



LM-79-08 Test Report

for

Maxlite Inc

12 York Avenue, West Caldwell, NJ 07006, USA

LED ROUND LIGHT ENGINE

Model: FRK23X5.5 - 927/V2

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

3rd Floor, Bld. 2, NO. 96 Longchuanwu Rd Qianjiang Economy Dev. Zone, Yuhang Dist,
Hangzhou, Zhejiang Province, China 311100

Tel: +86 571 86376106

www.ledtestlab.com

Report No.: HZ17100020b

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

Review by:

Engineer: April Zou
Oct. 31, 2017

Approved by

Manager: Jim Zhang
Oct. 31, 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: **FRK23X5.5 - 927/V2**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
75.4	1748.2	23.19	0.9928
CCT (K)	CRI	Stabilization Time (Light & Power)	
2681	93.4	60	

Table 1: Executive Data Summary

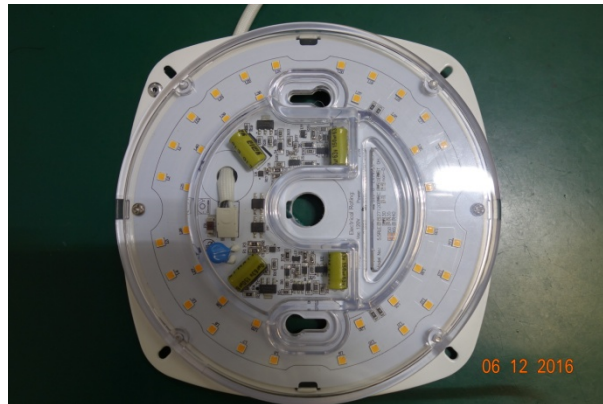
Test specifications:

Date of Receipt	: Oct. 19, 2017
Date of Test	: Oct. 23, 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
Sample Photos.....	4
TEST RESULTS	5
Spectral Power Distribution	6
Zonal Lumen Tabulation.....	8
Luminous Intensity Distribution Plots.....	10
Luminous Intensity Data	11
EQUIPMENT LIST	13
TEST METHODS	13
Seasoning of SSL Product.....	13
Goniophotometer Method	13
Photometric and Electrical Measurements.....	13
Color Characteristics Measurements.....	14
Color Spatial Uniformity	14

Sample Photos



Overview of the sample

Equipment Under Test (EUT)

Name	: LED ROUND LIGHT ENGINE
Model	: FRK23X5.5 - 927/V2
Electrical Ratings	: 120VAC, 60Hz
Product Description	: 2700K, CRI90 Manufacturer of light source: Seoul Model of LED light source: 3030
Manufacturer	: Maxlite Inc
Address	: 12 York Avenue. West Caldwell, NJ 07006, USA

TEST RESULTS

Test ambient temperature was 25.2°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 95 minutes.

The photometric distance of Goniophotometer is 2.47 m.

Luminous data was taken at 0.5° vertical intervals and 10.0° horizontal intervals.

Parameter	Result
Test Voltage (V)	120.0
Voltage frequency (Hz)	60
Test Current (A)	0.199
Power Factor	0.9928
Test Power (W)	23.19
THD A%	11.80
Luminous Efficacy (lm/W)	75.4
Total Luminous Flux (lm)	1748.2
Beam Angle (°)	110.7
Center Beam Candle Power (cd)	635
Spacing Criteria	1.15 (0°-180°)/ 1.24 (90°-270°)
Zonal Lumens in the 0°-60°Zone	80.99%
Zonal Lumens in the 60°-90°Zone	17.36%
Zonal Lumens in the 90°-120°Zone	1.39%
Zonal Lumens in the 120°-180°Zone	0.26%

Special Rendering Indices	Color
R1	93.6
R2	97.2
R3	99
R4	93.5
R5	93.5
R6	97.2
R7	91.6
R8	81.6
R9	60.4
R10	92.6
R11	94.8
R12	87.7
R13	94.6
R14	98.9

