

LM-79-08 Test Report

for

GREEN CREATIVE LTD

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

LED Lamp

Model: 19.5PAR30HO/930FL40/277V/R

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ18120026a

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

Review by:



Engineer: April Zou
Dec. 24, 2018

Approved by:



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/930FL40/277V/R

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
107.3	2064.0	19.24	0.9938
CCT (K)	CRI	Stabilization Time (Light & Power)	
3015	92.4	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

TABLE OF CONTENT

LM-79-08 Test Report.....	1
Test Summary.....	2
Sample Photos	4
TEST RESULTS	5
Goniophotometer Method	6
Spectral Power Distribution - Sphere Spectroradiometer Method	7
Chromaticity Diagram - Sphere Spectroradiometer Method.....	8
Nominal CCT Quadrangles – Sphere Spectroradiometer Method	9
Zonal Lumen Tabulation- Goniophotometer Method	10
Luminous Intensity Distribution Plots- Goniophotometer Method.....	12
Luminous Intensity Data- Goniophotometer Method.....	13
EQUIPMENT LIST	15
TEST METHODS	15
Seasoning of SSL Product.....	15
Sphere-Spectroradiometer Method- Photometric and Electrical Measurements.....	15
Goniophotometer Method	16
Photometric and Electrical Measurements	16
Color Characteristics Measurements.....	16
Color Spatial Uniformity	16

Sample Photos



Figure 1- Overview of the sample

Equipment Under Test (EUT)

Name	: LED Lamp
Model	: 19.5PAR30HO/930FL40/277V/R
Electrical Ratings	: 120-277V, 50/60Hz, 19.5W
Product Description	: 3000K
Manufacturer	: GREEN CREATIVE LTD
Address	: 756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai

TEST RESULTS

Test ambient temperature was 25.0°C.

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)	0.161	0.077
Power Factor	0.9938	0.9179
Test Power (W)	19.24	19.50
THD A%	6.05	25.23
Luminous Efficacy (lm/W)	107.3	108.0
Total Luminous Flux (lm)	2064.0	2106.0
Color Rendering Index (CRI)	92.4	
R9	60	
Correlated Color Temperature (CCT)(K)	3015	
Chromaticity Chroma x	0.4380	
Chromaticity Chroma y	0.4085	
Chromaticity Chroma u	0.2494	
Chromaticity Chroma v	0.3488	
Duv	0.0015	
Chromaticity Chroma u'	0.2494	
Chromaticity Chroma v'	0.5233	

Special Color Rendering Indices	
R1	92.3
R2	94.9
R3	96.6
R4	93.3
R5	91.9
R6	93.9
R7	93.6
R8	83.1
R9	60
R10	87.5
R11	94
R12	81.8
R13	92.8
R14	97.4
Rf	92
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°C.

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)	0.163
Power Factor	0.9940
Test Power (W)	19.40
Luminous Efficacy (lm/W)	108.7
Total Luminous Flux (lm)	2108.6
Beam Angle (°)	20.8
Center Beam Candle Power (cd)	9326
Spacing Criteria	0.31 (0 °-180 °) / 0.37 (90 °-270 °)
Zonal Lumens in the 0 °-60 ° Zone	97.03%
Zonal Lumens in the 60 °-90 ° Zone	2.84%
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

