



## LM-79-08 Test Report

for

**ABBlighting, Inc.**

1501 Industrial Way N. Toms River, NJ 08755 RD, Shanghai

**35W TROFFER**

**Model: ABBRT24D3541**

**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.: HZ14100006b

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

Reviewed by:

*April Zou*

Engineer: April Zou  
Oct. 16, 2014



Approved by

*Jim Zhang*

Manager: Jim Zhang  
Oct. 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: ABBRT24D3541

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
97.3	3112.0	31.99	0.9930
CCT (K)	CRI	Stabilization Time (Light & Power)	
4071	82.4	60	

Table 1: Executive Data Summary

### Test specifications:

**Date of Receipt** : Oct. 14, 2014

**Date of Test** : Oct. 14, 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

## TABLE OF CONTENT

LM-79-08 Test Report.....	1
Test Summary.....	2
Photos .....	4
TEST RESULTS .....	5
Spectral Power Distribution .....	6
Zonal Lumen Tabulation .....	7
Illuminance Plots.....	8
Luminous Intensity Distribution Plots.....	10
Luminous Intensity Data .....	11
EQUIPMENT LIST .....	13
TEST METHODS .....	13
Seasoning of SSL Product.....	13
Sphere-Spectroradiometer Method- Photometric and Electrical Measurements.....	13
Goniophotometer Method .....	14
Photometric and Electrical Measurements .....	14
Color Characteristics Measurements.....	14
Color Spatial Uniformity .....	14

## Photos

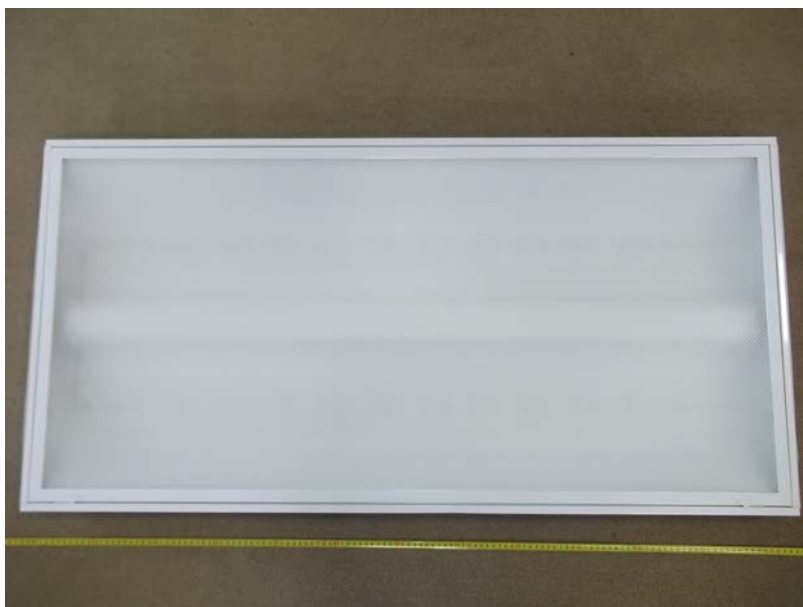


Figure 1- Overview of the sample

### Equipment Under Test (EUT)

<b>Name</b>	: 35W TROFFER
<b>Model</b>	: ABBRT24D3541
<b>Electrical Ratings</b>	: 100~277V AC, 50/60Hz, 35W
<b>Product Description</b>	: 4100K, 2x4 Luminaires for Ambient Lighting of Interior Commercial Spaces Manufacturer of light source: EVERLIGHT Model of light source: EVERLIGHT (67-21 S/KK2C-HXXXXXXXXX2934Z6/2T) Quantity of LED light source: 216pcs
<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 24.7°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 85 minutes.

