4.00	3.69	3.46	3.26	3.09	3.09
90	0.61	0.69	0.74	0.77	0.76	0.72	0.64	0.53	0.40	0.25	0.11	0.04	0.01	0.01	0.00	0.00	0.00	0.00	0.00
95	0.00	0.00	0.01	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
100	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
105	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
110	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	0.03	0.03	0.04
115	0.03	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	0.05	0.05	0.05	0.05	0.06
120	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	0.07	0.07	0.07	0.08	0.08	0.10
125	0.10	0.10	0.10	0.09	0.10	0.10	0.10	0.10	0.10	0.10	0.11	0.11	0.11	0.12	0.12	0.12	0.13	0.13	0.18
130	0.17	0.17	0.16	0.16	0.16	0.16	0.16	0.17	0.17	0.18	0.18	0.19	0.19	0.20	0.20	0.21	0.22	0.22	0.34
135	0.30	0.30	0.30	0.29	0.29	0.29	0.30	0.30	0.30	0.31	0.32	0.33	0.34	0.35	0.36	0.37	0.38	0.38	0.61
140	0.48	0.48	0.47	0.47	0.47	0.47	0.48	0.48	0.49	0.50	0.51	0.52	0.54	0.55	0.57	0.58	0.60	0.58	0.95
145	0.70	0.69	0.69	0.69	0.69	0.70	0.70	0.71	0.73	0.74	0.75	0.77	0.78	0.80	0.81	0.83	0.84	0.81	1.31
150	0.94	0.94	0.93	0.93	0.93	0.94	0.94	0.95	0.97	0.98	1.00	1.01	1.03	1.05	1.07	1.08	1.10	1.06	1.62
155	1.21	1.20	1.20	1.20	1.20	1.20	1.21	1.22	1.23	1.24	1.26	1.28	1.30	1.32	1.34	1.36	1.38	1.34	1.84
160	1.49	1.48	1.47	1.47	1.47	1.48	1.48	1.49	1.50	1.51	1.53	1.55	1.57	1.59	1.61	1.63	1.65	1.62	1.95
165	1.71	1.70	1.69	1.69	1.69	1.69	1.70	1.70	1.71	1.73	1.74	1.76	1.78	1.80	1.81	1.83	1.84	1.84	1.93
170	1.82	1.83	1.83	1.84	1.84	1.84	1.85	1.86	1.87	1.88	1.88	1.89	1.91	1.92	1.93	1.94	1.94	1.95	1.92
175	1.87	1.86	1.85	1.85	1.85	1.85	1.86	1.86	1.87	1.88	1.89	1.90	1.91	1.92	1.92	1.93	1.95	1.97	1.99
180	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10

