



LM-79-08 Test Report

for

AOK LED LIGHT CO. LTD

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

LED HIGH BAY LIGHT

Model: AOK-240Wi (5700K)

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ14050049e

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-240Wi (5700K)**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
107.3	25356.9	236.3	0.9948
CCT (K)	CRI	Stabilization Time (Light & Power)	
5823	77.6	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)

Name	: LED HIGH BAY LIGHT
Model	: AOK-240Wi (5700K)
Electrical Ratings	: 90~277V AC, 50/60Hz, 240W
Product Description	: 5700K, Outdoor Luminaire, Black coating enclosure, 6 LED bars, Suspended Mounting Manufacturer of light source: Philips Lumileds Model of light source: LXH7-FW57 Quantity of light source: 84pcs
Manufacturer	: Shenzhen AOK LED LIGHT CO. LTD
Address	: 1#3 Building, Sans Souci Technology Industrial Park, Shajin street, Shenzhen city, Guangdong Province, China

TEST RESULTS

Test ambient temperature was 25.6 °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)	1.979	2.691	0.878
Power Factor	0.9948	0.9941	0.9398
Test Power (W)	236.3	240.8	228.8
Off-State Power (W)	0	0	0
THD A%	4.37	8.61	10.99
Luminous Efficacy (lm/W)	107.3		
Total Luminous Flux (lm)	25356.9		
Color Rendering Index (CRI)	77.6		
R9	18		
Correlated Color Temperature (CCT) (K)	5823		
Chromaticity (Chroma x, Chroma y)	(0.3256, 0.3323)		
Chromaticity (Chroma u, Chroma v)	(0.2056, 0.3147)		
Chromaticity (Chroma u', Chroma v')	(0.2056, 0.4720)		
Duv	0.0014		
Average Beam Angle (°)	109.2		
Center Beam Candle Power (cd)	8517		
Spacing Criteria	1.42(0°-180°)/ 1.30(90°-270°)		
Zonal Lumens in the 0°-60°Zone	83.00%		
Zonal Lumens in the 60°-90°Zone	16.93%		
Zonal Lumens in the 90°-120°Zone	0.02%		
Zonal Lumens in the 120°-180°Zone	0.04%		

Special Color Rendering Indices	
R1	82
R2	79
R3	72
R4	81
R5	82
R6	70
R7	81
R8	75
R9	18
R10	45
R11	83
R12	51
R13	79
R14	84

