NVLAP LAB CODE 200960-0

LM-79-08 Test Report

for

ABBlighting, Inc.

3 Adams St Belvidere, NJ 07823.

SLIM WALL PACK

Model: SWP18501-A

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ15080016a

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

Reviewed by:

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Aug. 13, 2015

Approved by:

Manager: Jim Zhang

Aug. 13, 2015

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: **SWP18501-A**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
101.4	1826.7	18.01	0.9839

CCT (K)	CRI	Stabilization Time (Light & Power)
4867	76.4	60

Table 1: Executive Data Summary

Test specifications:	
Date of Receipt	: Aug. 10, 2015
Date of Test	: Aug. 11, 2015
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 Photo

Figure 1- Overview of the sample

Equipment Under Test (EUT)	
Name	: SLIM WALL PACK
Model	: SWP18501-A
Electrical Ratings	: 100~277VAC, 50/60Hz, 18W
Product Description	: 5000K, Outdoor Wall-Mounted Area Luminaires Manufacturer of light source: SAMSUNG Model of light source: LH351B Quantity of LED light source: 10pcs
Manufacturer	: ABB Lighting (shanghai) Co., Ltd.
Address	: Room 1012, North Minch Fortune 108 Plaza,# 1839 Qixin road, Shanghai

TEST RESULTS

Test ambient temperature was 25.1℃.

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 85 minutes.

The photometric distance is 2.475m.

Luminous data was taken at 0.5°vertical intervals and 10°horizontal intervals.

Parameter	Result			Special Color Rendering Indices	
Test Voltage (V)	120.0	100.0	277.0	R1	74
Voltage frequency (Hz)	60	60	60	R2	82
Test Current (A)	0.153	0.184	0.077	R3	85
Power Factor	0.9839	0.9840	0.8751	R4	76
Test Power (W)	18.01	18.11	18.62	R5	76
THD A%	15.39	13.27	18.07	R6	74
Luminous Efficacy (lm/W)	101.4	100.4	98.0	R7	83
Total Luminous Flux (lm)	1826.7	1819.0	1824.0	R8	61
Color Rendering Index (CRI)	76.4			R9	-16
R9	-16			R10	56
Correlated Color Temperature (CCT) (K)	4867			R11	72
Chromaticity (Chroma x, Chroma y)	(0.3498, 0.3619)			R12	52
Chromaticity (Chroma u, Chroma v)	(0.2106, 0.3269)			R13	76
Chromaticity (Chroma u', Chroma v')	(0.2106, 0.4903)			R14	92
Duv	0.0033				
Average Beam Angle (°)	95.1				
Center Beam Candle Power (cd)	670				
Spacing Criteria	1.04 (0°-180°)/ 1.47 (90°-270°)				
Zonal Lumens in the 0°-60°Zone	97.39%				
Zonal Lumens in the 60°-90°Zone	2.55%				
Zonal Lumens in the 90°-120°Zone	0.01%				
Zonal Lumens in the 120°-180°Zone	0.05%				

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).

