LM-79-08 Test Report

for

GREEN CREATIVE LTD

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

LED lamp

Model: 9BR30DIM/827

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ18110032c

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

Review by: April Zou

Engineer: April Zou
Nov. 27, 2018

Approved by: Jim Zhang

Manager: Jim Zhang
Nov. 27, 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: **9BR30DIM/827**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
93.8	775.8	8.27	0.7307

CCT (K)	CRI	Stabilization Time (Light & Power)
2757	82.2	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	: Nov. 20, 2018
Date of Test	: Nov. 22, 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	: 9BR30DIM/827
Electrical Ratings	: 120V, 60Hz, 9W
Product Description	: E26 Base, 2700K
Manufacturer	: GREEN CREATIVE LTD
Address	: 756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai

TEST RESULTS

Test ambient temperature was 24.9℃.

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)	0.094
Power Factor	0.7307
Test Power (W)	8.27
THD A%	90.81
Luminous Efficacy (lm/W)	93.8
Total Luminous Flux (lm)	775.8
Color Rendering Index (CRI)	82.2
R9	6.8
Correlated Color Temperature (CCT)(K)	2757
Chromaticity Chroma x	0.4522
Chromaticity Chroma y	0.4042
Chromaticity Chroma u	0.2604
Chromaticity Chroma v	0.3492
Duv	0.0019
Chromaticity Chroma u ’	0.2604
Chromaticity Chroma v’	0.5237

Special Color Rendering Indices	
R1	81.4
R2	93.2
R3	93
R4	79.1
R5	82
R6	92.7
R7	79.9
R8	56.2
R9	6.8
R10	85
R11	78.7
R12	78.6
R13	84.4
R14	96.9
Rf	83
Rg	95

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)	0.093
Power Factor	0.7340
Test Power (W)	8.25
Luminous Efficacy (lm/W)	95.5
Total Luminous Flux (lm)	787.5
Beam Angle (°)	102.1
Center Beam Candle Power (cd)	265
Spacing Criteria	1.15 (0°-180°)/ 1.18 (90°-270°)
Zonal Lumens in the 0°-60°Zone	68.90%
Zonal Lumens in the 60°-90°Zone	23.54%
Zonal Lumens in the 90°-120°Zone	6.16%
Zonal Lumens in the 120°-180°Zone	1.39%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

