NVLAP LAB CODE 200960-0

LM-79-08 Test Report

for

ABBlighting, Inc.

3 Adams St Belvidere, NJ 07823.

Troffer

Model: ABBRT22D3550

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

No.1805, DongLiu road, BinJiang District, Hangzhou, China

Tel: +86-571-56680806

www.ledtestlab.com

Report No.: HZ15070041b

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

Reviewed by: April Zou

Engineer: April Zou

Aug. 10, 2015

Approved by: Jim Zhang

Manager: Jim Zhang

Aug. 10, 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: **ABBRT22D3550**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
98.4	3409.3	34.64	0.9930

CCT (K)	CRI	Stabilization Time (Light & Power)
4895	83.6	60

Table 1: Executive Data Summary

Test specifications:

Date of Receipt : Jul. 23, 2015

Date of Test : Jul. 24, 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

TABLE OF CONTENT

Sample Photo

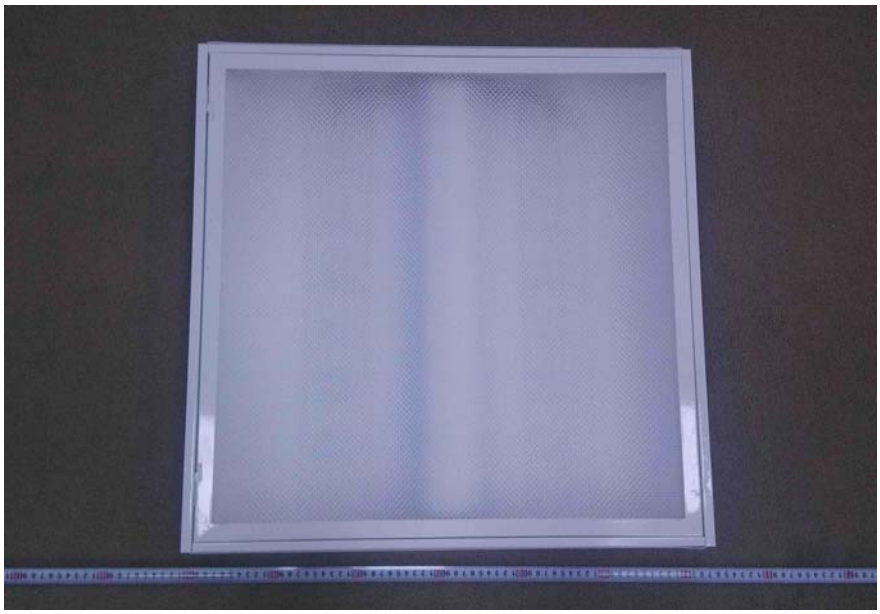


Figure 1- Overview of the sample

Equipment Under Test (EUT)	
Name	: Troffer
Model	: ABBRT22D3550
Electrical Ratings	: 100~277VAC, 50/60Hz, 35W
Product Description	: 5000K, 2x2 Luminaires for Ambient Lighting of Interior Commercial Spaces Manufacturer of light source: EVERLIGHT Model of light source: 67-21S Series 2835 Quantity of LED light source: 216 pcs
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.

Parameter	Result		
Test Voltage (V)	120.0	100.0	277.0
Voltage frequency (Hz)	60	60	60
Test Current (A)	0.291	0.353	0.133
Power Factor	0.9930	0.9886	0.9534
Test Power (W)	34.64	34.92	35.18
THD A%	6.55	7.17	8.16
Luminous Efficacy (lm/W)	98.4		
Total Luminous Flux (lm)	3409.3		
Color Rendering Index (CRI)	83.6		
R9	18		
Correlated Color Temperature (CCT) (K)	4895		
Chromaticity (Chroma x, Chroma y)	(0.3486, 0.3582)		
Chromaticity (Chroma u, Chroma v)	(0.2112, 0.3256)		
Chromaticity (Chroma u', Chroma v')	(0.2112, 0.4884)		
Duv	0.0020		
Average Beam Angle (°)	92.9		
Center Beam Candle Power (cd)	1547		
Spacing Criteria	1.22 (0°-180°)/ 1.25 (90°-270°)		
Zonal Lumens in the 0°-60°Zone	87.39%		
Zonal Lumens in the 60°-90°Zone	12.49%		
Zonal Lumens in the 90°-120°Zone	0.06%		
Zonal Lumens in the 120°-180°Zone	0.06%		

