



## LM-79-08 Test Report

for

### AOK LED LIGHT CO. LTD

3<sup>rd</sup> Floor Building 23 No.152 Guanpu Road, Jianxin Town,  
Cangshan District Fuzhou City, Fujian, China

### LED HIGH BAY LIGHT

**Model: AOK-280Wi (5700K)**

### Laboratory: Leading Testing Laboratories

**NVLAP CODE: 200960-0**

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Report No.: HZ14050049f

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

Review by:

Engineer: April Zou  
Jul. 07, 2014

Approved



Manager: Jim Zhang  
Jul. 07, 2014

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: **AOK-280Wi (5700K)**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
106.2	29212.3	275.0	0.9961
CCT (K)	CRI	Stabilization Time (Light & Power)	
5792	76.4	80	

Table 1: Executive Data Summary

### Test specifications:

**Date of Receipt** : May 30, 2014

**Date of Test** : Jun. 05, 2014

**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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## Photo



Figure 1- Overview of the sample

### Equipment Under Test (EUT)

<b>Name</b>	: LED HIGH BAY LIGHT
<b>Model</b>	: AOK-280Wi (5700K)
<b>Electrical Ratings</b>	: 90~277V AC, 50/60Hz, 280W
<b>Product Description</b>	: 5700K, Outdoor Luminaire, Black coating enclosure, 7 LED bars, Suspended Mounting Manufacturer of light source: Philips Lumileds Model of light source: LXH7-FW57 Quantity of light source: 98pcs
<b>Manufacturer</b>	: Shenzhen AOK LED LIGHT CO. LTD
<b>Address</b>	: 1#3 Building, Sans Souci Technology Industrial Park, Shajin street, Shenzhen city, Guangdong Province, China

**TEST RESULTS**

Test ambient temperature was 25.3 °C.

Base orientation was Light down. Test was conducted without a dimmer in the circuit.

The stabilization time of the sample was 80 minutes, and the total operating time including stabilization was 115 minutes.

Parameter	Result		
Test Voltage (V)	120.0	90.0	277.0
Voltage frequency (Hz)	60	60	60
Test Current (A)	2.298	3.173	1.021
Power Factor	0.9961	0.9970	0.9480
Test Power (W)	275.0	284.7	268.1
Off-State Power (W)	0	0	0
THD A%	5.09	6.14	10.45
Luminous Efficacy (lm/W)	106.2		
Total Luminous Flux (lm)	29212.3		
Color Rendering Index (CRI)	76.4		
R9	12		
Correlated Color Temperature (CCT) (K)	5792		
Chromaticity (Chroma x, Chroma y)	(0.3262, 0.3345)		
Chromaticity (Chroma u, Chroma v)	(0.2051, 0.3155)		
Chromaticity (Chroma u', Chroma v')	(0.2051, 0.4732)		
Duv	0.0005		
Average Beam Angle (°)	109.0		
Center Beam Candle Power (cd)	9880		
Spacing Criteria	1.38(0°-180°)/ 1.31(90°-270°)		
Zonal Lumens in the 0°-60°Zone	83.39%		
Zonal Lumens in the 60°-90°Zone	16.54%		
Zonal Lumens in the 90°-120°Zone	0.02%		
Zonal Lumens in the 120°-180°Zone	0.04%		

Special Color Rendering Indices	
R1	80
R2	77
R3	71
R4	80
R5	81
R6	69
R7	80
R8	73
R9	12
R10	43
R11	82
R12	50
R13	78
R14	83

