LM-79-08 Test Report

for

GREEN CREATIVE LTD

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

LED Lamp

Model: 19.5PAR30HO/940NF25/277V/R

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ18120026d

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/940NF25/277V/R

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
113.6	2111.0	18.59	0.9934

CCT (K)	CRI	Stabilization Time (Light & Power)
3938	90.6	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/940NF25/277V/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)	0.156	0.074
Power Factor	0.9934	0.9152
Test Power (W)	18.59	18.79
THD A%	5.95	26.21
Luminous Efficacy (lm/W)	113.6	114.2
Total Luminous Flux (lm)	2111.0	2146.0
Color Rendering Index (CRI)	90.6	
R9	56.9	
Correlated Color Temperature (CCT)(K)	3938	
Chromaticity Chroma x	0.3849	
Chromaticity Chroma y	0.3849	
Chromaticity Chroma u	0.2248	
Chromaticity Chroma v	0.3372	
Duv	0.0024	
Chromaticity Chroma u ’	0.2248	
Chromaticity Chroma v’	0.5058	

Special Color Rendering Indices	
R1	90
R2	92.6
R3	94.2
R4	91.1
R5	89.4
R6	89.4
R7	94.1
R8	83.8
R9	56.9
R10	82.1
R11	90.7
R12	71.6
R13	90.4
R14	96.5
Rf	90
Rg	99

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)	0.157
Power Factor	0.9936
Test Power (W)	18.71
Luminous Efficacy (lm/W)	115.3
Total Luminous Flux (lm)	2157.1
Beam Angle (°)	19.5
Center Beam Candle Power (cd)	9856
Spacing Criteria	0.33 (0 °-180 °)/ 0.35 (90 °-270 °)
Zonal Lumens in the 0 °-60 °Zone	96.74%
Zonal Lumens in the 60 °-90 °Zone	3.12%
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