Table 2: Test data per Goniophotometer Method

Spectral Power Distribution

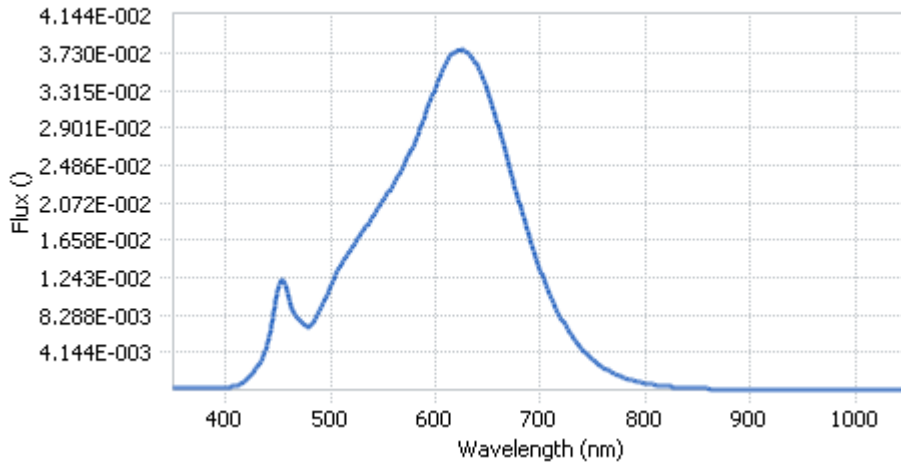
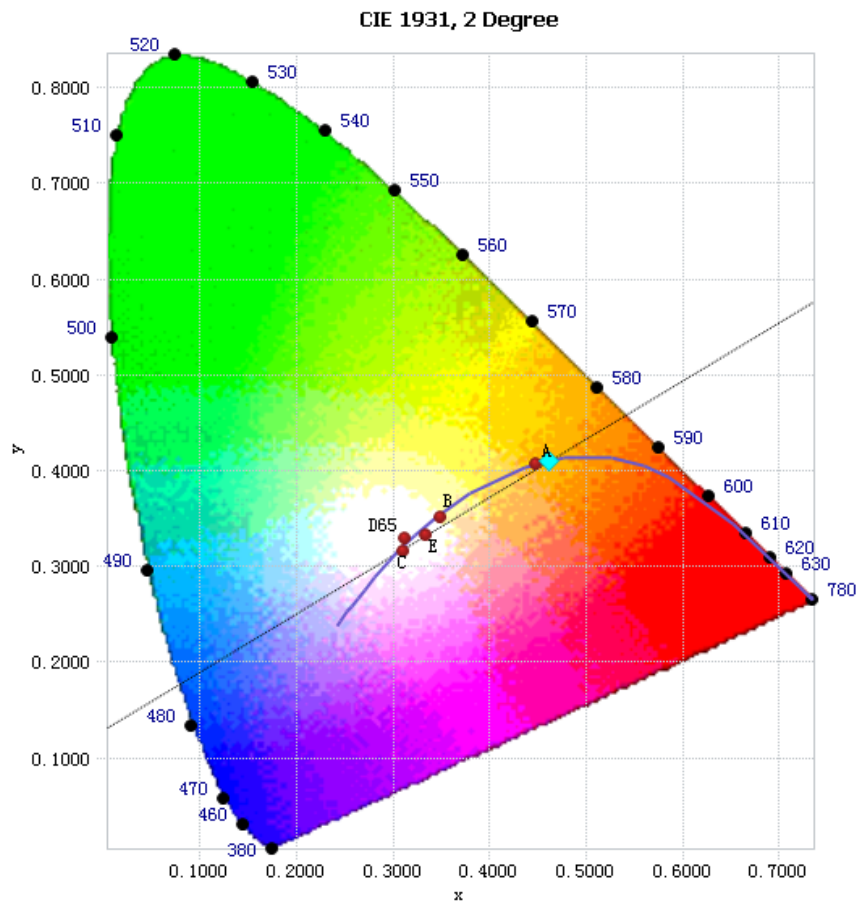


