



LM-79-08 Test Report

for

GREEN CREATIVE LTD

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

Downlight

Model: 97993 12DL6DIM/940

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ17080054f

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

Review by:

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Sep. 01, 2017

Approved by:



Manager: Jim Zhang
Sep. 01, 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: 97993 12DL6DIM/940

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
97.0	1164.0	12.00	0.9755
CCT (K)	CRI	Stabilization Time (Light & Power)	
3871	92.0	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. 29, 2017

Date of Test : Aug. 30, 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

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Sample Photos



Figure 1- Overview of the sample

Equipment Under Test (EUT)

Name	: Downlight
Model	: 97993 12DL6DIM/940
Electrical Ratings	: 120V, 60Hz, 12W
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°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
Voltage frequency (Hz)	60
Test Current (A)	0.103
Power Factor	0.9755
Test Power (W)	12.00
THD A%	17.65
Luminous Efficacy (lm/W)	97.0
Total Luminous Flux (lm)	1164.0
Color Rendering Index (CRI)	92
R9	57.5
Correlated Color Temperature (CCT)(K)	3871
Chromaticity Chroma x	0.3874
Chromaticity Chroma y	0.3843
Chromaticity Chroma u	0.2266
Chromaticity Chroma v	0.3373
Duv	0.0014
Chromaticity Chroma u'	0.2266
Chromaticity Chroma v'	0.5059

Special Color Rendering Indices	
R1	91.9
R2	95.9
R3	97.9
R4	90.9
R5	91
R6	93.4
R7	92.7
R8	82.6
R9	57.5
R10	89.1
R11	91.1
R12	72.7
R13	93.2
R14	98.7
Rf	89
Rg	97

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 24.6°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)	0.103
Power Factor	0.9754
Test Power (W)	12.07
Luminous Efficacy (lm/W)	97.9
Total Luminous Flux (lm)	1181.2
Beam Angle (°)	99.3
Center Beam Candle Power (cd)	501
Spacing Criteria	1.20 (0°-180°)/ 1.20 (90°-270°)
Zonal Lumens in the 0°-60°Zone	85.81%
Zonal Lumens in the 60°-90°Zone	14.09%
Zonal Lumens in the 90°-120°Zone	0.02%
Zonal Lumens in the 120°-180°Zone	0.08%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