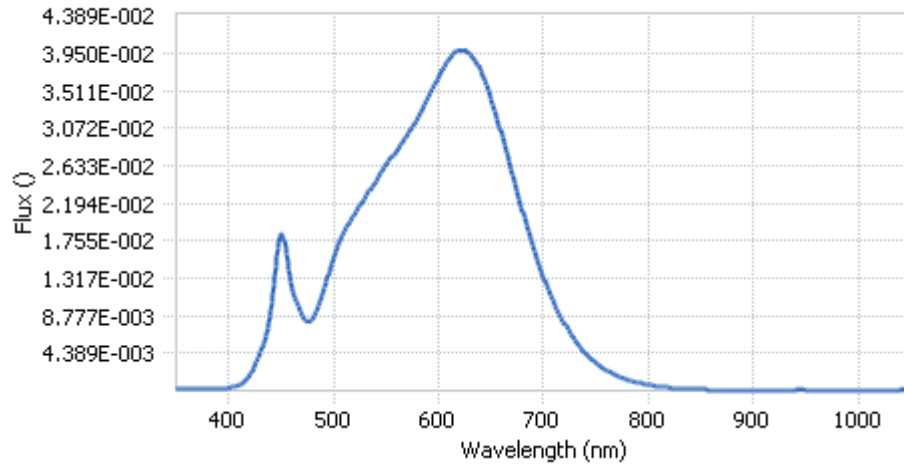
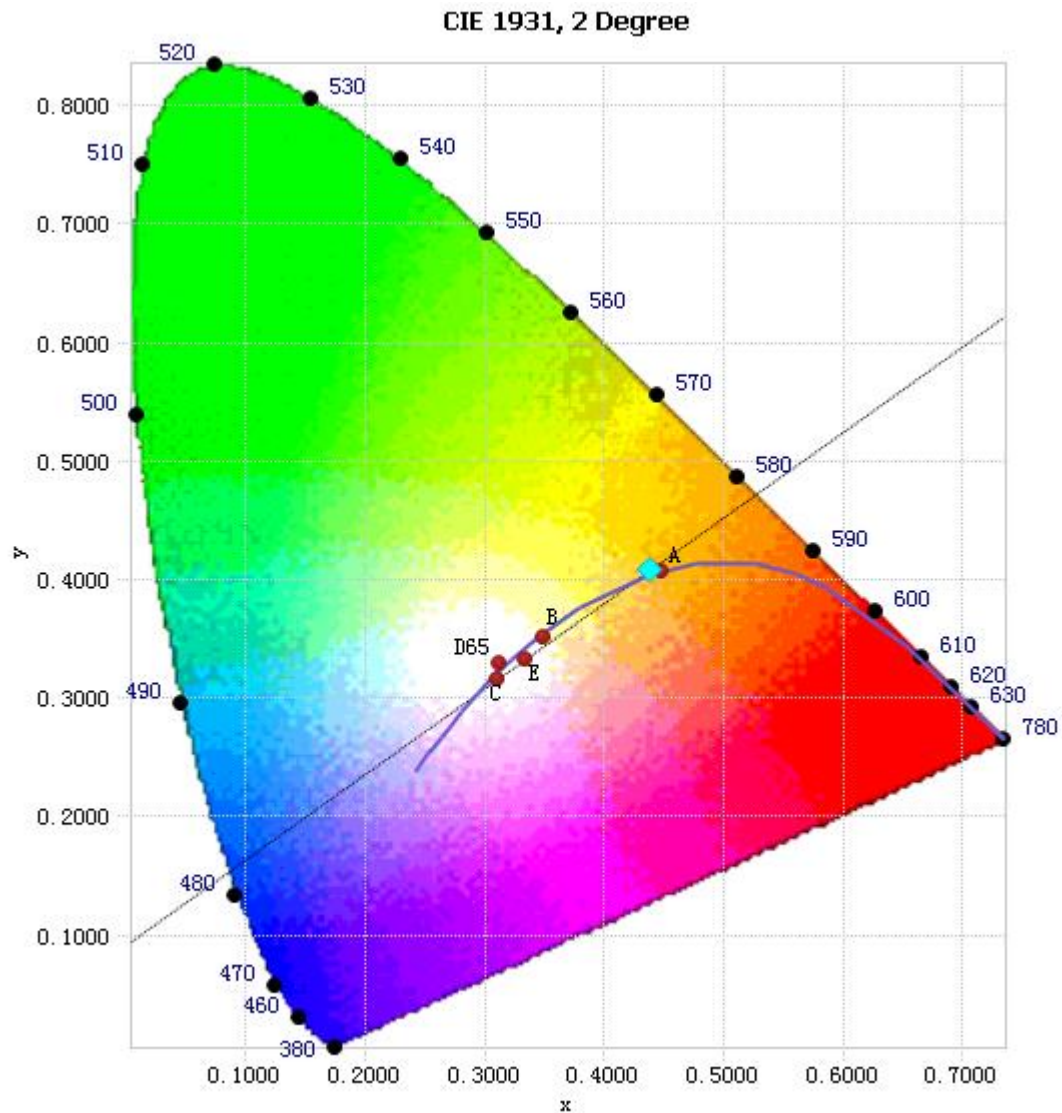


