



LM-79-08 Test Report

for

GREEN CREATIVE LTD

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

Downlight

Model: 97992 12DL6DIM/930

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ17080054e

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

Review by:

Engineer: April Zou
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: 97992 12DL6DIM/930

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
88.9	1052.0	11.83	0.9748
CCT (K)	CRI	Stabilization Time (Light & Power)	
2960	92.9	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	: 97992 12DL6DIM/930
Electrical Ratings	: 120V, 60Hz, 12W
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
Voltage frequency (Hz)	60
Test Current (A)	0.101
Power Factor	0.9748
Test Power (W)	11.83
THD A%	17.98
Luminous Efficacy (lm/W)	88.9
Total Luminous Flux (lm)	1052.0
Color Rendering Index (CRI)	92.9
R9	58.2
Correlated Color Temperature (CCT)(K)	2960
Chromaticity Chroma x	0.4395
Chromaticity Chroma y	0.4048
Chromaticity Chroma u	0.2519
Chromaticity Chroma v	0.3480
Duv	0.0003
Chromaticity Chroma u'	0.2519
Chromaticity Chroma v'	0.5221

Special Color Rendering Indices	
R1	93.3
R2	97.6
R3	98.5
R4	92.4
R5	93.2
R6	96.8
R7	90.9
R8	80.8
R9	58.2
R10	93.6
R11	93.6
R12	83
R13	94.7
R14	99.8
Rf	91
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 24.6°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	0.9749
Test Power (W)	12.03
Luminous Efficacy (lm/W)	88.7
Total Luminous Flux (lm)	1066.7
Beam Angle (°)	99.1
Center Beam Candle Power (cd)	452
Spacing Criteria	1.19 (0°-180°)/ 1.21 (90°-270°)
Zonal Lumens in the 0°-60°Zone	85.77%
Zonal Lumens in the 60°-90°Zone	14.14%
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

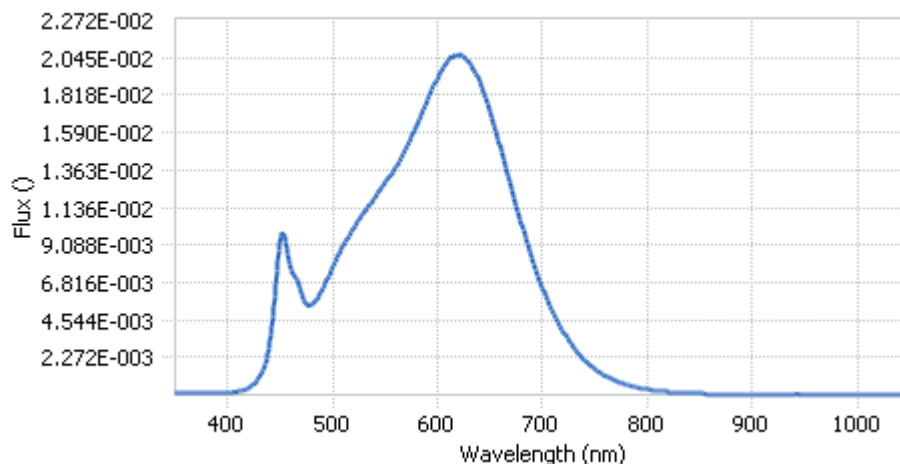


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.54E-04	485	5.82E-03	590	1.78E-02	695	7.34E-03
385	1.40E-04	490	6.35E-03	595	1.86E-02	700	6.49E-03
390	1.49E-04	495	7.05E-03	600	1.92E-02	705	5.70E-03
395	1.52E-04	500	7.77E-03	605	1.98E-02	710	4.98E-03
400	1.64E-04	505	8.46E-03	610	2.02E-02	715	4.35E-03
405	1.80E-04	510	9.05E-03	615	2.05E-02	720	3.80E-03
410	2.25E-04	515	9.62E-03	620	2.06E-02	725	3.31E-03
415	2.94E-04	520	1.01E-02	625	2.05E-02	730	2.86E-03
420	4.32E-04	525	1.06E-02	630	2.02E-02	735	2.46E-03
425	6.55E-04	530	1.11E-02	635	1.97E-02	740	2.12E-03
430	1.06E-03	535	1.15E-02	640	1.90E-02	745	1.82E-03
435	1.78E-03	540	1.19E-02	645	1.81E-02	750	1.57E-03
440	3.24E-03	545	1.24E-02	650	1.72E-02	755	1.35E-03
445	5.99E-03	550	1.28E-02	655	1.61E-02	760	1.16E-03
450	9.21E-03	555	1.33E-02	660	1.50E-02	765	9.91E-04
455	9.26E-03	560	1.38E-02	665	1.38E-02	770	8.55E-04
460	7.69E-03	565	1.43E-02	670	1.26E-02	775	7.28E-04
465	7.08E-03	570	1.50E-02	675	1.15E-02	780	6.28E-04
470	6.33E-03	575	1.56E-02	680	1.03E-02		
475	5.51E-03	580	1.63E-02	685	9.29E-03		
480	5.50E-03	585	1.71E-02	690	8.27E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method

