



LM-79-08 Test Report

for

GREEN CREATIVE LTD

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

LED LAMP

Model: 13PAR30DIM/930SP15

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ17080059a

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

Review by:

Engineer: April Zou
Sep. 07, 2017

Approved by:



Manager: Jim Zhang
Sep. 07, 2017

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: 13PAR30DIM/930SP15

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
81.7	1012.0	12.39	0.9783
CCT (K)	CRI	Stabilization Time (Light & Power)	
3061	92.7	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 : Aug. 31, 2017

Date of Test : Sep. 04, 2017

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	: 13PAR30DIM/930SP15
Electrical Ratings	: 120V, 60Hz, 13W
Product Description	: E26 base, CRI90, 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 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
Voltage frequency (Hz)	60
Test Current (A)	0.106
Power Factor	0.9783
Test Power (W)	12.39
THD A%	12.12
Luminous Efficacy (lm/W)	81.7
Total Luminous Flux (lm)	1012.0
Color Rendering Index (CRI)	92.7
R9	68.1
Correlated Color Temperature (CCT)(K)	3061
Chromaticity Chroma x	0.4323
Chromaticity Chroma y	0.4021
Chromaticity Chroma u	0.2484
Chromaticity Chroma v	0.3466
Duv	0.0002
Chromaticity Chroma u'	0.2484
Chromaticity Chroma v'	0.5199

Special Color Rendering Indices	
R1	93.3
R2	94.5
R3	94.3
R4	93.5
R5	92.5
R6	92.6
R7	94
R8	86.7
R9	68.1
R10	86.4
R11	93.9
R12	81.3
R13	93.3
R14	96.1
Rf	91
Rg	102

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 24.7°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)	0.106
Power Factor	0.9777
Test Power (W)	12.45
Luminous Efficacy (lm/W)	82.8
Total Luminous Flux (lm)	1030.7
Beam Angle (°)	13.8
Center Beam Candle Power (cd)	7266
Spacing Criteria	0.26 (0°-180°)/ 0.21 (90°-270°)
Zonal Lumens in the 0°-60°Zone	97.55%
Zonal Lumens in the 60°-90°Zone	2.32%
Zonal Lumens in the 90°-120°Zone	0.00%
Zonal Lumens in the 120°-180°Zone	0.12%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