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.77E-04	485	9.85E-03	590	3.42E-02	695	1.50E-02
385	2.72E-04	490	1.16E-02	595	3.56E-02	700	1.33E-02
390	3.08E-04	495	1.36E-02	600	3.68E-02	705	1.17E-02
395	3.34E-04	500	1.56E-02	605	3.78E-02	710	1.03E-02
400	3.82E-04	505	1.73E-02	610	3.87E-02	715	8.99E-03
405	4.81E-04	510	1.86E-02	615	3.95E-02	720	7.87E-03
410	7.22E-04	515	1.98E-02	620	3.98E-02	725	6.87E-03
415	1.12E-03	520	2.07E-02	625	3.99E-02	730	5.92E-03
420	1.86E-03	525	2.17E-02	630	3.94E-02	735	5.10E-03
425	2.97E-03	530	2.26E-02	635	3.85E-02	740	4.38E-03
430	4.43E-03	535	2.36E-02	640	3.74E-02	745	3.77E-03
435	6.39E-03	540	2.45E-02	645	3.59E-02	750	3.28E-03
440	9.46E-03	545	2.55E-02	650	3.41E-02	755	2.83E-03
445	1.45E-02	550	2.65E-02	655	3.21E-02	760	2.44E-03
450	1.83E-02	555	2.73E-02	660	3.00E-02	765	2.08E-03
455	1.60E-02	560	2.81E-02	665	2.78E-02	770	1.79E-03
460	1.21E-02	565	2.90E-02	670	2.55E-02	775	1.53E-03
465	1.03E-02	570	2.99E-02	675	2.32E-02	780	1.31E-03
470	8.97E-03	575	3.08E-02	680	2.10E-02		
475	8.08E-03	580	3.19E-02	685	1.89E-02		
480	8.54E-03	585	3.31E-02	690	1.69E-02		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4380, 0.4085)

