



## LM-79-08 Test Report

for

**ABBlighting, Inc.**

1501 Industrial Way N. Toms River, NJ 08755

**185W Linear Highbay**

**Model: LHB185501-82**

**Laboratory: Leading Testing Laboratories**

**NVLAP CODE: 200960-0**

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Report No.: HZ14110022b

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

Reviewed by:

*April Zou*

Engineer: April Zou  
Dec. 16, 2014



Approved by

*Jim Zhang*

Manager: Jim Zhang  
Dec. 16, 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: **LHB185501-82**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
107.9	20347.1	188.56	0.9956
CCT (K)	CRI	Stabilization Time (Light & Power)	
5381	84.2	60	

Table 1: Executive Data Summary

### Test specifications:

**Date of Receipt** : Nov. 28, 2014

**Date of Test** : Dec. 15, 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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## Photos



Figure 1- Overview of the sample

### Equipment Under Test (EUT)

<b>Name</b>	: 185W Linear Highbay
<b>Model</b>	: LHB185501-82
<b>Electrical Ratings</b>	: 100~277V AC, 50/60Hz, 185W
<b>Product Description</b>	: 5300K, High-Bay Luminaires for Commercial and Industrial buildings Manufacturer of light source: LG Model of light source: LGIT 5630 Quantity of LED light source: 384pcs
<b>Manufacturer</b>	: ABB Lighting (Shanghai) Co., Ltd.
<b>Address</b>	: Room 1012, North Minch Fortune 108 Plaza, # 1839 Qixin road, Shanghai

## TEST RESULTS

Test ambient temperature was 24.2°C.

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 95 minutes.

Parameter	Result			Special Color Rendering Indices	
Test Voltage (V)	120.0	100.0	277.0	R1	84
Voltage frequency (Hz)	60	60	60	R2	87
Test Current (A)	1.577	1.911	0.714	R3	88
Power Factor	0.9956	0.9973	0.9382	R4	86
Test Power (W)	188.56	190.59	185.45	R5	86
THD A%	5.96	5.44	12.02	R6	82
Luminous Efficacy (lm/W)	107.9	105.9	109.1	R7	87
Total Luminous Flux (lm)	20347.1	20179.0	20231.0	R8	75
Color Rendering Index (CRI)	84.2			R9	25
R9	25			R10	68
Correlated Color Temperature (CCT) (K)	5381			R11	87
Chromaticity (Chroma x, Chroma y)	(0.3352, 0.3424)			R12	67
Chromaticity (Chroma u, Chroma v)	(0.2083, 0.3191)			R13	84
Chromaticity (Chroma u', Chroma v')	(0.2083, 0.4786)			R14	93
Duv	0.0006				
Average Beam Angle (°)	99.6				
Center Beam Candle Power (cd)	8792				
Spacing Criteria	1.31 (0°-180°)/ 1.18 (90°-270°)				
Zonal Lumens in the 0°-60°Zone	91.90%				
Zonal Lumens in the 60°-90°Zone	8.04%				
Zonal Lumens in the 90°-120°Zone	0.02%				
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