Spectral Power Distribution

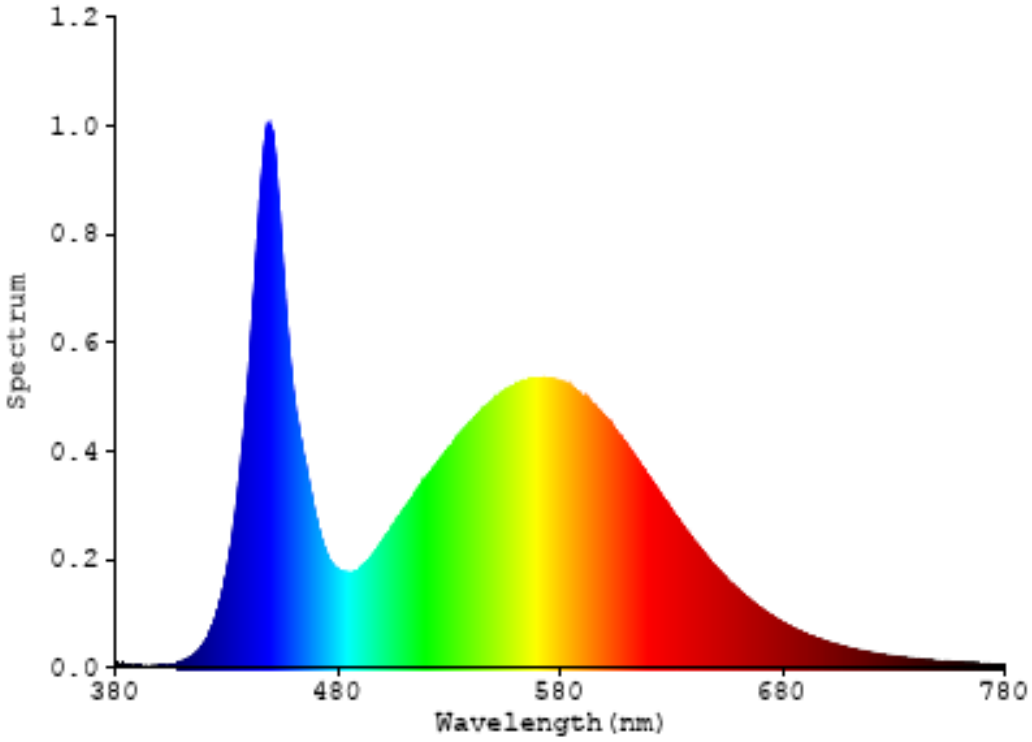


Chart 1: Spectral Power Distribution

Zonal Lumen Tabulation

γ(°)	Lumens	% Total
0- 10	63.785	3.49%
10- 20	192.216	10.52%
20- 30	347.782	19.04%
30- 40	498.006	27.26%
40- 50	444.527	24.33%
50- 60	232.784	12.74%
60- 70	39.744	2.18%
70- 80	6.409	0.35%
80- 90	0.393	0.02%
90-100	0.035	0.00%
100-110	0.087	0.00%
110-120	0.125	0.01%
120-130	0.143	0.01%
130-140	0.179	0.01%
140-150	0.191	0.01%
150-160	0.168	0.01%
160-170	0.112	0.01%
170-180	0.042	0.00%
Total	1826.7	100%

γ(°)	Lumens	% Total
0- 60	1779.1	97.39%
60- 90	46.546	2.55%
0-90	1825.646	99.94%
90- 180	1.082	0.06%
0- 180	1826.7	100%