Special Color Rendering Indices	
R1	82
R2	89
R3	93
R4	81
R5	81
R6	83
R7	89
R8	70
R9	18
R10	73
R11	79
R12	55
R13	84
R14	96

Table 2: Test data per Goniophotometer 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

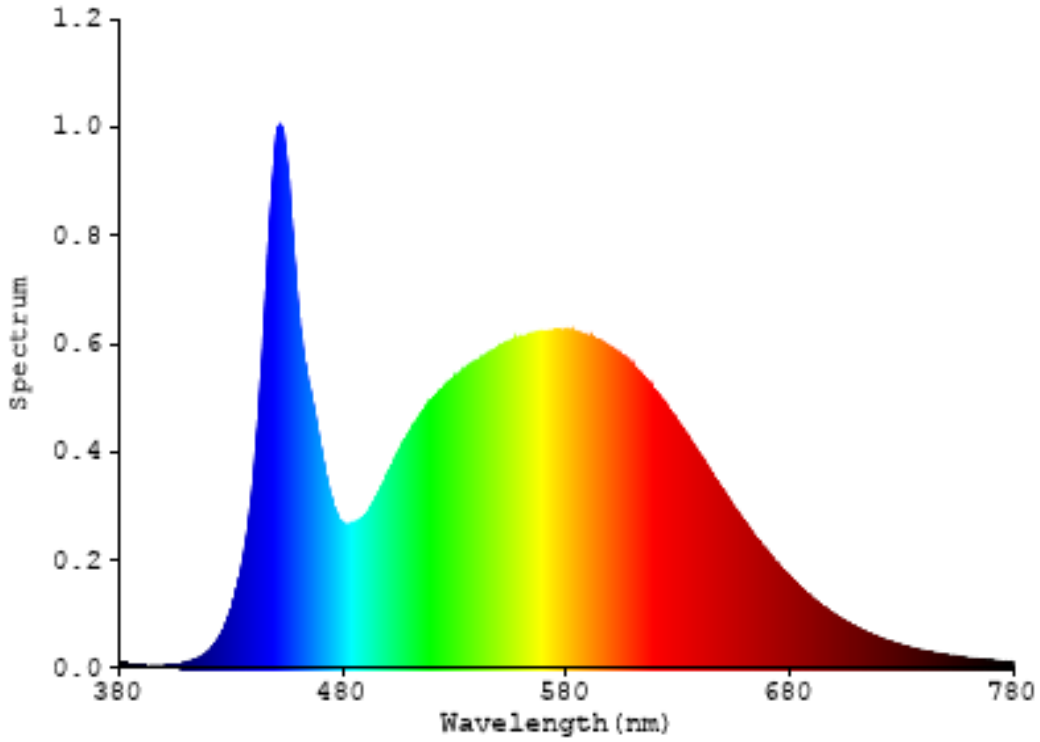


Chart 1: Spectral Power Distribution

Zonal Lumen Tabulation

γ(°)	Lumens	% Total
0- 10	145.546	4.27%
10- 20	418.613	12.28%
20- 30	630.772	18.50%
30- 40	716.261	21.01%
40- 50	634.651	18.62%
50- 60	433.639	12.72%
60- 70	233.398	6.85%
70- 80	145.06	4.25%
80- 90	47.417	1.39%
90-100	0.599	0.02%
100-110	0.651	0.02%
110-120	0.63	0.02%
120-130	0.537	0.02%
130-140	0.479	0.01%
140-150	0.414	0.01%
150-160	0.314	0.01%
160-170	0.201	0.01%
170-180	0.074	0.00%
Total	3409.3	100%

γ(°)	Lumens	% Total
0- 60	2979.482	87.39%
60- 90	425.875	12.49%
0-90	3405.357	99.88%
90- 180	3.899	0.12%
0- 180	3409.3	100%