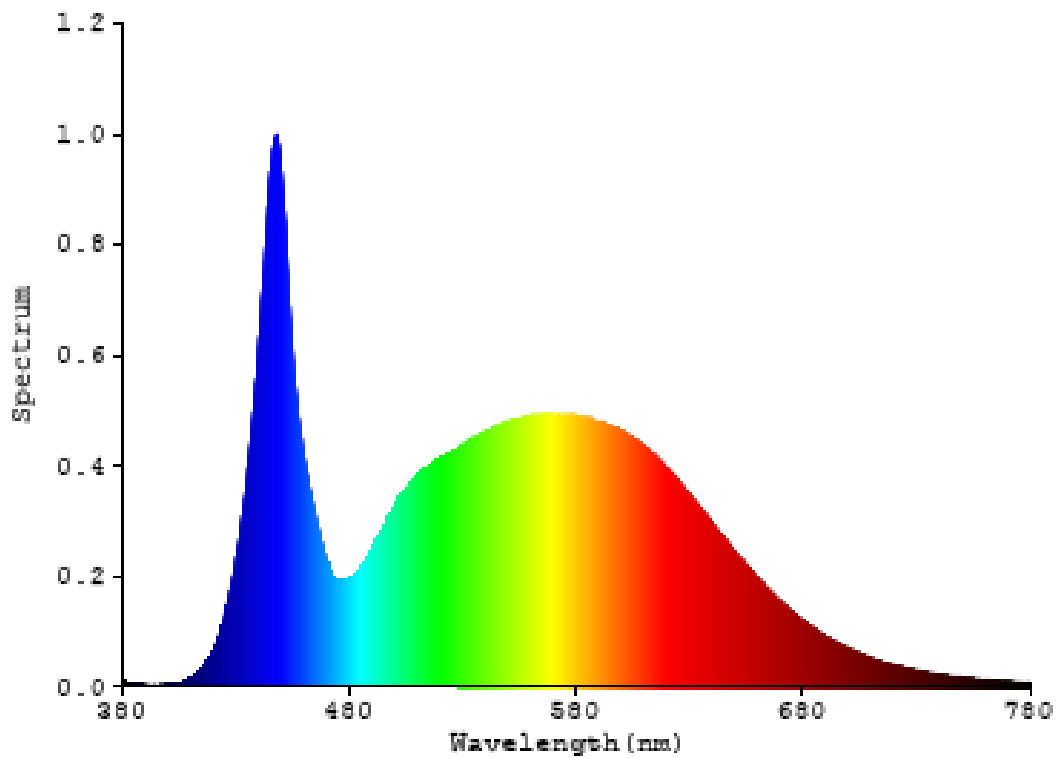


Chart 1: Spectral Power Distribution

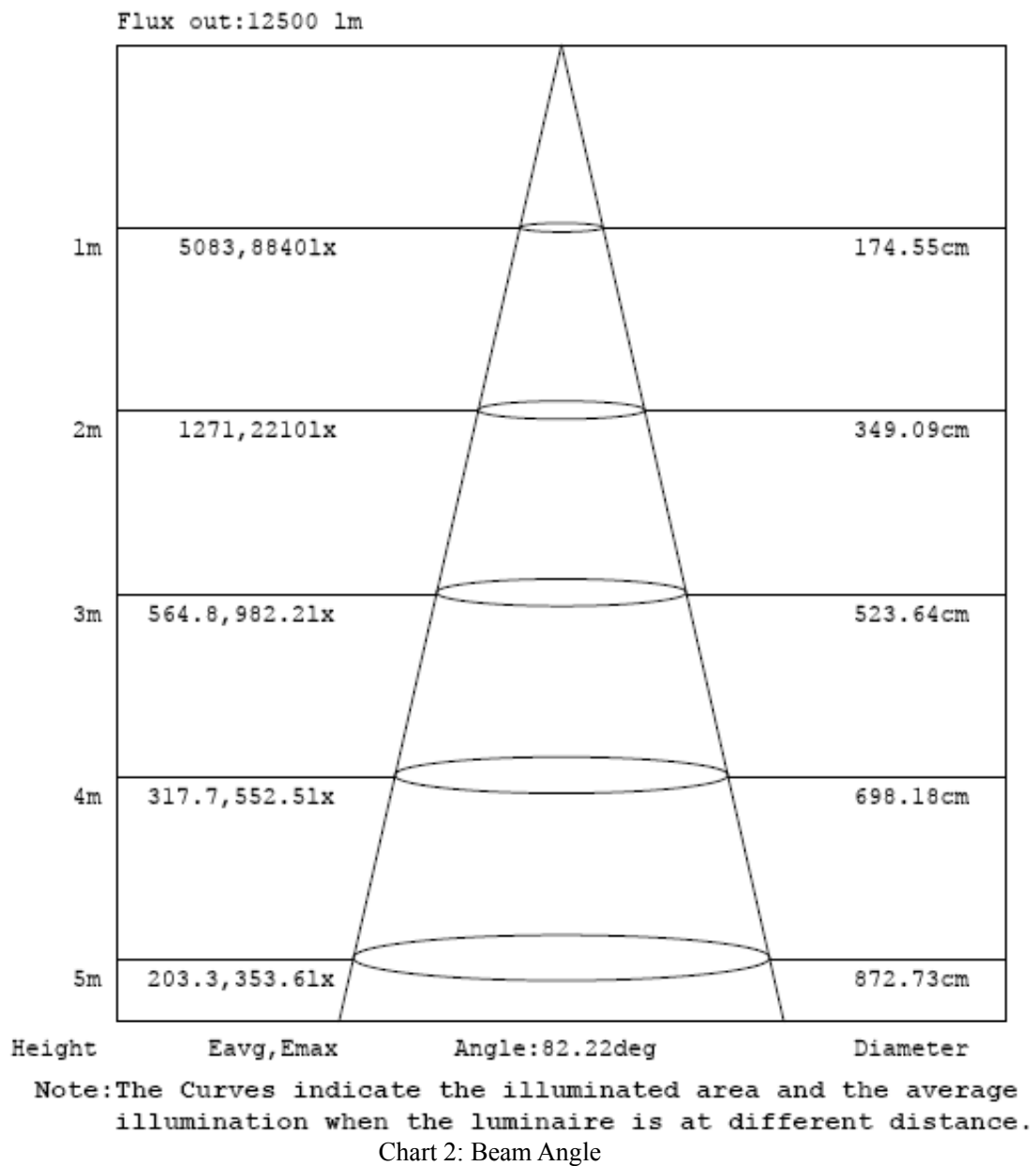
## Zonal Lumen Tabulation

$\gamma(^{\circ})$	Lumens	% Total
0- 10	819.346	4.03%
10- 20	2454.038	12.06%
20- 30	3916.939	19.25%
30- 40	4637.596	22.79%
40- 50	4096.889	20.14%
50- 60	2773.613	13.63%
60- 70	1243.525	6.11%
70- 80	358.953	1.76%
80- 90	33.396	0.16%
90-100	0.74	0.00%
100-110	1.224	0.01%
110-120	1.507	0.01%
120-130	1.82	0.01%
130-140	2.117	0.01%
140-150	2.058	0.01%
150-160	1.723	0.01%
160-170	1.168	0.01%
170-180	0.444	0.00%
Total	20347.1	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	18698.421	91.90%
60- 90	1635.874	8.04%
0-90	20334.295	99.94%
90- 180	12.801	0.06%
0- 180	20347.1	100%