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

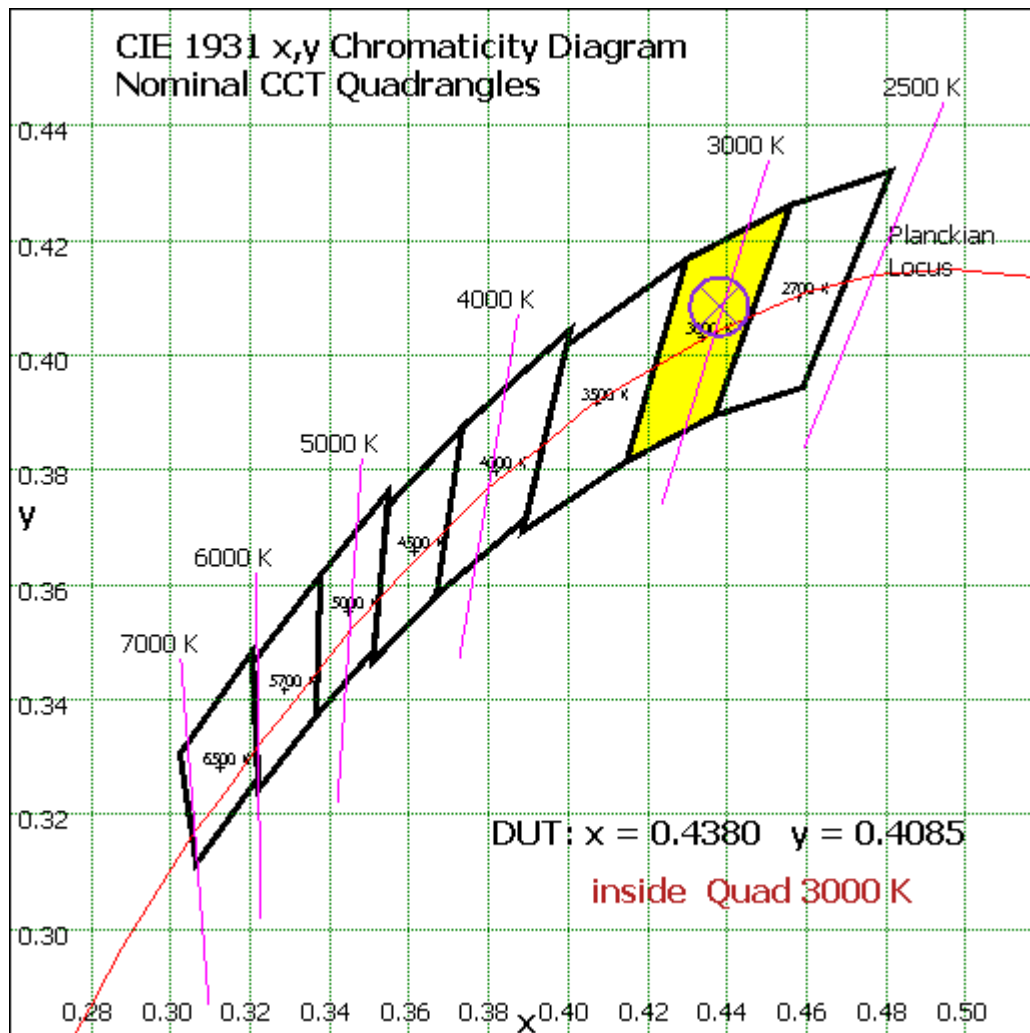


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	645.832	30.63%
10- 20	729.478	34.60%
20- 30	355.292	16.85%
30- 40	177.951	8.44%
40- 50	84.85	4.02%
50- 60	52.49	2.49%
60- 70	35.191	1.67%
70- 80	19.463	0.92%
80- 90	5.186	0.25%
90-100	0.017	0.00%
100-110	0.017	0.00%
110-120	0.036	0.00%
120-130	0.093	0.00%
130-140	0.285	0.01%
140-150	0.661	0.03%
150-160	0.876	0.04%
160-170	0.66	0.03%
170-180	0.204	0.01%
Total	2108.6	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	2045.893	97.03%
60- 90	59.84	2.84%
0-90	2105.733	99.86%
90- 180	2.849	0.14%
0- 180	2108.6	100%