Parameter	Result			Special Color Rendering Indices	
Test Voltage (V)	120.0	100.0	277.0	R1	80
Voltage frequency (Hz)	60	60	60	R2	86
Test Current (A)	0.268	0.326	0.125	R3	91
Power Factor	0.9930	0.9887	0.9404	R4	82
Test Power (W)	31.99	32.21	32.67	R5	80
THD A%	7.72	9.42	6.17	R6	81
Luminous Efficacy (lm/W)	97.3			R7	88
Total Luminous Flux (lm)	3112.0			R8	69
Color Rendering Index (CRI)	82.4			R9	17
R9	17			R10	68
Correlated Color Temperature (CCT) (K)	4071			R11	80
Chromaticity (Chroma x, Chroma y)	(0.3798, 0.3840)			R12	61
Chromaticity (Chroma u, Chroma v)	(0.2218, 0.3364)			R13	81
Chromaticity (Chroma u', Chroma v')	(0.2218, 0.5046)			R14	95
Duv	0.0036				
Average Beam Angle (°)	94.9				
Center Beam Candle Power (cd)	1354				
Spacing Criteria	1.25 (0°-180°)/ 1.21 (90°-270°)				
Zonal Lumens in the 0°-60°Zone	86.37%				
Zonal Lumens in the 60°-90°Zone	13.54%				
Zonal Lumens in the 90°-120°Zone	0.04%				
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