Table 3: Zonal Lumen Data

## Illuminance Plots





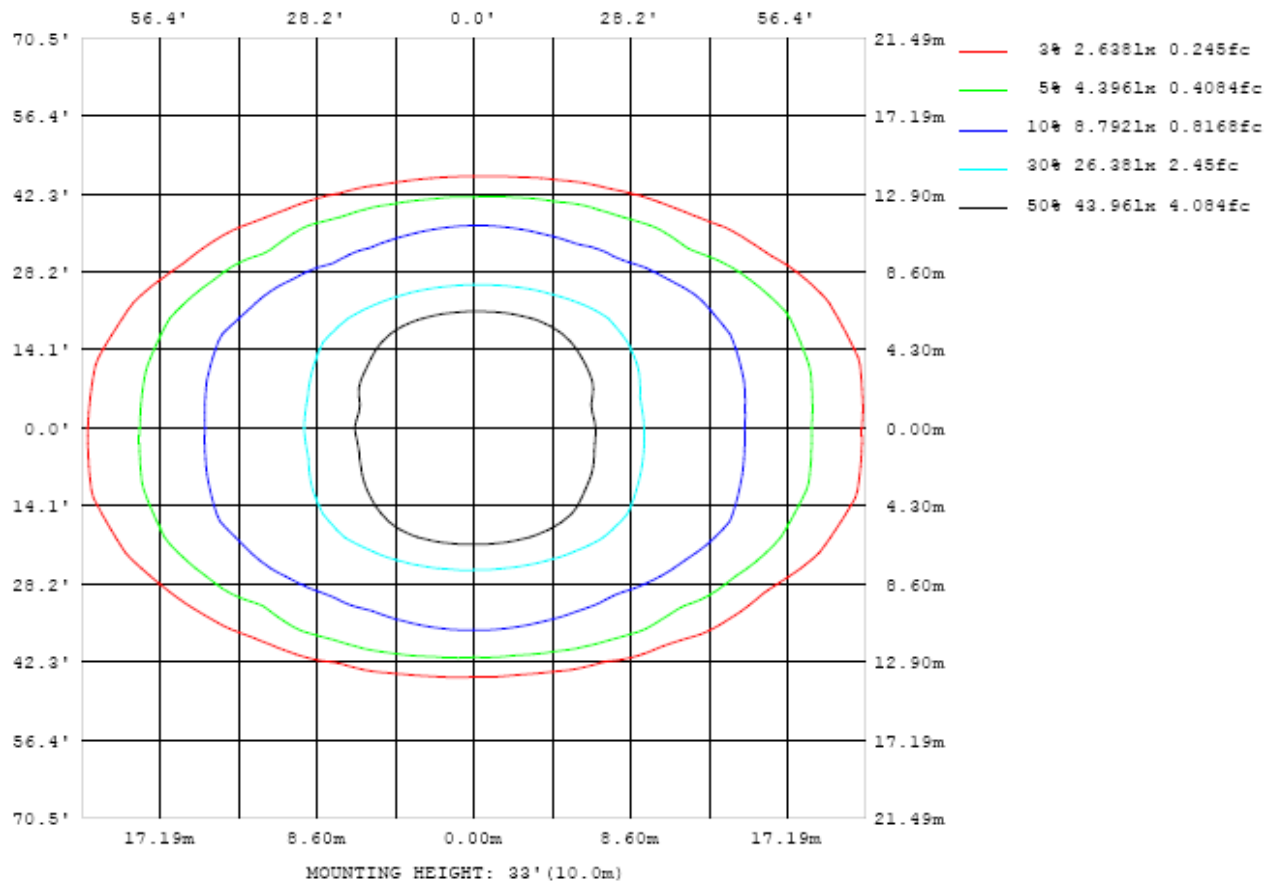


Chart 3: Illuminance Plot (Footcandles)