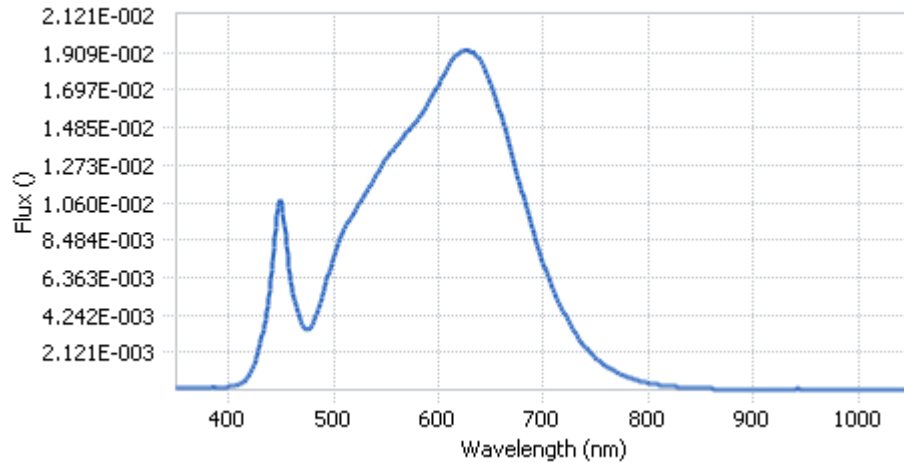
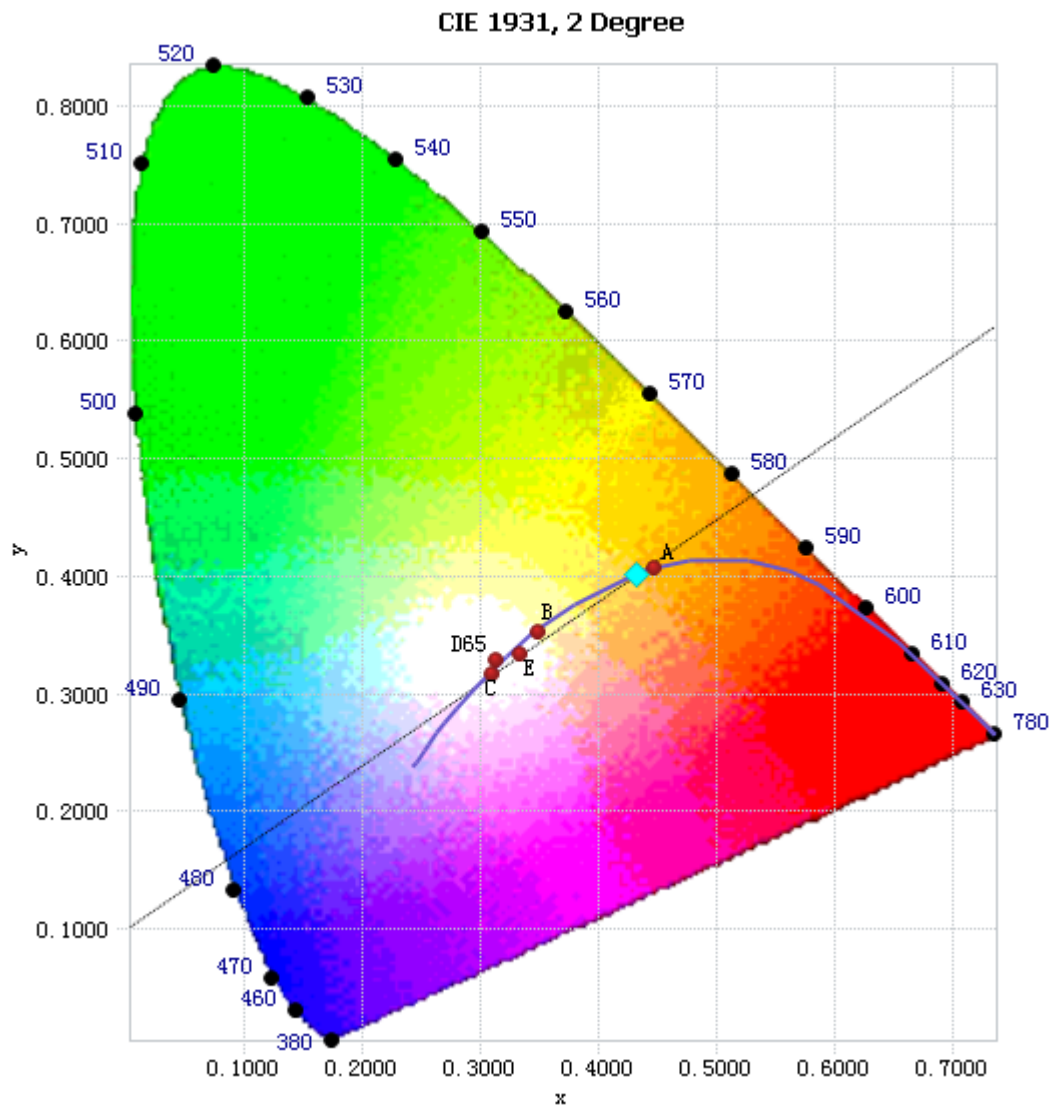


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.46E-04	485	4.50E-03	590	1.62E-02	695	8.02E-03
385	1.38E-04	490	5.42E-03	595	1.68E-02	700	7.14E-03
390	1.49E-04	495	6.54E-03	600	1.73E-02	705	6.31E-03
395	1.56E-04	500	7.52E-03	605	1.79E-02	710	5.56E-03
400	1.84E-04	505	8.39E-03	610	1.83E-02	715	4.88E-03
405	2.30E-04	510	9.06E-03	615	1.88E-02	720	4.29E-03
410	3.21E-04	515	9.65E-03	620	1.91E-02	725	3.75E-03
415	5.14E-04	520	1.01E-02	625	1.92E-02	730	3.25E-03
420	8.72E-04	525	1.06E-02	630	1.92E-02	735	2.79E-03
425	1.54E-03	530	1.11E-02	635	1.90E-02	740	2.41E-03
430	2.58E-03	535	1.15E-02	640	1.86E-02	745	2.08E-03
435	4.03E-03	540	1.21E-02	645	1.80E-02	750	1.77E-03
440	6.23E-03	545	1.27E-02	650	1.73E-02	755	1.56E-03
445	9.24E-03	550	1.31E-02	655	1.64E-02	760	1.35E-03
450	1.08E-02	555	1.35E-02	660	1.54E-02	765	1.15E-03
455	8.17E-03	560	1.39E-02	665	1.44E-02	770	9.95E-04
460	5.76E-03	565	1.42E-02	670	1.33E-02	775	8.44E-04
465	4.67E-03	570	1.46E-02	675	1.22E-02	780	7.28E-04
470	3.76E-03	575	1.49E-02	680	1.11E-02		
475	3.43E-03	580	1.53E-02	685	1.01E-02		
480	3.80E-03	585	1.58E-02	690	9.03E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4323, 0.4021)