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

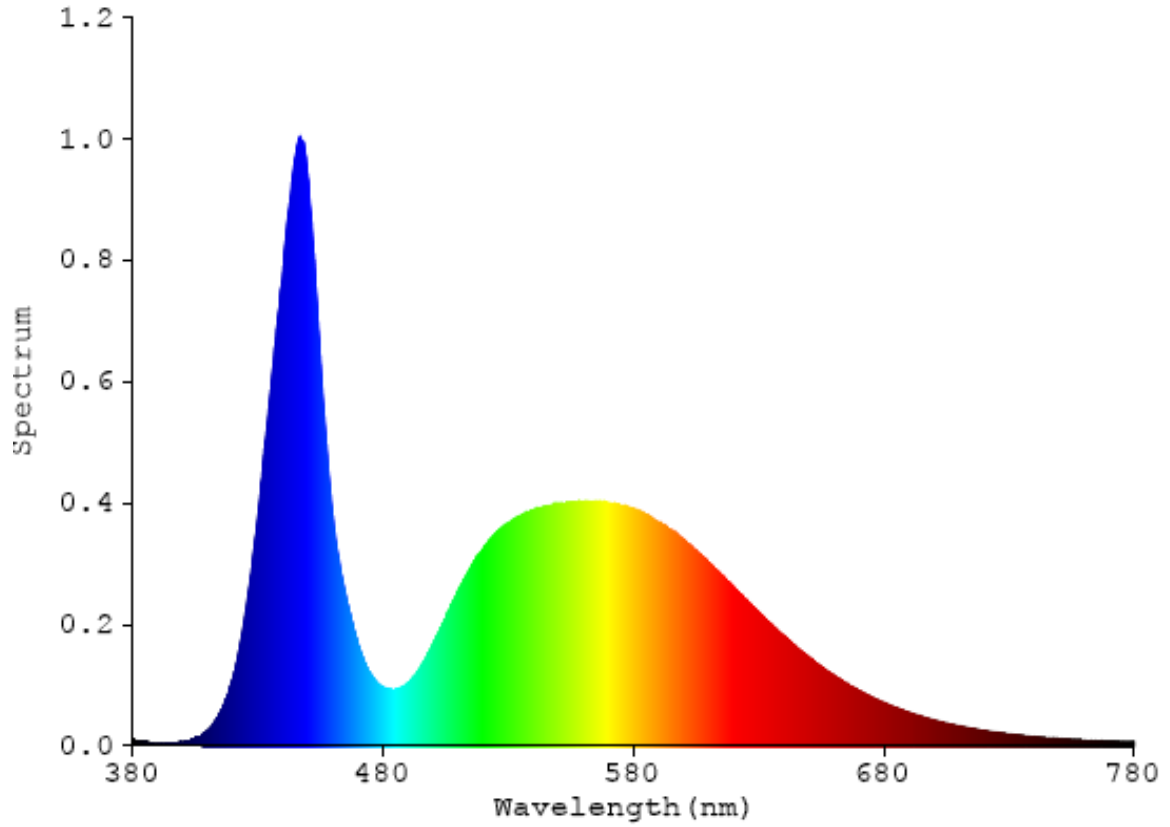


Chart 1: Spectral Power Distribution

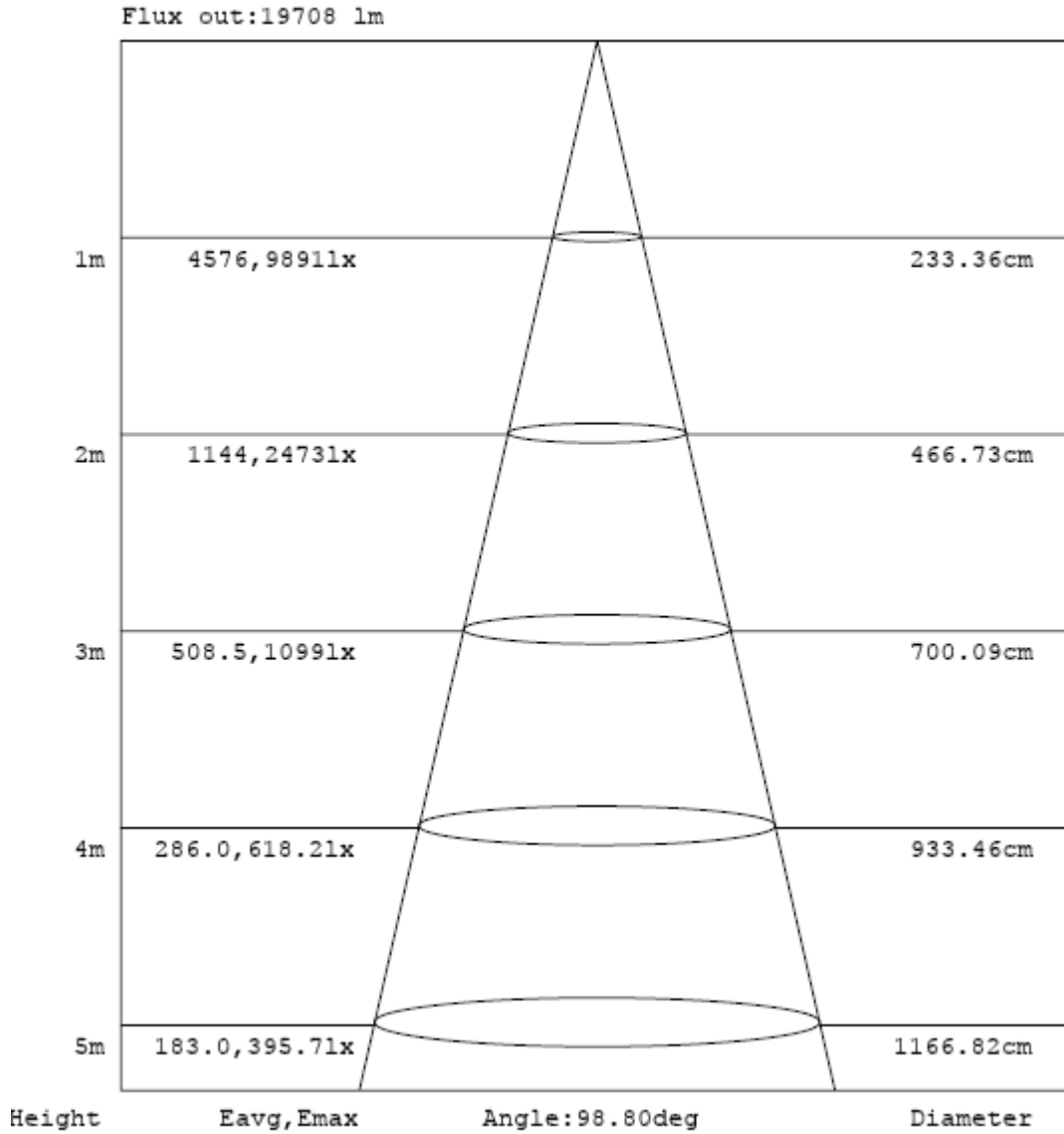
### Zonal Lumen Tabulation

$\gamma(^{\circ})$	Lumens	% Total
0- 10	950.851	3.25%
10- 20	2889.677	9.89%
20- 30	4727.287	16.18%
30- 40	5850.773	20.03%
40- 50	5541.118	18.97%
50- 60	4400.776	15.06%
60- 70	3142.63	10.76%
70- 80	1493.909	5.11%
80- 90	196.477	0.67%
90-100	1.772	0.01%
100-110	2.242	0.01%
110-120	2.411	0.01%
120-130	2.563	0.01%
130-140	2.776	0.01%
140-150	2.669	0.01%
150-160	2.246	0.01%
160-170	1.517	0.01%
170-180	0.569	0.00%
Total	29212.3	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	24360.482	83.39%
60- 90	4833.016	16.54%
0-90	29193.498	99.94%
90- 180	18.765	0.06%
0- 180	29212.3	100%

Table 4: Zonal Lumen Data

### Illuminance Plots



Note:The Curves indicate the illuminated area and the average illumination when the luminaire is at different distance.