Table 3: Zonal Lumen Data

Illuminance Plots

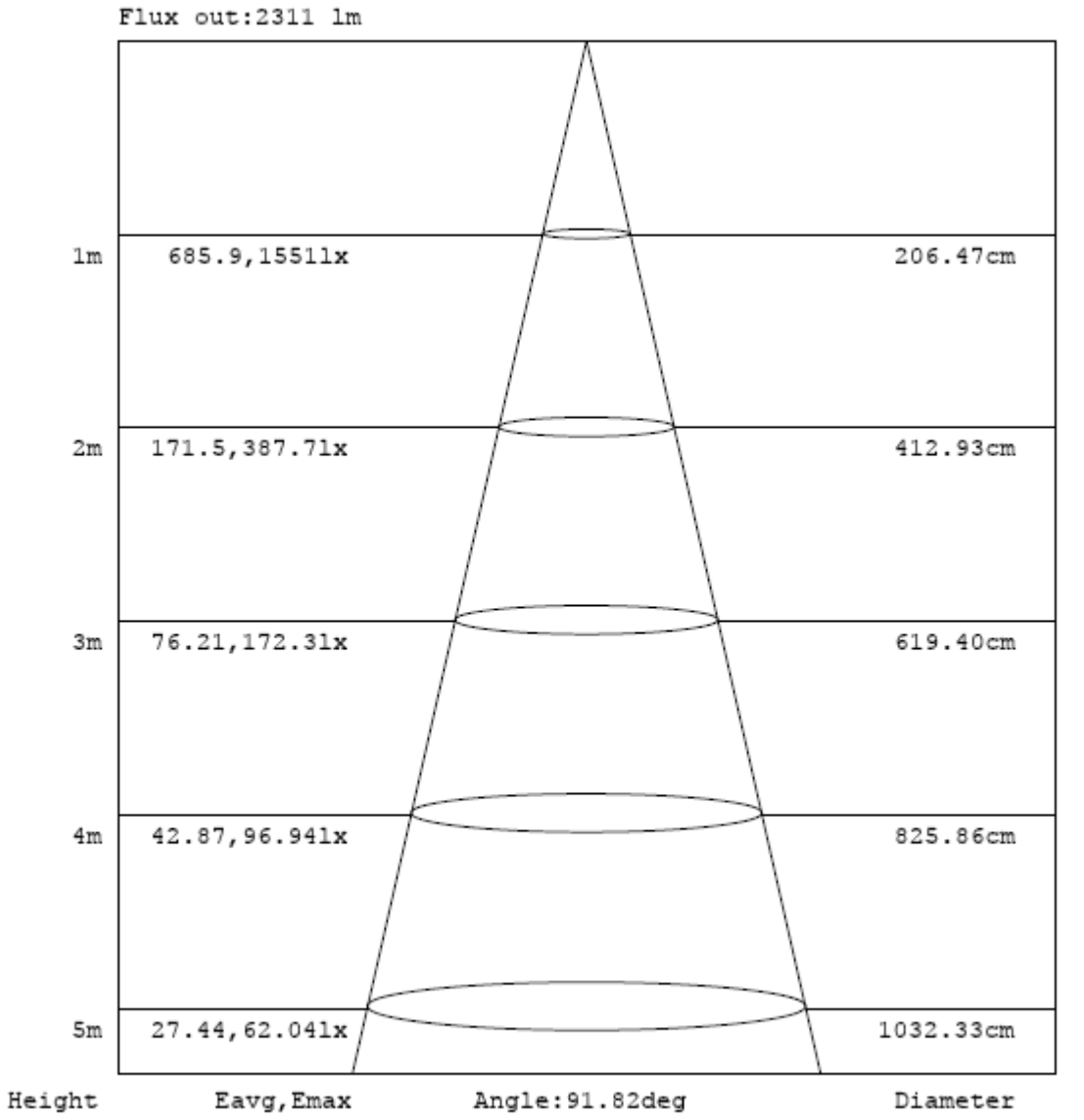


Chart 2: Beam Angle

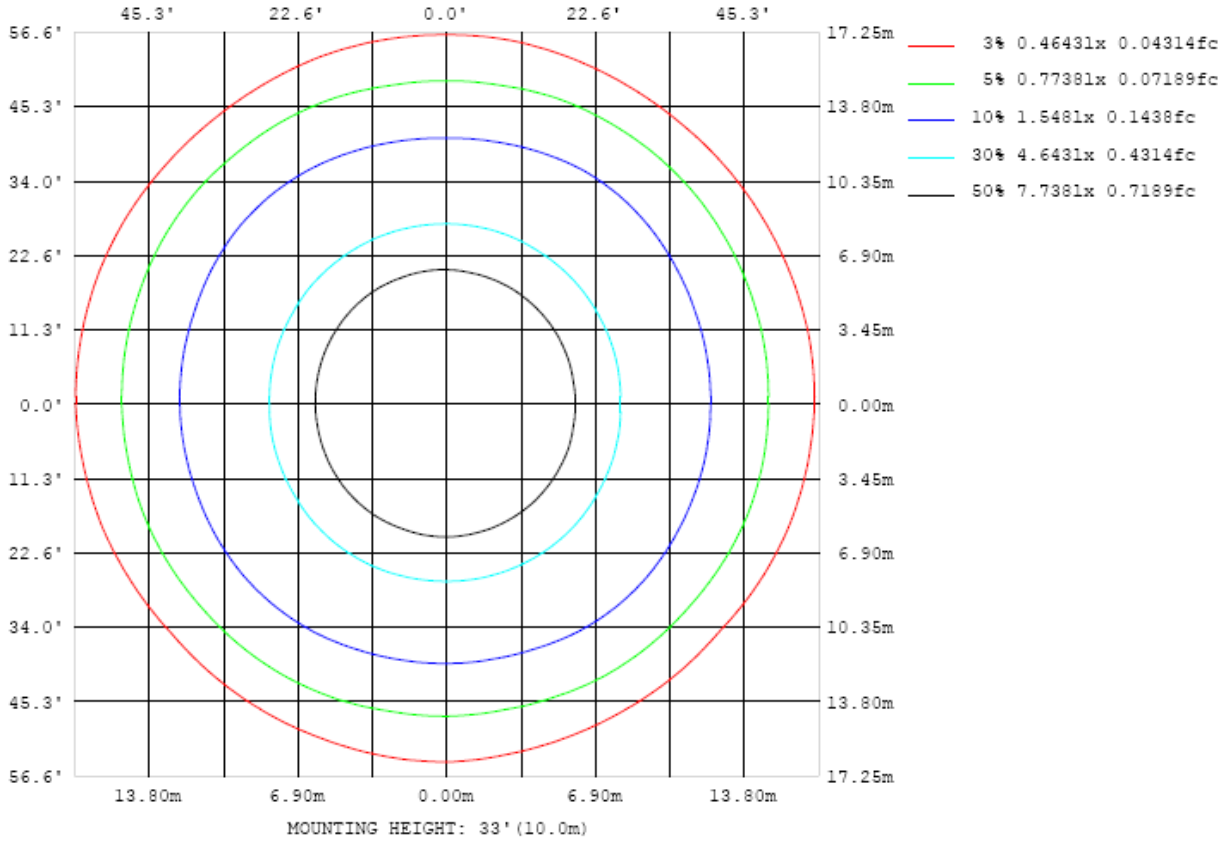


Chart 3: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots

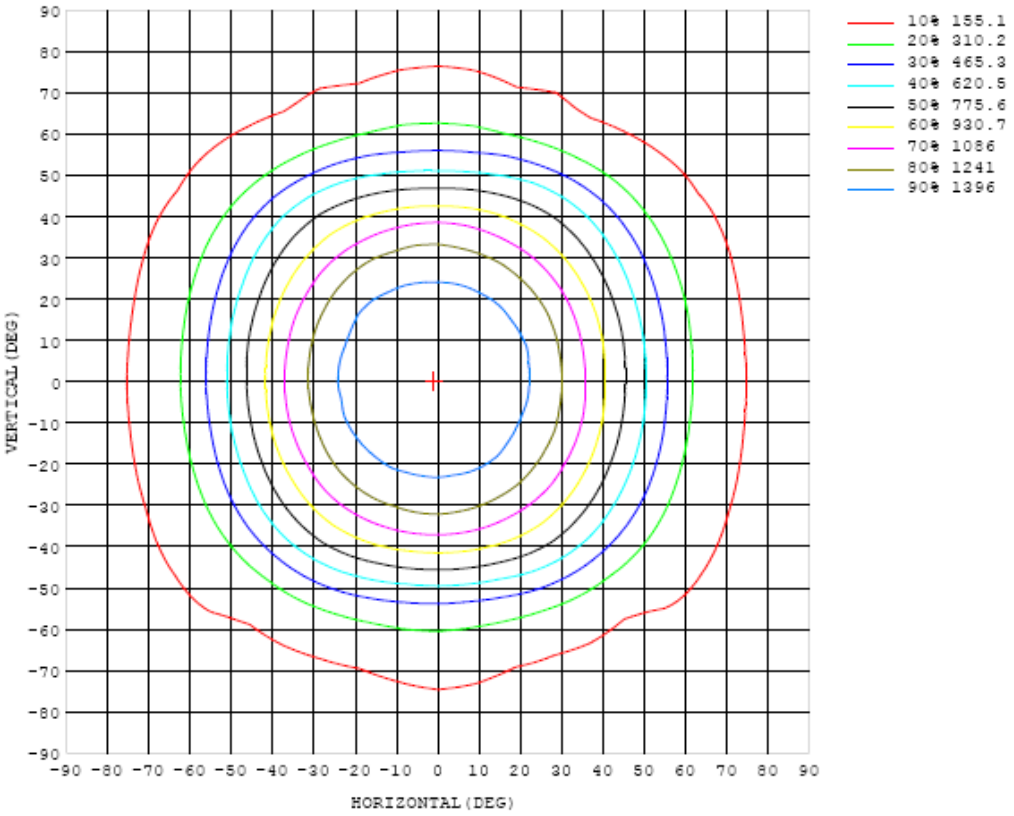


Chart 4: Isocandela Plot

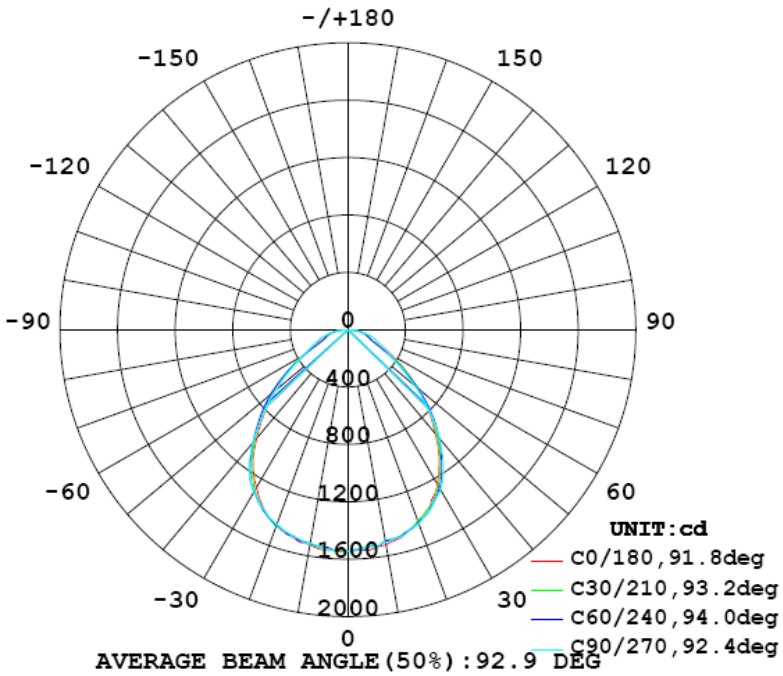


Chart 5: Polar Candela Distribution

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	1547	1547	1547	1547	1547	1547	1547	1547	1547	1547	1547	1547	1547	1547	1547	1547	1547	1547	1547
5	1545	1529	1514	1517	1528	1534	1530	1518	1511	1512	1517	1522	1530	1536	1538	1530	1529	1538	1537
10	1522	1500	1514	1497	1504	1513	1495	1494	1502	1504	1503	1503	1503	1521	1511	1509	1522	1509	1522
15	1486	1472	1472	1482	1469	1482	1479	1472	1473	1485	1478	1482	1474	1492	1474	1495	1483	1485	1497
20	1424	1422	1419	1416	1425	1433	1427	1430	1428	1438	1428	1435	1446	1445	1436	1441	1443	1445	1452
25	1352	1344	1350	1355	1362	1363	1362	1365	1368	1371	1371	1378	1374	1374	1380	1379	1379	1375	1380