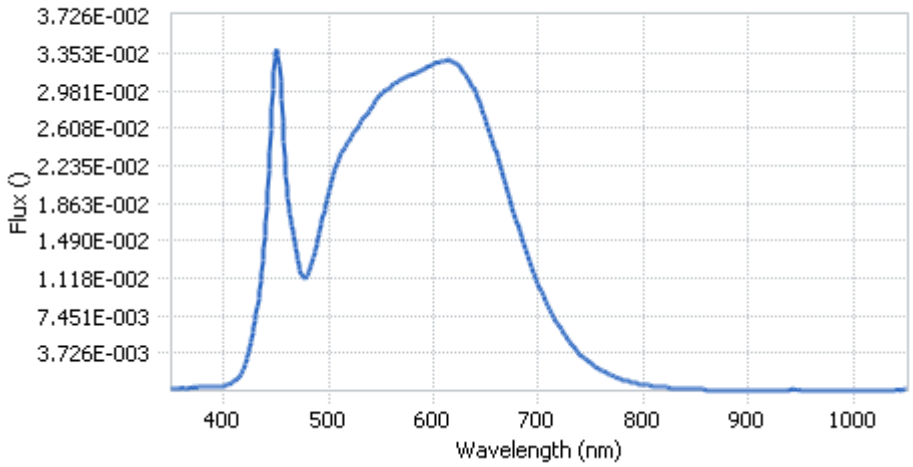
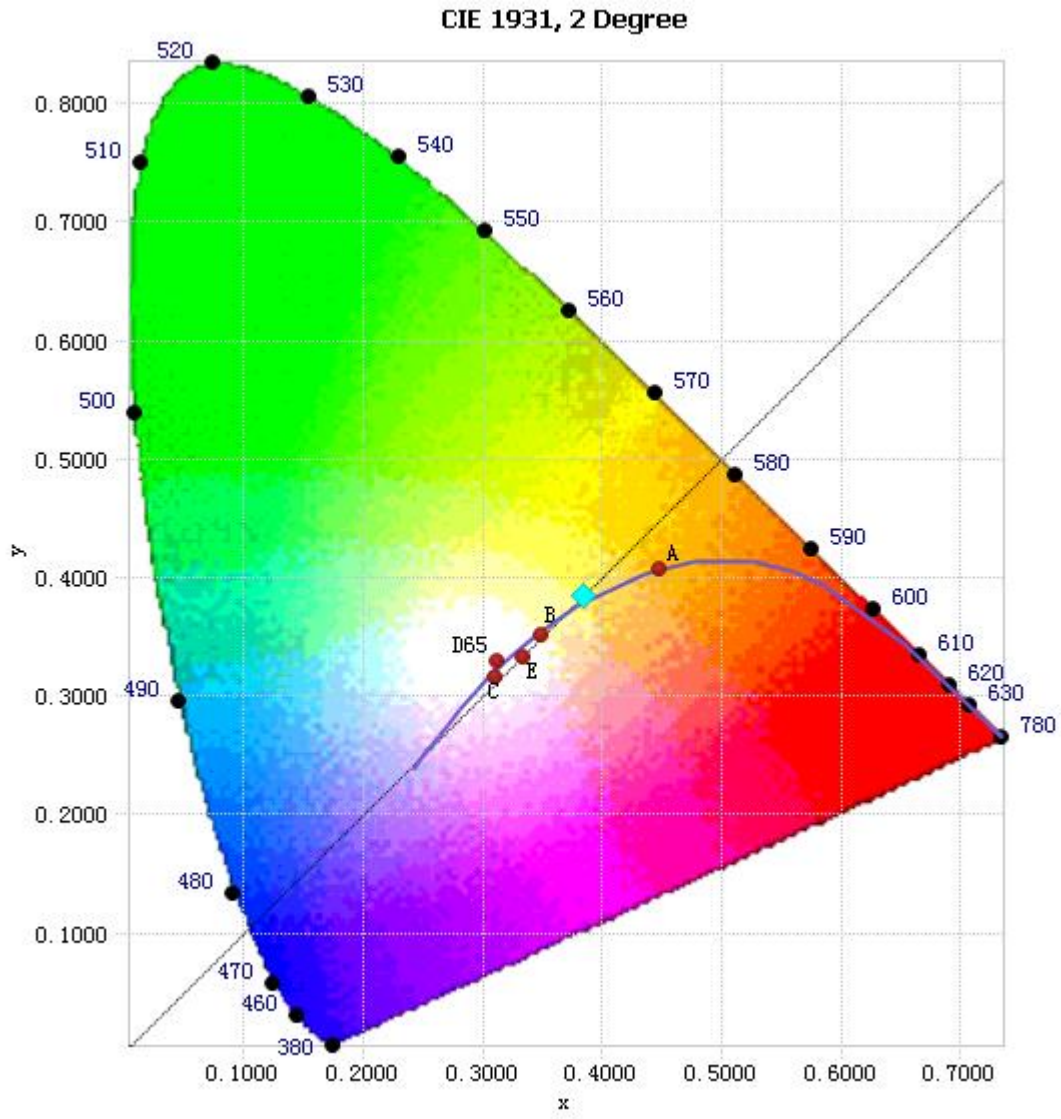