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

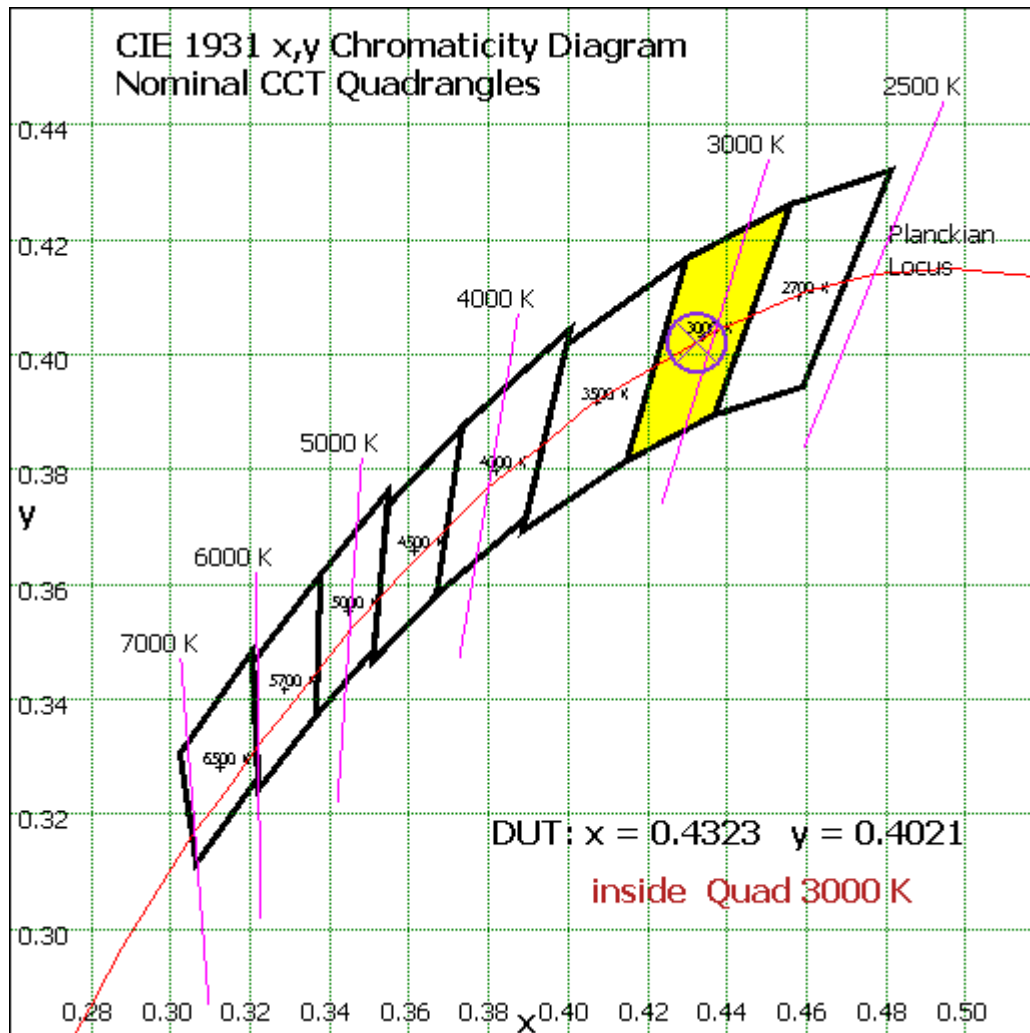


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	381.452	37.01%
10- 20	366.707	35.58%
20- 30	132.237	12.83%
30- 40	56.661	5.50%
40- 50	41.965	4.07%
50- 60	26.465	2.57%
60- 70	14.658	1.42%
70- 80	7.428	0.72%
80- 90	1.855	0.18%
90-100	0.025	0.00%
100-110	0.003	0.00%
110-120	0.011	0.00%
120-130	0.028	0.00%
130-140	0.106	0.01%
140-150	0.286	0.03%
150-160	0.406	0.04%
160-170	0.31	0.03%
170-180	0.098	0.01%
Total	1030.7	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	1005.487	97.55%
60- 90	23.941	2.32%
0-90	1029.428	99.88%
90- 180	1.273	0.12%
0- 180	1030.7	100%