Table 5: Zonal Lumen Data

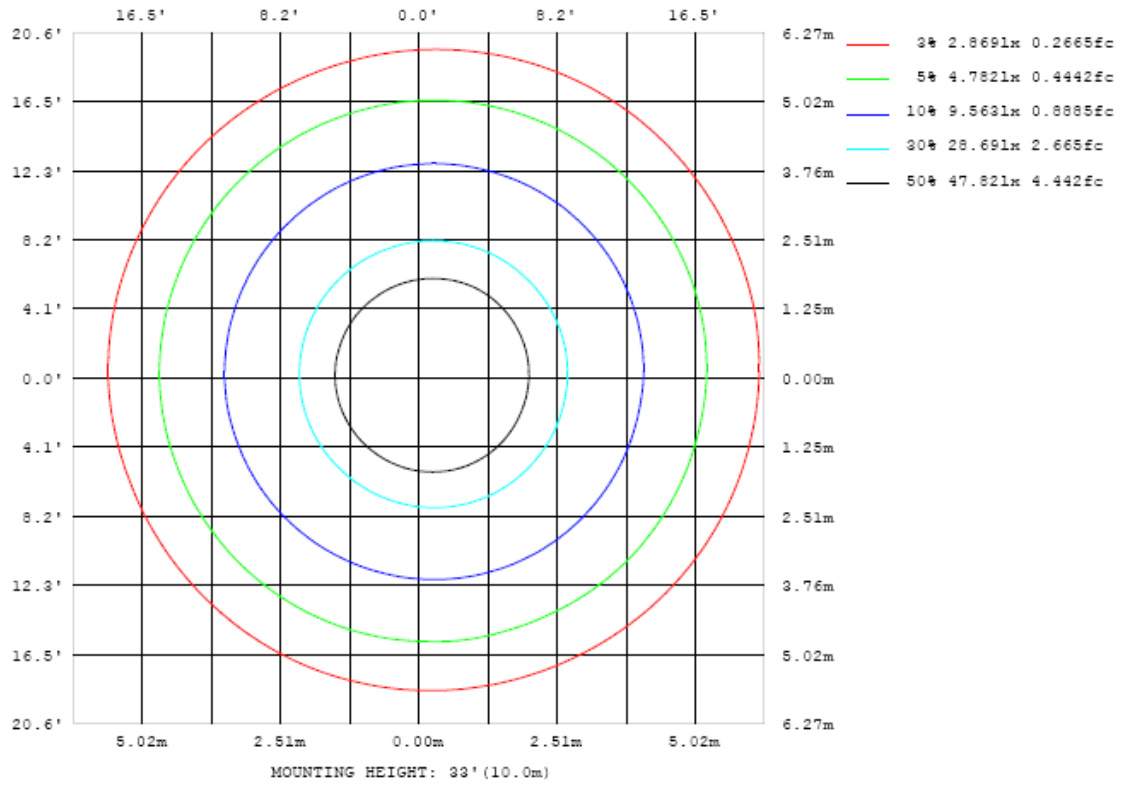


Chart 4: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

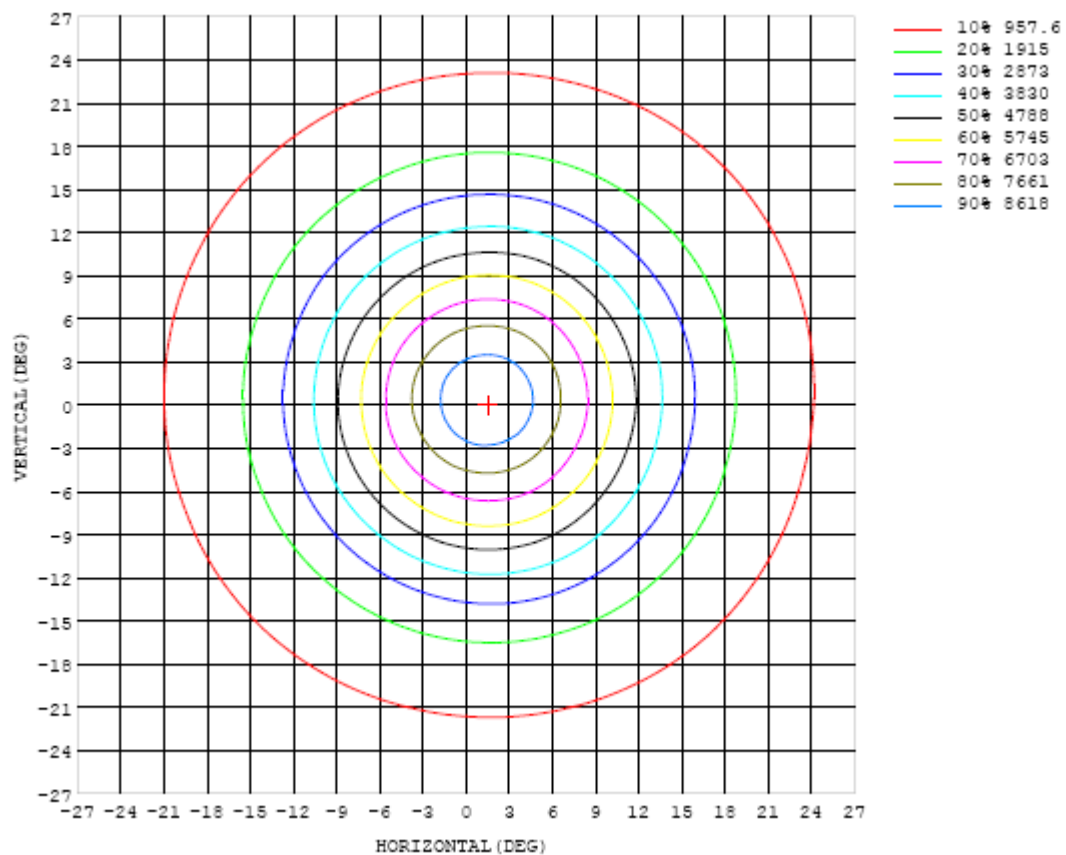


Chart 5: Isocandela Plot

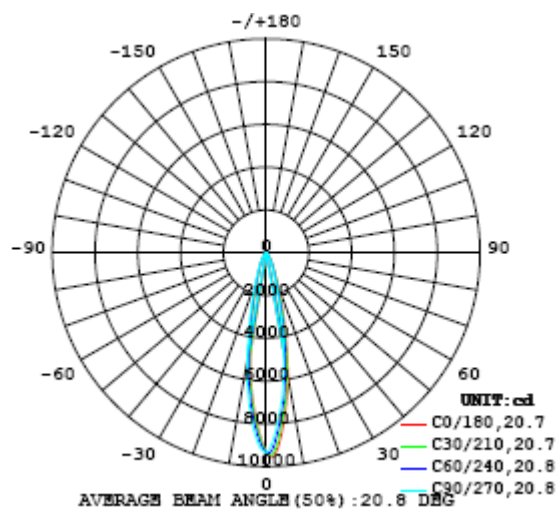


Chart 6: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1

UNIT: cd

C (DEG) γ (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	9326	9326	9326	9326	9326	9326	9326	9326	9326	9326	9326	9326	9326	9326	9326	9326	9326	9326	9326
5	8441	8372	8291	8145	8043	7927	7795	7667	7538	7439	7341	7243	7155	7094	7049	7020	7011	7016	7030
10	5848	5779	5690	5600	5483	5350	5208	5054	4896	4742	4595	4461	4345	4257	4196	4158	4139	4134	4147
15	3232	3162	3102	3016	2916	2809	2700	2585	2473	2366	2272	2192	2130	2085	2053	2038	2033	2052	2065
20	1624	1560	1521	1472	1415	1359	1301	1246	1201	1158	1119	1093	1071	1057	1046	1045	1044	1056	1067
25	876	853	833	810	787	763	739	716	701	683	673	663	656	651	646	646	647	653	659
30	549	535	522	506	488	470	452	437	425	416	407	403	397	393	390	391	393	401	410
35	335	326	316	303	288	273	260	249	242	237	234	232	230	228	228	229	232	238	245
40	204	200	193	185	175	164	155	148	144	140	138	137	136	136	136	135	138	143	149