Chart 2: Beam Angle



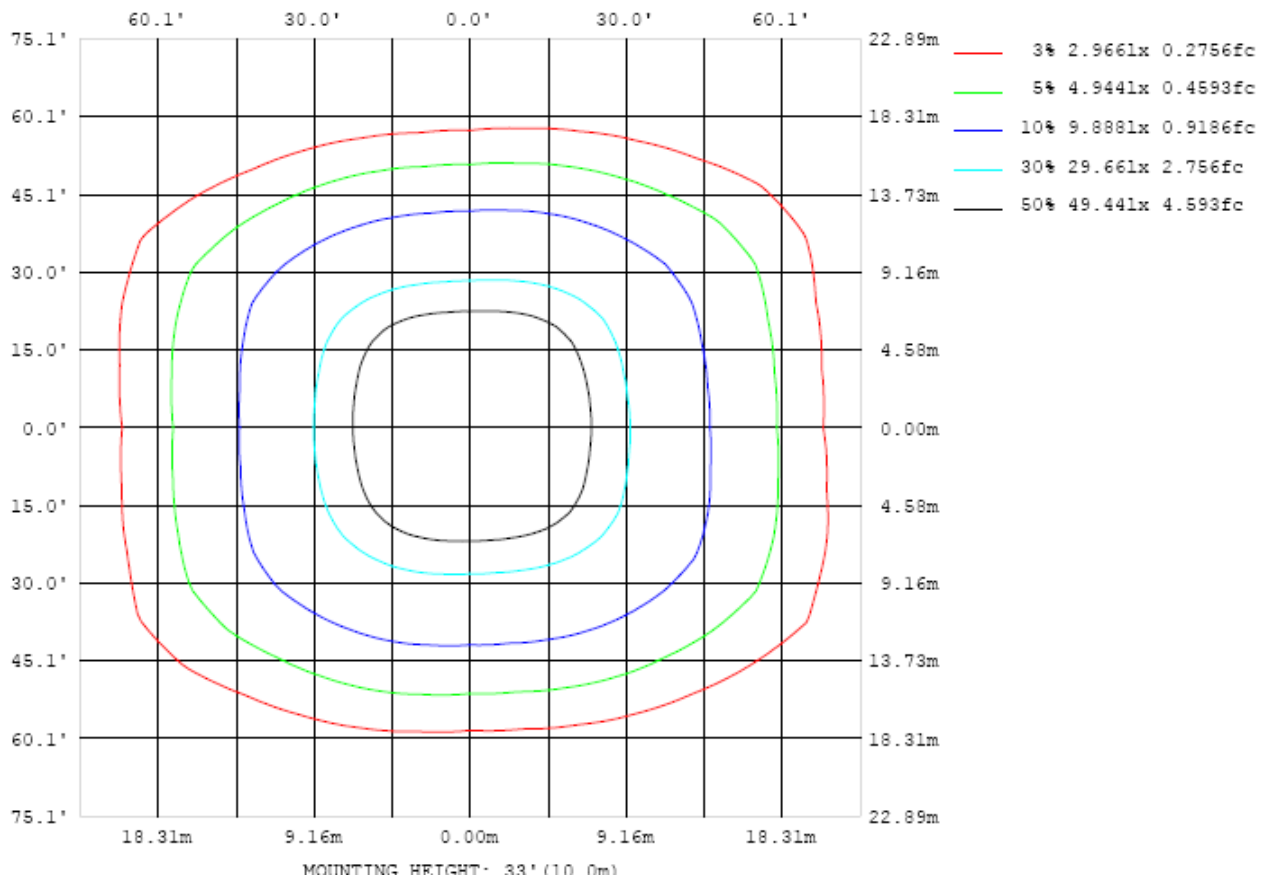


Chart 3: Illuminance Plot (Footcandles)