30	1242	1242	1249	1254	1262	1265	1271	1277	1284	1287	1289	1286	1290	1288	1285	1277	1277	1271	1271
35	1107	1114	1119	1119	1130	1135	1138	1146	1155	1158	1156	1159	1157	1158	1157	1146	1150	1148	1151
40	946	954	957	964	975	981	986	986	985	987	989	994	999	999	998	990	990	993	987
45	789	789	790	800	812	823	819	807	803	799	805	812	826	837	829	822	817	815	821
50	634	635	630	632	647	644	630	607	600	600	604	620	638	650	655	652	645	650	658
55	481	481	476	466	455	451	444	431	425	431	432	444	456	465	471	481	488	492	500
60	348	340	329	312	294	293	291	298	310	319	316	307	305	307	307	322	339	350	362
65	258	240	220	201	185	191	190	208	236	253	240	214	200	202	197	208	229	251	269
70	202	184	170	158	143	150	151	158	182	201	183	162	156	153	148	161	173	190	211
75	153	145	136	135	125	130	123	125	143	152	141	125	127	131	126	137	135	143	160
80	99.8	103	91.0	93.7	84.8	87.0	82.7	86.0	94.6	88.4	94.2	87.0	85.4	89.3	86.9	97.0	91.8	105	103
85	41.7	43.1	38.3	36.0	34.5	29.3	28.7	36.0	40.0	36.8	40.2	35.9	29.3	31.2	37.2	38.1	40.5	45.6	43.7
90	0.42	0.84	0.97	0.59	0.55	0.41	0.27	0.15	0.07	0.07	0.08	0.16	0.27	0.40	0.64	0.77	0.80	0.84	0.56
95	0.43	1.08	0.78	0.59	0.64	0.46	0.30	0.17	0.10	0.09	0.15	0.20	0.32	0.47	0.65	0.74	0.82	1.08	0.65
100	0.52	1.01	0.94	0.58	0.55	0.46	0.32	0.19	0.11	0.10	0.15	0.25	0.37	0.51	0.55	0.71	0.96	1.03	0.64
105	0.60	1.04	1.00	0.65	0.54	0.41	0.33	0.23	0.13	0.12	0.16	0.29	0.37	0.43	0.58	0.81	1.08	1.09	0.67
110	0.64	1.05	1.04	0.68	0.59	0.45	0.34	0.25	0.16	0.16	0.17	0.31	0.40	0.49	0.68	0.83	1.11	1.13	0.71
115	0.69	1.00	0.96	0.65	0.60	0.49	0.38	0.29	0.20	0.20	0.21	0.34	0.44	0.55	0.67	0.84	1.02	1.06	0.71
120	0.75	0.96	0.85	0.70	0.64	0.52	0.44	0.31	0.25	0.25	0.26	0.36	0.46	0.58	0.68	0.83	0.95	0.97	0.75
125	0.78	0.94	0.77	0.75	0.62	0.57	0.48	0.34	0.30	0.30	0.31	0.39	0.50	0.59	0.66	0.75	0.84	1.00	0.74
130	0.67	0.89	0.82	0.76	0.66	0.58	0.51	0.40	0.36	0.36	0.36	0.43	0.52	0.58	0.67	0.83	0.80	0.91	0.57