45	127	124	120	114	109	103	97.3	94.0	92.0	90.6	89.3	89.3	88.9	87.9	86.8	87.4	89.2	91.4	95.0
50	87.7	86.4	84.0	80.1	76.5	73.6	70.8	68.9	68.0	67.3	67.2	67.0	66.7	65.7	65.4	66.2	66.4	67.4	69.8
55	65.9	65.4	64.1	62.2	59.8	57.9	56.4	54.5	53.5	52.8	52.5	52.0	51.3	50.5	50.4	51.2	51.6	52.1	53.4
60	51.1	50.5	49.4	47.8	46.5	44.9	44.0	43.4	42.7	42.3	41.9	41.6	41.0	40.2	39.8	39.7	39.9	40.5	41.6
65	39.1	38.9	38.3	37.4	36.5	35.4	34.8	34.4	34.0	33.6	33.3	33.0	32.4	31.9	31.5	31.5	31.6	31.9	32.4
70	28.8	28.8	28.7	28.3	27.8	27.3	26.9	26.5	26.0	25.7	25.3	25.0	24.6	24.1	23.9	23.8	23.8	23.8	24.0
75	20.5	20.6	20.5	20.2	19.9	19.6	19.3	18.8	18.4	18.0	17.7	17.4	17.0	16.6	16.4	16.3	16.2	16.1	16.4
80	12.6	12.6	12.6	12.4	12.2	11.9	11.6	11.2	10.8	10.5	10.2	9.87	9.55	9.29	9.13	8.96	8.85	8.84	9.00
85	6.12	6.09	6.00	5.84	5.65	5.39	5.11	4.79	4.48	4.20	3.90	3.62	3.40	3.19	3.02	2.86	2.75	2.70	2.85
90	0.78	0.76	0.70	0.60	0.46	0.28	0.14	0.05	0.02	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	0.01	0.00	0.00	0.00	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	0.01
105	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	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	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03
115	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	0.04	0.04	0.04	0.04	0.04