Table 3: Zonal Lumen Data

Illuminance Plots

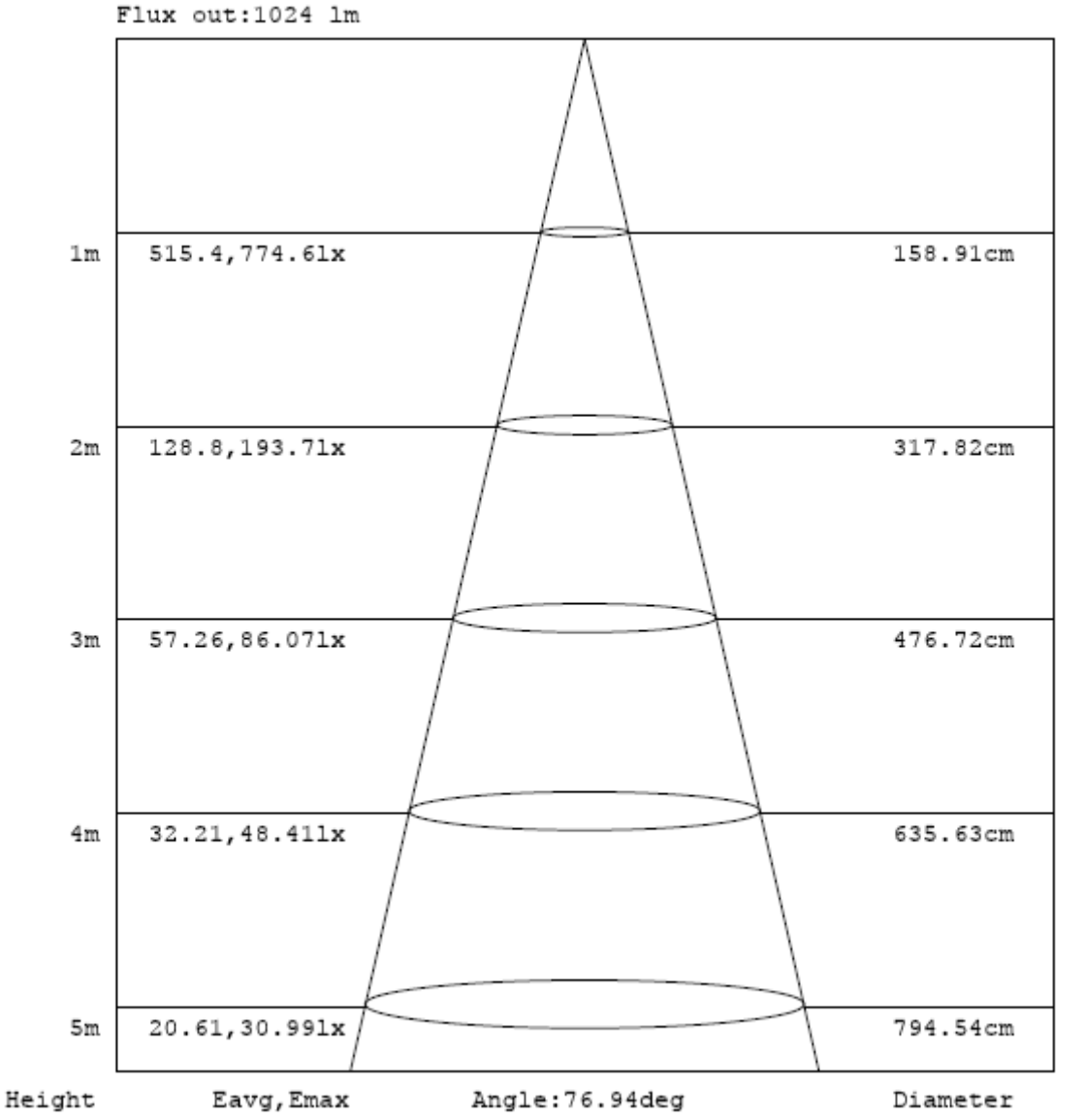


Chart 2: Beam Angle

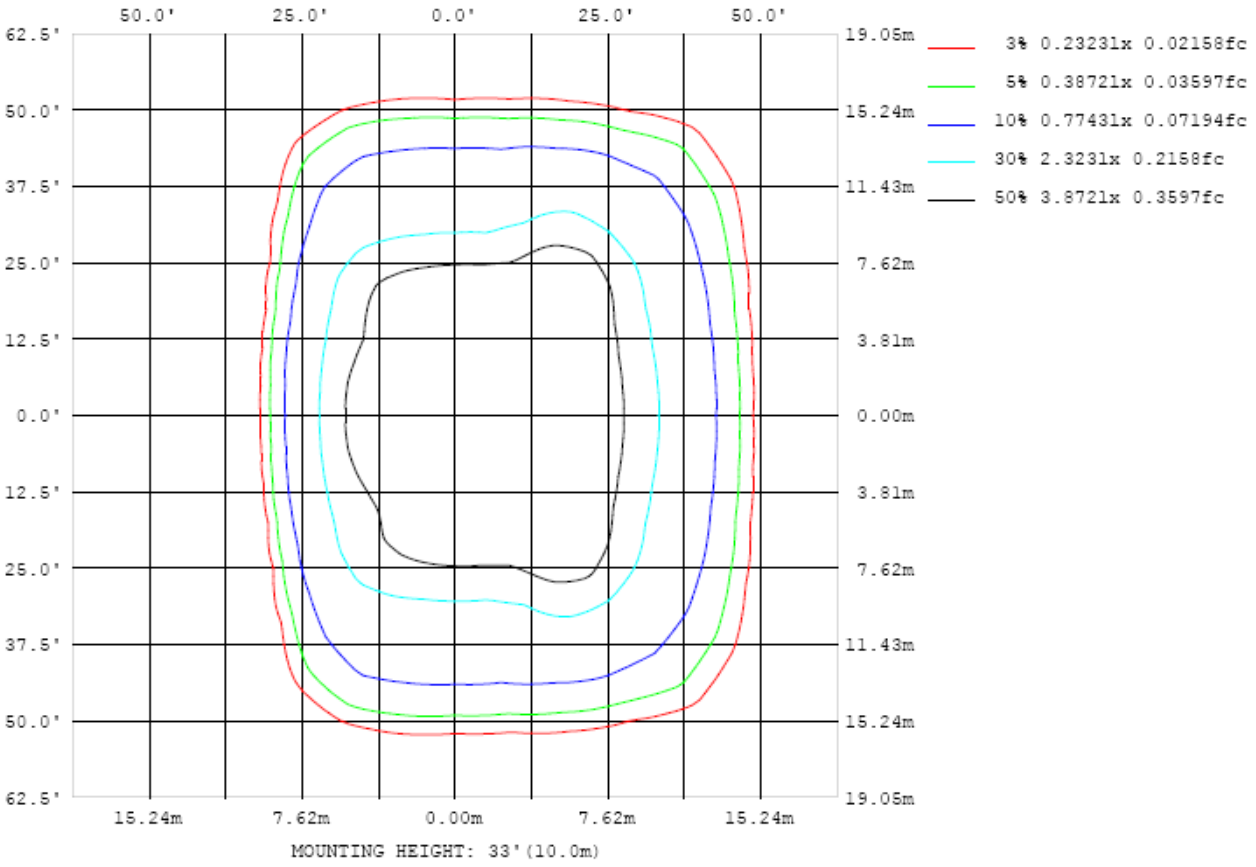


Chart 3: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots

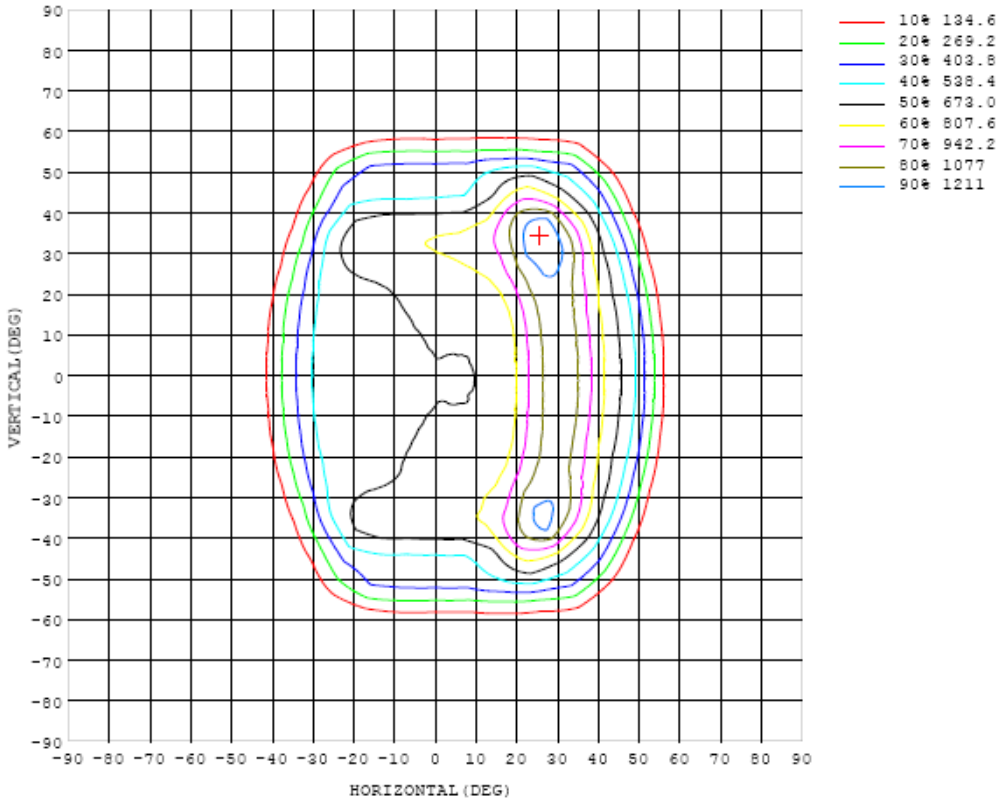


Chart 4: Isocandela Plot

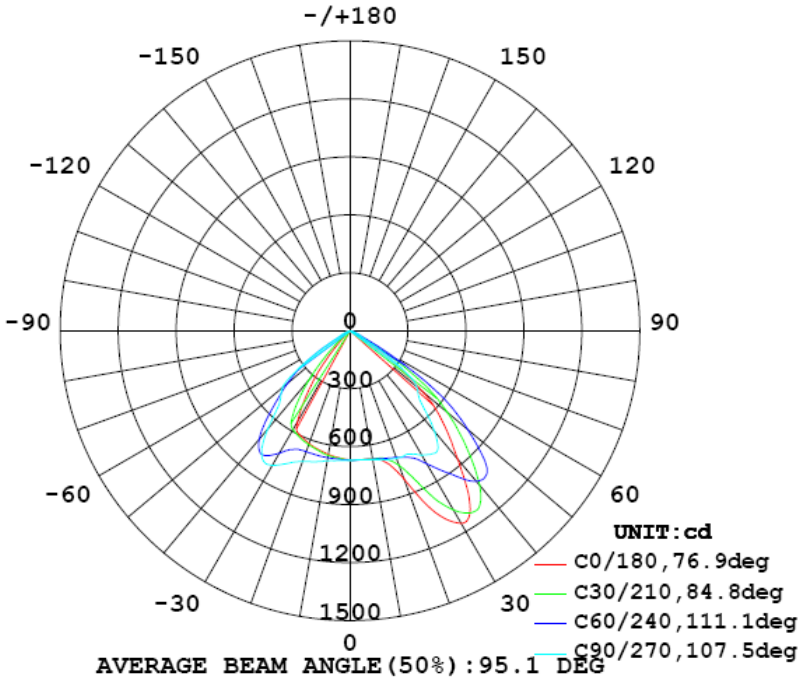


Chart 5: Polar Candela Distribution

Luminous Intensity Data

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	670	670	670	670	670	670	670	670	670	670	670	670	670	670	670	670	670	670	670
5	670	669	669	670	669	669	670	671	672	670	668	667	666	665	662	661	661	660	659
10	673	673	673	673	673	674	675	677	679	677	674	669	665	661	657	654	653	651	650
15	703	700	692	684	679	680	685	691	695	691	682	671	661	653	645	641	638	636	636
20	814	803	775	741	712	694	697	710	712	703	689	674	656	638	629	626	624	622	621
25	1033	1018	977	898	810	750	723	721	719	705	691	674	650	627	615	610	605	603	602
30	1151	1141	1116	1070	992	875	795	768	756	742	728	702	659	617	595	586	576	554	545