### Luminous Intensity Distribution Plots

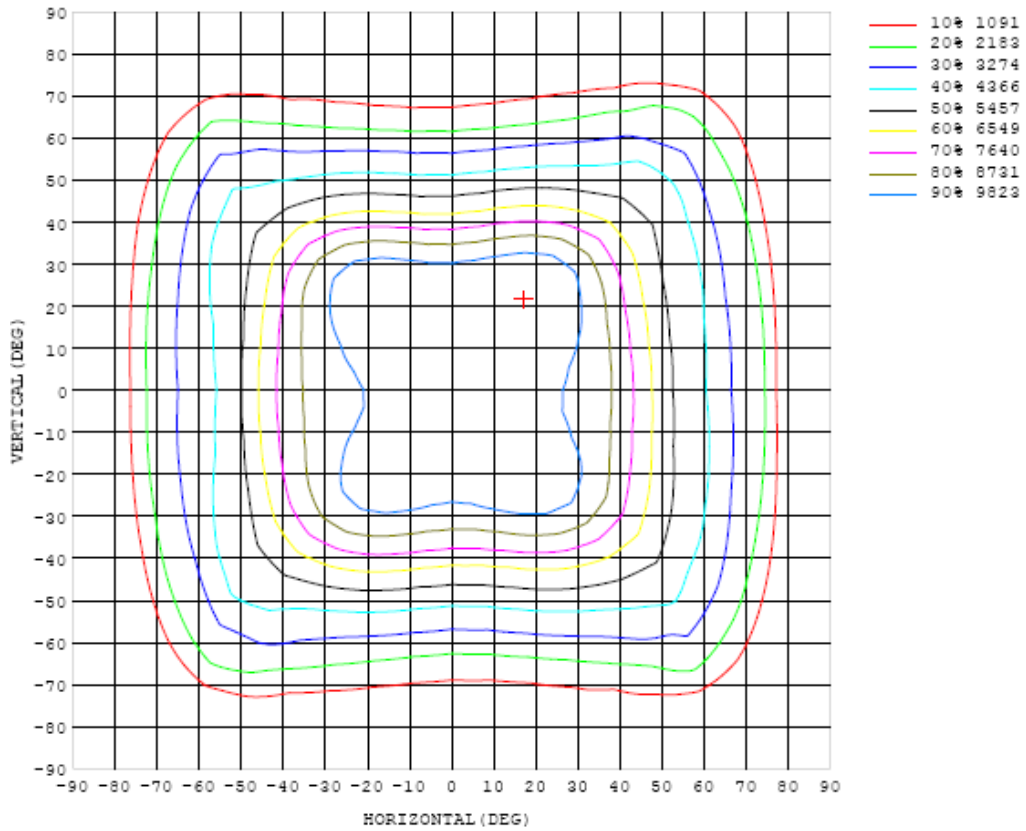


Chart 4: Isocandela Plot

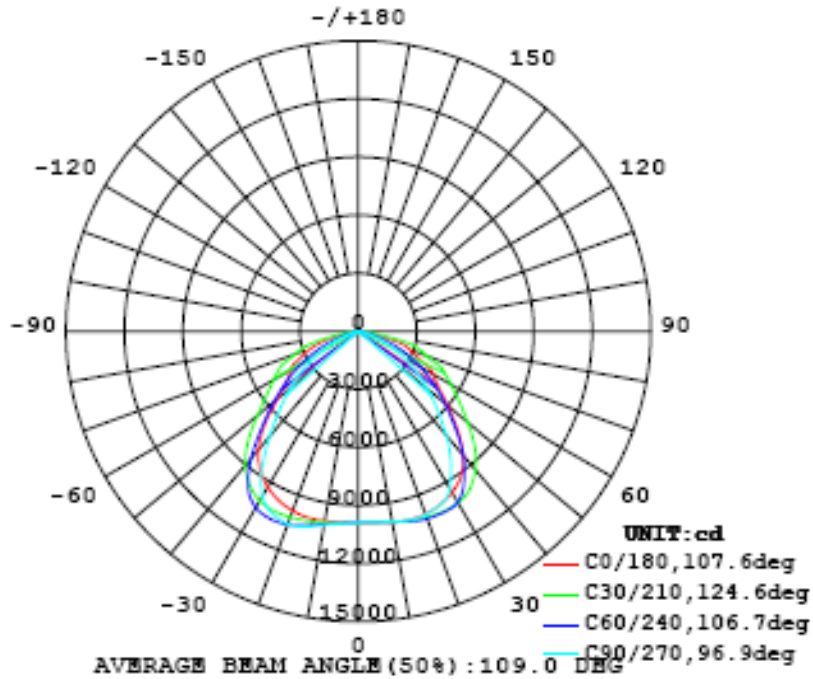


Chart 5: Polar Candela Distribution

### Luminous Intensity Data

Table--1 UNIT: ×10cd

C (DEG) y (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	988	988	988	988	988	988	988	988	988	988	988	988	988	988	988	988	988	988	988
5	992	991	991	991	991	991	991	990	990	989	989	989	989	990	990	990	989	989	990
10	1001	1001	1001	1001	1000	1000	1000	1000	999	999	999	999	999	998	997	996	995	994	995
15	1008	1008	1010	1013	1016	1017	1016	1014	1012	1011	1011	1012	1012	1011	1008	1003	999	996	997
20	1005	1005	1011	1022	1033	1037	1031	1020	1012	1009	1011	1018	1024	1025	1018	1006	994	986	986
25	989	990	1003	1027	1047	1047	1033	1012	996	991	997	1011	1027	1032	1022	1002	980	966	965
30	960	963	985	1023	1049	1049	1020	980	948	938	954	984	1013	1027	1016	984	953	932	930
35	917	922	950	996	1022	1004	945	882	840	828	850	896	950	983	981	945	905	881	878
40	834	842	878	935	955	908	837	762	712	700	727	782	844	898	912	876	830	803	798
45	718	733	782	844	844	783	702	629	585	574	599	650	716	773	808	781	730	691	680
50	599	621	676	732	712	647	580	517	474	463	486	530	583	640	682	666	604	557	543
55	501	526	582	632	594	531	470	413	373	363	385	425	469	520	572	566	505	463	448
60	441	464	511	547	495	425	368	315	277	267	287	327	371	421	488	505	453	419	402
65	348	377	448	479	405	326	264	216	186	178	196	232	279	339	420	456	392	345	328
70	281	309	353	375	310	224	164	121	99.4	95.3	109	138	184	247	317	348	301	270	259
75	196	236	283	295	193	116	82.8	63.3	49.3	46.0	53.6	66.2	88.6	131	215	268	218	178	155
80	60.3	92.2	124	127	72.7	45.0	31.2	23.9	16.7	13.9	18.8	22.9	29.1	46.0	75.7	106	86.3	57.9	52.6
85	10.1	26.0	31.8	26.6	14.8	10.6	10.5	8.78	6.61	6.34	7.30	9.31	9.00	10.6	16.1	23.3	24.6	17.2	9.73