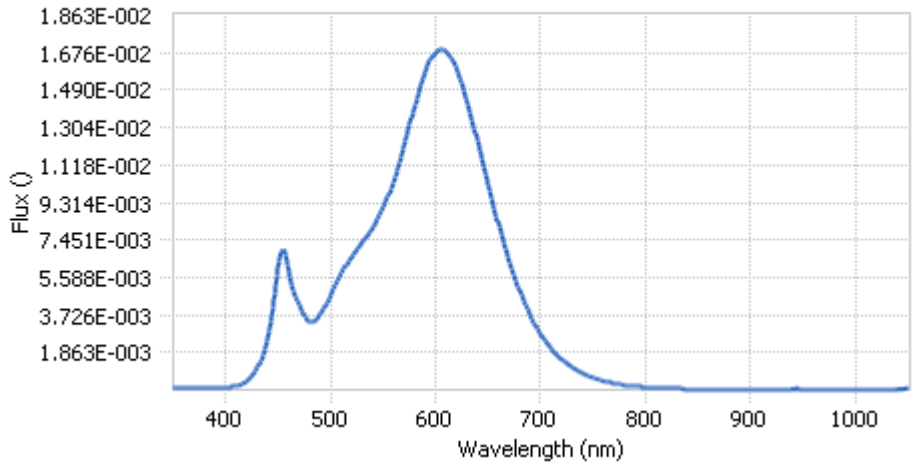
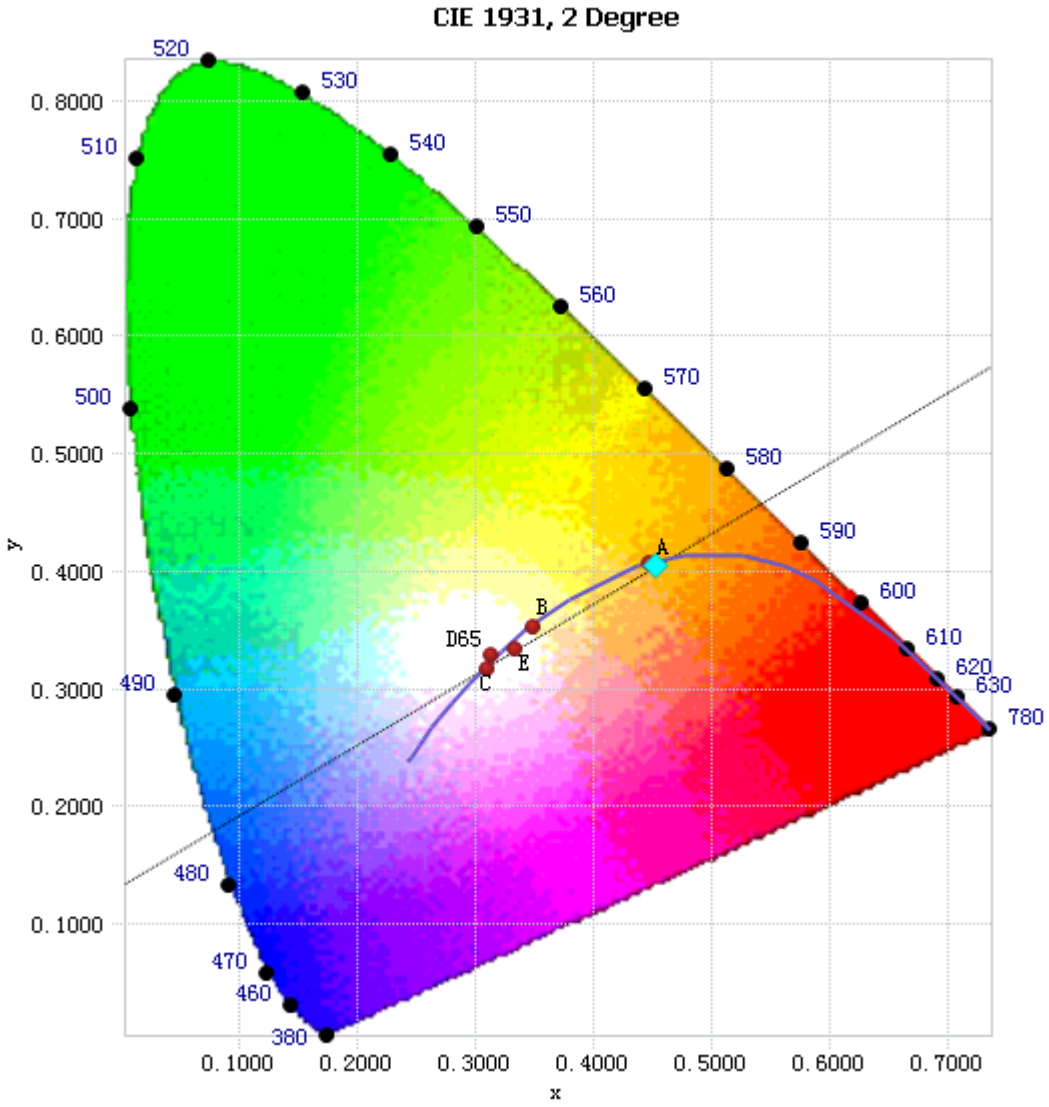