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	3.61E-04	485	1.31E-02	590	3.19E-02	695	1.19E-02
385	3.59E-04	490	1.51E-02	595	3.22E-02	700	1.06E-02
390	3.98E-04	495	1.75E-02	600	3.25E-02	705	9.33E-03
395	4.51E-04	500	1.98E-02	605	3.26E-02	710	8.21E-03
400	5.15E-04	505	2.17E-02	610	3.27E-02	715	7.24E-03
405	6.38E-04	510	2.30E-02	615	3.28E-02	720	6.35E-03
410	9.58E-04	515	2.42E-02	620	3.26E-02	725	5.56E-03
415	1.51E-03	520	2.50E-02	625	3.22E-02	730	4.83E-03
420	2.57E-03	525	2.57E-02	630	3.15E-02	735	4.18E-03
425	4.35E-03	530	2.65E-02	635	3.06E-02	740	3.60E-03
430	6.99E-03	535	2.73E-02	640	2.96E-02	745	3.12E-03
435	1.09E-02	540	2.80E-02	645	2.82E-02	750	2.73E-03
440	1.67E-02	545	2.88E-02	650	2.67E-02	755	2.36E-03
445	2.59E-02	550	2.95E-02	655	2.52E-02	760	2.04E-03
450	3.37E-02	555	2.99E-02	660	2.35E-02	765	1.76E-03
455	2.89E-02	560	3.03E-02	665	2.18E-02	770	1.53E-03
460	2.01E-02	565	3.07E-02	670	1.99E-02	775	1.32E-03
465	1.65E-02	570	3.10E-02	675	1.82E-02	780	1.13E-03
470	1.36E-02	575	3.12E-02	680	1.65E-02		
475	1.14E-02	580	3.14E-02	685	1.49E-02		
480	1.16E-02	585	3.17E-02	690	1.33E-02		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3849, 0.3849)