Chart 1: Spectral Power Distribution



Tristimulus values(x, y) : (0.4610, 0.4105)

Chart 2: Chromaticity Diagram per Sphere - Spectroradiometer Method

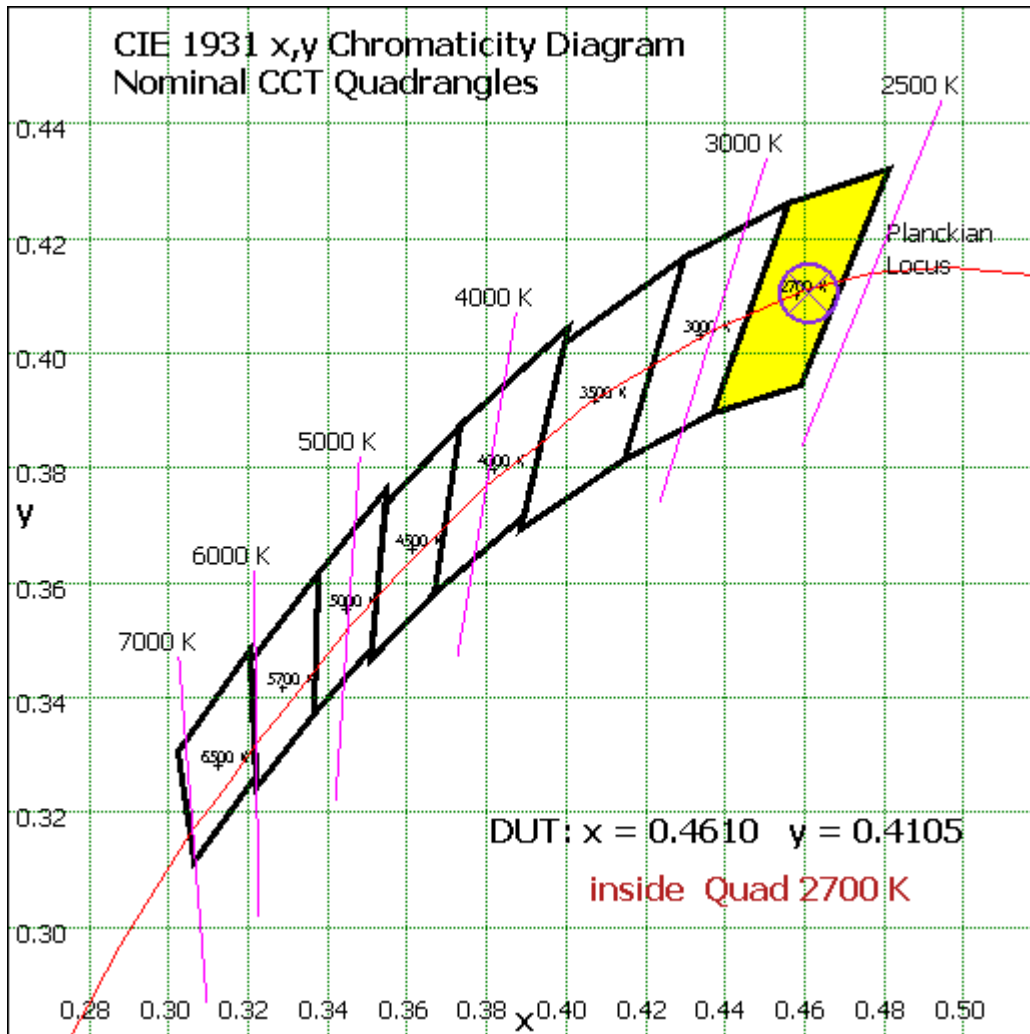


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Zonal Lumen Tabulation

$\gamma(^{\circ})$	Lumens	% Total
0- 10	60.121	3.44%
10- 20	174.401	9.98%
20- 30	257.598	14.74%
30- 40	307.085	17.57%
40- 50	330.183	18.89%
50- 60	286.46	16.39%
60- 70	201.987	11.55%
70- 80	79.369	4.54%
80- 90	22.118	1.27%
90-100	8.664	0.50%
100-110	10.107	0.58%
110-120	5.614	0.32%
120-130	2.149	0.12%
130-140	0.97	0.06%
140-150	0.674	0.04%
150-160	0.4	0.02%
160-170	0.219	0.01%
170-180	0.068	0.00%
Total	1748.2	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	1415.848	80.99%
60- 90	303.474	17.36%
0-90	1719.322	98.35%
90- 180	28.865	1.65%
0- 180	1748.2	100%