Table 5: Zonal Lumen Data

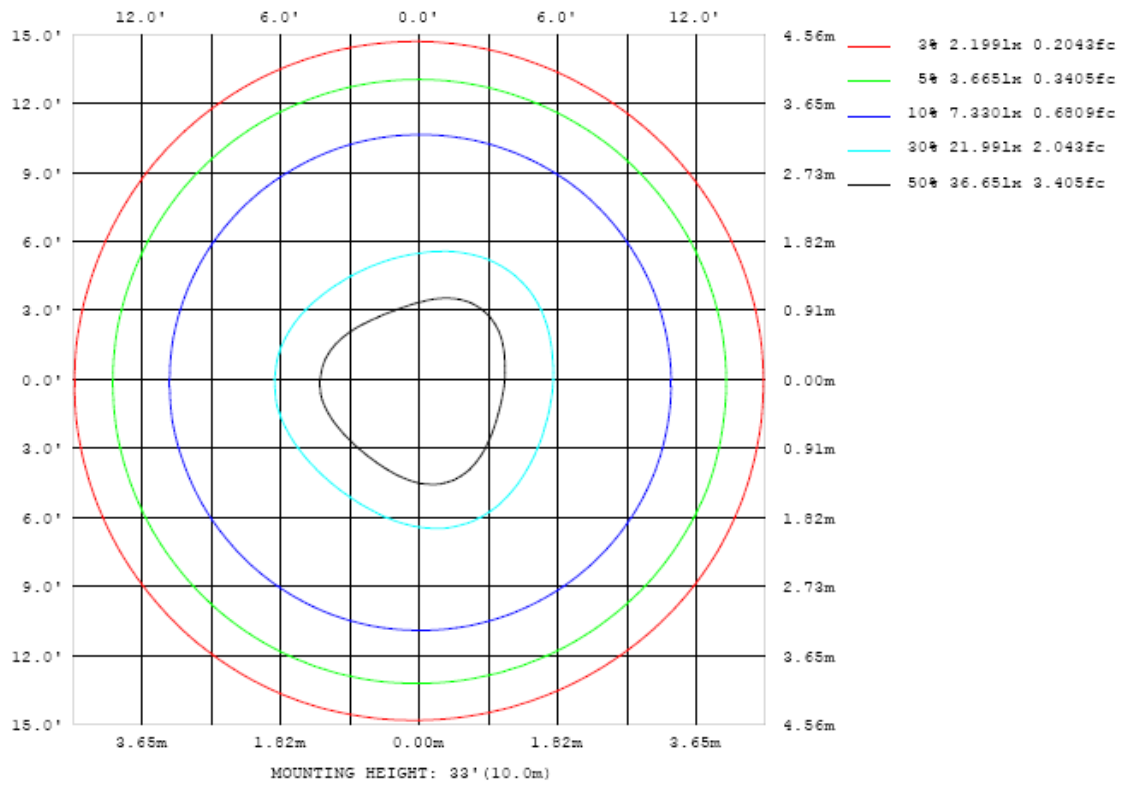


Chart 4: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

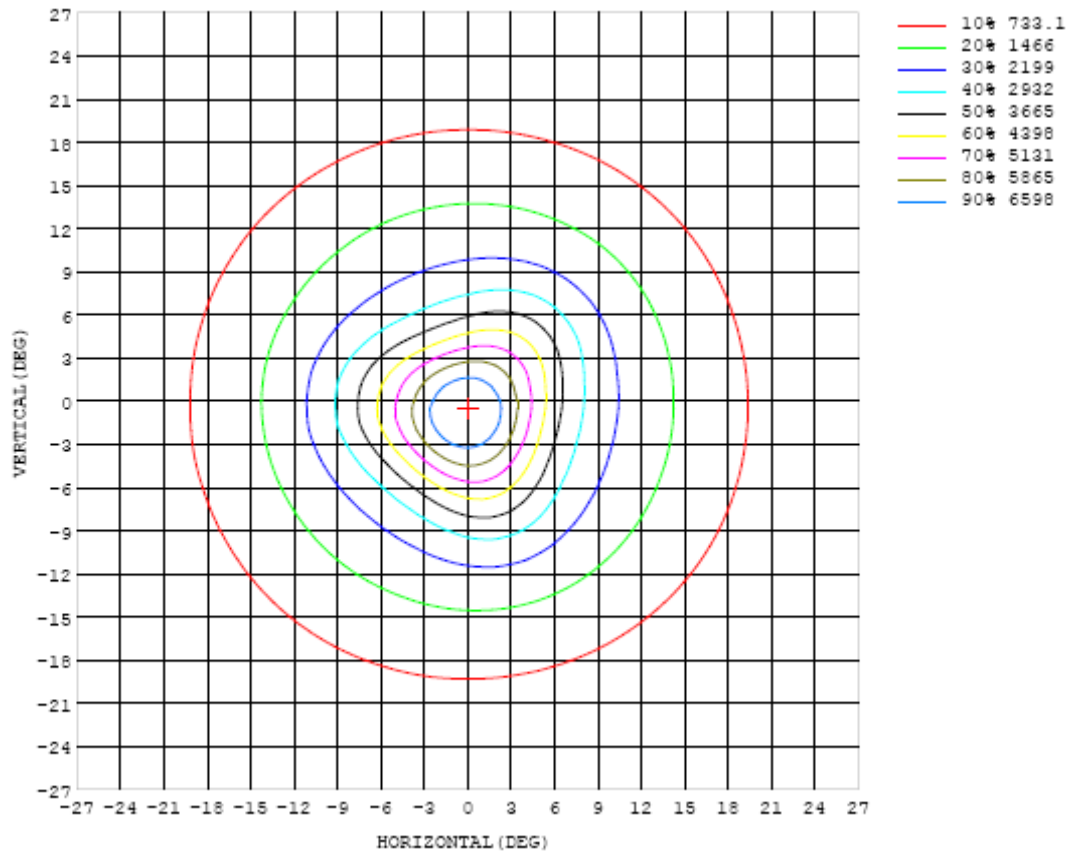


Chart 5: Isocandela Plot

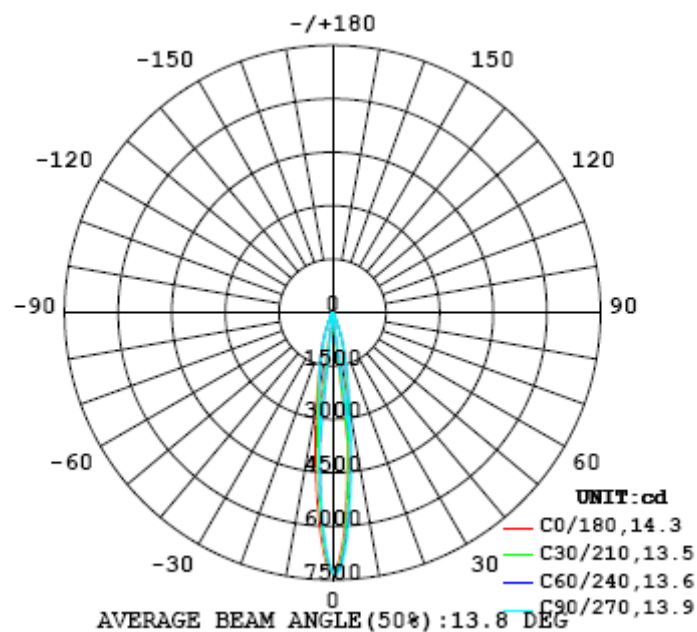


Chart 6: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1

UNIT: cd

C (DEG) y (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	7266	7266	7266	7266	7266	7266	7266	7266	7266	7266	7266	7266	7266	7266	7266	7266	7266	7266	7266
5	4685	4671	4723	4840	5002	5194	5375	5489	5546	5530	5446	5340	5237	5182	5161	5191	5207	5221	5108
10	2302	2290	2307	2359	2449	2585	2745	2839	2827	2706	2555	2434	2365	2347	2368	2427	2514	2607	2594
15	1342	1343	1352	1364	1378	1388	1400	1400	1392	1379	1363	1344	1341	1334	1328	1330	1331	1334	1331
20	658	664	670	667	662	656	656	662	654	660	654	662	659	653	663	663	659	653	645
25	260	261	262	261	258	254	251	249	250	252	256	260	262	264	264	264	264	264	262
30	137	138	139	138	134	130	126	125	127	130	136	140	143	142	139	137	134	132	131
35	91.4	92.0	92.2	91.8	89.4	85.6	82.2	81.2	83.2	86.6	92.2	94.0	96.1	95.3	94.6	92.9	89.4	87.1	85.6
40	68.0	67.1	67.8	67.9	66.7	64.3	61.9	61.1	63.1	66.1	68.6	69.3	69.1	68.7	68.8	68.8	67.2	65.3	63.1