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

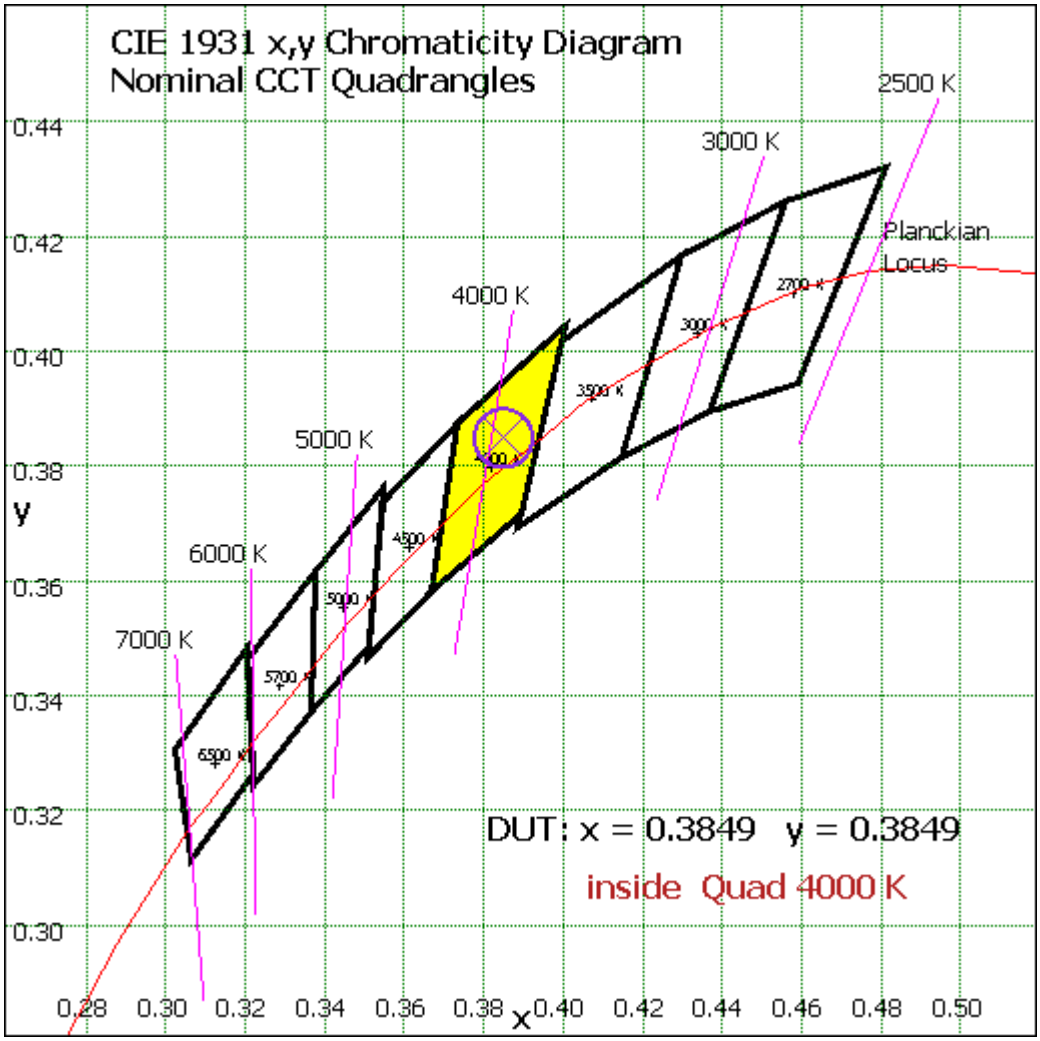


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

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Zonal Lumen Tabulation- Goniophotometer Method

γ(°)	Lumens	% Total
0- 10	645.608	29.93%
10- 20	747.255	34.64%
20- 30	353.681	16.40%
30- 40	185.447	8.60%
40- 50	95.344	4.42%
50- 60	59.517	2.76%
60- 70	39.56	1.83%
70- 80	22.063	1.02%
80- 90	5.73	0.27%
90-100	0.007	0.00%
100-110	0.019	0.00%
110-120	0.04	0.00%
120-130	0.098	0.00%
130-140	0.293	0.01%
140-150	0.672	0.03%
150-160	0.89	0.04%
160-170	0.672	0.03%
170-180	0.208	0.01%
Total	2157.1	100%

γ(°)	Lumens	% Total
0- 60	2086.852	96.74%
60- 90	67.353	3.12%
0-90	2154.205	99.87%
90- 180	2.899	0.13%
0- 180	2157.1	100%