## Luminous Intensity Distribution Plots

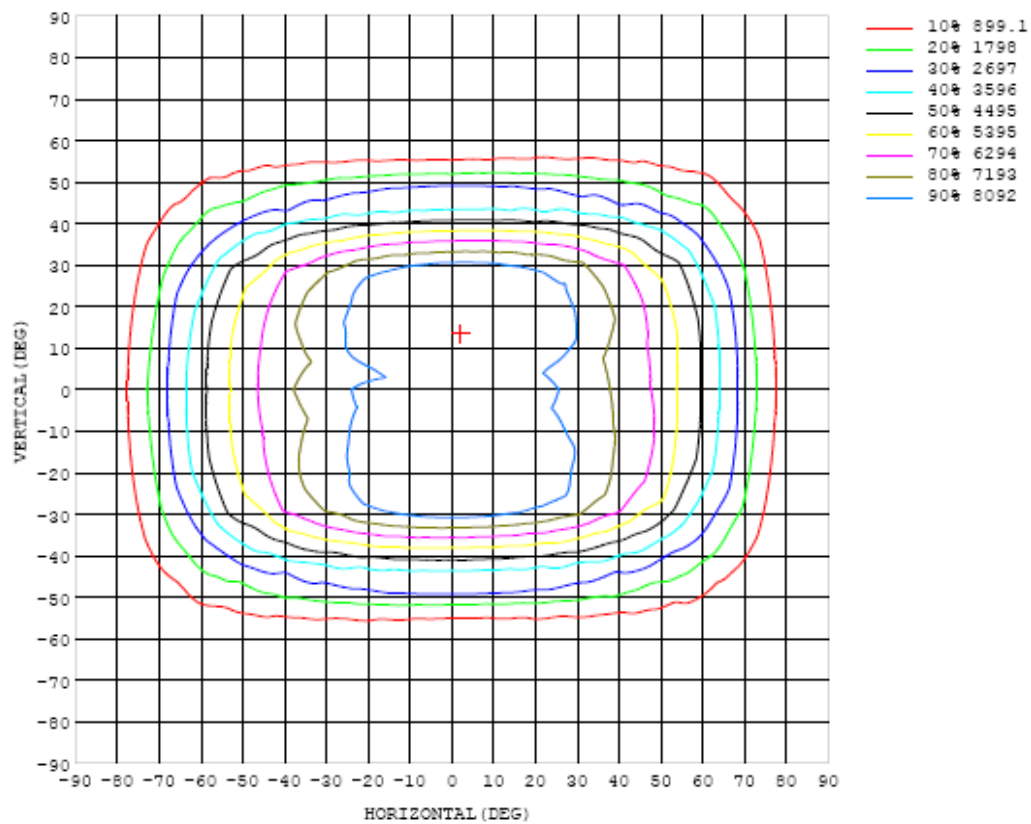


Chart 4: Isocandela Plot

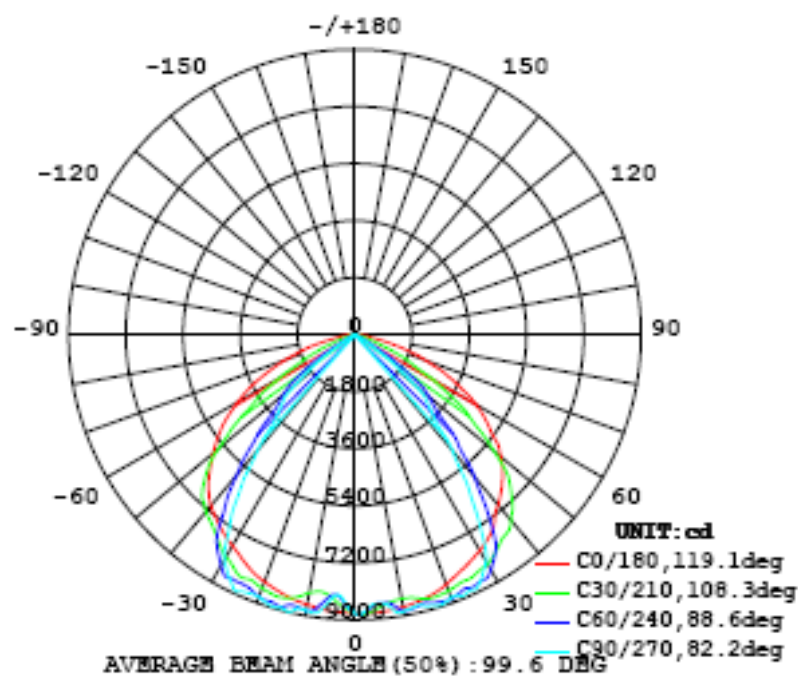


Chart 5: Polar Candela Distribution

## Luminous Intensity Data

Table--1

UNIT: cd

C (DEG) y (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	8792	8792	8792	8792	8792	8792	8792	8792	8792	8792	8792	8792	8792	8792	8792	8792	8792	8792	8792
5	8795	8809	8753	8648	8564	8523	8511	8521	8525	8519	8525	8515	8509	8530	8580	8678	8780	8793	8754
10	8723	8648	8510	8462	8541	8723	8856	8883	8874	8866	8874	8870	8805	8640	8475	8418	8512	8683	8646
15	8606	8454	8377	8634	8775	8752	8739	8833	8869	8866	8850	8777	8681	8709	8691	8498	8311	8470	8503
20	8389	8286	8460	8600	8675	8780	8880	8880	8863	8845	8853	8856	8809	8666	8527	8481	8244	8243	8298
25	8120	8054	8322	8506	8656	8644	8792	8833	8870	8878	8826	8763	8685	8571	8496	8291	8177	7964	8024
30	7861	7821	8074	8354	8398	8546	8558	8408	8298	8254	8283	8385	8506	8401	8212	8060	7756	7553	7697
35	7540	7602	7881	7987	8228	8066	7586	6980	6613	6498	6657	7046	7644	7966	7877	7683	7479	7201	7391
40	7007	7130	7364	7641	7602	6722	5861	5156	4853	4796	4865	5239	5909	6703	7371	7362	7159	6843	7040
45	6554	6682	6791	6934	6123	5059	4243	3563	3417	3380	3423	3586	4362	5141	6150	6864	6678	6431	6503