35	1079	1092	1119	1137	1123	1066	904	810	781	772	758	746	713	622	565	491	425	384	371
40	866	883	934	1044	1194	1222	1016	780	694	680	688	723	709	598	429	319	242	196	183
45	688	703	742	853	1085	1238	1001	659	526	514	522	562	584	420	243	136	75.6	51.5	47.6
50	490	512	562	657	821	899	796	573	460	450	449	450	398	221	78.6	24.4	32.7	41.1	43.9
55	191	216	285	416	538	580	546	393	299	282	306	341	238	62.9	18.2	23.5	31.2	42.5	44.3
60	50.9	52.6	56.6	127	270	338	208	137	92.9	80.7	88.3	84.5	61.7	12.5	10.7	22.6	29.8	38.2	39.4
65	18.4	18.0	18.6	26.0	53.6	85.8	62.4	54.6	59.4	54.2	48.3	13.4	10.6	13.3	6.50	15.1	28.6	32.9	33.7
70	5.58	6.00	6.89	8.56	12.0	23.3	29.9	19.0	29.0	26.6	18.2	5.65	8.83	13.9	5.69	7.60	20.2	23.3	22.5
75	2.66	3.01	3.75	4.18	4.78	6.19	6.24	5.67	6.26	5.00	4.19	3.73	6.46	10.5	3.25	2.74	5.92	6.55	6.08
80	1.07	1.22	1.38	1.51	1.37	1.68	1.59	1.41	1.44	1.41	1.35	1.56	1.64	2.12	1.14	0.85	1.12	1.21	1.18