45	57.9	57.0	57.1	58.7	57.0	54.4	52.3	51.2	52.4	54.8	57.3	58.5	57.6	57.1	57.7	58.7	56.5	53.9	52.0
50	44.0	44.2	44.3	45.0	43.8	41.9	40.3	39.6	40.5	42.3	44.2	45.4	45.2	45.2	45.4	45.6	43.5	41.3	39.4
55	29.6	30.0	30.2	30.4	29.9	29.1	28.3	28.0	28.5	29.6	30.7	31.6	31.6	31.5	31.5	31.3	30.3	29.2	28.0
60	20.7	20.9	20.9	20.9	20.6	20.1	19.6	19.5	19.8	20.4	21.0	21.5	21.6	21.6	21.6	21.4	21.0	20.4	19.6
65	15.2	15.3	15.3	15.3	15.0	14.6	14.3	14.2	14.4	14.8	15.2	15.5	15.6	15.7	15.6	15.5	15.3	14.9	14.4
70	10.9	11.0	11.0	11.0	10.8	10.5	10.3	10.3	10.4	10.7	10.9	11.2	11.3	11.3	11.3	11.2	11.0	10.8	10.4
75	7.15	7.24	7.31	7.31	7.22	7.10	7.01	6.97	7.06	7.24	7.41	7.54	7.61	7.65	7.62	7.55	7.43	7.26	7.00
80	3.99	4.07	4.14	4.16	4.16	4.12	4.09	4.10	4.16	4.25	4.34	4.41	4.44	4.45	4.43	4.38	4.30	4.18	4.05
85	1.49	1.55	1.61	1.66	1.70	1.73	1.75	1.78	1.81	1.86	1.89	1.91	1.92	1.91	1.89	1.85	1.77	1.70	1.61
90	0.17	0.16	0.16	0.17	0.17	0.18	0.21	0.23	0.24	0.25	0.25	0.25	0.24	0.23	0.22	0.19	0.17	0.13	0.10
95	0.05	0.05	0.05	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
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	0.01	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.01
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	0.01	0.01
120	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02
125	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
130	0.04	0.04	0.05	0.05	0.04	0.04	0.04	0.05	0.05	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.07
135	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.10	0.10	0.17
140	0.18	0.18	0.18	0.18	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.18	0.18	0.18	0.18	0.18	0.33
145	0.31	0.31	0.31	0.31	0.31	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.31	0.31	0.31	0.59
150	0.49	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.47	0.47	0.47	0.47	0.47	0.48	0.48	0.48	0.92
155	0.62	0.62	0.62	0.62	0.62	0.61	0.61	0.61	0.62	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	1.17
160	0.73	0.73	0.73	0.73	0.73	0.73	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	1.33
165	0.84	0.85	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	1.39
170	0.92	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	1.31
175	0.89	0.90	0.91	0.91	0.92	0.92	0.93	0.93	0.93	0.93	0.93	0.93	0.92	0.92	0.92	0.92	0.92	0.92	1.05
180	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74