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

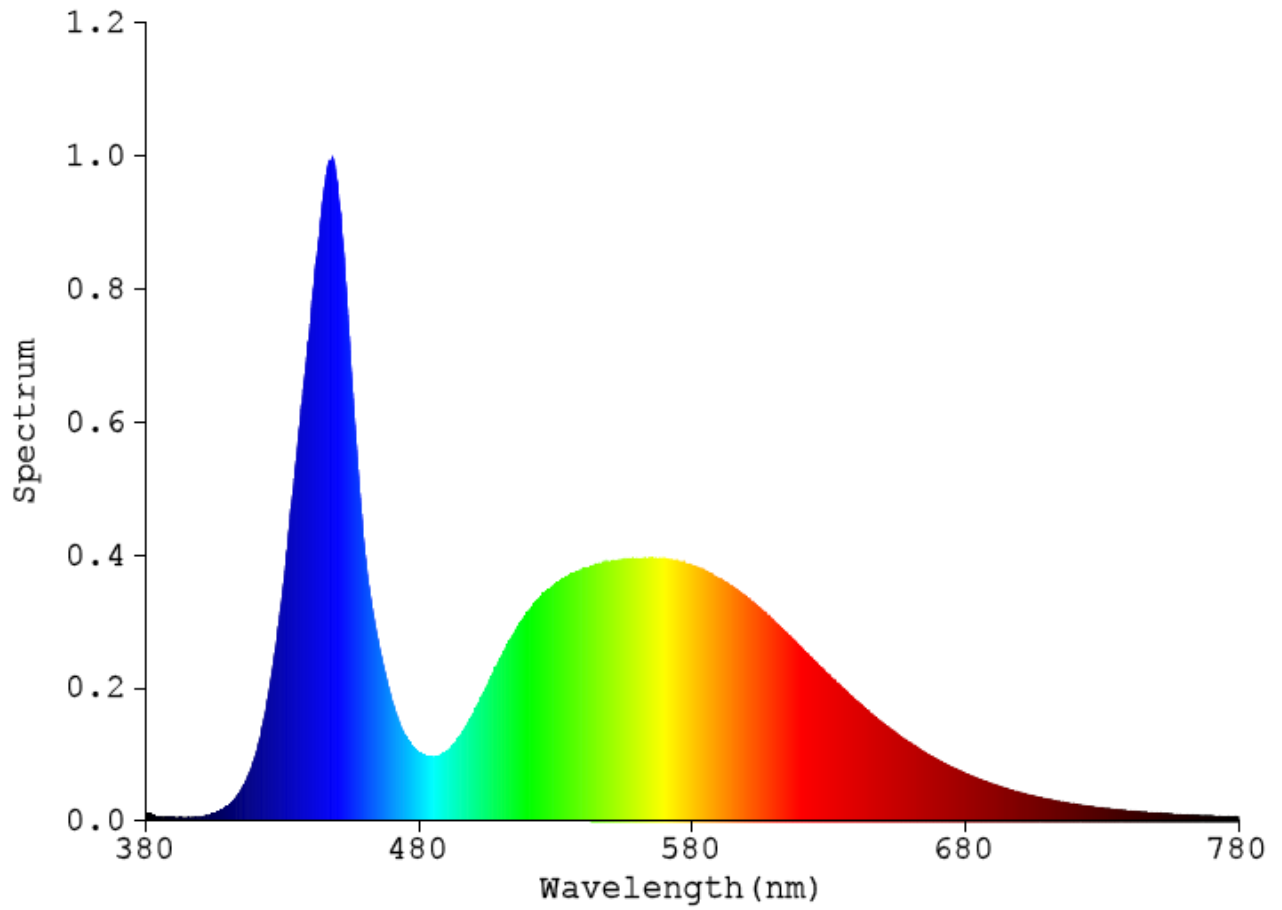


Chart 1: Spectral Power Distribution

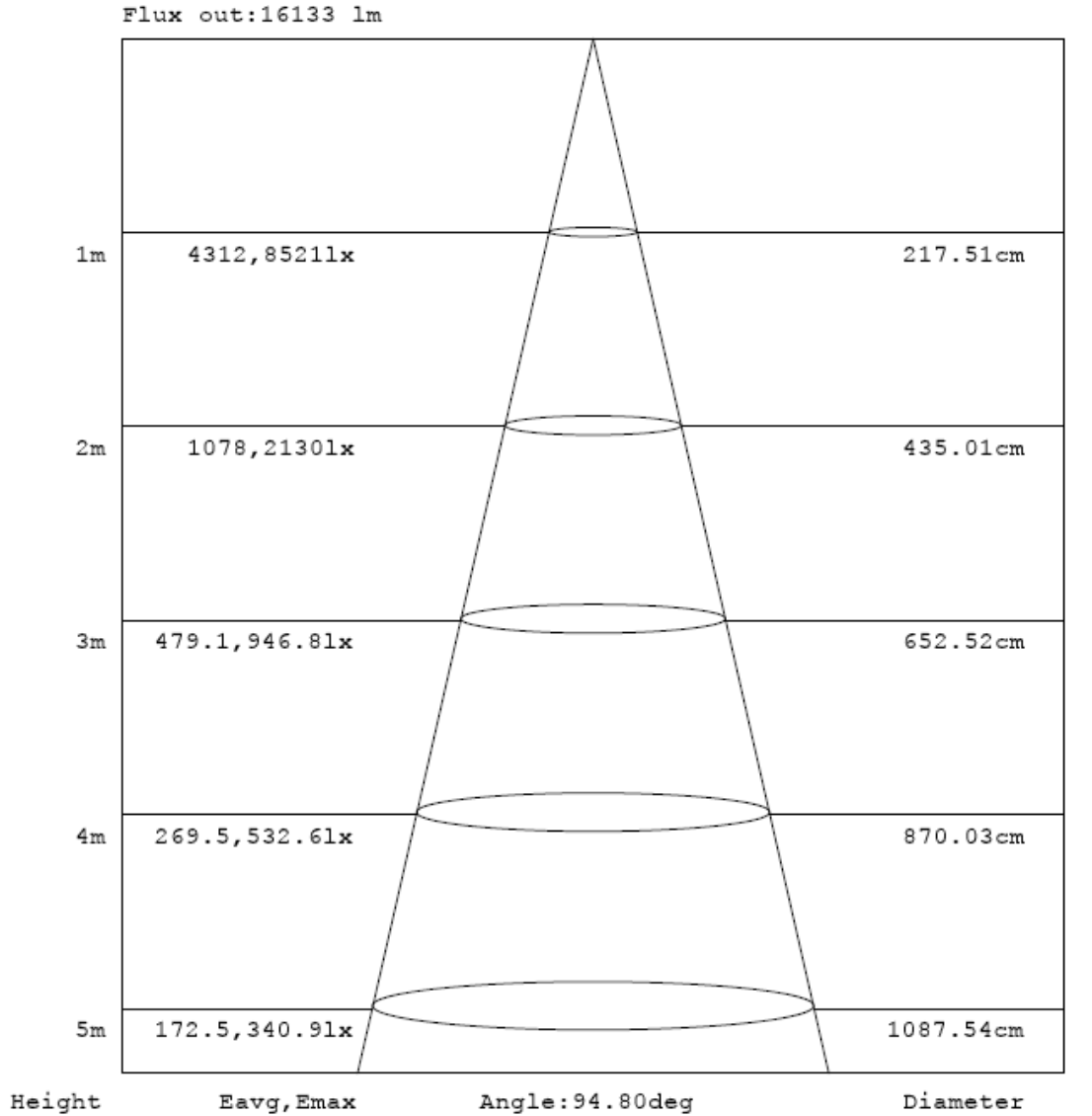
Zonal Lumen Tabulation

$\gamma(^{\circ})$	Lumens	% Total
0- 10	820.68	3.24%
10- 20	2497.108	9.85%
20- 30	4082.915	16.10%
30- 40	5054.864	19.93%
40- 50	4789.587	18.89%
50- 60	3800.911	14.99%
60- 70	2749.724	10.84%
70- 80	1376.163	5.43%
80- 90	168.283	0.66%
90-100	1.554	0.01%
100-110	1.961	0.01%
110-120	2.119	0.01%
120-130	2.27	0.01%
130-140	2.486	0.01%
140-150	2.413	0.01%
150-160	2.021	0.01%
160-170	1.36	0.01%
170-180	0.506	0.00%
Total	25356.9	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	21046.065	83.00%
60- 90	4294.17	16.93%
0-90	25340.235	99.93%
90- 180	16.69	0.07%
0- 180	25356.9	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