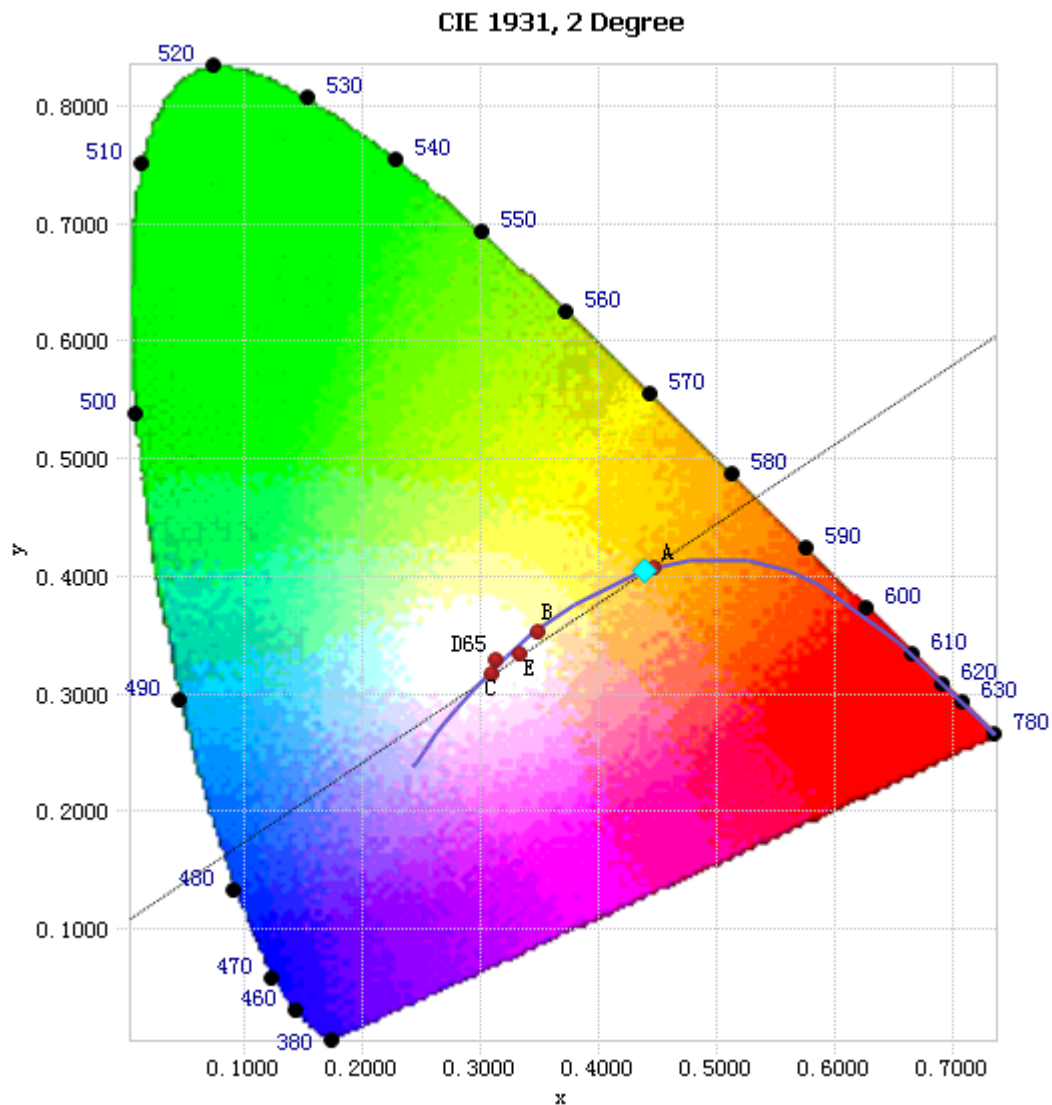


Chart 2: Chromaticity Diagram per Sphere - Spectroradiometer Method

Note: The location on the diagram of the tristimulus coordinates are indicated by the blue diamond.