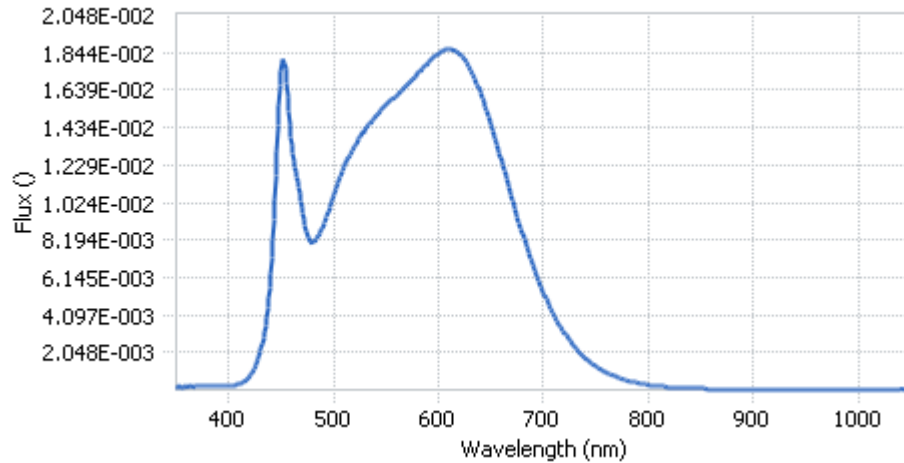
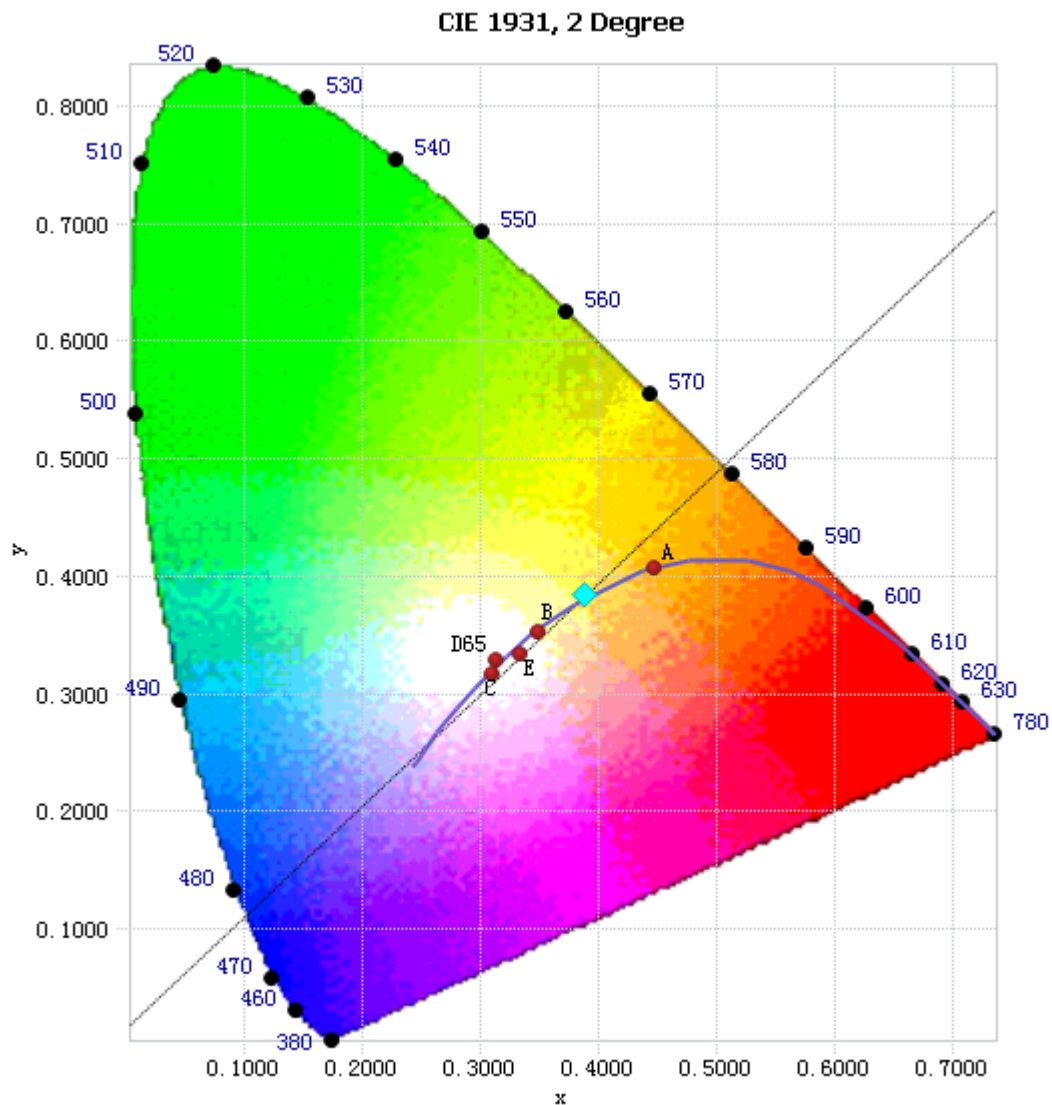