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.00E-04	485	3.44E-03	590	1.58E-02	695	3.23E-03
385	9.22E-05	490	3.76E-03	595	1.64E-02	700	2.79E-03
390	9.69E-05	495	4.19E-03	600	1.68E-02	705	2.40E-03
395	1.08E-04	500	4.72E-03	605	1.69E-02	710	2.06E-03
400	1.16E-04	505	5.27E-03	610	1.68E-02	715	1.77E-03
405	1.48E-04	510	5.77E-03	615	1.65E-02	720	1.54E-03
410	2.02E-04	515	6.23E-03	620	1.59E-02	725	1.32E-03
415	2.87E-04	520	6.62E-03	625	1.52E-02	730	1.13E-03
420	4.46E-04	525	6.96E-03	630	1.43E-02	735	9.66E-04
425	6.90E-04	530	7.34E-03	635	1.34E-02	740	8.27E-04
430	1.07E-03	535	7.68E-03	640	1.23E-02	745	7.07E-04
435	1.67E-03	540	8.05E-03	645	1.13E-02	750	6.03E-04
440	2.59E-03	545	8.55E-03	650	1.02E-02	755	5.25E-04
445	4.06E-03	550	9.07E-03	655	9.21E-03	760	4.51E-04
450	6.04E-03	555	9.68E-03	660	8.23E-03	765	3.90E-04
455	6.96E-03	560	1.04E-02	665	7.29E-03	770	3.33E-04
460	5.87E-03	565	1.12E-02	670	6.43E-03	775	2.86E-04
465	4.84E-03	570	1.22E-02	675	5.65E-03	780	2.45E-04
470	4.28E-03	575	1.31E-02	680	4.94E-03		
475	3.66E-03	580	1.41E-02	685	4.31E-03		
480	3.34E-03	585	1.50E-02	690	3.74E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4522, 0. 4042)

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

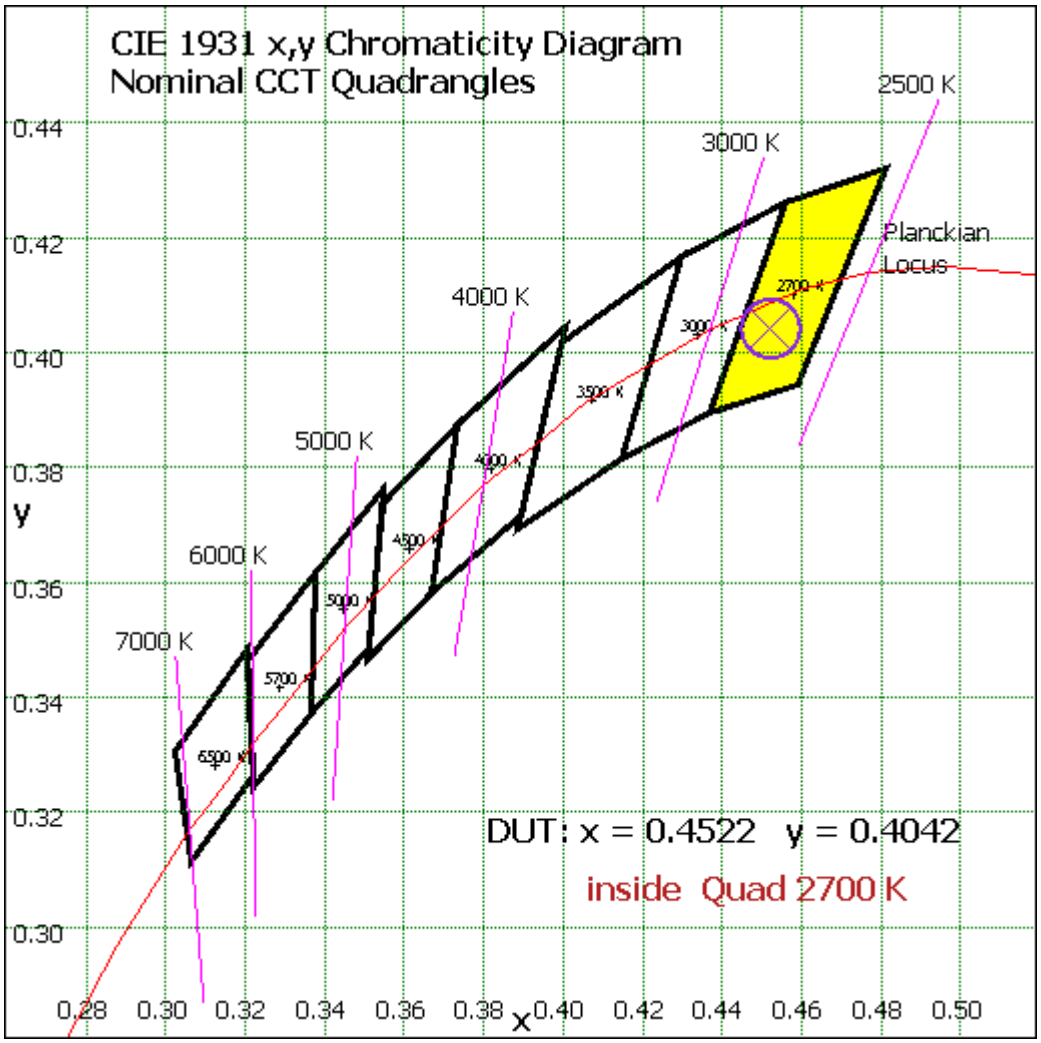


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Zonal Lumen Tabulation- Goniophotometer Method