Nominal CCT Quadrangles – Sphere Spectroradiometer Method

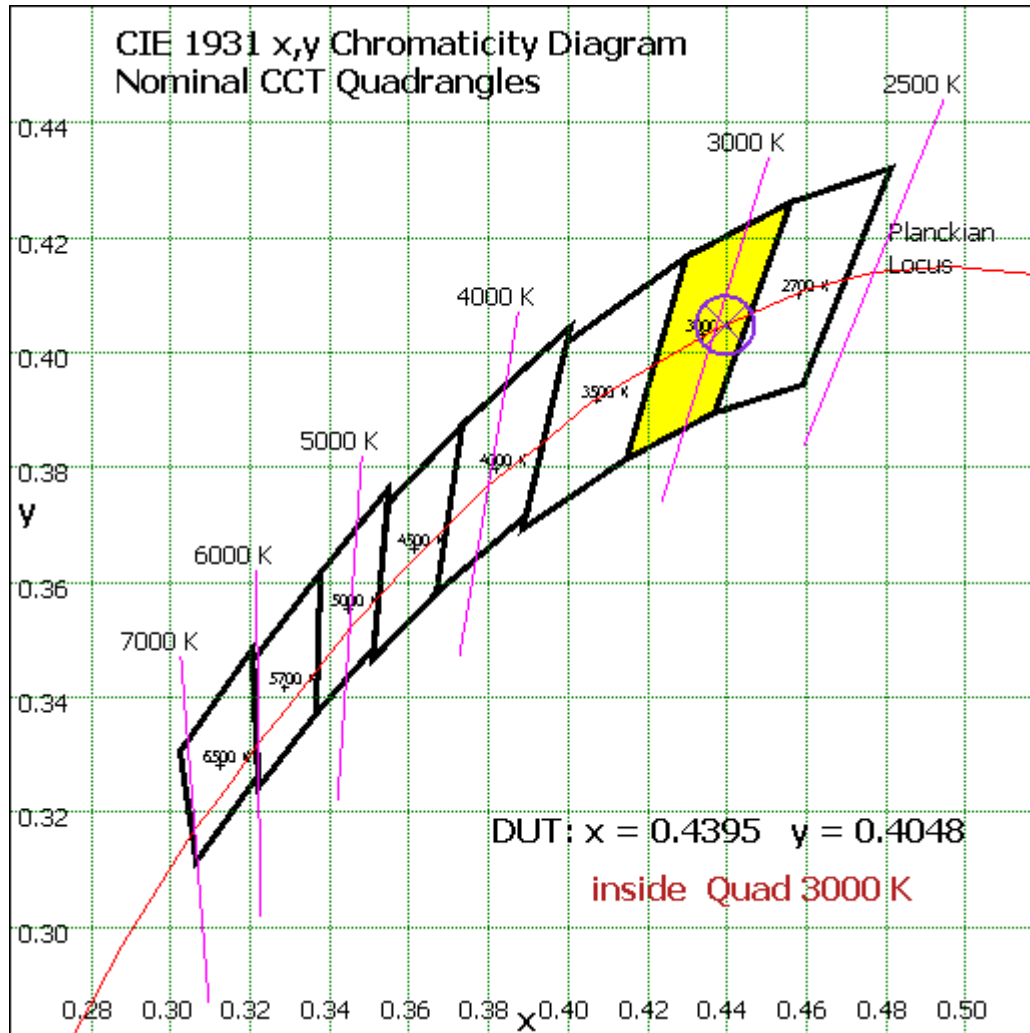


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	42.636	4.00%
10- 20	120.693	11.31%
20- 30	178.727	16.75%
30- 40	207.918	19.49%
40- 50	202.341	18.97%
50- 60	162.561	15.24%
60- 70	102.593	9.62%
70- 80	40.829	3.83%
80- 90	7.363	0.69%
90-100	0.025	0.00%
100-110	0.057	0.01%
110-120	0.097	0.01%
120-130	0.142	0.01%
130-140	0.192	0.02%
140-150	0.211	0.02%
150-160	0.178	0.02%
160-170	0.117	0.01%
170-180	0.041	0.00%
Total	1066.7	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	914.876	85.77%
60- 90	150.785	14.14%
0-90	1065.661	99.90%
90- 180	1.06	0.10%
0- 180	1066.7	100%