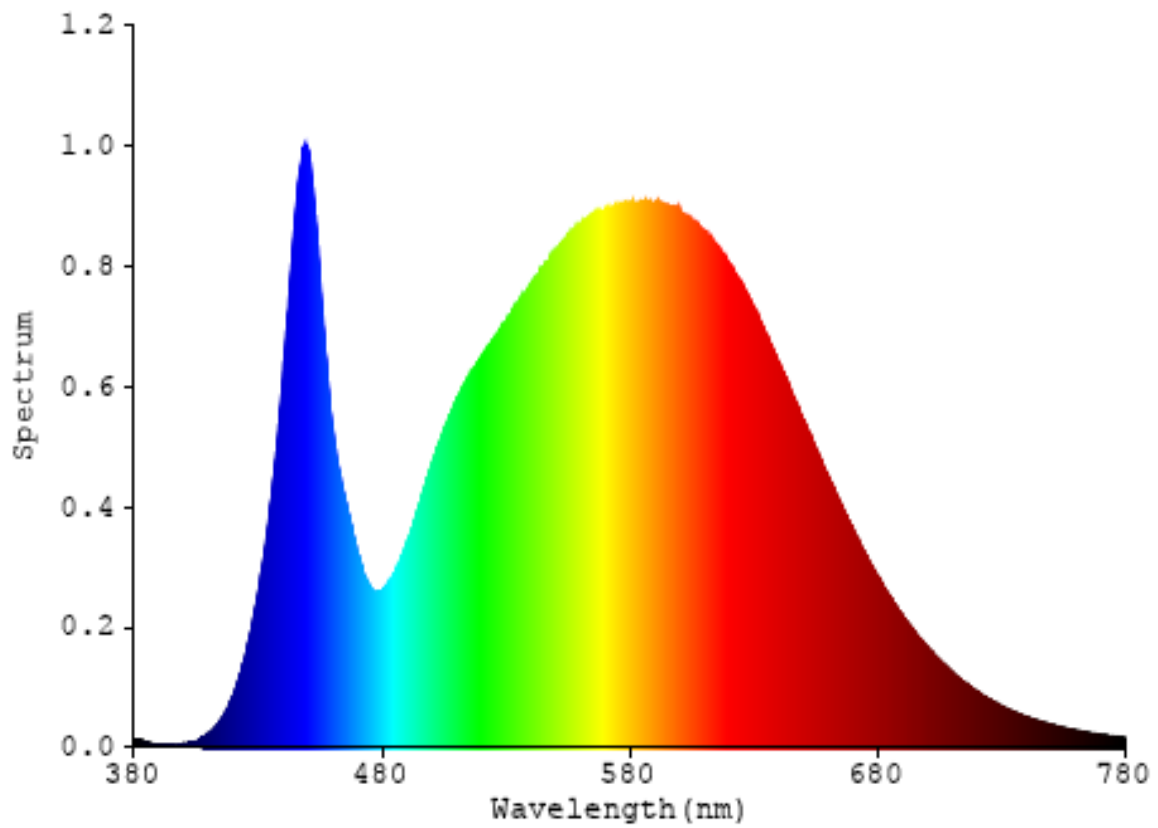


Chart 1: Spectral Power Distribution

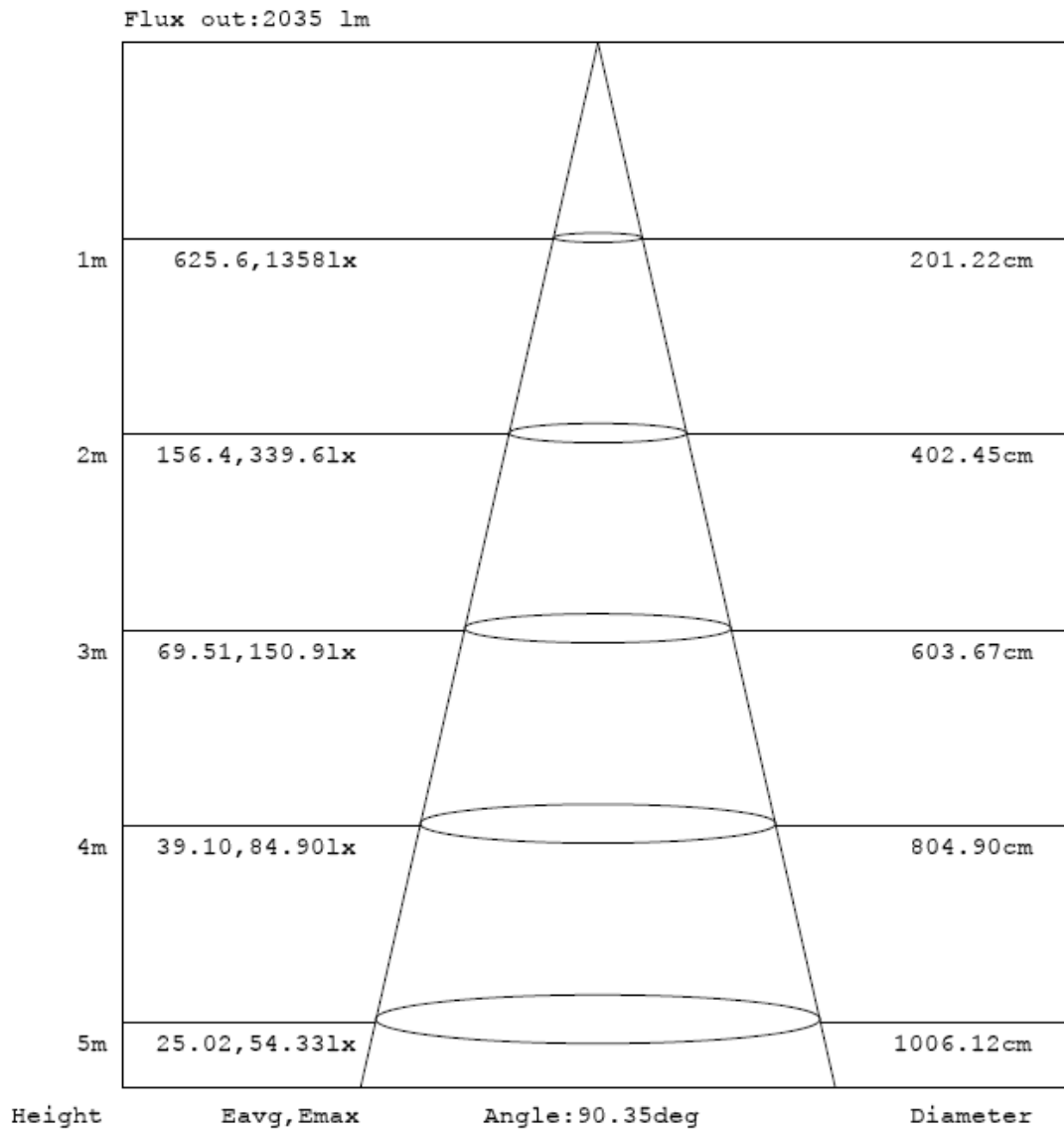
## Zonal Lumen Tabulation

$\gamma(^{\circ})$	Lumens	% Total
0- 10	128.62	4.13%
10- 20	369.974	11.89%
20- 30	558.441	17.94%
30- 40	642.11	20.63%
40- 50	580.855	18.67%
50- 60	407.677	13.10%
60- 70	229.938	7.39%
70- 80	137.742	4.43%
80- 90	53.663	1.72%
90-100	0.527	0.02%
100-110	0.408	0.01%
110-120	0.395	0.01%
120-130	0.384	0.01%
130-140	0.383	0.01%
140-150	0.341	0.01%
150-160	0.268	0.01%
160-170	0.179	0.01%
170-180	0.068	0.00%
Total	3112.0	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	2687.677	86.37%
60- 90	421.343	13.54%
0-90	3109.02	99.91%
90- 180	2.953	0.09%
0- 180	3112.0	100%