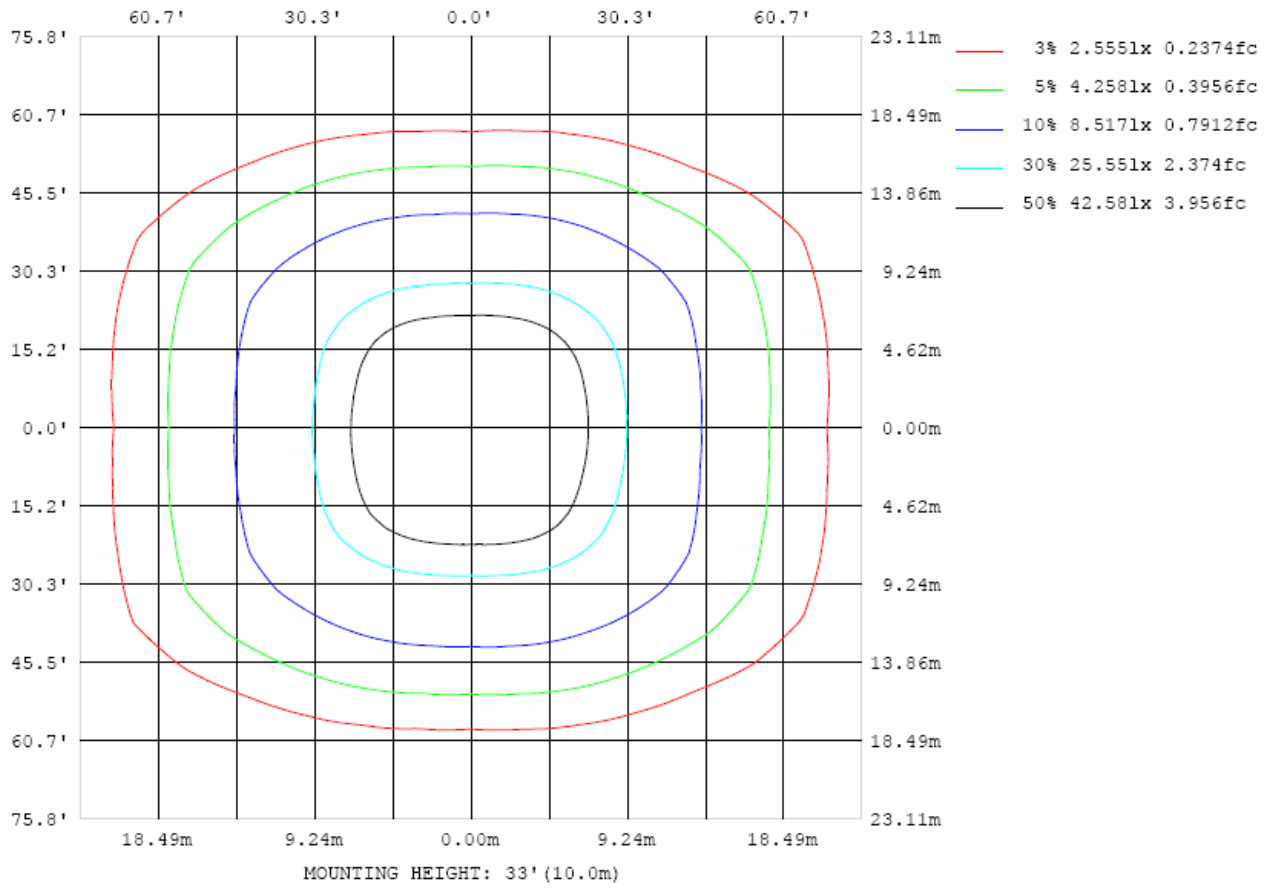


Chart 3: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots

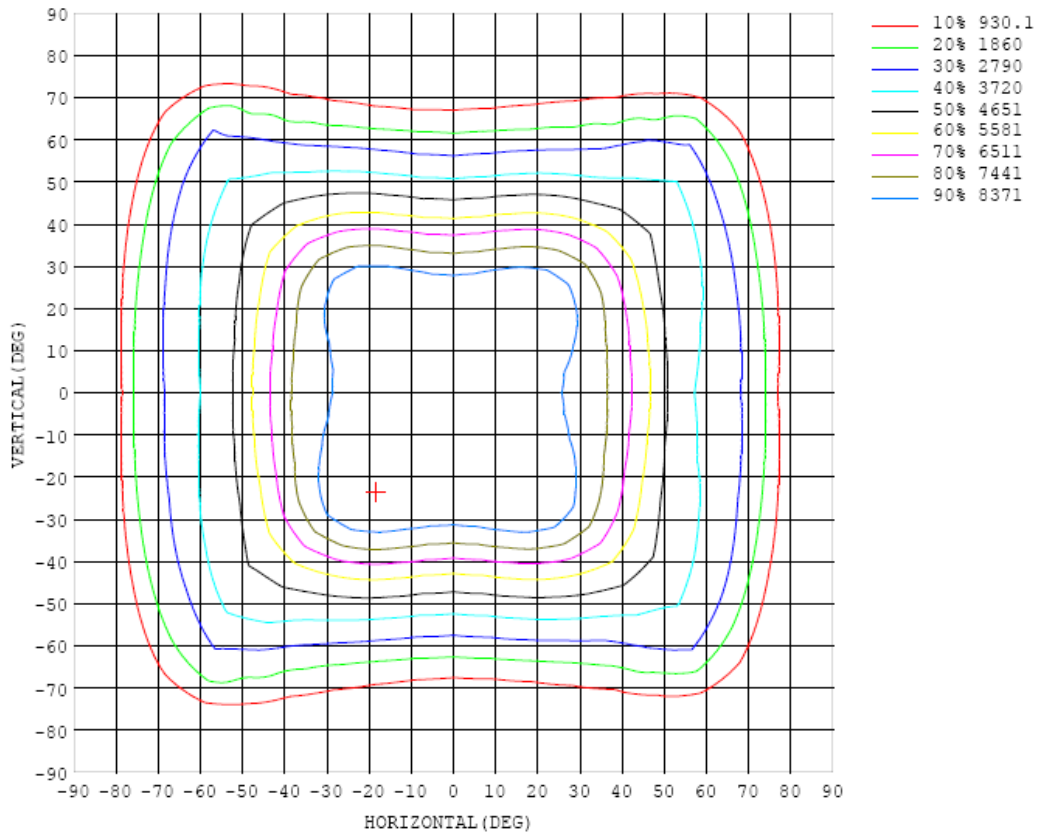


Chart 4: Isocandela Plot

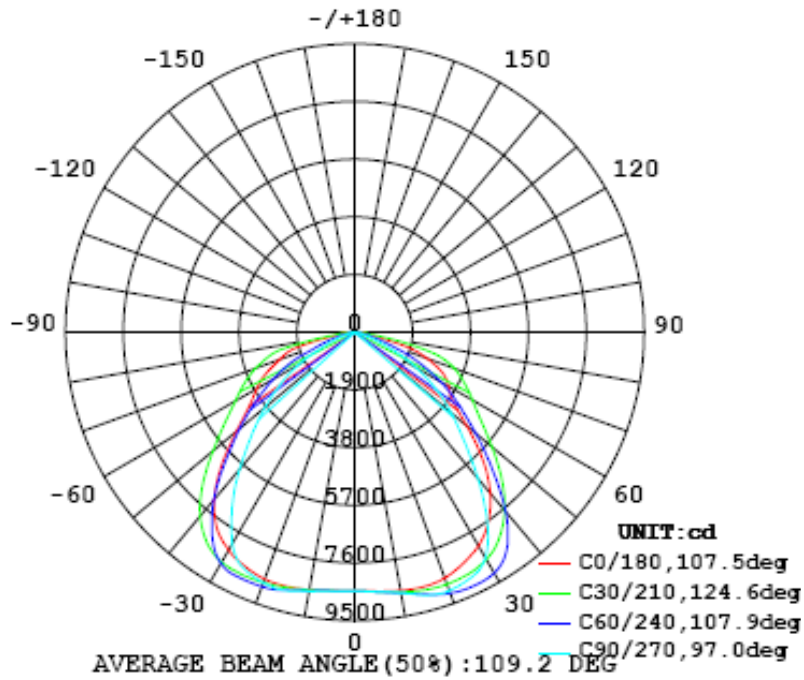


Chart 5: Polar Candela Distribution

Luminous Intensity Data

Table--1 UNIT: 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	8517	8517	8517	8517	8517	8517	8517	8517	8517	8517	8517	8517	8517	8517	8517	8517	8517	8517	8517
5	8565	8571	8577	8581	8583	8585	8584	8583	8583	8583	8581	8578	8574	8569	8563	8556	8550	8542	8535
10	8635	8646	8666	8687	8704	8717	8724	8727	8724	8721	8713	8704	8692	8680	8666	8653	8636	8622	8607
15	8685	8705	8747	8789	8838	8890	8938	8966	8968	8962	8956	8939	8913	8874	8832	8780	8731	8691	8665
20	8614	8651	8729	8835	8979	9096	9147	9133	9088	9061	9070	9106	9144	9119	9026	8896	8778	8697	8655
25	8405	8457	8582	8795	9043	9213	9223	9116	8999	8945	8975	9084	9202	9259	9169	8967	8742	8587	8519
30	8120	8178	8340	8641	9001	9198	9155	8938	8684	8571	8662	8909	9166	9300	9205	8921	8605	8379	8289