Table 5: Zonal Lumen Data

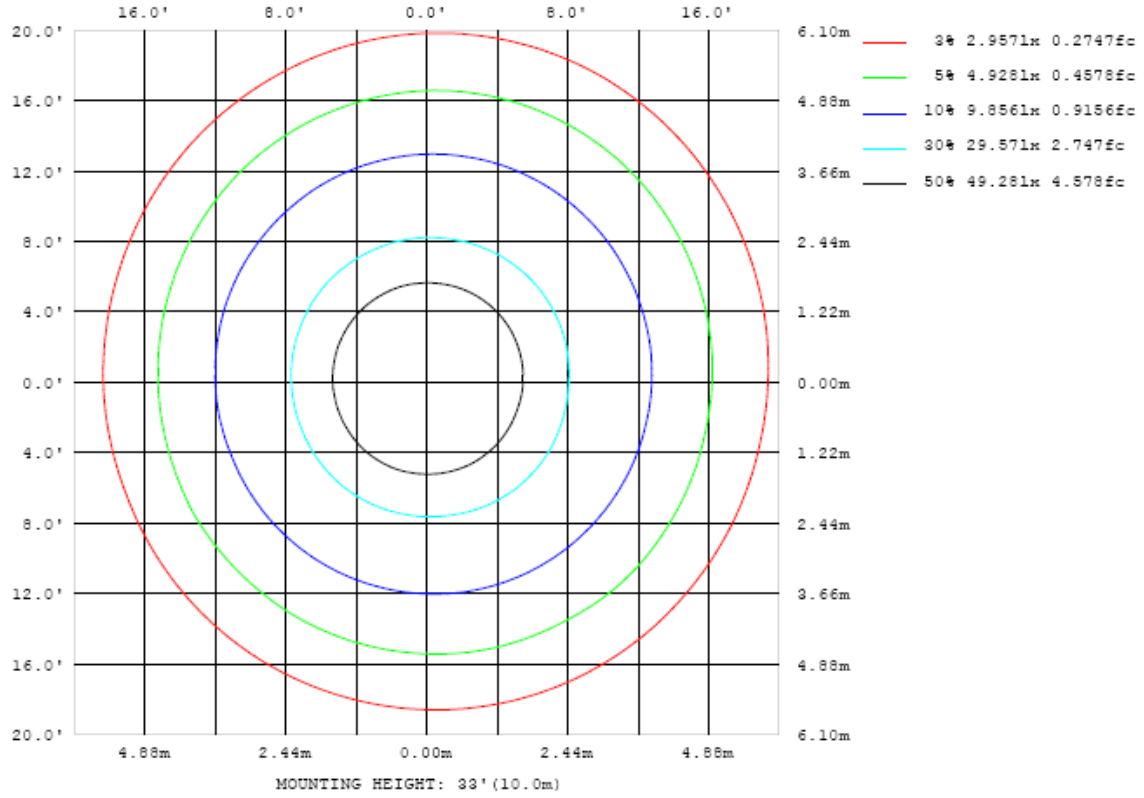


Chart 4: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

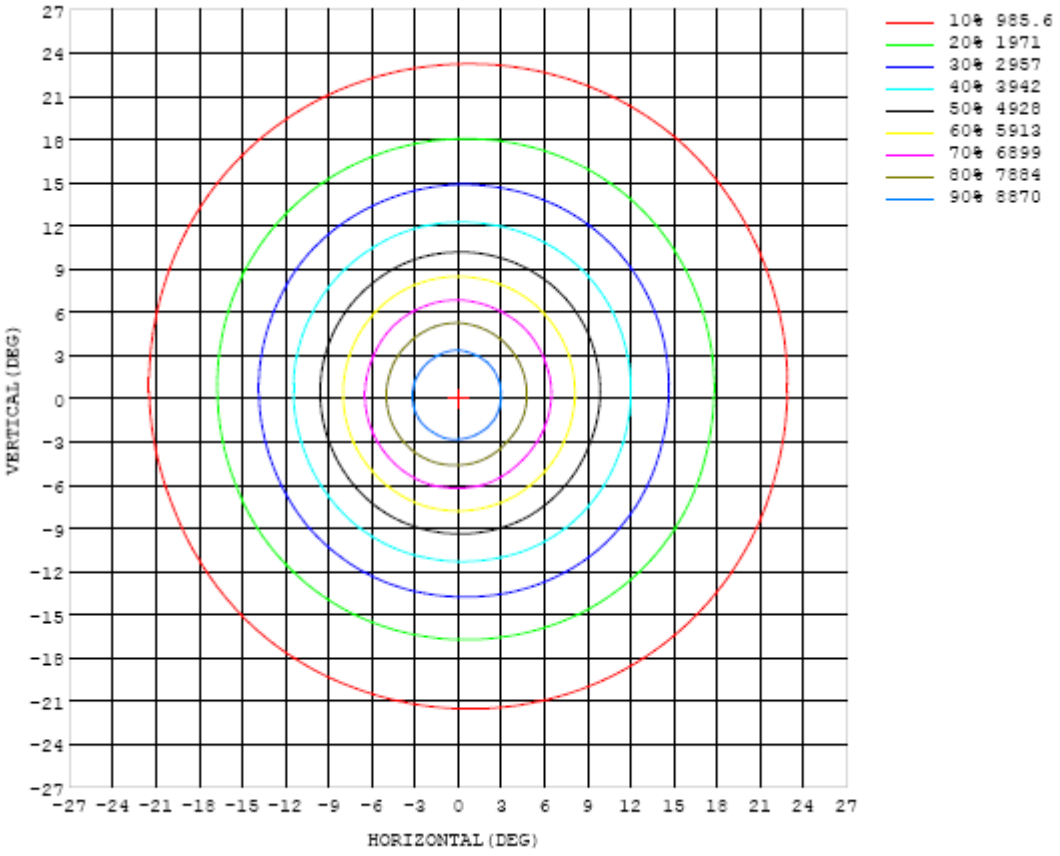


Chart 5: Isocandela Plot

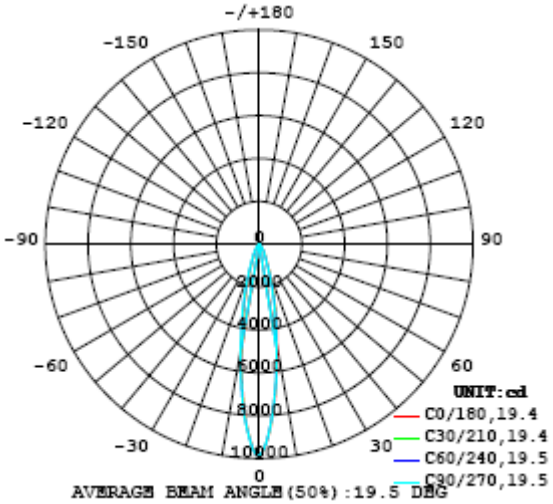


Chart 6: Polar Candela Distribution

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	9856	9856	9856	9856	9856	9856	9856	9856	9856	9856	9856	9856	9856	9856	9856	9856	9856	9856	9856
5	7745	7713	7670	7615	7588	7600	7605	7639	7643	7652	7677	7710	7738	7762	7780	7804	7837	7862	7888
10	4850	4793	4742	4717	4698	4676	4663	4624	4597	4579	4562	4571	4577	4590	4582	4584	4600	4640	4682
15	2832	2787	2773	2753	2715	2678	2631	2583	2542	2511	2491	2486	2477	2473	2471	2472	2469	2495	2529
20	1469	1424	1402	1372	1338	1313	1286	1261	1238	1213	1195	1180	1171	1163	1159	1160	1165	1189	1217
25	776	759	748	737	726	717	703	695	688	676	668	663	658	651	650	655	650	652	661
30	490	479	472	466	460	456	450	444	438	432	426	422	418	415	411	408	405	409	416
35	302	294	289	285	282	280	277	274	272	269	265	261	258	254	253	250	248	250	253
40	192	187	184	182	180	178	177	176	175	173	171	168	166	164	163	163	162	162	164
45	125	121	119	117	115	115	115	116	116	115	114	113	111	110	109	107	107	107	109