Table 5: Zonal Lumen Data

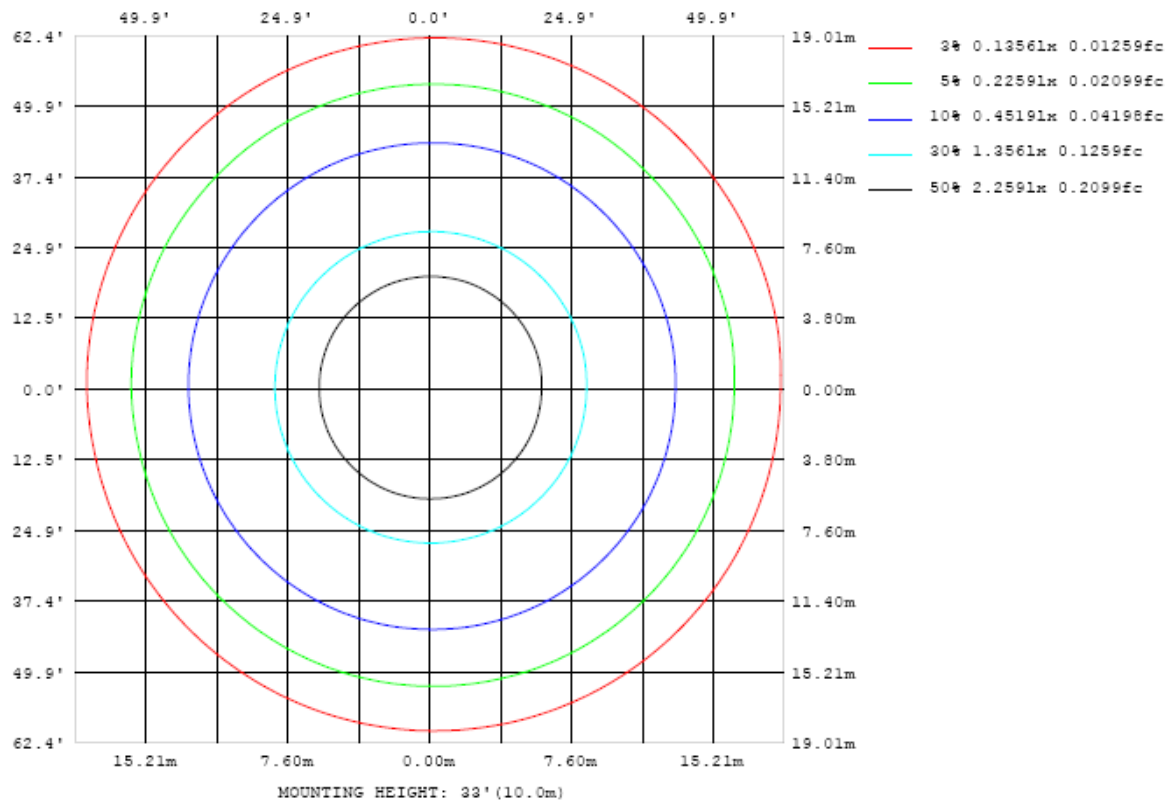


Chart 4: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

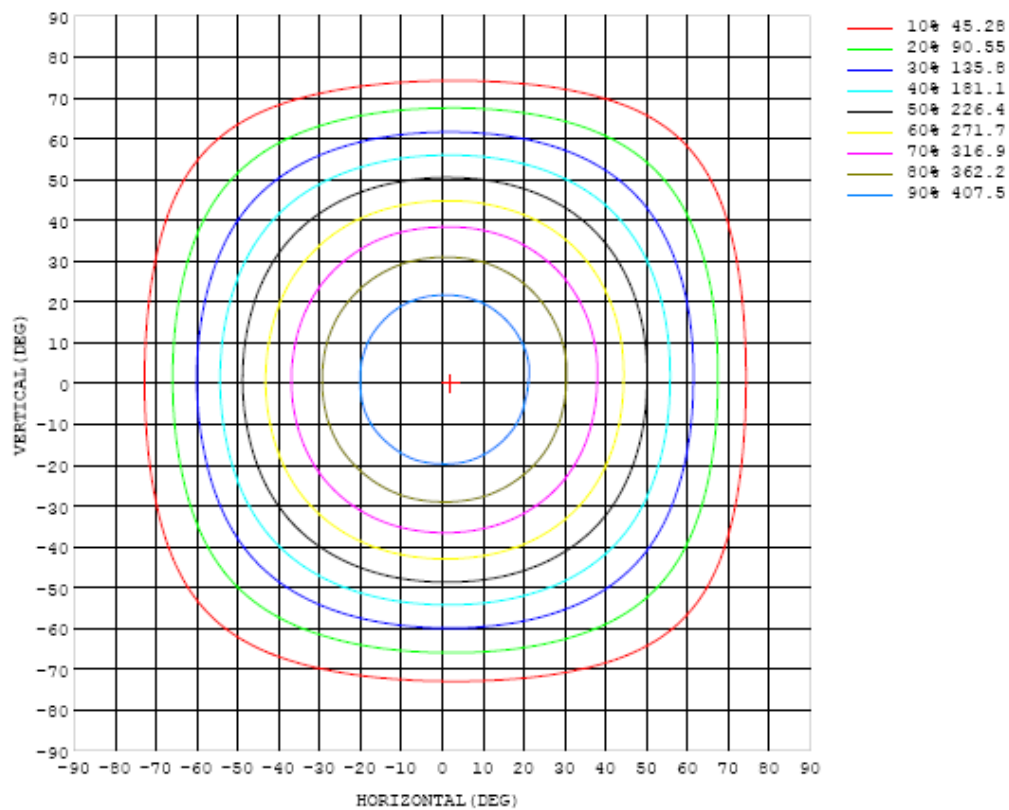


Chart 5: Isocandela Plot

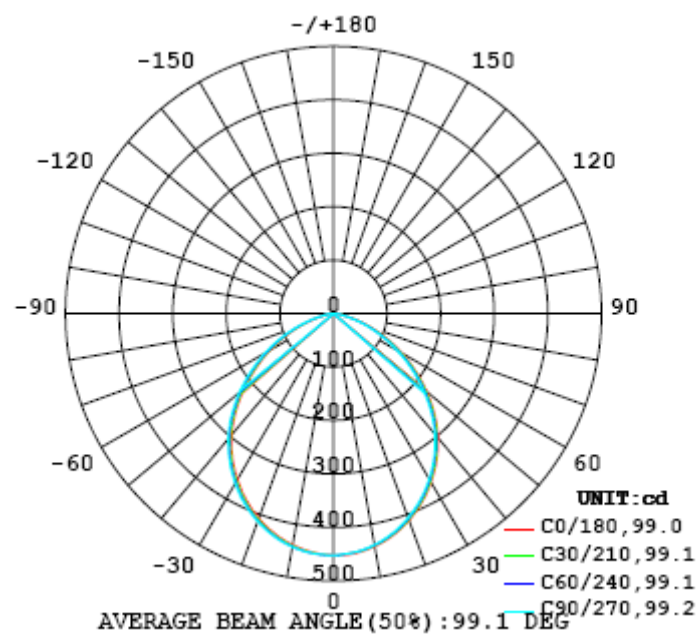


Chart 6: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1

UNIT: cd

C (DEG) γ (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	452	452	452	452	452	452	452	452	452	452	452	452	452	452	452	452	452	452	452
5	451	449	448	448	448	448	448	448	448	448	448	449	448	449	449	449	449	447	448
10	442	441	441	441	440	440	440	440	439	439	439	439	439	439	440	440	440	439	439
15	429	428	428	428	427	426	426	426	425	425	425	425	425	425	425	426	426	426	426
20	412	411	410	410	409	408	408	408	407	406	406	407	406	406	407	407	408	408	408
25	390	389	388	388	387	386	385	385	384	383	383	383	383	383	383	384	385	385	385
30	364	363	362	362	360	360	359	359	357	357	356	357	356	356	357	357	358	358	358
35	335	334	333	332	331	330	329	329	328	327	327	327	326	326	327	327	328	328	329
40	303	302	301	300	299	298	297	296	294	294	293	293	293	292	293	293	294	295	296
45	267	265	264	263	262	260	259	258	257	256	255	255	254	254	254	255	255	256	258
50	227	226	225	224	222	221	219	218	217	216	215	214	214	213	213	214	214	215	217
55	187	186	185	183	182	180	179	178	176	175	174	173	172	172	172	173	173	174	176
60	147	146	145	143	142	140	139	138	136	135	134	133	133	132	132	132	133	134	136
65	109	107	106	105	104	102	101	99.9	98.6	97.4	96.5	95.7	95.0	94.6	94.5	94.5	95.0	95.5	97.5
70	72.6	71.7	71.0	69.9	68.5	67.6	66.8	65.5	64.5	63.3	62.5	61.8	61.1	60.8	60.6	60.5	60.8	61.3	62.8