γ(°)	Lumens	% Total
0- 10	24.98	3.17%
10- 20	70.193	8.91%
20- 30	102.844	13.06%
30- 40	118.967	15.11%
40- 50	119.121	15.13%
50- 60	106.525	13.53%
60- 70	85.659	10.88%
70- 80	61.228	7.77%
80- 90	38.537	4.89%
90-100	23.441	2.98%
100-110	15.316	1.94%
110-120	9.794	1.24%
120-130	5.786	0.73%
130-140	3.073	0.39%
140-150	1.381	0.18%
150-160	0.484	0.06%
160-170	0.162	0.02%
170-180	0.047	0.01%
Total	787.5	100%

γ(°)	Lumens	% Total
0- 60	542.63	68.90%
60- 90	185.424	23.54%
0-90	728.054	92.45%
90- 180	59.484	7.55%
0- 180	787.5	100%

Table 5: Zonal Lumen Data

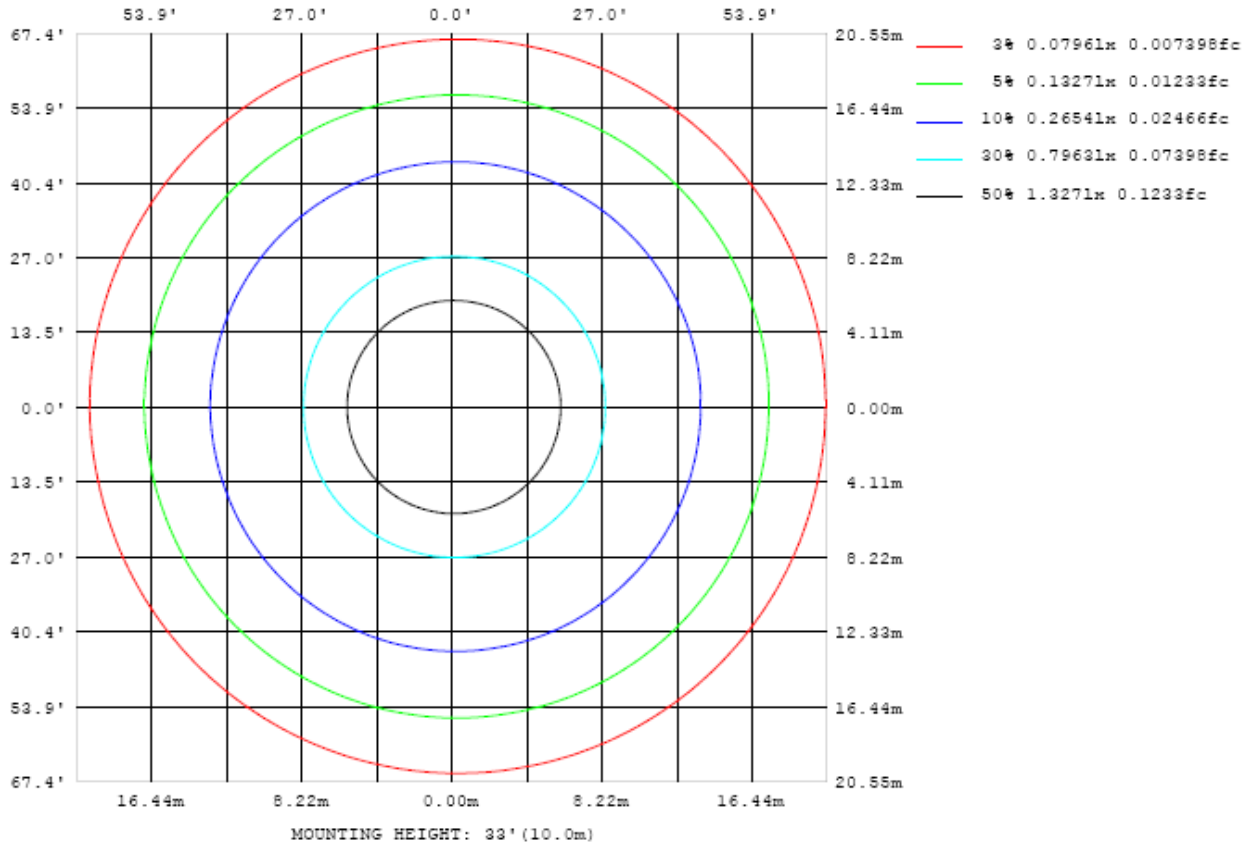


Chart 4: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

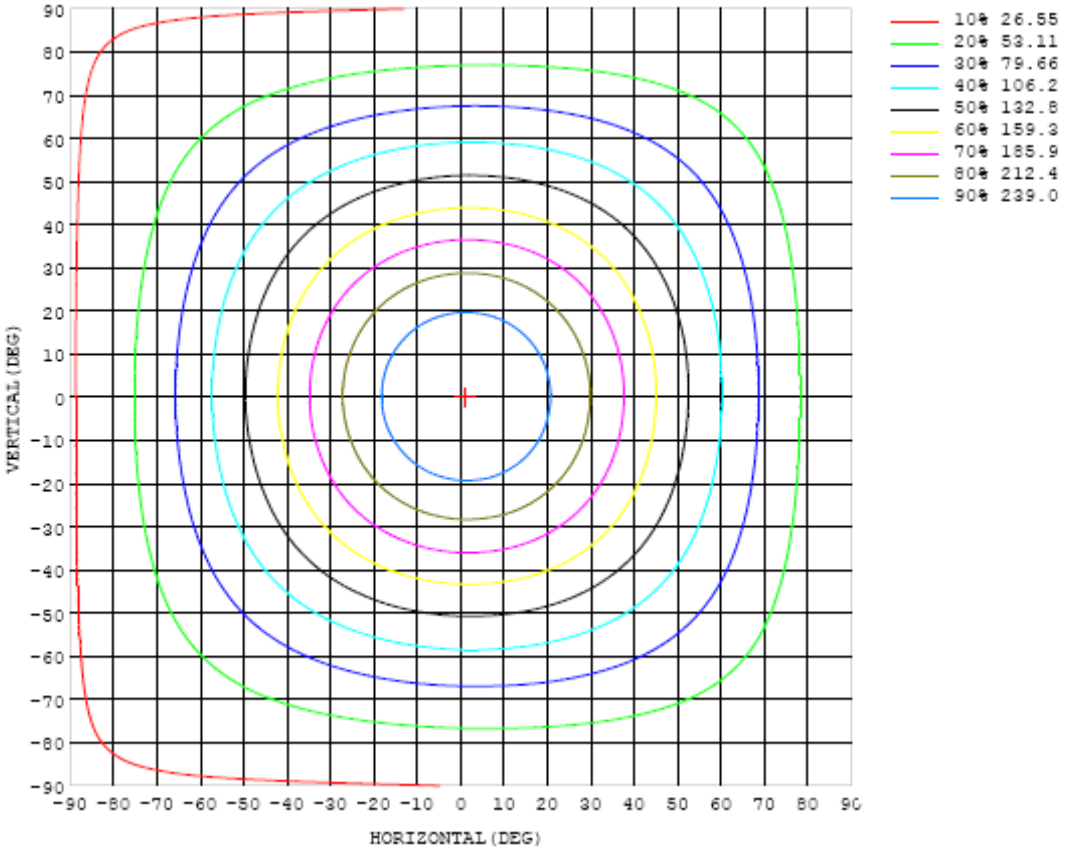


Chart 5: Isocandela Plot

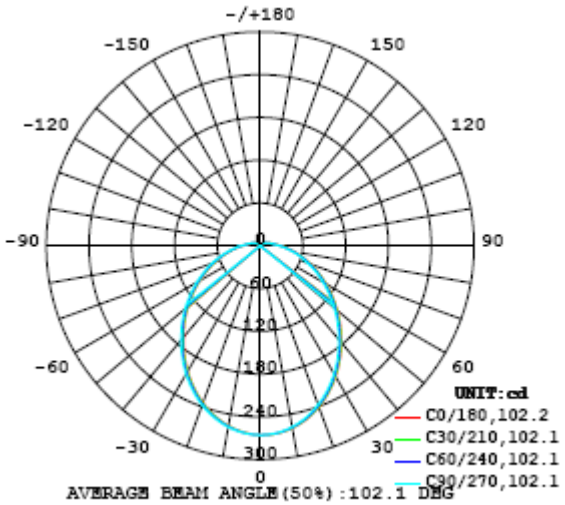


Chart 6: Polar Candela Distribution

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	265	265	265	265	265	265	265	265	265	265	265	265	265	265	265	265	265	265	265
5	264	264	264	264	264	264	264	264	264	264	263	263	263	263	263	263	263	263	263
10	260	260	259	259	259	259	259	258	258	258	257	257	257	257	257	256	256	256	256
15	252	251	251	251	251	251	250	250	249	249	248	248	247	247	247	247	247	247	247
20	241	240	240	240	240	239	239	238	238	237	236	236	235	235	235	234	234	234	234
25	227	227	227	227	226	225	225	224	223	223	222	221	221	220	220	220	219	219	220
30	212	212	211	211	210	210	209	208	208	207	206	205	205	204	203	203	203	203	203