35	7636	7707	7896	8268	8719	8930	8705	8210	7762	7579	7743	8171	8691	9054	9022	8629	8225	7978	7893
40	6921	6967	7183	7652	8158	8195	7702	7025	6493	6299	6501	7038	7726	8302	8481	8072	7540	7260	7182
45	5940	5990	6289	6814	7215	6997	6385	5768	5280	5093	5279	5757	6419	7084	7479	7182	6607	6260	6181
50	4806	4900	5290	5880	6122	5725	5180	4669	4282	4127	4274	4676	5199	5732	6241	6119	5536	5187	5074
55	3922	4030	4450	5047	5136	4667	4173	3756	3397	3239	3383	3753	4187	4668	5184	5224	4695	4363	4229
60	3559	3689	3977	4461	4295	3742	3239	2811	2459	2306	2443	2822	3309	3840	4394	4653	4172	3876	3719
65	3183	3343	3651	3974	3566	2789	2249	1837	1502	1363	1495	1869	2326	2971	3780	4239	3774	3408	3215
70	2528	2752	3166	3470	2786	1870	1225	887	688	635	726	970	1352	2040	2859	3478	3072	2751	2630
75	1559	1890	2314	2655	1645	882	558	386	297	258	309	424	650	1089	1881	2708	2443	2211	2040
80	538	690	1036	1004	592	278	175	115	87.7	64.0	90.7	127	181	359	785	1391	1362	989	682