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.13E-04	485	8.39E-03	590	1.79E-02	695	6.00E-03
385	1.86E-04	490	8.93E-03	595	1.82E-02	700	5.32E-03
390	1.99E-04	495	9.74E-03	600	1.84E-02	705	4.66E-03
395	2.21E-04	500	1.07E-02	605	1.85E-02	710	4.06E-03
400	2.31E-04	505	1.15E-02	610	1.86E-02	715	3.56E-03
405	2.69E-04	510	1.22E-02	615	1.86E-02	720	3.10E-03
410	3.45E-04	515	1.28E-02	620	1.83E-02	725	2.70E-03
415	5.00E-04	520	1.34E-02	625	1.81E-02	730	2.35E-03
420	7.59E-04	525	1.38E-02	630	1.76E-02	735	2.01E-03
425	1.25E-03	530	1.43E-02	635	1.70E-02	740	1.74E-03
430	2.06E-03	535	1.46E-02	640	1.62E-02	745	1.49E-03
435	3.55E-03	540	1.50E-02	645	1.54E-02	750	1.28E-03
440	6.41E-03	545	1.53E-02	650	1.45E-02	755	1.11E-03
445	1.17E-02	550	1.56E-02	655	1.35E-02	760	9.51E-04
450	1.74E-02	555	1.58E-02	660	1.25E-02	765	8.21E-04
455	1.68E-02	560	1.61E-02	665	1.15E-02	770	7.02E-04
460	1.34E-02	565	1.64E-02	670	1.04E-02	775	6.01E-04
465	1.16E-02	570	1.67E-02	675	9.47E-03	780	5.13E-04
470	9.99E-03	575	1.69E-02	680	8.57E-03		
475	8.37E-03	580	1.73E-02	685	7.66E-03		
480	8.08E-03	585	1.76E-02	690	6.81E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3874, 0.3843)