90	0.10	0.15	0.15	0.49	1.54	0.22	0.16	0.14	0.15	0.16	0.14	0.14	0.17	0.21	0.26	0.26	0.17	0.15	0.24
95	0.10	0.09	0.09	0.09	0.09	0.08	0.06	0.06	0.05	0.05	0.06	0.07	0.08	0.08	0.09	0.10	0.11	0.11	0.29
100	0.11	0.10	0.10	0.10	0.10	0.09	0.08	0.07	0.07	0.07	0.08	0.09	0.10	0.10	0.11	0.11	0.12	0.13	0.34
105	0.14	0.12	0.11	0.11	0.12	0.11	0.10	0.09	0.08	0.09	0.10	0.11	0.12	0.13	0.13	0.14	0.15	0.15	0.36
110	0.18	0.16	0.14	0.14	0.14	0.14	0.13	0.12	0.11	0.11	0.12	0.14	0.14	0.16	0.16	0.17	0.18	0.19	0.37
115	0.28	0.20	0.18	0.18	0.18	0.18	0.16	0.15	0.15	0.15	0.16	0.17	0.18	0.20	0.21	0.22	0.23	0.24	0.43
120	0.40	0.25	0.24	0.22	0.22	0.22	0.21	0.19	0.19	0.19	0.20	0.22	0.23	0.24	0.26	0.27	0.29	0.29	0.35
125	0.46	0.31	0.29	0.28	0.27	0.27	0.26	0.25	0.25	0.25	0.26	0.27	0.28	0.29	0.31	0.33	0.34	0.35	0.38
130	0.43	0.36	0.33	0.33	0.30	0.31	0.32	0.31	0.30	0.31	0.31	0.33	0.33	0.34	0.35	0.37	0.37	0.42	0.49
135	0.43	0.39	0.36	0.35	0.34	0.34	0.35	0.37	0.35	0.37	0.36	0.37	0.37	0.38	0.39	0.40	0.40	0.43	0.47
140	0.43	0.41	0.38	0.37	0.37	0.38	0.38	0.39	0.39	0.39	0.39	0.40	0.39	0.40	0.40	0.41	0.42	0.45	0.46
145	0.47	0.45	0.43	0.41	0.40	0.40	0.42	0.42	0.44	0.43	0.43	0.43	0.43	0.43	0.43	0.44	0.46	0.47	0.47
150	0.49	0.48	0.48	0.46	0.44	0.43	0.43	0.45	0.45	0.45	0.45	0.45	0.45	0.46	0.47	0.48	0.50	0.51	0.50
155	0.54	0.53	0.50	0.51	0.47	0.45	0.44	0.46	0.46	0.45	0.47	0.48	0.49	0.49	0.51	0.53	0.53	0.53	0.52
160	0.53	0.54	0.53	0.53	0.51	0.47	0.45	0.46	0.47	0.43	0.49	0.51	0.53	0.54	0.55	0.55	0.54	0.54	0.53
165	0.53	0.55	0.55	0.55	0.56	0.52	0.50	0.51	0.50	0.48	0.52	0.56	0.58	0.59	0.58	0.57	0.57	0.55	0.52
170	0.56	0.56	0.57	0.58	0.59	0.54	0.52	0.51	0.54	0.52	0.52	0.58	0.60	0.60	0.59	0.58	0.58	0.57	0.56
175	0.62	0.64	0.64	0.65	0.65	0.63	0.60	0.60	0.59	0.57	0.60	0.63	0.64	0.64	0.64	0.63	0.62	0.61	0.60
180	0.59	0.61	0.61	0.60	0.60	0.61	0.61	0.60	0.59	0.59	0.57	0.58	0.57	0.55	0.59	0.60	0.61	0.62	0.60