Table 3: 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



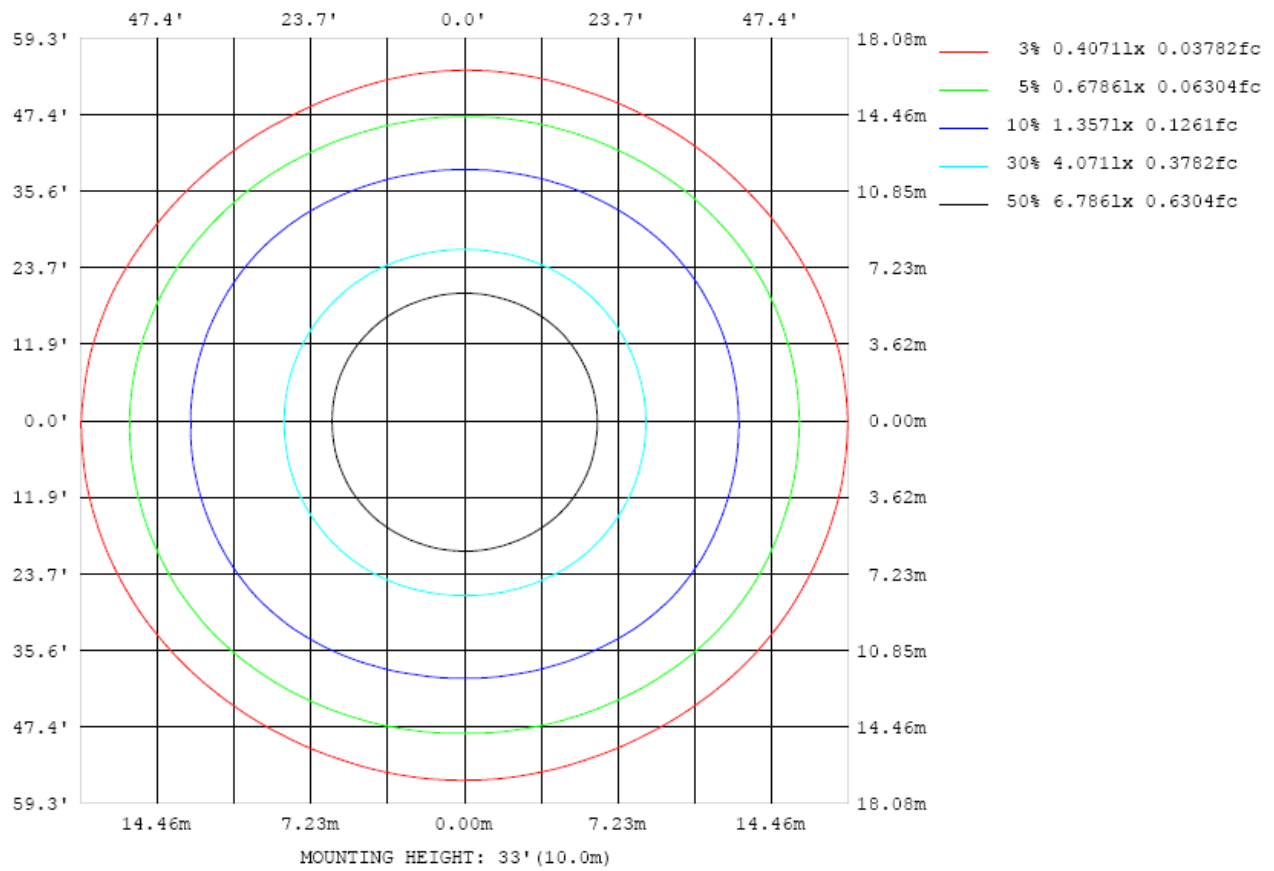


Chart 3: Illuminance Plot (Footcandles)