85	59.0	175	202	143	75.9	39.1	35.3	25.2	18.8	17.9	19.0	31.5	44.5	55.1	101	243	323	250	214
90	2.31	2.35	2.35	2.25	2.01	1.64	1.24	0.99	0.89	0.50	0.54	0.65	0.74	0.85	1.07	2.66	2.32	4.73	3.10
95	2.78	2.81	2.76	2.63	2.41	2.06	1.61	1.26	1.07	0.43	0.47	0.55	0.63	0.71	0.78	0.86	0.95	0.99	0.96
100	3.10	3.11	3.05	2.90	2.71	2.43	2.04	1.67	1.46	0.55	0.60	0.66	0.74	0.82	0.90	0.98	1.08	1.14	1.11
105	3.32	3.32	3.24	3.09	2.91	2.69	2.38	2.06	1.84	0.73	0.77	0.84	0.87	0.95	1.04	1.15	1.25	1.32	1.31
110	3.44	3.27	3.16	2.99	2.83	2.64	2.41	2.14	1.95	0.99	1.02	1.11	1.13	1.18	1.29	1.41	1.52	1.58	1.74
115	3.71	3.09	2.95	2.76	2.57	2.41	2.28	2.08	1.93	1.35	1.31	1.38	1.44	1.45	1.60	1.68	1.87	1.93	2.48
120	4.02	2.87	2.67	2.44	2.33	2.26	2.20	2.10	2.01	1.78	1.76	1.77	1.82	1.85	2.03	2.13	2.21	2.35	3.84
125	4.19	2.76	2.59	2.36	2.28	2.22	2.21	2.15	2.12	2.30	2.24	2.18	2.27	2.32	2.51	2.62	2.60	2.79	3.77
130	3.32	3.00	2.93	2.66	2.53	2.41	2.48	2.42	2.39	2.76	2.71	2.69	2.71	2.66	2.87	3.06	3.12	3.17	3.93