50	88.6	86.6	85.2	84.5	85.4	85.6	84.9	84.1	83.7	83.3	82.4	82.2	82.1	81.0	80.6	80.1	79.6	79.8	80.9
55	67.4	66.1	65.4	64.8	65.0	65.4	64.3	63.8	63.7	63.4	62.8	62.7	62.8	62.3	62.0	61.9	61.8	61.8	62.5
60	52.5	51.9	51.3	50.6	50.2	50.0	49.9	49.6	49.1	48.5	48.2	48.5	48.7	48.5	48.4	48.5	48.5	48.4	48.9
65	40.5	40.2	39.7	39.2	38.8	38.6	38.6	38.2	37.9	37.7	37.7	37.9	38.2	38.1	38.0	37.9	37.9	38.1	38.5
70	30.4	30.0	29.7	29.3	29.0	28.8	28.6	28.3	28.2	28.1	28.2	28.3	28.4	28.5	28.5	28.6	28.7	28.7	29.2
75	21.2	20.9	20.6	20.4	20.2	20.0	19.9	19.7	19.5	19.4	19.3	19.3	19.5	19.5	19.6	19.7	19.9	20.0	20.4
80	12.5	12.3	12.1	11.9	11.8	11.7	11.5	11.4	11.3	11.3	11.2	11.2	11.3	11.3	11.3	11.4	11.6	11.7	11.9
85	5.16	4.99	4.87	4.68	4.59	4.49	4.41	4.33	4.28	4.27	4.28	4.28	4.31	4.28	4.28	4.28	4.36	4.46	4.81
90	0.01	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	0.00	0.01	0.00
95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
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	0.01
105	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	0.02	0.02
110	0.02	0.02	0.02	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	0.02	0.03
115	0.03	0.03	0.03	0.03	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