50	5995	6202	6286	5704	4494	3380	3029	2841	2498	2369	2553	2840	2991	3582	4723	5845	5943	5814	5807
55	5185	5306	5474	4302	2928	2530	1782	1383	995	887	1065	1436	1895	2549	3233	4301	5240	5226	5105
60	4384	4470	3984	2857	2000	1222	557	163	121	121	129	271	628	1276	2113	2957	4144	4405	4240
65	3402	3425	2688	1658	855	155	101	100	90.6	91.5	95.5	111	121	256	973	1705	2738	3396	3338
70	2366	2225	1464	644	120	87.4	81.7	81.4	72.8	72.7	77.7	88.5	92.2	100	135	733	1560	2331	2328
75	1365	1101	474	98.3	69.2	61.8	46.5	41.4	34.7	33.7	38.6	47.9	57.7	72.1	80.1	111	563	1207	1403
80	548	301	64.2	46.5	31.8	26.4	23.4	21.1	19.1	18.8	21.3	24.3	27.5	31.8	41.7	57.8	132	428	583
85	67.5	35.9	17.6	13.3	11.4	10.2	9.20	8.73	7.78	8.00	8.84	10.5	11.1	12.4	14.5	17.8	26.4	54.6	91.2
90	0.54	0.42	0.39	0.34	0.27	0.28	0.32	0.32	0.32	0.30	0.26	0.23	0.25	0.30	0.34	0.51	1.62	2.58	1.55
95	0.57	0.52	0.46	0.38	0.30	0.30	0.34	0.36	0.34	0.31	0.27	0.25	0.29	0.36	0.45	0.52	0.55	0.55	1.89
100	0.73	0.70	0.62	0.53	0.41	0.40	0.44	0.48	0.42	0.38	0.35	0.34	0.40	0.50	0.63	0.72	0.74	0.72	2.39
105	0.90	0.91	0.80	0.73	0.61	0.57	0.60	0.63	0.55	0.50	0.47	0.52	0.61	0.73	0.89	0.97	1.00	0.94	2.62
110	1.17	1.36	1.01	0.98	0.86	0.84	0.86	0.86	0.77	0.69	0.67	0.79	1.09	1.08	1.20	1.27	1.26	1.26	2.44
115	1.52	1.44	1.23	1.24	1.15	1.15	1.21	1.18	1.06	0.95	0.98	1.13	1.25	1.39	1.55	1.62	1.60	1.49	2.07