Table 3: Zonal Lumen Data

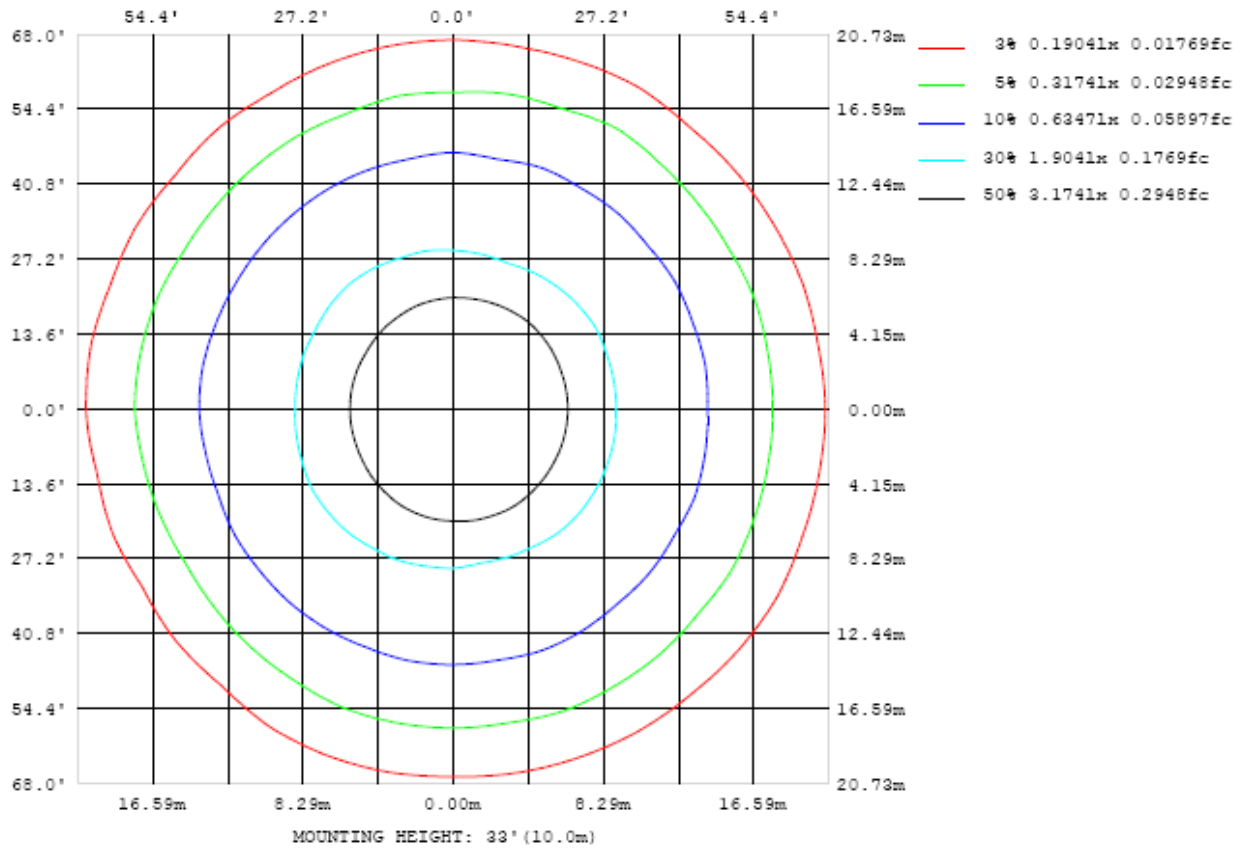


Chart 2: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots

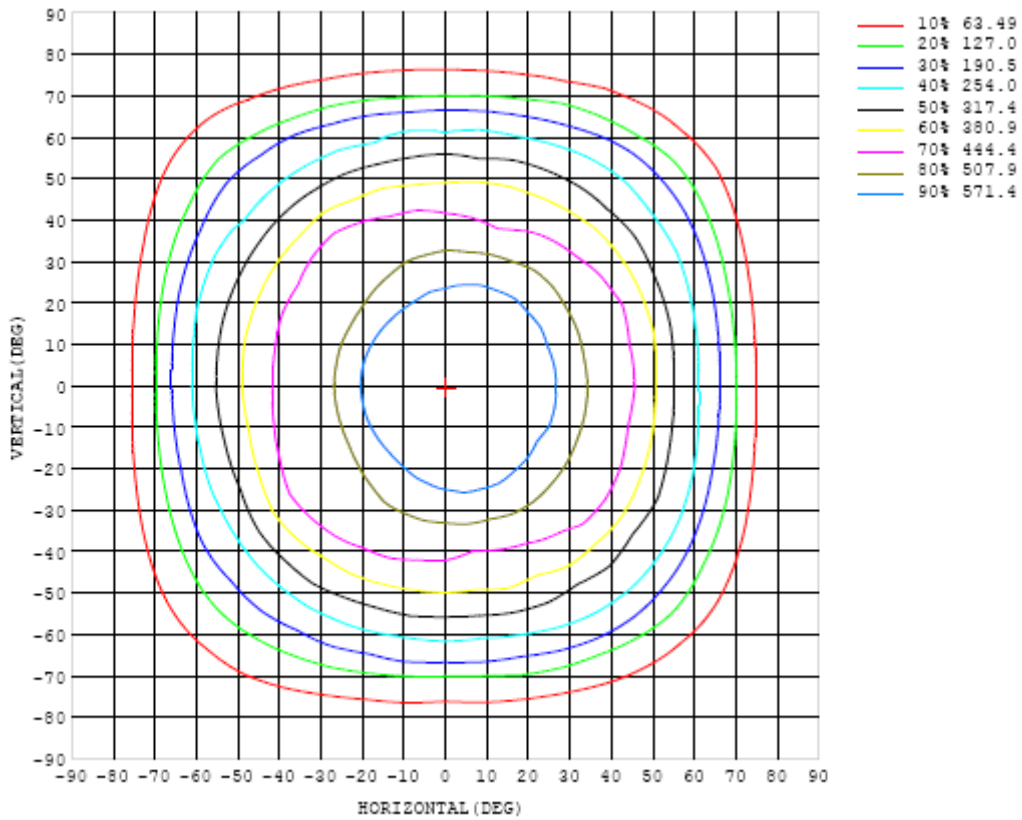


Chart 3: Isocandela Plot

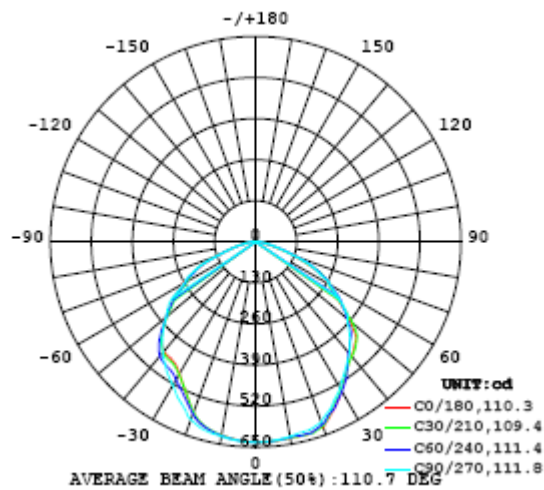


Chart 4: Polar Candela Distribution

Luminous Intensity Data

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	635	635	635	635	635	635	635	635	635	635	635	635	635	635	635	635	635	635	635
5	634	634	634	633	633	633	633	632	632	631	631	631	631	631	630	630	630	630	630
10	631	631	630	630	630	629	628	627	626	625	624	623	623	623	623	622	622	622	622
15	632	631	631	631	634	632	629	626	624	620	616	613	611	610	610	609	609	609	608
20	623	623	624	621	619	620	615	609	606	606	598	592	586	580	577	576	576	575	576
25	585	586	582	577	580	581	584	581	578	572	565	556	547	538	530	524	523	523	524
30	543	546	541	540	541	544	547	543	540	535	529	522	515	504	497	489	485	483	483
35	501	502	499	502	502	505	503	496	494	494	496	492	493	487	479	473	465	460	459
40	472	475	475	474	475	473	458	454	447	462	463	470	468	475	473	471	460	456	453
45	447	443	448	451	449	432	426	417	420	422	424	428	429	431	436	441	428	420	422
50	390	394	397	400	389	394	378	386	378	381	379	377	378	371	376	379	365	360	369