## Luminous Intensity Distribution Plots

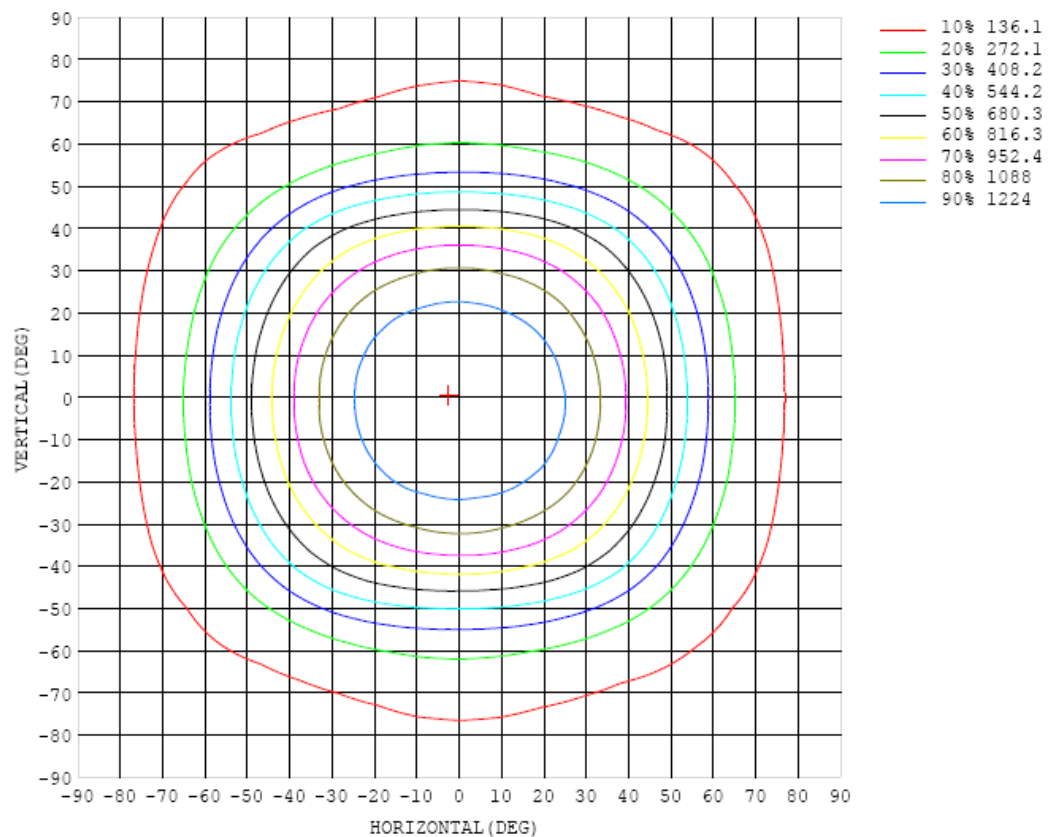


Chart 4: Isocandela Plot

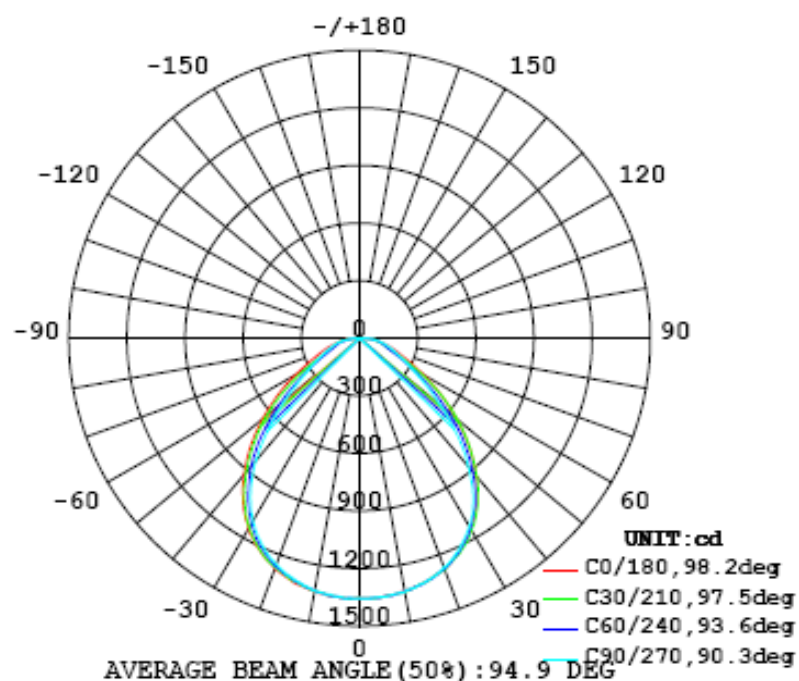


Chart 5: Polar Candela Distribution

## 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	1354	1354	1354	1354	1354	1354	1354	1354	1354	1354	1354	1354	1354	1354	1354	1354	1354	1354	1354
5	1352	1352	1353	1354	1352	1352	1353	1352	1352	1353	1353	1352	1355	1356	1354	1355	1355	1352	1352
10	1338	1340	1341	1341	1339	1339	1338	1338	1340	1341	1342	1343	1341	1335	1342	1339	1338	1339	1338
15	1313	1315	1316	1316	1317	1314	1315	1314	1314	1314	1316	1314	1315	1315	1316	1313	1314	1316	1317
20	1279	1276	1277	1282	1279	1278	1279	1278	1272	1271	1273	1276	1275	1278	1280	1281	1280	1277	1277
25	1224	1226	1226	1231	1227	1224	1221	1216	1215	1214	1215	1215	1221	1224	1226	1226	1224	1222	1219
30	1149	1151	1155	1154	1154	1148	1141	1135	1132	1132	1131	1135	1141	1148	1151	1154	1152	1150	1146
35	1054	1056	1058	1061	1055	1047	1042	1032	1027	1023	1025	1028	1036	1043	1051	1055	1054	1050	1048
40	937	939	942	940	933	923	910	892	879	874	877	892	905	916	925	932	934	930	927
45	800	804	804	802	796	781	761	738	720	713	721	739	761	779	791	797	800	797	794
50	654	659	660	659	651	629	596	569	552	546	554	573	603	632	651	658	659	657	652
55	512	514	512	510	494	467	441	424	412	407	414	428	448	474	499	511	514	516	513
60	380	378	369	359	342	324	310	303	303	303	304	305	312	326	344	363	375	382	381
65	275	270	253	237	224	215	215	219	227	234	229	218	211	212	222	239	255	270	275
70	203	194	175	162	156	152	157	167	179	187	179	163	152	148	151	161	174	195	205
75	154	143	127	126	126	125	128	133	143	148	143	130	124	122	121	126	127	143	154
80	106	102	92.4	94.9	97.1	96.9	99.3	102	107	111	107	102	96.8	95.5	92.1	92.8	91.7	101	106
85	57.0	60.5	55.2	53.1	56.5	54.5	53.2	58.8	61.2	62.3	61.6	58.8	52.1	53.4	54.7	50.4	50.2	57.6	57.3