135	0.82	0.91	0.73	0.73	0.68	0.62	0.50	0.45	0.41	0.43	0.43	0.46	0.48	0.61	0.72	0.74	0.72	0.85	0.75
140	0.79	0.82	0.82	0.77	0.72	0.64	0.55	0.48	0.46	0.48	0.47	0.48	0.56	0.58	0.71	0.71	0.81	0.80	0.73
145	0.84	0.85	0.86	0.73	0.73	0.60	0.57	0.52	0.53	0.53	0.52	0.53	0.58	0.58	0.67	0.72	0.83	0.77	0.75
150	0.88	0.82	0.86	0.81	0.65	0.64	0.60	0.58	0.57	0.58	0.57	0.57	0.61	0.67	0.65	0.68	0.81	0.75	0.77
155	0.71	0.70	0.72	0.73	0.70	0.62	0.59	0.59	0.60	0.60	0.60	0.60	0.61	0.65	0.74	0.77	0.70	0.66	0.68
160	0.77	0.74	0.76	0.74	0.69	0.63	0.60	0.59	0.60	0.57	0.61	0.62	0.63	0.67	0.72	0.75	0.76	0.75	0.79
165	0.75	0.74	0.73	0.72	0.69	0.65	0.63	0.64	0.64	0.63	0.65	0.67	0.69	0.71	0.72	0.73	0.73	0.74	0.76
170	0.75	0.75	0.74	0.73	0.71	0.67	0.65	0.65	0.69	0.68	0.66	0.70	0.71	0.73	0.74	0.74	0.74	0.75	0.79
175	0.83	0.84	0.83	0.82	0.81	0.79	0.77	0.78	0.77	0.75	0.77	0.79	0.80	0.81	0.84	0.84	0.83	0.83	0.83
180	0.83	0.83	0.81	0.81	0.81	0.80	0.79	0.79	0.78	0.77	0.77	0.77	0.79	0.80	0.82	0.81	0.83	0.82	0.83