55	318	323	331	319	328	321	332	334	325	327	327	320	319	320	313	313	306	312	321
60	272	269	272	267	266	272	272	277	268	268	269	271	258	254	247	241	250	259	266
65	207	208	212	220	223	218	216	213	215	210	215	209	204	194	195	191	201	193	201
70	129	133	128	134	131	131	138	137	132	130	134	135	132	132	130	131	127	123	124
75	62.3	66.0	65.8	64.2	67.8	73.1	73.5	75.5	75.8	73.0	75.0	74.8	80.1	74.7	81.6	72.3	73.6	70.2	66.5
80	31.2	30.8	30.4	31.0	33.2	34.8	35.1	36.7	35.6	41.1	44.0	40.5	41.5	42.4	40.1	35.0	35.4	36.9	35.6
85	15.8	17.3	17.2	17.2	17.0	17.9	18.3	18.6	19.3	18.4	20.1	21.0	21.5	22.9	22.1	19.8	20.3	21.1	20.5
90	7.88	7.93	7.42	7.76	8.28	8.29	8.60	8.92	9.85	10.1	10.7	10.5	10.4	10.5	10.9	9.78	9.50	10.3	10.2
95	5.88	5.67	5.75	6.51	6.81	7.44	6.97	7.27	7.33	7.46	7.92	7.75	7.61	7.38	7.79	7.11	6.81	7.42	6.31
100	9.57	8.25	9.52	10.5	10.6	9.89	11.1	10.2	9.16	7.88	8.25	9.22	11.0	11.9	9.61	9.07	9.76	9.47	9.24
105	9.65	9.95	9.79	10.4	11.8	11.2	10.2	9.05	9.39	8.65	8.61	10.4	9.55	10.5	11.1	11.8	11.5	11.9	10.9
110	7.67	7.39	6.73	7.47	8.94	7.56	7.38	6.68	6.60	6.64	6.68	7.06	7.84	8.35	8.47	10.5	7.81	7.59	8.17
115	5.70	5.54	5.07	5.15	5.16	5.43	4.78	5.36	5.83	6.24	6.24	5.97	5.77	5.33	5.85	5.71	5.82	6.19	7.12