85	0.10	0.11	0.12	0.13	0.16	0.12	0.08	0.06	0.05	0.08	0.11	0.14	0.18	0.20	0.20	0.25	0.29	0.29	0.29
90	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02
95	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.04	0.04	0.05	0.06	0.06	0.06	0.04	0.03	0.03	0.03
100	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.07	0.08	0.10	0.11	0.12	0.11	0.09	0.07	0.05	0.05
105	0.01	0.01	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.11	0.13	0.16	0.18	0.19	0.18	0.16	0.12	0.10	0.09
110	0.02	0.02	0.02	0.03	0.03	0.04	0.04	0.05	0.05	0.14	0.16	0.19	0.22	0.23	0.23	0.20	0.17	0.14	0.13
115	0.02	0.03	0.04	0.04	0.05	0.06	0.07	0.07	0.08	0.15	0.17	0.20	0.22	0.24	0.24	0.23	0.20	0.18	0.17
120	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.17	0.19	0.21	0.22	0.23	0.23	0.22	0.21	0.19	0.19
125	0.07	0.08	0.09	0.10	0.11	0.12	0.13	0.15	0.17	0.17	0.19	0.20	0.20	0.21	0.22	0.23	0.22	0.22	0.21
130	0.11	0.12	0.13	0.14	0.15	0.15	0.17	0.19	0.22	0.20	0.22	0.23	0.22	0.22	0.23	0.25	0.26	0.26	0.26