75	41.3	40.7	40.0	39.2	38.3	37.4	36.5	35.6	34.7	34.0	33.3	32.7	32.2	31.9	31.7	31.8	31.8	32.1	33.3
80	17.8	17.6	17.2	16.8	16.4	16.0	15.5	15.1	14.7	14.3	14.0	13.7	13.4	13.3	13.1	13.1	13.1	13.2	13.9
85	7.74	7.62	7.48	7.32	7.06	6.85	6.58	6.32	6.07	5.83	5.59	5.45	5.21	5.14	5.03	4.97	4.95	5.01	5.31
90	0.19	0.17	0.13	0.08	0.05	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	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	0.02
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	0.04	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	0.05	0.05	0.05	0.05	0.06
110	0.06	0.06	0.06	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	0.08
115	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	0.10	0.10	0.10	0.09	0.09	0.11
120	0.11	0.11	0.11	0.11	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	0.13
125	0.14	0.14	0.14	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.17
130	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.21
135	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.22	0.27
140	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.27	0.26	0.26	0.26	0.26	0.33
145	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.30	0.30	0.30	0.29	0.30	0.29	0.29	0.29	0.29	0.38
150	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.30	0.41
155	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.32	0.42
160	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.34	0.43
165	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	0.37	0.43
170	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.42
175	0.44	0.44	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	0.44	0.44
180	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45