135	3.99	3.45	3.18	3.03	2.90	2.95	2.90	2.90	2.87	3.25	3.18	3.13	3.10	3.01	3.13	3.33	3.51	3.54	4.53
140	4.42	3.77	3.45	3.36	3.21	3.25	3.23	3.29	3.28	3.59	3.52	3.44	3.39	3.26	3.36	3.45	3.59	3.90	4.84
145	4.32	3.92	3.85	3.70	3.66	3.57	3.61	3.67	3.68	3.92	3.89	3.84	3.63	3.57	3.57	3.73	3.83	4.25	4.70
150	4.30	4.18	4.16	3.96	3.99	3.98	4.14	4.13	4.17	4.25	4.27	4.24	4.10	3.89	3.82	3.88	4.12	4.24	4.46
155	4.45	4.37	4.21	4.17	4.11	4.30	4.53	4.42	4.48	4.56	4.57	4.47	4.51	4.12	3.94	4.00	4.10	4.16	4.14
160	4.21	4.34	4.27	4.38	4.40	4.61	4.86	4.91	4.92	4.81	4.83	4.74	4.73	4.49	4.13	4.01	4.10	4.24	4.07
165	4.44	4.37	4.41	4.49	4.51	4.74	4.99	5.04	4.97	4.86	4.95	4.99	4.97	4.92	4.47	4.37	4.43	4.36	4.31
170	4.83	4.73	4.80	4.75	4.62	5.00	5.34	5.36	5.25	5.07	5.10	5.15	5.23	5.15	4.65	4.51	4.48	4.71	4.60
175	5.05	4.91	5.28	5.21	5.15	5.40	5.62	5.61	5.57	5.68	5.73	5.74	5.76	5.73	5.44	5.25	5.22	5.15	4.92
180	5.16	5.17	5.11	5.20	5.34	5.48	5.52	5.51	5.56	5.53	5.63	5.66	5.69	5.61	5.48	5.44	5.31	5.17	5.20