135	0.15	0.16	0.18	0.18	0.19	0.20	0.22	0.24	0.28	0.24	0.27	0.28	0.27	0.27	0.28	0.29	0.31	0.31	0.31
140	0.19	0.19	0.21	0.21	0.22	0.23	0.25	0.28	0.32	0.28	0.31	0.32	0.32	0.32	0.33	0.33	0.35	0.35	0.34
145	0.22	0.22	0.23	0.24	0.25	0.26	0.28	0.32	0.35	0.31	0.34	0.35	0.36	0.36	0.37	0.37	0.39	0.39	0.39
150	0.25	0.25	0.26	0.27	0.28	0.30	0.33	0.36	0.39	0.34	0.37	0.38	0.38	0.38	0.39	0.39	0.41	0.41	0.40
155	0.28	0.28	0.29	0.30	0.33	0.35	0.38	0.39	0.41	0.35	0.38	0.40	0.41	0.40	0.40	0.40	0.41	0.41	0.41
160	0.28	0.31	0.33	0.34	0.37	0.40	0.41	0.41	0.43	0.37	0.39	0.40	0.42	0.42	0.41	0.41	0.41	0.41	0.40
165	0.32	0.34	0.37	0.39	0.42	0.43	0.43	0.44	0.44	0.37	0.38	0.40	0.41	0.42	0.43	0.43	0.43	0.40	0.40
170	0.35	0.34	0.39	0.42	0.44	0.45	0.45	0.45	0.46	0.40	0.41	0.42	0.43	0.44	0.45	0.45	0.45	0.43	0.42
175	0.41	0.43	0.46	0.49	0.50	0.51	0.51	0.51	0.51	0.44	0.44	0.45	0.46	0.46	0.46	0.47	0.47	0.46	0.44
180	0.44	0.45	0.46	0.47	0.49	0.47	0.46	0.47	0.48	0.45	0.45	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.44