35	195	195	195	194	193	193	192	191	190	190	189	188	187	186	186	185	185	185	185
40	177	177	177	176	176	175	174	173	172	171	170	170	169	168	168	167	167	167	167
45	159	159	159	158	158	157	156	155	154	153	152	151	151	150	149	149	149	149	150
50	141	141	141	140	139	139	138	137	136	135	134	134	133	132	131	131	131	131	132
55	124	123	123	123	122	121	121	120	119	118	117	116	115	115	114	114	113	114	114
60	107	106	106	106	105	105	104	103	102	101	100	99.6	98.8	98.2	97.8	97.4	96.9	97.0	97.8
65	90.7	90.5	90.3	89.8	89.2	88.6	87.9	87.1	86.3	85.6	84.7	84.0	83.3	82.7	82.2	81.7	81.4	81.5	82.1
70	75.5	75.3	75.2	74.7	74.1	73.6	72.9	72.1	71.4	70.3	70.1	69.5	68.8	68.3	68.1	67.5	67.1	67.1	67.4
75	61.7	61.6	61.4	61.0	60.6	60.0	59.4	58.8	58.1	57.4	56.7	56.1	55.4	55.0	54.5	54.2	53.8	53.8	53.9
80	48.7	48.8	48.6	48.2	47.8	47.3	46.8	46.2	45.6	45.1	44.5	43.9	43.4	42.9	42.6	42.2	42.0	42.0	42.0
85	37.7	37.7	37.5	37.3	37.0	36.5	36.2	35.6	35.2	34.7	34.2	33.8	33.4	33.0	32.6	32.5	32.3	32.3	32.2
90	28.9	28.9	28.8	28.5	28.3	28.1	27.7	27.4	27.0	26.8	26.3	26.0	25.7	25.5	25.3	25.1	25.0	24.9	25.0
95	22.5	22.5	22.4	22.3	22.1	21.9	21.7	21.5	21.2	21.0	20.8	20.6	20.4	20.2	20.1	20.0	19.9	19.8	19.9
100	18.2	18.2	18.2	18.1	17.9	17.8	17.7	17.5	17.4	17.3	17.1	16.9	16.8	16.7	16.6	16.5	16.4	16.4	16.5
105	15.1	15.1	15.1	15.0	14.9	14.8	14.7	14.7	14.5	14.4	14.2	14.1	14.0	13.9	13.9	13.8	13.7	13.7	13.6