120	1.99	1.76	1.48	1.47	1.44	1.51	1.60	1.55	1.43	1.32	1.42	1.52	1.69	1.77	1.89	1.98	2.01	2.17	2.10
125	2.38	2.22	1.79	1.75	1.74	1.90	2.05	1.96	1.91	1.78	1.95	2.00	2.10	2.16	2.20	2.36	2.39	2.41	2.01
130	2.77	2.65	2.20	2.04	2.08	2.27	2.49	2.45	2.37	2.30	2.44	2.51	2.47	2.58	2.54	2.66	3.07	3.01	2.53
135	3.09	2.95	2.61	2.37	2.32	2.59	2.84	2.87	2.72	2.64	2.85	2.93	2.78	2.74	2.58	3.44	3.02	3.11	2.84
140	3.23	3.01	2.98	3.32	2.56	2.76	3.05	3.08	3.00	3.23	3.13	3.09	2.94	2.90	2.87	2.89	2.96	3.11	2.84
145	3.57	3.32	3.27	2.98	2.94	3.01	3.15	3.19	3.22	3.40	3.26	3.16	3.12	3.06	3.13	3.24	3.40	3.38	3.23
150	3.84	3.65	3.75	4.12	3.31	3.28	3.48	3.27	3.30	3.54	3.32	3.27	3.55	3.36	3.36	3.76	3.69	3.68	3.49
155	4.20	3.87	3.63	3.65	3.38	3.47	3.59	3.48	3.56	3.60	3.65	3.47	3.69	3.81	3.63	3.70	3.70	3.85	3.59
160	4.23	4.11	3.81	3.74	3.65	3.53	3.67	3.64	3.68	3.57	3.84	3.71	3.76	3.87	4.13	4.05	3.95	4.08	3.87
165	4.47	4.43	4.21	3.97	3.80	3.57	3.65	3.66	3.56	3.64	3.79	3.84	4.13	4.29	4.25	4.21	4.51	4.68	4.31
170	4.72	4.67	4.61	4.41	4.11	3.89	3.81	3.77	4.05	4.14	4.08	4.11	4.30	4.38	4.41	4.57	4.72	4.78	4.55
175	4.96	4.90	4.87	4.82	4.75	4.54	4.50	4.73	4.96	4.89	4.71	4.57	4.70	4.88	4.82	4.75	4.78	4.85	4.88
180	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24