Table 5: Luminous Intensity Data

Table--2 UNIT: ×10cd

C (DEG) y (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	988	988	988	988	988	988	988	988	988	988	988	988	988	988	988	988	988		
5	991	992	993	994	995	996	997	997	998	998	997	997	996	995	995	994	993		
10	997	1000	1004	1006	1008	1011	1013	1015	1016	1016	1016	1015	1013	1011	1008	1005	1003		
15	1001	1007	1014	1022	1030	1037	1042	1045	1046	1047	1047	1044	1039	1032	1025	1018	1012		
20	994	1005	1022	1041	1056	1062	1062	1060	1059	1063	1070	1074	1070	1058	1039	1023	1011		
25	977	997	1026	1055	1071	1069	1057	1044	1041	1049	1068	1084	1089	1074	1046	1018	998		
30	943	969	1011	1051	1065	1052	1022	993	985	1004	1039	1073	1089	1074	1037	997	970		
35	891	921	972	1017	1027	987	924	874	861	889	947	1013	1054	1044	997	953	925		
40	807	843	903	946	927	855	775	721	709	742	810	895	963	977	923	866	838		
45	691	734	799	824	776	699	630	581	571	602	663	739	819	858	816	754	720		
50	559	611	678	684	628	564	505	466	459	484	535	598	663	719	696	638	604		
55	467	516	575	559	503	448	401	364	355	380	426	480	537	600	596	542	508		
60	424	462	502	460	394	339	290	255	248	271	317	376	443	514	532	481	450		
65	354	412	445	373	290	230	183	155	151	169	209	264	343	443	483	402	360		
70	285	327	349	273	188	129	92.8	72.8	69.7	85.4	117	168	242	314	358	312	284		
75	193	235	252	157	84.0	58.1	42.3	33.4	31.5	39.0	50.2	76.0	128	223	272	238	211		
80	74.1	95.2	91.3	52.6	31.1	20.5	16.6	12.2	10.9	14.9	19.2	25.2	42.2	80.5	120	104	67.2		
85	18.4	22.3	18.8	10.5	6.19	6.35	5.87	4.75	4.79	5.49	7.32	7.03	8.09	18.7	29.2	30.4	20.9		
90	0.25	0.25	0.25	0.23	0.19	0.15	0.12	0.11	0.10	0.11	0.13	0.16	0.20	0.22	0.24	0.24	0.23		
95	0.30	0.30	0.30	0.28	0.24	0.20	0.16	0.14	0.14	0.15	0.17	0.21	0.25	0.28	0.29	0.28	0.28		
100	0.34	0.34	0.33	0.32	0.29	0.25	0.21	0.19	0.18	0.19	0.22	0.26	0.30	0.32	0.32	0.32	0.32		
105	0.36	0.36	0.35	0.35	0.33	0.29	0.26	0.23	0.23	0.24	0.27	0.31	0.34	0.35	0.34	0.33	0.34		
110	0.36	0.35	0.34	0.34	0.33	0.30	0.27	0.25	0.24	0.25	0.28	0.31	0.34	0.33	0.32	0.32	0.33		
115	0.33	0.32	0.30	0.31	0.30	0.28	0.26	0.24	0.24	0.24	0.27	0.30	0.31	0.30	0.29	0.29	0.32		
120	0.33	0.31	0.28	0.28	0.27	0.26	0.24	0.23	0.22	0.23	0.25	0.27	0.28	0.28	0.27	0.28	0.34		
125	0.34	0.31	0.28	0.27	0.27	0.25	0.24	0.23	0.23	0.23	0.24	0.26	0.27	0.26	0.27	0.28	0.36		
130	0.37	0.34	0.32	0.30	0.29	0.28	0.27	0.27	0.26	0.26	0.27	0.27	0.28	0.28	0.29	0.30	0.37		
135	0.40	0.38	0.37	0.36	0.35	0.33	0.32	0.32	0.31	0.31	0.31	0.32	0.32	0.33	0.33	0.35	0.39		
140	0.44	0.42	0.40	0.40	0.40	0.39	0.38	0.37	0.37	0.36	0.36	0.35	0.35	0.36	0.35	0.38	0.39		
145	0.46	0.45	0.43	0.43	0.43	0.43	0.43	0.42	0.42	0.39	0.40	0.39	0.40	0.39	0.39	0.41	0.43		
150	0.49	0.48	0.47	0.47	0.46	0.46	0.46	0.45	0.43	0.44	0.44	0.42	0.43	0.43	0.45	0.45	0.46		
155	0.52	0.51	0.52	0.50	0.49	0.49	0.48	0.47	0.46	0.47	0.45	0.45	0.45	0.47	0.49	0.48	0.51		
160	0.54	0.54	0.54	0.54	0.54	0.53	0.51	0.50	0.47	0.49	0.48	0.48	0.49	0.51	0.52	0.52	0.53		
165	0.53	0.54	0.55	0.56	0.57	0.57	0.56	0.52	0.50	0.50	0.51	0.51	0.51	0.53	0.54	0.53	0.52		
170	0.56	0.58	0.59	0.60	0.61	0.62	0.61	0.57	0.55	0.55	0.55	0.55	0.55	0.58	0.58	0.57	0.55		
175	0.60	0.62	0.63	0.64	0.64	0.64	0.63	0.61	0.57	0.56	0.60	0.59	0.59	0.61	0.63	0.61	0.60		
180	0.59	0.61	0.61	0.62	0.62	0.62	0.62	0.61	0.59	0.60	0.59	0.59	0.60	0.61	0.60	0.59	0.59		