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

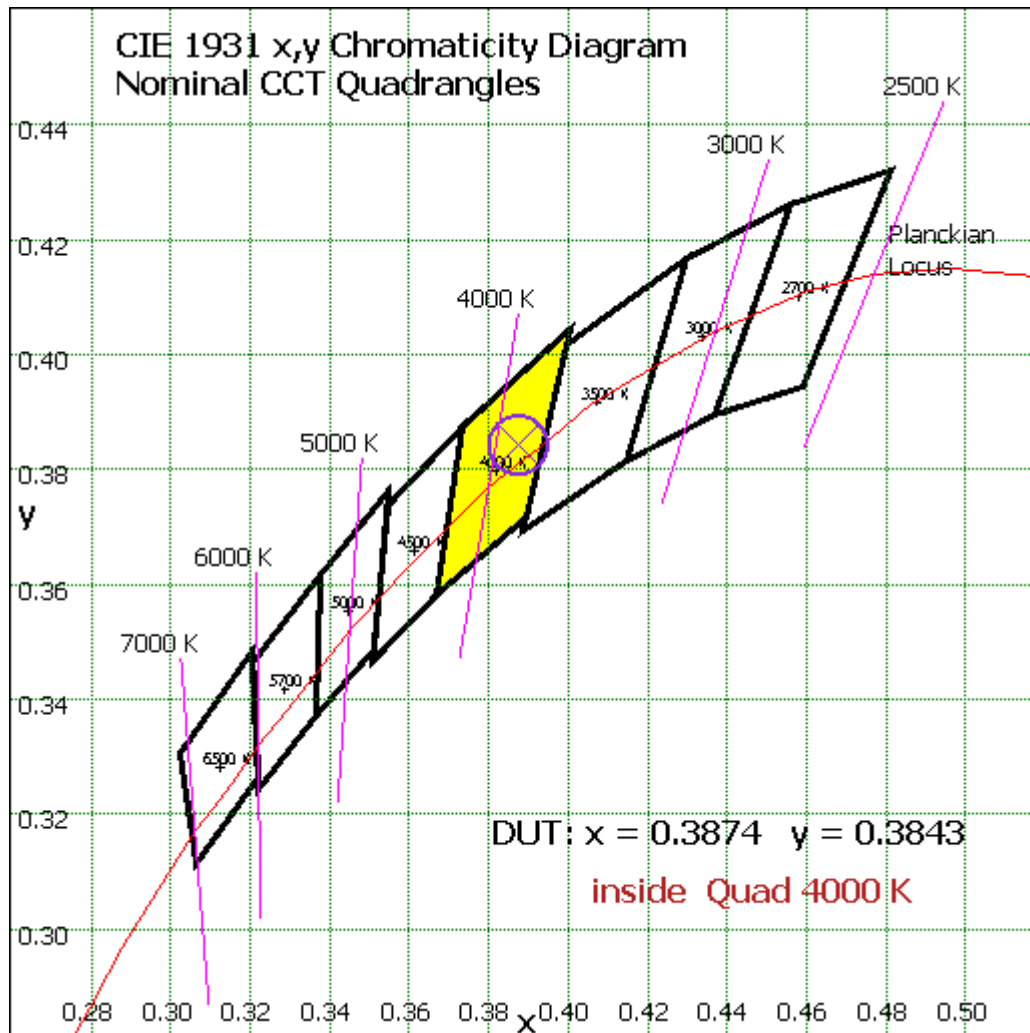


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	47.24	4.00%
10- 20	133.605	11.31%
20- 30	197.773	16.74%
30- 40	230.197	19.49%
40- 50	224.302	18.99%
50- 60	180.44	15.28%
60- 70	113.911	9.64%
70- 80	44.821	3.79%
80- 90	7.716	0.65%
90-100	0.026	0.00%
100-110	0.064	0.01%
110-120	0.108	0.01%
120-130	0.157	0.01%
130-140	0.212	0.02%
140-150	0.233	0.02%
150-160	0.198	0.02%
160-170	0.131	0.01%
170-180	0.046	0.00%
Total	1181.2	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	1013.557	85.81%
60- 90	166.448	14.09%
0-90	1180.005	99.90%
90- 180	1.175	0.10%
0- 180	1181.2	100%