120	3.90	3.76	3.58	3.26	2.72	2.65	2.77	3.38	4.05	4.31	4.12	4.06	3.56	2.85	3.18	3.02	3.44	4.18	4.13
125	2.07	1.99	2.05	1.98	2.25	1.72	1.90	2.06	2.27	2.42	2.45	2.44	2.29	1.92	2.20	2.74	2.87	3.44	3.67
130	1.32	1.28	1.14	1.20	1.29	1.61	1.36	1.39	1.30	1.28	1.27	1.29	1.53	1.68	2.30	1.73	1.44	1.63	1.88
135	0.93	0.95	0.92	0.99	1.15	1.33	1.27	1.14	1.03	0.99	1.02	1.09	1.30	1.46	1.49	1.42	1.30	1.33	1.58
140	0.90	0.94	0.93	0.95	1.00	0.99	1.21	1.09	0.99	0.96	1.00	1.04	1.19	1.35	1.32	1.22	1.16	1.14	1.29
145	0.77	0.87	0.87	0.90	0.87	0.86	0.86	1.50	1.01	0.96	0.98	1.04	1.06	1.09	1.13	1.04	1.04	1.04	1.20
150	0.70	0.75	0.80	0.81	0.76	0.77	0.80	0.80	0.87	0.93	0.93	0.89	0.86	0.90	0.86	0.90	0.90	0.91	1.08
155	0.62	0.63	0.68	0.71	0.77	0.72	0.74	0.74	0.74	0.75	0.76	0.75	0.77	0.79	0.76	0.81	0.81	0.82	0.98
160	0.60	0.61	0.65	0.69	0.77	0.77	0.73	0.73	0.72	0.72	0.69	0.70	0.72	0.74	0.74	0.74	0.75	0.74	0.86
165	0.62	0.63	0.67	0.68	0.71	0.76	0.77	0.77	0.76	0.71	0.65	0.72	0.72	0.73	0.72	0.72	0.72	0.71	0.81
170	0.64	0.64	0.69	0.69	0.70	0.70	0.71	0.73	0.74	0.74	0.66	0.65	0.65	0.71	0.71	0.70	0.71	0.72	0.75
175	0.68	0.68	0.68	0.68	0.69	0.69	0.69	0.70	0.70	0.71	0.72	0.70	0.71	0.67	0.71	0.72	0.72	0.71	0.70
180	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65