Table 4: 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	670	670	670	670	670	670	670	670	670	670	670	670	670	670	670	670	670		
5	660	661	662	663	666	668	670	672	674	674	673	672	671	670	670	670	669		
10	651	653	656	658	662	667	672	680	684	684	682	680	678	676	674	674	674		
15	636	638	641	646	655	666	678	689	702	706	700	693	689	685	687	695	701		
20	622	624	627	631	644	666	687	702	720	729	728	719	714	728	753	784	807		
25	603	606	612	620	640	677	712	735	757	773	772	771	794	844	918	987	1024		
30	556	579	591	610	668	731	769	788	804	818	832	874	957	1044	1094	1130	1146		
35	386	434	504	598	688	785	792	789	796	814	866	992	1159	1196	1165	1122	1090		
40	200	255	327	457	641	732	714	674	663	690	809	1099	1324	1254	1064	936	882		
45	53.2	80.1	145	262	449	572	539	511	513	532	694	1048	1273	1117	864	743	702		
50	41.0	31.2	26.5	93.2	248	424	464	457	457	471	610	830	885	824	656	563	510		
55	41.6	30.3	22.9	16.7	83.2	265	332	295	270	293	395	563	592	543	405	278	212		
60	37.7	30.7	18.9	10.3	13.9	69.3	87.4	85.7	76.3	93.3	132	203	340	263	118	55.9	53.4		
65	34.3	27.2	11.6	7.34	16.5	10.3	13.2	45.3	47.5	52.8	43.9	58.5	84.4	49.3	25.5	17.8	16.2		
70	23.9	17.2	5.91	6.61	16.1	7.59	5.67	19.2	21.3	24.3	17.2	27.6	19.2	10.9	8.42	6.66	5.70		
75	6.86	5.07	2.28	3.75	12.3	5.60	3.53	4.20	4.76	5.65	4.91	6.18	5.45	4.56	4.28	3.64	2.87		
80	1.29	1.05	0.81	1.06	1.85	1.43	1.57	1.55	1.54	1.52	1.61	1.81	1.78	1.55	1.54	1.35	1.18		
85	0.30	0.27	0.22	0.20	0.19	0.19	0.18	0.16	0.13	0.14	0.15	0.16	0.19	0.21	0.15	0.12	0.10		
90	0.02	0.02	0.03	0.04	0.03	0.03	0.03	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		
95	0.03	0.03	0.05	0.06	0.06	0.06	0.05	0.04	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		
100	0.05	0.07	0.09	0.11	0.12	0.11	0.10	0.08	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01		
105	0.10	0.13	0.16	0.18	0.19	0.18	0.15	0.13	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02		
110	0.14	0.17	0.21	0.23	0.23	0.21	0.19	0.16	0.04	0.04	0.04	0.04	0.03	0.03	0.02	0.02	0.02		
115	0.18	0.21	0.24	0.24	0.23	0.21	0.19	0.16	0.07	0.06	0.06	0.05	0.05	0.05	0.04	0.03	0.03		
120	0.20	0.22	0.24	0.23	0.21	0.19	0.19	0.18	0.11	0.09	0.08	0.08	0.07	0.07	0.06	0.05	0.04		
125	0.21	0.23	0.23	0.22	0.20	0.18	0.18	0.18	0.15	0.13	0.11	0.11	0.10	0.10	0.09	0.08	0.07		
130	0.26	0.26	0.25	0.23	0.21	0.21	0.21	0.21	0.19	0.16	0.15	0.14	0.14	0.13	0.12	0.11	0.11		
135	0.31	0.30	0.28	0.26	0.26	0.25	0.25	0.26	0.24	0.21	0.19	0.18	0.18	0.17	0.16	0.15	0.14		
140	0.33	0.32	0.31	0.30	0.29	0.28	0.29	0.30	0.29	0.25	0.23	0.21	0.21	0.21	0.19	0.19	0.17		
145	0.35	0.36	0.35	0.35	0.33	0.32	0.34	0.35	0.32	0.29	0.27	0.25	0.24	0.24	0.23	0.22	0.22		
150	0.40	0.40	0.38	0.38	0.37	0.38	0.39	0.40	0.36	0.33	0.31	0.29	0.28	0.26	0.26	0.25	0.25		
155	0.42	0.40	0.41	0.39	0.40	0.43	0.43	0.43	0.38	0.36	0.33	0.32	0.30	0.29	0.28	0.28	0.28		
160	0.42	0.42	0.41	0.41	0.45	0.46	0.45	0.46	0.39	0.37	0.35	0.34	0.32	0.31	0.30	0.30	0.30		
165	0.40	0.41	0.42	0.42	0.45	0.46	0.45	0.44	0.39	0.38	0.37	0.36	0.35	0.34	0.33	0.34	0.32		
170	0.42	0.43	0.43	0.42	0.47	0.49	0.47	0.46	0.40	0.39	0.39	0.38	0.38	0.36	0.35	0.35	0.36		
175	0.45	0.48	0.46	0.47	0.51	0.52	0.50	0.50	0.45	0.45	0.45	0.45	0.45	0.44	0.43	0.43	0.42		
180	0.44	0.44	0.46	0.47	0.49	0.49	0.48	0.49	0.45	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.44		