120	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	0.06	0.06	0.06	0.06	0.06	0.07
125	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.12
130	0.12	0.12	0.12	0.12	0.12	0.13	0.13	0.13	0.13	0.14	0.14	0.14	0.15	0.15	0.16	0.16	0.16	0.16	0.24
135	0.22	0.23	0.23	0.23	0.23	0.24	0.24	0.24	0.25	0.26	0.27	0.28	0.28	0.29	0.30	0.31	0.31	0.30	0.48
140	0.40	0.40	0.40	0.41	0.41	0.42	0.43	0.44	0.45	0.46	0.48	0.50	0.51	0.53	0.54	0.55	0.56	0.55	0.86
145	0.65	0.65	0.66	0.67	0.68	0.69	0.71	0.73	0.75	0.77	0.79	0.81	0.83	0.85	0.86	0.88	0.89	0.85	1.34
150	0.94	0.94	0.95	0.96	0.97	0.98	1.00	1.02	1.04	1.06	1.09	1.11	1.13	1.15	1.17	1.19	1.21	1.16	1.79
155	1.23	1.23	1.23	1.23	1.24	1.26	1.27	1.29	1.31	1.33	1.36	1.39	1.41	1.43	1.46	1.48	1.50	1.45	2.07
160	1.48	1.47	1.48	1.48	1.49	1.50	1.52	1.54	1.56	1.58	1.60	1.63	1.65	1.68	1.70	1.73	1.75	1.71	2.14
165	1.68	1.67	1.68	1.68	1.69	1.70	1.72	1.73	1.75	1.77	1.79	1.82	1.84	1.86	1.88	1.91	1.93	1.93	2.03
170	1.82	1.83	1.83	1.85	1.85	1.86	1.88	1.89	1.91	1.92	1.94	1.96	1.97	1.99	2.00	2.02	2.03	2.04	2.01
175	1.84	1.84	1.85	1.85	1.86	1.87	1.88	1.89	1.90	1.91	1.92	1.93	1.94	1.95	1.95	1.96	1.97	1.98	1.99
180	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94