Table 6: Luminous Intensity Data

## EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Sep. 18, 2013	Sep. 17, 2014
Digital Power Meter	PF2010A	HZTE028-01	Sep. 18, 2013	Sep. 17, 2014
AC Power Supply	PCR 500L	HZTE001-08	Sep. 18, 2013	Sep. 17, 2014
DC Power Supply	WY12010	HZTE004-03	Sep. 18, 2013	Sep. 17, 2014
Temperature Meter	TES1310	HZTE017-01	Sep. 18, 2013	Sep. 17, 2014
Standard source	D908	HZTE012-01	Sep. 18, 2013	Sep. 17, 2014
Integrate Sphere system	2M	HZTE015-01	Sep. 18, 2013	Sep. 17, 2014
Digital Power Meter	WT210	HZTE008-01	Sep. 18, 2013	Sep. 17, 2014
AC Power Supply	PCR 500L	HZTE001-07	Sep. 18, 2013	Sep. 17, 2014
DC Power Supply	6154	HZTE004-04	Sep. 18, 2013	Sep. 17, 2014
Temperature and humidity recorder	JR900	HZTE018-01	Sep. 18, 2013	Sep. 17, 2014
Standard source	SCL-1400	HZTE012-02	Sep. 18, 2013	Sep. 17, 2014

Table 7: 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  $4\pi$ . 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 expanded uncertainty is 1.06% 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 expanded 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.

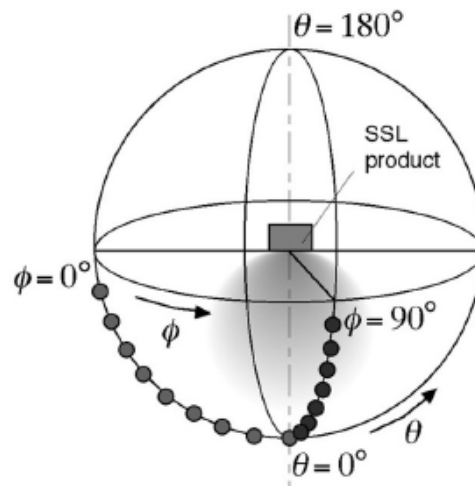
### **Color Spatial Uniformity**

The characteristics of SSL products may be spatially non-uniform, the chromaticity coordinate shall be measured at two vertical planes ( $C=0^\circ/180^\circ$  and  $C=90^\circ/270^\circ$ ) and at  $10^\circ$  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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