Table 4: 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	635	635	635	635	635	635	635	635	635	635	635	635	635	635	635	635	635		
5	630	631	630	631	631	631	632	632	632	632	632	633	633	633	633	634	634		
10	622	622	622	622	623	623	624	624	625	626	628	629	630	630	630	630	630		
15	608	608	607	608	609	609	611	614	618	621	623	624	626	628	629	631	632		
20	575	575	574	575	577	581	585	592	599	603	605	610	615	617	619	621	622		
25	524	524	524	526	530	537	546	554	561	568	576	578	581	581	583	584	586		
30	483	485	485	489	498	504	513	521	525	529	537	542	545	546	543	542	542		
35	460	462	465	471	479	485	490	491	494	488	489	495	504	505	501	502	499		
40	453	456	456	466	472	472	463	466	458	452	442	452	464	480	477	475	475		
45	423	425	421	429	438	430	425	424	416	411	414	415	421	434	442	449	445		
50	372	367	366	367	377	369	374	370	370	378	381	378	380	385	388	395	399		
55	320	315	310	313	314	318	319	323	331	319	332	324	326	318	324	319	324		
60	263	260	252	252	254	256	255	266	262	272	269	280	265	267	265	276	267		
65	204	204	208	198	203	206	216	212	210	211	212	212	205	211	214	217	214		
70	127	126	135	127	124	129	129	125	127	130	131	138	131	127	134	129	127		
75	67.7	74.5	71.8	71.3	78.5	74.2	75.3	74.6	71.5	74.1	73.3	67.6	68.3	66.8	62.8	64.5	62.3		
80	33.2	37.8	36.9	36.5	40.9	40.8	40.8	38.7	37.0	34.9	33.5	35.0	33.7	31.4	32.1	30.3	30.1		
85	21.2	22.3	21.6	21.4	21.7	20.4	20.4	20.5	18.8	19.7	18.3	17.7	18.4	17.2	17.0	17.0	16.4		
90	10.6	11.0	9.89	10.3	10.1	9.11	9.55	8.94	9.60	9.01	8.37	7.69	7.90	8.00	8.56	7.51	6.95		
95	6.35	6.89	7.08	7.93	8.61	7.99	9.09	8.28	7.59	7.78	7.47	7.55	7.79	7.63	7.21	6.51	5.49		
100	8.09	10.4	11.0	11.2	11.6	11.9	10.3	8.88	9.21	8.91	9.91	11.0	11.2	9.07	10.0	10.2	8.65		
105	11.2	11.4	11.8	12.2	11.5	10.3	9.62	8.50	8.56	8.88	8.80	9.20	9.72	10.9	10.7	10.0	10.5		
110	8.25	7.55	8.64	9.24	8.40	7.87	7.24	6.56	6.91	7.04	6.48	7.14	8.14	7.89	7.93	7.00	7.54		
115	6.92	6.26	5.91	5.49	5.60	5.09	5.70	5.70	6.21	6.25	5.67	5.55	4.71	5.14	5.38	5.19	5.38		
120	4.24	4.05	3.52	2.77	2.95	2.65	3.47	3.92	3.97	4.25	3.69	3.13	2.37	2.64	3.15	3.31	3.98		
125	3.70	3.30	2.88	2.44	2.16	1.88	2.13	2.27	2.38	2.33	2.11	1.80	1.55	1.80	1.84	1.88	2.11		
130	1.89	2.11	1.65	1.67	1.72	1.44	1.45	1.28	1.22	1.16	1.17	1.26	1.32	1.81	1.31	1.16	1.23		
135	1.55	1.47	1.41	1.68	1.50	1.36	1.25	1.13	1.08	1.09	1.18	1.21	1.41	1.42	1.14	1.00	0.93		
140	1.34	1.36	1.32	1.34	1.42	1.36	1.25	1.14	1.11	1.11	1.15	1.24	1.21	1.10	1.03	1.06	0.92		
145	1.20	1.20	1.21	1.21	1.25	1.25	1.31	1.24	1.20	1.19	1.35	1.19	1.06	1.03	1.01	1.05	0.95		
150	1.07	1.09	1.11	1.13	1.14	1.12	1.10	1.09	1.10	1.09	1.09	1.07	1.04	0.99	0.98	0.96	0.96		
155	0.99	0.99	0.99	1.00	1.00	0.99	0.97	0.95	0.96	0.97	0.98	0.96	0.95	0.95	0.97	0.86	0.85		
160	0.83	0.89	0.90	0.91	0.90	0.89	0.88	0.87	0.87	0.88	0.89	0.89	0.91	0.92	0.88	0.82	0.80		
165	0.80	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.86	0.88	0.89	0.87	0.84	0.82	0.79	0.78		
170	0.76	0.77	0.80	0.76	0.77	0.77	0.77	0.79	0.80	0.81	0.82	0.82	0.80	0.79	0.79	0.79	0.78		
175	0.71	0.72	0.71	0.71	0.72	0.72	0.72	0.72	0.73	0.74	0.72	0.71	0.70	0.70	0.70	0.70	0.70		
180	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65		