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	7266	7266	7266	7266	7266	7266	7266	7266	7266	7266	7266	7266	7266	7266	7266	7266	7266		
5	4997	4841	4625	4408	4202	4081	4045	4099	4215	4393	4574	4725	4829	4870	4858	4785	4696		
10	2551	2431	2307	2204	2144	2114	2105	2122	2160	2228	2314	2423	2496	2508	2465	2391	2326		
15	1323	1308	1285	1273	1261	1260	1258	1258	1263	1267	1276	1294	1317	1331	1339	1338	1340		
20	647	640	632	627	618	612	611	610	608	608	611	615	624	630	639	646	651		
25	260	256	255	254	252	251	250	247	243	240	237	237	239	243	247	253	257		
30	131	130	132	134	135	135	134	134	132	129	126	124	124	125	127	132	134		
35	84.8	85.1	86.8	89.8	89.6	89.3	88.1	88.3	87.9	87.1	84.3	81.9	80.9	82.4	84.2	87.2	89.1		
40	62.1	63.1	64.5	66.2	66.3	65.9	65.5	65.8	66.6	66.0	63.3	61.6	60.7	62.2	64.0	65.9	67.1		
45	51.3	52.0	53.7	55.9	57.3	56.7	56.0	56.8	58.2	56.2	53.0	50.5	49.4	50.8	53.2	55.6	58.0		
50	38.7	39.0	40.4	41.8	42.9	42.7	42.9	43.0	43.1	41.3	39.0	37.4	36.9	37.9	39.6	41.4	43.3		
55	27.5	27.7	28.3	28.6	28.8	28.8	28.8	28.8	28.6	28.0	27.0	26.2	26.1	26.6	27.6	28.4	29.2		
60	19.4	19.2	19.5	19.6	19.6	19.4	19.5	19.5	19.5	19.3	19.0	18.6	18.8	19.0	19.7	20.0	20.5		
65	14.1	14.1	14.1	14.2	14.0	13.9	13.9	14.0	14.0	14.0	13.8	13.6	13.8	14.0	14.4	14.8	15.0		
70	10.2	10.1	10.1	10.1	9.92	9.81	9.79	9.87	9.92	9.93	9.85	9.81	9.89	10.0	10.3	10.5	10.7		
75	6.86	6.79	6.73	6.63	6.52	6.42	6.36	6.40	6.44	6.46	6.43	6.44	6.50	6.61	6.80	6.87	7.02		
80	3.93	3.86	3.81	3.71	3.62	3.53	3.46	3.48	3.48	3.50	3.50	3.54	3.59	3.67	3.77	3.85	3.94		
85	1.54	1.48	1.42	1.35	1.30	1.24	1.20	1.19	1.18	1.18	1.18	1.20	1.23	1.27	1.32	1.37	1.43		
90	0.06	0.04	0.01	0.00	0.00	0.00	0.00	0.01	0.02	0.04	0.07	0.09	0.11	0.13	0.15	0.15	0.16		
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	0.02	0.03	0.04	0.04	0.05		
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	0.01	0.01	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	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		
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	0.02	0.02	0.02	0.02	0.02	0.02	0.02		
125	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	0.03		
130	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.07	0.07	0.08	0.07		
135	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17		
140	0.33	0.33	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.33	0.34	0.34		
145	0.60	0.60	0.60	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.60	0.59		
150	0.93	0.93	0.93	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.93	0.93	0.92		
155	1.17	1.18	1.18	1.18	1.19	1.19	1.19	1.19	1.19	1.18	1.18	1.18	1.18	1.18	1.18	1.17	1.17		
160	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.34	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33		
165	1.39	1.39	1.39	1.39	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.39	1.39	1.39	1.39	1.39	1.38		
170	1.31	1.31	1.31	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30		
175	1.06	1.06	1.05	1.05	1.04	1.04	1.03	1.03	1.03	1.03	1.03	1.04	1.04	1.04	1.05	1.05	1.05		
180	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74		

Table 7: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Aug. 23, 2017	Aug. 22, 2018
Digital Power Meter	PF2010A	HZTE028-01	Aug. 10, 2017	Aug. 09, 2018
AC Power Supply	DPS1060	HZTE001-06	Aug. 10, 2017	Aug. 09, 2018
DC Power Supply	WY12010	HZTE004-03	Aug. 10, 2017	Aug. 09, 2018
Temperature Meter	TES1310	HZTE017-01	Aug. 17, 2017	Aug. 16, 2018
Standard source	D908	HZTE012-01	Aug. 20, 2017	Aug. 19, 2018
Integrate Sphere system	2M	HZTE015-01	Aug. 23, 2017	Aug. 22, 2018
Digital Power Meter	WT210	HZTE008-01	Aug. 10, 2017	Aug. 09, 2018
AC Power Supply	PCR 500L	HZTE001-07	Aug. 10, 2017	Aug. 09, 2018
DC Power Supply	IT6154	HZTE004-04	Aug. 10, 2017	Aug. 09, 2018
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 16, 2017	Aug. 15, 2018
Standard source	SCL-1400	HZTE012-02	Aug. 20, 2017	Aug. 19, 2018

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 FA19 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 FA19 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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