120	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.07
125	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.12
130	0.13	0.13	0.13	0.13	0.14	0.14	0.14	0.14	0.15	0.15	0.15	0.15	0.15	0.16	0.16	0.16	0.16	0.15	0.22
135	0.25	0.25	0.25	0.26	0.26	0.26	0.27	0.27	0.28	0.28	0.28	0.29	0.29	0.29	0.30	0.30	0.30	0.29	0.44
140	0.44	0.44	0.45	0.45	0.46	0.46	0.47	0.48	0.49	0.49	0.50	0.51	0.51	0.52	0.52	0.52	0.52	0.50	0.78
145	0.71	0.72	0.72	0.73	0.74	0.75	0.77	0.78	0.79	0.80	0.81	0.82	0.83	0.83	0.84	0.84	0.84	0.80	1.22
150	1.00	1.01	1.01	1.02	1.04	1.05	1.06	1.08	1.10	1.11	1.13	1.14	1.15	1.16	1.17	1.18	1.18	1.12	1.68
155	1.27	1.27	1.28	1.29	1.30	1.32	1.33	1.35	1.37	1.39	1.41	1.43	1.45	1.47	1.48	1.49	1.50	1.44	2.00
160	1.52	1.53	1.53	1.54	1.55	1.56	1.58	1.60	1.61	1.63	1.65	1.68	1.70	1.72	1.74	1.75	1.76	1.72	2.10
165	1.73	1.73	1.74	1.75	1.76	1.77	1.78	1.79	1.81	1.83	1.85	1.87	1.89	1.91	1.93	1.94	1.96	1.95	2.01
170	1.86	1.87	1.88	1.89	1.90	1.91	1.92	1.94	1.95	1.97	1.98	2.00	2.02	2.04	2.05	2.07	2.08	2.08	2.04
175	1.84	1.85	1.86	1.87	1.88	1.89	1.91	1.92	1.94	1.95	1.96	1.98	1.99	2.00	2.01	2.02	2.03	2.04	2.05
180	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99