110	12.5	12.6	12.5	12.5	12.4	12.3	12.3	12.2	12.0	11.9	11.8	11.7	11.7	11.6	11.5	11.5	11.4	11.4	11.3
115	10.3	10.3	10.3	10.3	10.2	10.2	10.1	10.0	9.91	9.85	9.77	9.69	9.61	9.56	9.51	9.46	9.43	9.39	9.33
120	8.33	8.37	8.34	8.32	8.31	8.29	8.22	8.17	8.10	8.02	7.97	7.90	7.84	7.80	7.76	7.71	7.68	7.65	7.62
125	6.62	6.64	6.64	6.63	6.62	6.61	6.57	6.53	6.47	6.41	6.35	6.30	6.26	6.23	6.20	6.17	6.13	6.11	6.14
130	5.20	5.22	5.24	5.24	5.24	5.23	5.21	5.18	5.13	5.09	5.03	5.00	4.96	4.94	4.91	4.89	4.86	4.85	4.87
135	3.99	4.02	4.03	4.04	4.06	4.06	4.04	4.02	3.99	3.94	3.90	3.88	3.85	3.83	3.82	3.80	3.77	3.76	3.79
140	2.98	3.00	3.02	3.03	3.04	3.06	3.05	3.04	3.00	2.98	2.94	2.92	2.90	2.89	2.89	2.88	2.85	2.84	2.88
145	2.13	2.14	2.16	2.17	2.20	2.21	2.22	2.21	2.18	2.16	2.14	2.12	2.11	2.11	2.11	2.10	2.09	2.07	2.11
150	1.43	1.44	1.45	1.47	1.50	1.52	1.52	1.52	1.51	1.50	1.48	1.47	1.47	1.48	1.48	1.48	1.46	1.45	1.49
155	0.89	0.90	0.91	0.93	0.96	0.98	0.99	1.00	1.00	0.99	0.99	0.98	0.99	1.00	1.01	1.01	1.01	0.99	1.03
160	0.51	0.53	0.54	0.56	0.59	0.62	0.64	0.65	0.66	0.66	0.67	0.67	0.69	0.72	0.73	0.74	0.74	0.73	0.75
165	0.34	0.34	0.36	0.39	0.42	0.45	0.47	0.49	0.50	0.52	0.53	0.55	0.59	0.62	0.64	0.66	0.66	0.65	0.65
170	0.32	0.32	0.34	0.37	0.40	0.43	0.45	0.47	0.49	0.50	0.52	0.54	0.57	0.61	0.63	0.65	0.66	0.65	0.64
175	0.33	0.32	0.34	0.36	0.39	0.42	0.44	0.46	0.47	0.48	0.49	0.51	0.54	0.57	0.60	0.63	0.65	0.66	0.65
180	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	0.42