90	2.78	4.57	5.84	4.13	5.55	3.71	4.02	3.63	3.68	3.98	3.96	4.90	4.47	3.87	1.12	3.95	5.43	3.54	0.48
95	0.40	0.31	0.50	0.44	0.37	0.28	0.20	0.14	0.12	0.11	0.12	0.14	0.16	0.25	0.33	0.41	0.38	0.34	0.48
100	0.43	0.36	0.44	0.40	0.32	0.24	0.18	0.13	0.12	0.12	0.12	0.14	0.17	0.26	0.35	0.43	0.38	0.37	0.54
105	0.47	0.39	0.47	0.40	0.30	0.25	0.20	0.16	0.14	0.13	0.13	0.16	0.18	0.25	0.31	0.39	0.42	0.39	0.59
110	0.49	0.41	0.55	0.42	0.32	0.27	0.23	0.19	0.17	0.16	0.16	0.19	0.21	0.26	0.31	0.40	0.42	0.39	0.56
115	0.50	0.42	0.58	0.43	0.36	0.31	0.27	0.22	0.20	0.19	0.21	0.23	0.25	0.28	0.34	0.43	0.45	0.42	0.53
120	0.52	0.44	0.59	0.47	0.40	0.37	0.32	0.26	0.25	0.24	0.26	0.28	0.31	0.34	0.39	0.45	0.45	0.47	0.54
125	0.54	0.47	0.60	0.49	0.45	0.41	0.36	0.31	0.31	0.30	0.32	0.33	0.35	0.39	0.43	0.49	0.44	0.48	0.51
130	0.58	0.50	0.58	0.51	0.48	0.45	0.41	0.37	0.35	0.35	0.38	0.39	0.40	0.43	0.48	0.50	0.47	0.54	0.53
135	0.57	0.51	0.56	0.53	0.51	0.47	0.45	0.43	0.40	0.42	0.43	0.43	0.44	0.46	0.50	0.52	0.55	0.55	0.53
140	0.58	0.57	0.62	0.57	0.49	0.49	0.49	0.46	0.44	0.45	0.47	0.45	0.47	0.48	0.47	0.55	0.58	0.60	0.55
145	0.61	0.62	0.62	0.58	0.53	0.48	0.49	0.49	0.46	0.48	0.49	0.47	0.48	0.48	0.52	0.52	0.56	0.58	0.51
150	0.59	0.60	0.61	0.60	0.55	0.55	0.50	0.46	0.46	0.48	0.48	0.47	0.49	0.56	0.55	0.58	0.58	0.60	0.55
155	0.62	0.63	0.62	0.62	0.59	0.56	0.55	0.51	0.49	0.49	0.52	0.54	0.53	0.59	0.60	0.60	0.61	0.64	0.57
160	0.64	0.65	0.65	0.63	0.61	0.57	0.54	0.51	0.47	0.48	0.53	0.55	0.58	0.60	0.63	0.63	0.64	0.66	0.59
165	0.67	0.65	0.66	0.65	0.62	0.58	0.56	0.52	0.50	0.51	0.57	0.61	0.65	0.64	0.64	0.67	0.70	0.70	0.64
170	0.70	0.68	0.68	0.70	0.69	0.63	0.58	0.54	0.55	0.58	0.60	0.59	0.66	0.70	0.76	0.76	0.75	0.72	0.67
175	0.74	0.74	0.73	0.72	0.72	0.71	0.67	0.66	0.68	0.67	0.67	0.67	0.74	0.76	0.74	0.74	0.74	0.74	0.74
180	0.70	0.71	0.71	0.71	0.71	0.72	0.70	0.68	0.69	0.72	0.69	0.66	0.69	0.70	0.66	0.65	0.65	0.65	0.70