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	1547	1547	1547	1547	1547	1547	1547	1547	1547	1547	1547	1547	1547	1547	1547	1547	1547		
5	1527	1529	1543	1545	1533	1526	1529	1533	1538	1539	1536	1534	1534	1537	1535	1531	1537		
10	1529	1521	1518	1526	1512	1515	1518	1512	1512	1515	1514	1515	1514	1514	1515	1522	1515		
15	1501	1498	1490	1490	1487	1487	1486	1498	1491	1486	1489	1477	1486	1479	1483	1487	1481		
20	1450	1456	1457	1448	1447	1451	1451	1449	1442	1445	1443	1438	1437	1436	1432	1430	1430		
25	1382	1383	1388	1397	1396	1391	1388	1382	1382	1382	1376	1376	1372	1367	1366	1356	1352		
30	1283	1284	1297	1298	1303	1304	1310	1309	1304	1297	1293	1285	1275	1268	1261	1255	1244		
35	1152	1158	1167	1179	1185	1189	1191	1193	1193	1182	1171	1158	1150	1139	1128	1120	1108		
40	996	1007	1010	1022	1024	1027	1029	1028	1026	1023	1017	1003	995	988	973	966	957		
45	833	839	851	861	870	864	859	844	833	843	848	846	846	832	815	807	798		
50	664	672	690	708	711	701	684	666	655	664	676	690	690	674	658	643	639		
55	506	512	524	532	526	521	509	494	491	491	505	511	512	508	498	491	487		
60	364	365	360	352	348	350	356	358	357	357	347	340	336	340	343	347	352		
65	263	242	225	221	218	221	236	268	279	261	226	214	208	210	215	230	254		
70	196	171	162	160	159	171	177	204	225	199	171	165	150	153	158	166	190		
75	144	129	137	137	138	147	144	159	171	157	140	143	132	131	133	130	142		
80	103	89.4	101	98.6	101	108	109	117	112	119	107	104	95.2	94.2	93.4	89.6	100		
85	49.3	44.1	45.7	51.7	48.2	43.7	50.3	52.5	49.2	54.8	49.5	42.5	46.2	48.7	41.6	43.0	47.0		
90	0.85	0.80	0.79	0.90	0.58	0.41	0.31	0.28	0.28	0.30	0.35	0.41	0.61	0.67	1.24	0.73	0.84		
95	1.21	0.92	0.73	0.73	0.56	0.41	0.31	0.26	0.25	0.25	0.33	0.45	0.60	0.71	0.90	0.92	1.15		
100	1.23	1.02	0.60	0.71	0.59	0.44	0.36	0.28	0.26	0.28	0.35	0.46	0.64	0.70	0.78	1.09	1.11		
105	1.24	1.19	0.78	0.68	0.58	0.51	0.42	0.30	0.29	0.31	0.38	0.48	0.56	0.69	0.91	1.16	1.21		
110	1.22	1.22	0.81	0.72	0.60	0.52	0.42	0.31	0.31	0.32	0.40	0.48	0.58	0.75	0.93	1.20	1.21		
115	1.14	1.11	0.78	0.73	0.60	0.51	0.41	0.31	0.30	0.31	0.40	0.49	0.59	0.73	0.86	1.10	1.11		
120	1.03	1.02	0.78	0.69	0.60	0.47	0.37	0.29	0.29	0.29	0.38	0.45	0.56	0.71	0.88	0.96	1.02		
125	1.04	0.84	0.72	0.67	0.57	0.46	0.36	0.30	0.29	0.29	0.36	0.47	0.56	0.65	0.70	0.86	0.93		
130	0.90	0.79	0.76	0.60	0.55	0.48	0.39	0.34	0.34	0.33	0.38	0.48	0.54	0.64	0.76	0.70	0.79		
135	0.84	0.68	0.70	0.69	0.56	0.49	0.43	0.42	0.41	0.41	0.43	0.49	0.61	0.71	0.75	0.78	0.87		
140	0.82	0.74	0.71	0.68	0.58	0.55	0.48	0.48	0.48	0.46	0.47	0.51	0.63	0.70	0.66	0.78	0.70		
145	0.83	0.81	0.69	0.68	0.60	0.59	0.54	0.54	0.55	0.51	0.53	0.56	0.60	0.68	0.75	0.80	0.71		
150	0.84	0.81	0.70	0.66	0.66	0.62	0.60	0.59	0.57	0.57	0.59	0.61	0.64	0.64	0.78	0.84	0.75		
155	0.71	0.73	0.76	0.74	0.67	0.63	0.63	0.63	0.62	0.63	0.61	0.62	0.65	0.72	0.75	0.72	0.68		
160	0.77	0.79	0.78	0.75	0.71	0.68	0.67	0.67	0.64	0.67	0.65	0.66	0.68	0.74	0.78	0.79	0.77		
165	0.74	0.75	0.74	0.73	0.73	0.72	0.71	0.69	0.69	0.69	0.69	0.68	0.69	0.72	0.75	0.76	0.76		
170	0.79	0.78	0.78	0.78	0.78	0.78	0.77	0.74	0.75	0.75	0.75	0.73	0.72	0.75	0.78	0.79	0.77		
175	0.83	0.84	0.83	0.83	0.81	0.82	0.81	0.80	0.78	0.79	0.82	0.79	0.79	0.82	0.84	0.83	0.83		
180	0.82	0.83	0.81	0.81	0.80	0.80	0.80	0.79	0.77	0.78	0.76	0.77	0.79	0.81	0.81	0.81	0.81		