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	8792	8792	8792	8792	8792	8792	8792	8792	8792	8792	8792	8792	8792	8792	8792	8792	8792		
5	8613	8478	8329	8229	8210	8247	8301	8336	8348	8342	8306	8255	8234	8277	8393	8545	8674		
10	8355	8143	8269	8576	8783	8834	8826	8826	8832	8848	8863	8882	8820	8594	8288	8243	8511		
15	8133	8193	8598	8668	8711	8885	8923	8919	8926	8939	8971	8924	8791	8787	8658	8227	8318		
20	7932	8287	8515	8686	8736	8803	8795	8807	8816	8833	8867	8880	8832	8766	8674	8335	8184		
25	7665	8260	8445	8526	8511	8624	8759	8890	8913	8913	8811	8669	8652	8670	8544	8377	7950		
30	7365	7836	8107	8181	8381	8414	8287	8229	8224	8296	8414	8580	8510	8388	8346	8196	7646		
35	7149	7614	7642	7889	7839	7467	6952	6702	6622	6791	7094	7728	8115	8155	8052	7964	7357		
40	6895	7219	7293	7204	6492	5774	5182	4799	4758	4890	5419	6079	6931	7678	7510	7383	6858		
45	6475	6621	6742	5912	4974	4122	3462	3375	3361	3414	3553	4408	5376	6389	7002	6909	6497		
50	5897	5954	5595	4490	3238	2907	2767	2412	2331	2503	2851	3055	3746	4822	6144	6187	6075		
55	5240	5194	4037	2874	2453	1797	1383	1137	1008	1219	1526	1975	2552	3407	4670	5416	5394		
60	4268	3873	2767	1964	1177	613	219	132	125	129	352	713	1363	2163	3190	4458	4559		
65	3261	2560	1534	902	235	114	108	93.5	89.0	90.1	103	108	379	970	1737	2915	3510		
70	2225	1398	666	123	102	87.4	81.1	71.3	66.5	67.2	76.3	78.3	89.3	159	755	1737	2333		
75	1059	469	103	80.1	70.4	51.7	42.5	36.9	33.4	33.9	40.6	48.9	58.2	66.6	133	585	1214		
80	324	72.9	55.7	38.2	32.6	27.8	23.7	20.9	18.9	18.9	20.7	23.7	26.8	33.0	42.6	125	419		
85	42.4	23.5	17.9	14.5	12.4	10.8	9.48	8.40	7.75	7.41	8.50	9.28	10.2	11.9	15.0	20.7	46.5		
90	1.39	1.04	0.76	0.50	0.36	0.29	0.29	0.33	0.37	0.39	0.41	0.41	0.41	0.56	0.86	1.16	1.43		
95	1.76	1.49	1.12	0.74	0.51	0.37	0.34	0.37	0.41	0.45	0.49	0.53	0.60	0.84	1.24	1.62	1.86		
100	2.25	1.97	1.62	1.14	0.79	0.59	0.51	0.49	0.53	0.59	0.68	0.79	0.91	1.29	1.77	2.17	2.34		
105	2.55	2.32	2.19	1.62	1.18	0.94	0.77	0.69	0.74	0.86	1.03	1.14	1.33	1.81	2.28	2.60	2.69		
110	2.38	2.19	2.13	1.85	1.44	1.14	0.98	0.86	0.93	1.08	1.28	1.43	1.64	2.06	2.39	2.58	2.61		
115	2.08	1.81	1.94	1.80	1.54	1.35	1.18	1.06	1.13	1.33	1.54	1.66	1.82	2.09	2.25	2.25	2.26		
120	1.90	1.76	1.80	1.75	1.60	1.45	1.35	1.30	1.37	1.58	1.76	1.84	1.89	2.72	2.09	2.18	2.30		
125	2.01	1.99	1.93	1.90	1.83	1.72	1.72	1.67	1.62	1.82	1.99	2.08	2.08	2.08	2.14	2.32	2.50		
130	2.44	2.25	2.16	2.18	2.14	2.13	2.22	2.25	2.13	2.30	2.43	2.45	2.32	2.20	2.23	2.33	2.67		
135	2.74	2.53	3.80	2.60	2.56	2.58	2.81	2.85	2.80	2.87	2.97	2.87	2.63	2.45	2.53	2.69	2.91		
140	4.33	2.95	2.75	2.78	2.82	2.96	3.13	3.28	3.29	3.21	3.33	3.15	2.81	2.78	2.86	2.79	2.88		
145	3.21	3.17	3.47	3.31	3.19	3.35	3.38	3.61	3.67	3.37	3.48	3.33	3.16	2.98	2.91	2.95	3.15		
150	3.39	3.50	3.43	3.52	3.62	3.71	3.72	3.85	3.75	3.68	3.68	3.63	3.41	3.26	3.19	3.25	3.41		
155	3.54	3.52	3.64	3.62	3.93	3.92	3.91	4.18	3.97	3.91	3.89	4.03	3.60	3.53	3.62	3.40	3.80		
160	3.81	3.74	3.77	4.03	4.03	3.97	4.01	4.27	4.09	4.19	4.19	4.17	3.95	4.03	3.78	3.75	3.94		
165	4.11	4.22	4.12	4.06	4.19	4.33	4.38	4.39	4.41	4.35	4.34	4.37	4.26	4.20	4.12	4.07	4.17		
170	4.28	4.40	4.57	4.64	4.60	4.65	4.68	4.63	4.88	5.11	4.76	4.56	4.51	4.58	4.58	4.43	4.53		
175	4.69	4.66	4.74	4.76	4.82	4.88	5.02	4.96	5.20	5.50	5.20	4.92	4.88	4.79	4.60	4.55	4.99		
180	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24		

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

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  $k=2$ .

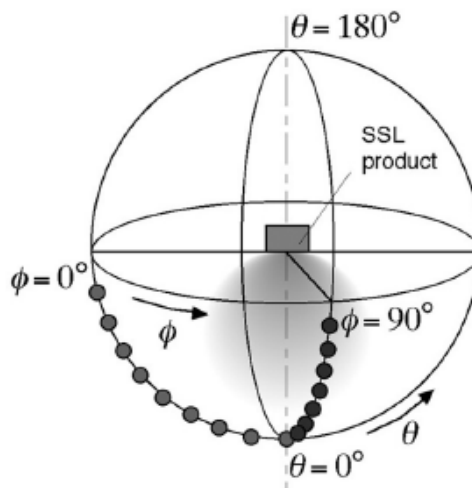
## Color Characteristics Measurements

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 ( $C=0^\circ/180^\circ$  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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