Table 5: 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	8517	8517	8517	8517	8517	8517	8517	8517	8517	8517	8517	8517	8517	8517	8517	8517	8517		
5	8533	8537	8542	8545	8546	8546	8548	8549	8549	8552	8556	8562	8568	8571	8572	8568	8565		
10	8606	8610	8612	8616	8630	8645	8655	8661	8666	8676	8687	8693	8692	8684	8673	8663	8645		
15	8663	8674	8707	8747	8773	8794	8802	8800	8803	8816	8833	8847	8846	8825	8784	8741	8707		
20	8652	8693	8776	8878	8940	8919	8850	8795	8784	8817	8894	8975	8998	8949	8844	8732	8650		
25	8526	8619	8799	8973	9013	8925	8780	8646	8602	8661	8807	8970	9063	9006	8827	8616	8460		
30	8312	8459	8753	8982	9007	8797	8450	8150	8047	8171	8463	8776	8964	8946	8698	8401	8188		
35	7924	8114	8465	8723	8639	8171	7589	7168	7026	7195	7610	8124	8513	8574	8310	7934	7707		
40	7214	7459	7907	8135	7832	7210	6526	6041	5894	6100	6572	7147	7666	7910	7668	7245	6973		
45	6252	6568	7060	7159	6702	6016	5369	4935	4796	4971	5398	5976	6537	6914	6791	6374	6040		
50	5179	5573	6080	6031	5513	4939	4385	3984	3852	4017	4389	4846	5332	5754	5751	5292	4941		
55	4355	4726	5215	5041	4515	3975	3477	3108	2984	3152	3481	3878	4294	4793	4896	4413	4075		
60	3859	4158	4529	4231	3622	3106	2633	2270	2119	2289	2607	3005	3436	4052	4391	4013	3731		
65	3429	3726	4008	3501	2800	2213	1592	1268	1193	1301	1635	2152	2690	3423	3952	3651	3377		
70	2847	3171	3465	2764	1755	1174	832	666	614	685	868	1181	1665	2709	3336	2946	2671		
75	2270	2615	2837	1673	936	586	413	308	268	311	382	522	836	1464	2464	2154	1809		
80	1014	1368	1284	687	301	183	125	79.5	59.6	82.6	106	137	217	485	861	896	649		
85	271	313	203	88.4	50.3	40.3	26.0	16.4	16.4	16.5	23.9	29.3	30.6	59.4	127	191	165		
90	1.52	1.91	1.93	1.06	0.85	0.68	0.55	0.47	0.86	0.86	1.00	1.29	1.70	2.06	2.28	2.34	2.32		
95	0.90	0.86	0.84	0.81	0.72	0.59	0.49	0.45	1.06	1.14	1.36	1.73	2.18	2.52	2.69	2.75	2.76		
100	1.03	0.97	0.95	0.92	0.84	0.72	0.61	0.58	1.47	1.55	1.79	2.17	2.58	2.87	2.99	3.03	3.07		
105	1.21	1.13	1.10	1.09	1.03	0.91	0.81	0.76	1.89	1.95	2.18	2.55	2.92	3.14	3.20	3.23	3.27		
110	1.49	1.41	1.36	1.35	1.29	1.18	1.08	1.04	2.01	2.08	2.29	2.62	2.92	3.08	3.11	3.14	3.21		
115	1.90	1.80	1.71	1.68	1.63	1.55	1.45	1.41	1.99	2.05	2.22	2.47	2.67	2.81	2.85	2.89	3.00		
120	2.33	2.22	2.12	2.10	2.09	2.00	1.91	1.88	2.07	2.10	2.22	2.39	2.50	2.54	2.52	2.55	2.74		
125	2.77	2.68	2.61	2.62	2.58	2.50	2.40	2.41	2.19	2.19	2.29	2.43	2.54	2.53	2.47	2.52	2.71		
130	3.22	3.13	3.08	3.03	2.96	2.96	2.86	2.88	2.47	2.50	2.56	2.72	2.75	2.75	2.77	2.80	2.93		
135	3.62	3.46	3.33	3.30	3.29	3.31	3.31	3.36	2.96	2.95	3.01	3.13	3.19	3.18	3.14	3.17	3.40		
140	3.89	3.57	3.46	3.50	3.46	3.52	3.62	3.73	3.37	3.39	3.42	3.47	3.54	3.56	3.53	3.56	3.82		
145	4.15	3.90	3.76	3.74	3.75	3.79	3.98	4.03	3.75	3.76	3.78	3.80	3.80	3.83	3.83	3.93	4.10		
150	4.28	4.11	3.98	4.04	4.14	4.20	4.38	4.40	4.17	4.20	4.20	4.12	4.12	4.07	4.08	4.18	4.28		
155	4.24	4.25	4.25	4.35	4.52	4.77	4.74	4.75	4.48	4.52	4.53	4.60	4.42	4.28	4.23	4.26	4.31		
160	4.45	4.49	4.55	4.72	4.95	5.02	5.03	5.04	4.88	4.89	4.89	4.87	4.84	4.67	4.56	4.49	4.45		
165	4.64	4.88	4.96	5.10	5.19	5.20	5.20	5.10	4.90	4.93	5.03	5.07	5.09	5.06	4.93	4.82	4.60		
170	4.60	5.01	5.14	5.26	5.37	5.38	5.31	5.27	5.15	5.17	5.29	5.46	5.54	5.53	5.42	5.26	4.95		
175	5.31	5.55	5.68	5.80	5.90	5.93	5.89	5.89	5.57	5.56	5.68	5.71	5.80	5.71	5.66	5.50	5.34		
180	5.16	5.16	5.22	5.46	5.41	5.45	5.66	5.65	5.51	5.49	5.60	5.63	5.66	5.58	5.46	5.41	5.30		

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 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 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

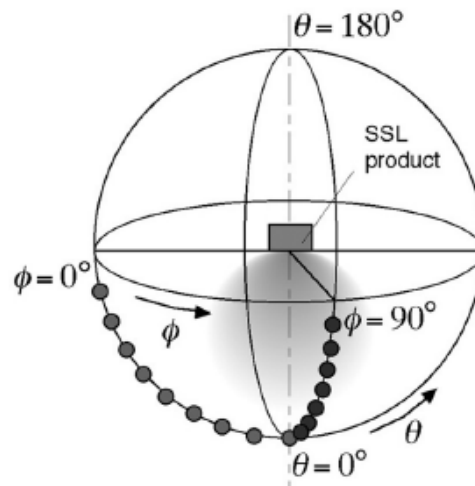
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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