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
Integrate Sphere system	2M	HZTE015-01	Sep. 18, 2014	Sep. 17, 2015
Digital Power Meter	WT210	HZTE008-01	Sep. 18, 2014	Sep. 17, 2015
AC Power Supply	PCR 500L	HZTE001-07	Sep. 18, 2014	Sep. 17, 2015
DC Power Supply	6154	HZTE004-04	Sep. 18, 2014	Sep. 17, 2015
Temperature and humidity recorder	JR900	HZTE018-01	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.

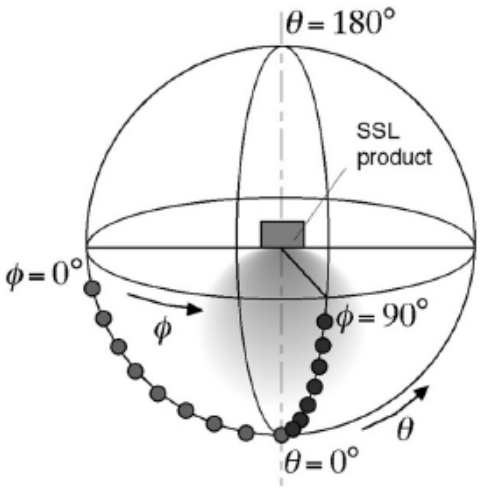
The standard reference of the Goniophotometer system is halogen incandescent lamp, the intensity distribution type is omni-directional, and is traceable to the National Institute of Metrology P.R. China.
The uncertainty of goniophotometer system reported in this document is expended uncertainty is 1.94% 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 ***