Table 5: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Sep. 18, 2014	Sep. 17, 2015
Digital Power Meter	PF2010A	HZTE028-01	Sep. 18, 2014	Sep. 17, 2015
AC Power Supply	PCR 500L	HZTE001-08	Sep. 18, 2014	Sep. 17, 2015
DC Power Supply	WY12010	HZTE004-03	Sep. 18, 2014	Sep. 17, 2015
Temperature Meter	TES1310	HZTE017-01	Sep. 18, 2014	Sep. 17, 2015
Standard source	D908	HZTE012-01	Sep. 18, 2014	Sep. 17, 2015
Standard source	SCL-1400	HZTE012-02	Sep. 18, 2014	Sep. 17, 2015

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

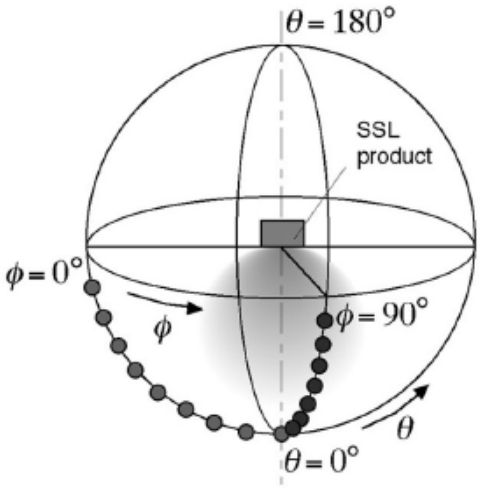
An EVERFINE Type C Model GO-R5000 Goniophotometer was used to measure the intensity at each angle of distribution for each sample. The photometric distance is 2.475m for near-field measurement or 30m for far-field measurement. Bandwidth of spectroradiometer is 380nm-780nm.
Ambient temperature was measured 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 expended uncertainty is 1.94% 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 ***