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	452	452	452	452	452	452	452	452	452	452	452	452	452	452	452	452	452		
5	449	449	449	449	450	450	451	450	450	451	451	451	451	450	451	451	451		
10	440	441	441	442	442	443	443	443	443	444	444	444	444	444	444	444	444		
15	427	428	428	429	429	430	431	431	431	432	432	432	432	432	432	432	431		
20	409	410	410	411	412	413	414	414	414	415	415	416	415	415	415	415	414		
25	386	387	388	389	390	391	392	392	393	394	394	394	394	394	394	393	393		
30	360	361	362	363	365	365	367	367	368	368	369	369	369	369	368	368	367		
35	330	331	333	334	335	336	337	338	338	339	340	341	340	340	340	339	338		
40	297	299	299	301	302	303	305	305	307	307	309	309	308	308	308	307	306		
45	259	261	262	263	265	266	268	269	270	271	272	273	273	272	272	271	270		
50	218	220	221	222	224	226	227	229	230	231	232	233	233	233	232	232	230		
55	177	178	180	181	183	185	186	188	189	190	191	192	192	192	191	191	190		
60	137	138	140	141	143	144	146	147	149	150	151	152	152	152	152	151	150		
65	98.7	99.8	101	103	104	105	107	108	109	110	111	112	112	112	112	112	111		
70	63.5	64.5	65.6	66.8	67.8	69.2	70.4	71.7	72.8	73.8	74.7	75.3	75.5	75.8	75.8	75.5	75.0		
75	33.7	34.3	35.1	35.9	36.8	37.7	38.6	39.6	40.5	41.2	42.1	42.8	43.0	43.2	43.3	43.1	42.6		
80	14.3	14.4	14.9	15.2	15.7	16.1	16.6	17.0	17.7	17.8	18.2	18.5	18.7	18.8	19.2	19.0	18.7		
85	5.38	5.55	5.71	5.92	6.15	6.39	6.64	6.86	7.14	7.37	7.60	7.82	7.95	8.06	8.13	8.12	8.05		
90	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.02	0.03	0.07	0.14	0.22	0.29	0.35	0.38	0.40	0.39		
95	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	0.02	0.02	0.02		
100	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		
105	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06		
110	0.09	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08		
115	0.11	0.11	0.11	0.10	0.11	0.11	0.11	0.11	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10		
120	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.12	0.12	0.12	0.13	0.13	0.13		
125	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16		
130	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.21	0.21	0.21	0.21	0.21	0.21	0.21		
135	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.27	0.28	0.27	0.27	0.27	0.27	0.26		
140	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33		
145	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.38	0.38	0.38	0.38	0.39	0.38		
150	0.43	0.43	0.43	0.42	0.43	0.43	0.43	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.41		
155	0.45	0.45	0.45	0.45	0.45	0.44	0.45	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.45	0.43		
160	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.44		
165	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.44		
170	0.46	0.45	0.45	0.45	0.45	0.45	0.46	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.43		
175	0.44	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.44		
180	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45		

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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