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	9856	9856	9856	9856	9856	9856	9856	9856	9856	9856	9856	9856	9856	9856	9856	9856	9856		
5	7913	7937	7965	7981	7997	8013	8033	8044	8037	8011	7980	7949	7914	7873	7837	7805	7772		
10	4739	4785	4827	4872	4906	4951	4994	5016	5027	5037	5040	5040	5034	5014	4988	4939	4893		
15	2582	2634	2689	2742	2782	2813	2841	2877	2912	2930	2951	2969	2974	2967	2947	2916	2870		
20	1242	1286	1327	1364	1404	1446	1480	1500	1532	1550	1564	1566	1567	1559	1543	1523	1501		
25	673	687	707	726	746	766	783	799	814	824	830	832	830	823	812	800	790		
30	421	431	443	457	472	487	501	515	525	533	538	539	535	529	521	512	502		
35	256	261	268	277	287	299	309	319	327	333	337	338	336	331	325	319	311		
40	166	168	171	175	181	188	195	201	206	211	212	213	211	209	207	204	199		
45	109	111	112	115	118	122	125	129	132	133	135	135	134	133	132	131	128		
50	81.0	82.1	84.1	85.9	87.8	89.0	90.2	91.8	93.2	93.7	94.0	94.1	94.0	93.7	93.7	92.7	91.2		
55	62.8	63.4	64.1	65.0	66.4	67.4	68.3	69.4	70.1	70.7	70.9	70.8	70.4	70.2	70.2	69.7	68.5		
60	49.1	49.7	50.6	51.4	52.2	52.8	53.3	53.9	54.2	54.1	54.0	53.9	53.7	53.6	53.6	53.4	53.1		
65	38.8	39.3	40.0	40.5	41.0	41.3	41.6	42.0	42.2	42.2	42.1	42.0	41.7	41.7	41.6	41.3	40.8		
70	29.4	29.8	30.2	30.6	31.0	31.2	31.4	31.7	31.8	31.9	31.9	31.9	31.8	31.7	31.4	31.2	30.9		
75	20.5	20.9	21.1	21.5	21.8	22.0	22.2	22.3	22.4	22.5	22.5	22.5	22.4	22.2	22.0	21.8	21.5		
80	12.1	12.3	12.5	12.7	13.0	13.1	13.2	13.2	13.3	13.3	13.4	13.3	13.2	13.0	12.9	12.8	12.7		
85	4.96	5.13	5.29	5.44	5.59	5.66	5.69	5.71	5.72	5.71	5.69	5.67	5.63	5.58	5.53	5.49	5.42		
90	0.01	0.01	0.03	0.05	0.06	0.07	0.07	0.07	0.08	0.07	0.06	0.07	0.05	0.06	0.05	0.05	0.03		
95	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00		
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		
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		
110	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		
115	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		
120	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.06	0.06	0.06	0.06	0.06		
125	0.12	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.12	0.12	0.12	0.12	0.12	0.12	0.11	0.11	0.10		
130	0.25	0.24	0.24	0.25	0.25	0.25	0.24	0.24	0.24	0.24	0.24	0.23	0.23	0.22	0.22	0.22	0.20		
135	0.50	0.49	0.49	0.48	0.48	0.48	0.47	0.47	0.46	0.46	0.45	0.45	0.44	0.44	0.44	0.44	0.40		
140	0.90	0.88	0.87	0.86	0.86	0.85	0.84	0.84	0.83	0.83	0.82	0.82	0.82	0.81	0.81	0.83	0.74		
145	1.48	1.43	1.42	1.41	1.40	1.39	1.38	1.38	1.37	1.36	1.37	1.37	1.37	1.37	1.38	1.43	1.21		
150	2.14	2.07	2.06	2.04	2.04	2.03	2.02	2.01	2.01	2.01	2.01	2.02	2.02	2.03	2.04	2.12	1.71		
155	2.69	2.61	2.60	2.59	2.59	2.59	2.58	2.58	2.59	2.59	2.59	2.60	2.60	2.61	2.62	2.72	2.04		
160	3.02	2.96	2.96	2.96	2.96	2.97	2.97	2.98	2.99	2.99	3.00	3.01	3.02	3.02	3.03	3.13	2.10		
165	3.03	3.04	3.05	3.05	3.07	3.08	3.10	3.11	3.13	3.14	3.16	3.17	3.18	3.18	3.19	3.21	1.79		
170	2.46	2.83	2.79	2.79	2.80	2.82	2.84	2.87	2.90	2.92	2.95	2.98	2.99	3.01	3.08	2.61	1.86		
175	2.06	2.07	2.18	2.15	2.15	2.17	2.21	2.26	2.31	2.36	2.40	2.43	2.45	2.44	1.83	1.84	1.84		
180	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99		

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.

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

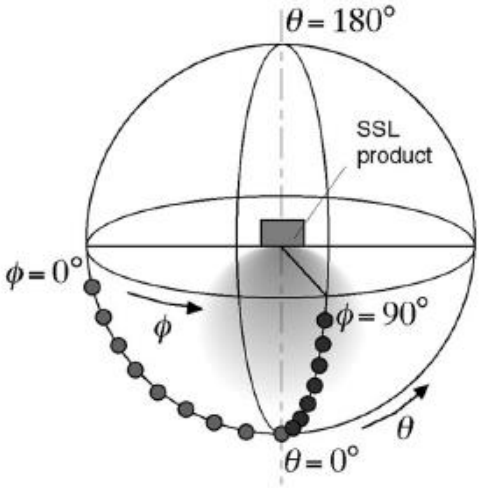
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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