Table 5: Zonal Lumen Data

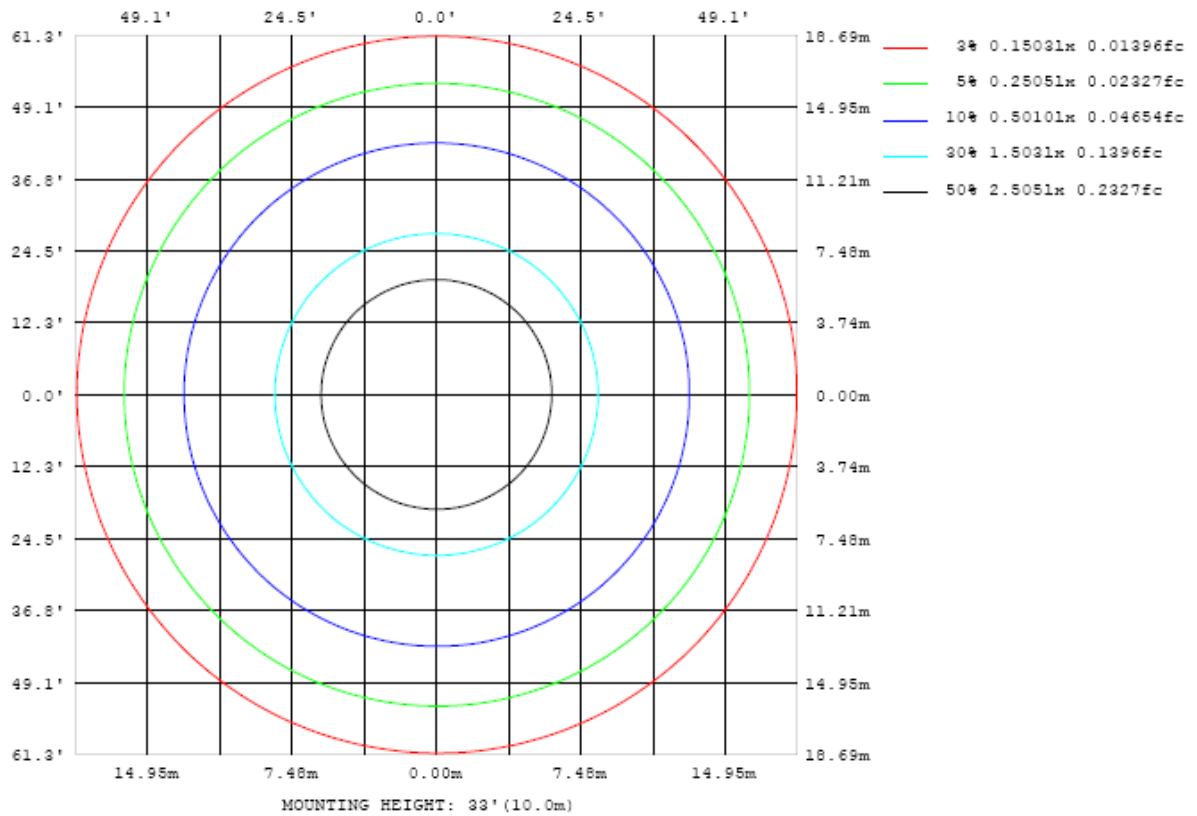


Chart 4: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

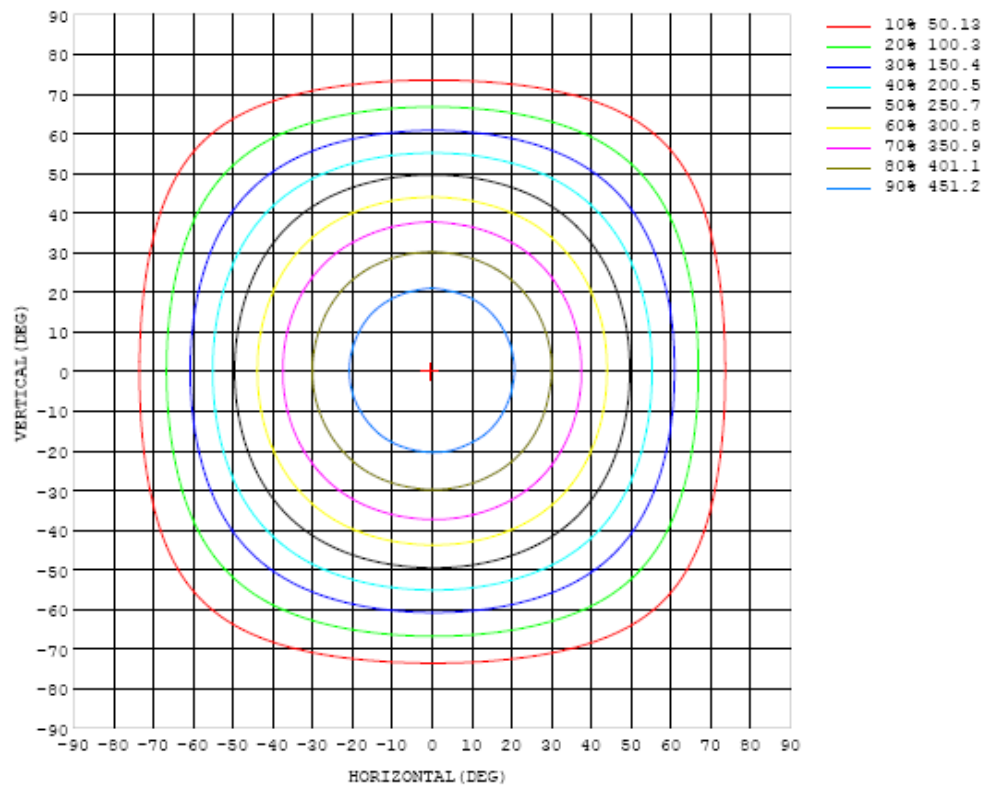


Chart 5: Isocandela Plot

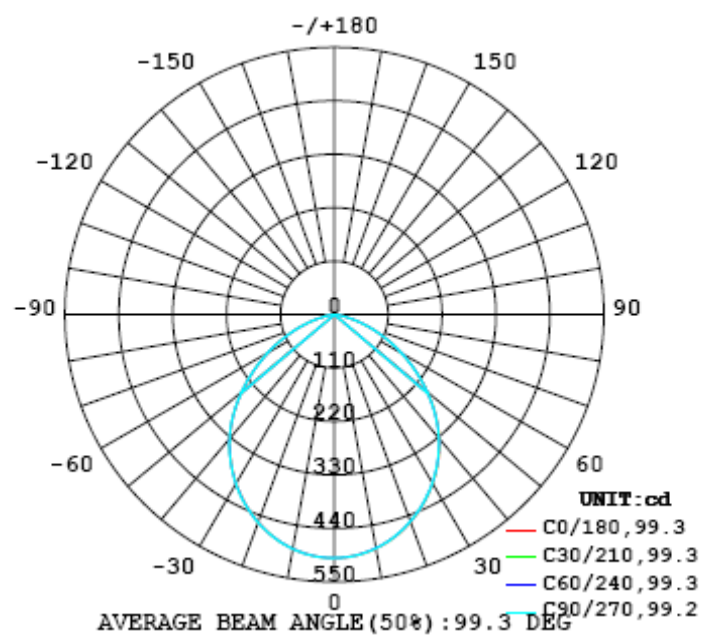


Chart 6: Polar Candela Distribution

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	501	501	501	501	501	501	501	501	501	501	501	501	501	501	501	501	501	501	501
5	498	497	497	497	498	497	498	497	498	498	497	497	498	498	498	498	498	499	498
10	489	488	488	488	488	488	488	488	488	488	488	488	489	489	488	489	489	490	490
15	474	473	473	473	474	473	473	473	473	473	473	473	473	473	473	474	474	475	475
20	454	454	453	453	454	453	453	453	453	453	452	453	453	453	453	453	454	454	455
25	430	429	429	429	429	429	428	428	428	428	428	428	428	429	428	429	429	430	430
30	401	400	400	401	401	400	400	400	400	400	399	399	399	400	400	400	400	401	401
35	369	368	368	368	368	368	368	367	367	367	367	366	367	367	367	367	368	368	369
40	333	332	332	332	333	332	332	331	331	331	330	330	331	331	331	331	332	332	333
45	292	292	292	292	292	292	291	291	291	290	290	290	290	290	290	290	291	291	292
50	248	248	248	248	248	247	247	247	247	246	246	246	246	246	246	246	246	246	247
55	203	203	203	203	203	203	202	202	202	201	201	201	201	201	201	201	201	201	201
60	158	158	158	158	158	158	158	158	157	157	157	157	157	156	156	156	156	156	157
65	116	116	116	116	116	115	115	115	115	115	114	114	114	114	114	114	114	114	115
70	75.7	75.7	75.7	75.8	75.8	75.6	75.4	75.3	75.1	75.0	74.8	74.6	74.5	74.4	74.3	74.2	74.2	74.1	74.8
75	41.3	41.3	41.3	41.3	41.3	41.2	41.1	41.0	40.9	40.9	40.8	40.7	40.7	40.6	40.5	40.5	40.5	40.5	40.8
80	16.6	16.6	16.6	16.6	16.5	16.5	16.5	16.5	16.5	16.5	16.5	16.5	16.6	16.6	16.7	16.7	16.8	16.8	17.7
85	6.66	6.64	6.63	6.63	6.61	6.60	6.58	6.59	6.60	6.63	6.65	6.67	6.71	6.76	6.79	6.84	6.88	6.91	7.00
90	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.01	0.01	0.02	0.01	0.01	0.01	0.02	0.02	0.01	0.01	0.01
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	0.02	0.03
100	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
105	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.07
110	0.07	0.07	0.08	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.07	0.08	0.07	0.08	0.07	0.09
115	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.12
120	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.15
125	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.17	0.16	0.16	0.16	0.17	0.17	0.18
130	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.24
135	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.31
140	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.37
145	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.43
150	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.47
155	0.36	0.36	0.36	0.37	0.36	0.36	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.49
160	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.51
165	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.51
170	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.45	0.44	0.44	0.44	0.45	0.44	0.45	0.45	0.45	0.45	0.50
175	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.49	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.49
180	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.50	0.50	0.50	0.50	0.50	0.49	0.49	0.49	0.49	0.49	0.49