Table 6: Luminous Intensity Data

Table--2

UNIT: cd

C (DEG) y (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	9326	9326	9326	9326	9326	9326	9326	9326	9326	9326	9326	9326	9326	9326	9326	9326	9326		
5	7060	7110	7183	7262	7354	7466	7583	7702	7821	7938	8063	8190	8296	8383	8439	8469	8471		
10	4179	4235	4313	4416	4518	4642	4786	4937	5093	5260	5425	5576	5702	5790	5851	5873	5869		
15	2090	2126	2180	2253	2328	2415	2509	2609	2714	2813	2915	3009	3090	3158	3215	3254	3258		
20	1079	1097	1120	1149	1183	1224	1271	1323	1386	1427	1487	1539	1580	1607	1632	1647	1647		
25	665	672	682	696	710	727	745	766	787	808	829	850	870	885	894	896	892		
30	416	422	427	434	442	450	461	474	489	505	520	534	545	553	559	561	559		
35	249	252	255	258	261	265	269	277	287	298	309	319	327	333	337	340	341		
40	153	157	159	161	163	165	168	172	176	182	188	193	198	201	204	206	207		
45	98.5	101	102	103	104	105	107	109	112	115	119	122	124	125	126	128	129		
50	71.9	72.8	73.4	73.9	74.8	75.2	75.8	77.3	78.5	80.2	81.7	83.2	84.2	85.3	86.6	87.5	88.4		
55	54.6	56.0	57.5	58.5	58.7	58.8	59.0	59.6	60.2	60.8	61.5	61.9	62.4	63.1	64.0	64.8	65.5		
60	42.7	44.0	45.0	45.7	46.5	47.0	47.4	47.8	48.1	48.5	48.9	49.3	49.8	50.4	51.0	51.4	51.5		
65	32.9	33.6	34.1	34.6	35.1	35.6	36.0	36.3	36.7	36.9	37.3	37.8	38.2	38.6	39.1	39.3	39.4		
70	24.2	24.5	24.8	25.0	25.5	25.9	26.3	26.7	27.0	27.2	27.6	28.0	28.3	28.5	28.9	28.9	29.0		
75	16.4	16.6	16.7	17.0	17.3	17.7	18.1	18.4	18.9	19.2	19.6	20.0	20.1	20.3	20.6	20.6	20.6		
80	9.04	9.13	9.30	9.52	9.79	10.1	10.4	10.8	11.1	11.4	11.8	12.0	12.2	12.3	12.6	12.7	12.7		
85	2.88	2.98	3.11	3.33	3.57	3.84	4.14	4.45	4.74	5.01	5.31	5.55	5.73	5.88	6.07	6.16	6.19		
90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.10	0.22	0.37	0.50	0.63	0.72	0.81	0.85		
95	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	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	0.01	0.01	0.01	0.01		
110	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02		
115	0.04	0.04	0.04	0.04	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		
120	0.07	0.07	0.07	0.07	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		
125	0.13	0.13	0.13	0.13	0.12	0.12	0.12	0.12	0.11	0.11	0.11	0.11	0.10	0.10	0.10	0.10	0.10		
130	0.26	0.26	0.25	0.25	0.25	0.24	0.24	0.23	0.23	0.22	0.22	0.21	0.21	0.20	0.20	0.20	0.19		
135	0.54	0.52	0.51	0.50	0.49	0.48	0.46	0.45	0.44	0.43	0.42	0.41	0.40	0.40	0.39	0.40	0.36		
140	0.99	0.96	0.94	0.92	0.90	0.87	0.85	0.83	0.81	0.79	0.77	0.76	0.75	0.74	0.73	0.74	0.66		
145	1.61	1.55	1.52	1.49	1.46	1.43	1.40	1.37	1.34	1.32	1.30	1.28	1.27	1.26	1.25	1.28	1.10		
150	2.26	2.18	2.16	2.13	2.10	2.07	2.03	2.01	1.98	1.95	1.93	1.92	1.90	1.89	1.89	1.95	1.60		
155	2.78	2.69	2.67	2.64	2.63	2.61	2.59	2.57	2.56	2.54	2.53	2.52	2.51	2.50	2.50	2.59	1.98		
160	3.05	2.98	2.97	2.96	2.96	2.96	2.95	2.96	2.96	2.96	2.96	2.97	2.96	2.96	2.97	3.06	2.10		
165	2.98	2.98	2.98	2.98	2.99	3.01	3.03	3.05	3.08	3.10	3.12	3.14	3.15	3.16	3.17	3.20	1.83		
170	2.43	2.72	2.68	2.67	2.69	2.70	2.74	2.78	2.83	2.88	2.92	2.96	2.99	3.02	3.11	2.68	1.82		
175	2.00	2.02	2.06	2.03	2.02	2.04	2.09	2.15	2.23	2.32	2.40	2.46	2.51	2.55	1.85	1.84	1.84		
180	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94		

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 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 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 expanded uncertainty is 2.3% with a coverage factor $k=2$.

Color Characteristics Measurements

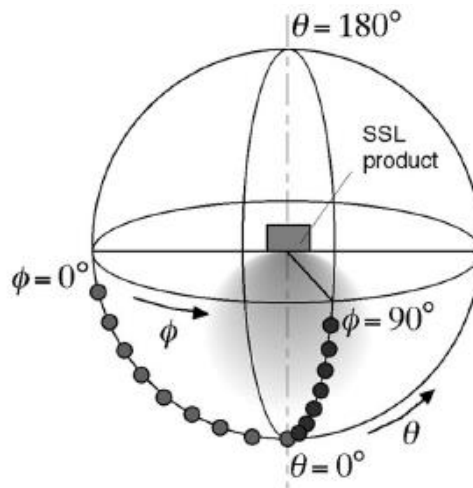
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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

Color Spatial Uniformity

The characteristics of SSL products may be spatially non-uniform, the chromaticity coordinate shall be measured at two vertical planes ($C=0^\circ/180^\circ$ and $C=90^\circ/270^\circ$) 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, $\Delta u'v'$, 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 ***

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