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	265	265	265	265	265	265	265	265	265	265	265	265	265	265	265	265	265		
5	263	263	263	263	263	263	263	263	264	264	264	264	264	264	264	264	264		
10	256	257	257	257	257	257	258	258	258	258	259	259	259	259	260	260	260		
15	247	247	247	248	248	248	249	249	250	250	250	251	251	251	251	252	252		
20	235	235	235	235	236	237	237	238	238	239	239	240	240	240	241	241	241		
25	220	220	220	221	222	222	223	224	224	225	225	226	226	227	227	227	227		
30	203	204	204	205	205	206	207	208	208	209	210	210	211	211	212	212	212		
35	186	186	186	187	188	189	189	190	191	192	193	193	194	194	195	195	195		
40	167	168	168	169	170	171	171	172	173	174	175	175	176	177	177	177	178		
45	150	150	151	152	152	153	154	155	156	156	157	158	158	159	159	159	160		
50	132	132	133	133	134	135	136	137	138	139	139	140	141	141	142	142	142		
55	114	115	115	116	117	117	118	119	120	121	122	122	123	124	124	124	125		
60	97.8	98.3	98.7	99.3	99.9	101	102	102	103	104	105	105	106	107	107	107	108		
65	82.2	82.5	82.9	83.5	84.1	84.8	85.6	86.4	87.2	88.0	88.7	89.4	90.0	90.5	90.9	91.1	91.4		
70	67.4	67.8	68.2	68.7	69.3	69.9	70.6	71.3	72.1	72.8	73.4	74.2	74.7	75.2	75.6	75.9	76.1		
75	54.0	54.2	54.5	55.1	55.5	56.1	56.8	57.4	58.2	58.8	59.3	60.0	60.5	61.0	61.3	61.6	61.8		
80	42.1	42.3	42.6	43.0	43.4	43.9	44.4	45.0	45.6	46.1	46.6	47.2	47.7	48.1	48.4	48.7	48.8		
85	32.4	32.5	32.7	33.0	33.4	33.8	34.2	34.6	35.1	35.5	36.0	36.5	36.8	37.2	37.4	37.6	37.7		
90	25.0	25.0	25.2	25.5	25.7	26.0	26.3	26.7	26.9	27.3	27.7	27.9	28.2	28.5	28.7	28.8	29.0		
95	20.0	20.0	20.1	20.2	20.4	20.6	20.8	21.0	21.2	21.4	21.7	21.9	22.1	22.2	22.4	22.5	22.6		
100	16.5	16.5	16.6	16.7	16.8	16.9	17.1	17.2	17.3	17.5	17.7	17.8	17.9	18.0	18.1	18.2	18.2		