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	501	501	501	501	501	501	501	501	501	501	501	501	501	501	501	501	501		
5	498	498	498	498	498	498	498	498	499	498	498	499	499	498	498	498	498		
10	489	489	489	490	490	489	490	490	490	489	489	489	490	489	489	489	489		
15	474	474	475	476	475	475	475	475	475	475	474	475	475	475	474	474	474		
20	455	455	455	455	455	455	456	455	455	455	455	455	455	455	455	454	455		
25	431	430	430	431	431	431	431	431	431	431	430	431	431	430	430	430	430		
30	402	401	402	402	402	402	402	402	402	402	402	402	402	402	402	402	402		
35	369	369	369	369	370	369	370	370	370	369	369	370	370	370	369	369	369		
40	333	332	333	333	334	333	334	334	333	333	333	334	334	333	333	333	333		
45	292	292	292	292	292	292	292	292	292	292	292	292	293	292	292	293	293		
50	247	247	247	248	248	247	247	248	247	247	248	248	248	248	248	248	248		
55	202	201	202	202	201	201	202	202	202	202	202	203	203	202	203	203	203		
60	157	157	157	157	157	157	157	157	158	158	158	158	158	158	159	159	159		
65	114	114	114	114	114	114	114	115	115	115	115	116	116	116	116	116	116		
70	74.5	74.6	74.6	74.5	74.6	74.5	74.7	74.9	75.3	75.2	75.2	75.6	75.7	76.1	76.1	76.2	76.5		
75	40.7	40.7	40.6	40.7	40.5	40.7	40.8	40.9	41.0	40.9	41.0	41.3	41.3	41.4	41.5	41.6	41.7		
80	17.7	17.3	17.7	17.7	17.7	17.4	17.4	17.4	17.4	17.4	17.4	17.3	17.4	17.4	17.3	17.4	17.3		
85	7.02	7.03	7.04	7.03	7.01	6.98	6.95	6.93	6.91	6.89	6.84	6.83	6.80	6.78	6.75	6.74	6.71		
90	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	0.01	0.02	0.02	0.02		
95	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		
100	0.04	0.05	0.05	0.05	0.04	0.05	0.05	0.05	0.04	0.04	0.05	0.04	0.05	0.04	0.05	0.05	0.05		
105	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07		
110	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	0.09		
115	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12		
120	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.14	0.14	0.14	0.15	0.14	0.14	0.14	0.15	0.15		
125	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18		
130	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24		
135	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.30	0.30	0.31	0.30	0.30	0.31	0.31	0.31		
140	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37		
145	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43		
150	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47		
155	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49		
160	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51		
165	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51		
170	0.50	0.50	0.50	0.51	0.50	0.51	0.51	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50		
175	0.50	0.50	0.50	0.50	0.49	0.49	0.49	0.50	0.50	0.49	0.49	0.50	0.50	0.49	0.49	0.50	0.50		
180	0.49	0.49	0.49	0.49	0.49	0.50	0.50	0.50	0.50	0.50	0.49	0.49	0.49	0.49	0.49	0.49	0.49		

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. 15, 2017	Aug. 14, 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. 15, 2017	Aug. 14, 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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