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	4724	4724	4724	4724	4724	4724	4724	4724	4724	4724	4724	4724	4724	4724	4724	4724	4724		
5	4220	4211	4209	4217	4226	4237	4253	4277	4306	4338	4370	4402	4434	4465	4490	4510	4526		
10	3383	3377	3374	3382	3397	3414	3440	3472	3511	3549	3589	3635	3680	3722	3755	3793	3822		
15	2419	2414	2413	2421	2439	2466	2502	2542	2591	2644	2693	2742	2796	2842	2882	2920	2949		
20	1569	1560	1556	1560	1577	1599	1624	1655	1696	1742	1787	1832	1881	1920	1954	1988	2019		
25	952	949	949	952	964	983	1004	1032	1064	1095	1129	1163	1196	1229	1255	1277	1299		
30	550	549	551	556	565	579	593	612	635	659	684	709	732	753	769	785	799		
35	316	316	318	321	326	333	342	355	369	385	399	414	426	437	448	457	467		
40	187	187	188	189	191	195	201	207	215	223	231	238	246	251	256	262	267		
45	128	128	128	127	127	130	133	136	139	142	144	148	153	156	158	161	163		
50	95.0	95.1	95.2	95.2	95.5	96.5	97.9	99.6	101	103	104	106	108	109	110	111	112		
55	73.6	73.7	73.6	73.6	74.1	74.8	75.8	76.8	77.9	79.0	79.9	81.1	82.3	83.3	83.9	84.6	85.4		
60	57.0	57.2	57.2	57.3	57.6	58.3	59.0	59.8	60.5	61.4	62.1	63.0	63.8	64.6	65.2	65.8	66.4		
65	43.5	43.5	43.4	43.5	43.8	44.3	44.9	45.6	46.2	46.8	47.5	48.1	48.9	49.4	49.9	50.3	50.8		
70	31.5	31.3	31.3	31.3	31.6	31.9	32.5	33.0	33.7	34.2	34.8	35.3	36.0	36.4	36.8	37.2	37.6		
75	20.1	20.0	19.9	20.0	20.2	20.5	20.9	21.4	21.9	22.4	22.9	23.5	24.0	24.4	24.7	25.1	25.5		
80	10.6	10.5	10.4	10.5	10.6	10.9	11.1	11.5	11.9	12.3	12.7	13.2	13.6	13.9	14.3	14.6	14.9		
85	2.96	2.90	2.88	2.90	2.99	3.13	3.33	3.57	3.89	4.26	4.62	4.99	5.31	5.60	5.86	6.13	6.35		
90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.04	0.12	0.23	0.35	0.47	0.59		
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	0.01	0.01	0.01	0.01	0.01		
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	0.01	0.01	0.01	0.01	0.01		
105	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.02	0.02	0.02	0.02	0.02		
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	0.03	0.03	0.03	0.03		
115	0.06	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		
120	0.10	0.10	0.11	0.10	0.11	0.11	0.10	0.10	0.10	0.10	0.09	0.09	0.09	0.08	0.08	0.08	0.07		
125	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.19	0.19	0.18	0.18	0.17	0.16	0.15	0.15	0.14		
130	0.38	0.39	0.39	0.40	0.40	0.40	0.39	0.39	0.38	0.37	0.36	0.35	0.33	0.32	0.31	0.30	0.27		
135	0.71	0.71	0.71	0.72	0.71	0.71	0.70	0.69	0.68	0.66	0.65	0.63	0.61	0.59	0.57	0.57	0.51		
140	1.12	1.11	1.12	1.12	1.11	1.11	1.09	1.08	1.06	1.04	1.02	1.00	0.98	0.95	0.93	0.93	0.82		
145	1.60	1.57	1.57	1.57	1.56	1.55	1.53	1.51	1.49	1.47	1.45	1.43	1.41	1.38	1.36	1.38	1.18		
150	2.05	2.01	2.01	2.00	1.99	1.98	1.96	1.94	1.93	1.91	1.89	1.86	1.84	1.82	1.80	1.84	1.52		
155	2.41	2.35	2.34	2.34	2.32	2.32	2.30	2.29	2.28	2.26	2.25	2.23	2.22	2.20	2.19	2.24	1.78		
160	2.64	2.60	2.60	2.60	2.59	2.58	2.58	2.56	2.56	2.55	2.54	2.54	2.53	2.52	2.51	2.56	1.91		
165	2.70	2.70	2.69	2.69	2.69	2.69	2.69	2.69	2.69	2.69	2.70	2.70	2.70	2.70	2.70	2.72	1.81		
170	2.32	2.60	2.55	2.53	2.52	2.51	2.51	2.52	2.53	2.56	2.58	2.60	2.63	2.64	2.71	2.42	1.82		
175	2.01	2.04	2.18	2.16	2.14	2.14	2.15	2.17	2.19	2.23	2.27	2.30	2.33	2.37	1.91	1.90	1.89		
180	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10		

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

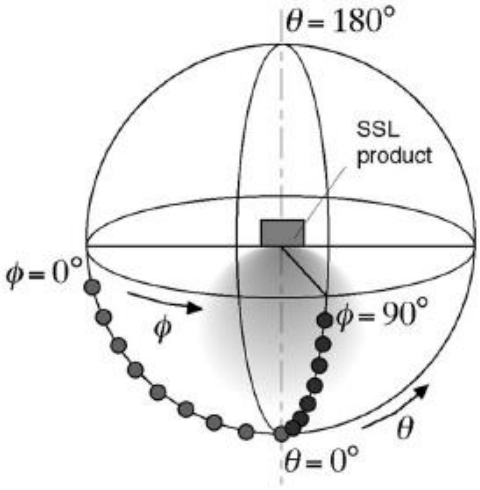
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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