105	13.6	13.7	13.7	13.8	13.9	14.0	14.1	14.2	14.3	14.5	14.6	14.7	14.8	14.9	15.0	15.1	15.1		
110	11.3	11.3	11.4	11.4	11.5	11.6	11.7	11.7	11.8	11.9	12.0	12.1	12.2	12.3	12.3	12.4	12.4		
115	9.32	9.34	9.36	9.41	9.46	9.51	9.58	9.64	9.70	9.78	9.85	9.93	10.0	10.1	10.1	10.2	10.2		
120	7.60	7.62	7.63	7.66	7.70	7.74	7.78	7.83	7.88	7.92	7.99	8.06	8.13	8.17	8.21	8.24	8.28		
125	6.13	6.13	6.14	6.17	6.19	6.22	6.24	6.28	6.31	6.34	6.39	6.46	6.51	6.55	6.57	6.60	6.62		
130	4.87	4.87	4.88	4.90	4.91	4.93	4.94	4.96	4.98	5.00	5.05	5.09	5.13	5.16	5.18	5.20	5.22		
135	3.80	3.80	3.81	3.82	3.82	3.83	3.83	3.84	3.85	3.87	3.89	3.93	3.97	3.99	4.00	4.02	4.02		
140	2.90	2.89	2.90	2.90	2.91	2.90	2.89	2.89	2.90	2.91	2.93	2.95	2.99	3.00	3.01	3.02	3.01		
145	2.15	2.14	2.14	2.14	2.14	2.13	2.11	2.10	2.11	2.11	2.12	2.14	2.16	2.18	2.18	2.19	2.16		
150	1.54	1.53	1.53	1.53	1.52	1.51	1.48	1.47	1.47	1.47	1.47	1.48	1.49	1.50	1.51	1.51	1.47		
155	1.09	1.08	1.08	1.08	1.06	1.04	1.02	0.99	0.98	0.98	0.98	0.98	0.97	0.95	0.93	0.93	0.91		
160	0.81	0.81	0.81	0.80	0.79	0.76	0.73	0.70	0.68	0.67	0.66	0.66	0.65	0.63	0.57	0.55	0.50		
165	0.70	0.71	0.71	0.71	0.70	0.67	0.64	0.60	0.56	0.54	0.52	0.52	0.52	0.50	0.47	0.43	0.35		
170	0.65	0.68	0.68	0.68	0.67	0.65	0.62	0.59	0.55	0.53	0.51	0.52	0.50	0.47	0.44	0.36	0.30		
175	0.65	0.65	0.65	0.65	0.64	0.62	0.54	0.46	0.44	0.40	0.35	0.32	0.31	0.31	0.32	0.35	0.34		
180	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		

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	2M	HZTE015-01	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

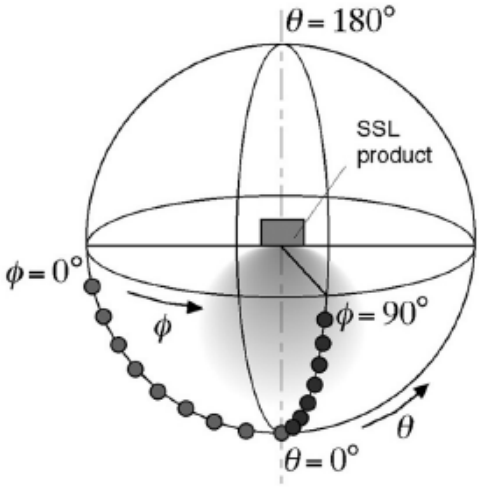
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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