Table 5: 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
Standard Source	D908	HZTE012-01	Aug. 20, 2017	Aug. 19, 2018
Standard source	SCL-1400	HZTE012-02	Aug. 20, 2017	Aug. 19, 2018
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 16, 2017	Aug. 15, 2018
Temperature recorder	JM624U	HZTE018-08	Aug. 17, 2017	Aug. 16, 2018

Table 6: 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.

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 $k=2$.

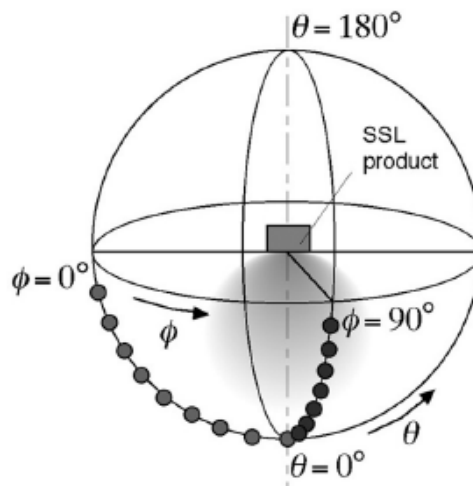
Color Characteristics Measurements

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 ***

This report is considered invalidated without the Special Seal for Inspection of the LTL. This report shall not be altered, increased or deleted. The results shown in this test report refer only to the sample(s) tested. Without written approval of LTL, this test report shall not be copied except in full and published as advertisement.