Table 4: Luminous Intensity Data

Table--2

UNIT: cd

C (DEG) γ (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	1354	1354	1354	1354	1354	1354	1354	1354	1354	1354	1354	1354	1354	1354	1354	1354	1354		
5	1354	1352	1352	1354	1353	1351	1352	1350	1350	1350	1349	1348	1349	1352	1353	1351	1354		
10	1336	1338	1338	1334	1334	1335	1332	1332	1335	1331	1330	1333	1336	1335	1337	1339	1337		
15	1313	1313	1310	1312	1305	1306	1304	1303	1301	1301	1305	1304	1306	1308	1306	1309	1314		
20	1275	1274	1271	1266	1264	1264	1259	1256	1254	1254	1259	1257	1263	1264	1268	1273	1276		
25	1220	1219	1217	1212	1208	1201	1195	1193	1189	1191	1193	1197	1203	1209	1213	1219	1218		
30	1145	1145	1139	1133	1125	1116	1105	1102	1101	1103	1106	1116	1126	1132	1138	1144	1146		
35	1046	1043	1035	1028	1013	1002	992	984	980	985	995	1003	1018	1030	1040	1043	1050		
40	925	919	910	896	884	868	849	836	833	838	851	871	889	904	919	927	932		
45	789	782	771	760	741	714	685	665	660	668	688	714	744	766	778	791	796		
50	647	638	626	609	578	545	520	505	501	507	525	549	582	615	633	643	652		
55	505	491	470	443	416	392	375	368	367	371	382	399	425	455	480	496	506		
60	370	351	323	299	281	270	268	274	277	275	274	282	294	312	335	357	373		
65	260	237	213	195	187	187	196	209	215	209	201	197	198	207	222	245	265		
70	187	168	153	144	142	142	151	165	171	165	155	148	146	149	159	172	191		
75	141	131	128	121	119	116	120	129	136	131	120	117	118	121	127	131	144		
80	104	96.3	94.4	88.1	85.7	83.1	88.1	92.7	95.7	93.0	87.4	82.6	86.7	91.7	94.5	95.9	105		
85	58.8	47.9	44.2	43.8	37.1	35.5	42.5	45.4	45.3	45.9	43.3	37.4	41.1	47.0	46.6	51.4	61.3		
90	0.50	0.61	0.51	0.41	0.34	0.27	0.24	0.21	0.20	0.20	0.21	0.23	0.31	0.39	0.49	0.61	0.69		
95	0.55	0.76	0.58	0.47	0.39	0.33	0.29	0.25	0.25	0.25	0.26	0.29	0.37	0.46	0.58	0.69	0.52		
100	0.67	0.67	0.60	0.52	0.43	0.36	0.32	0.28	0.28	0.28	0.30	0.33	0.43	0.51	0.62	0.64	0.53		
105	0.72	0.70	0.59	0.50	0.45	0.41	0.37	0.32	0.32	0.33	0.36	0.39	0.46	0.50	0.58	0.63	0.57		
110	0.68	0.69	0.58	0.48	0.43	0.42	0.37	0.33	0.34	0.35	0.37	0.40	0.45	0.50	0.54	0.63	0.56		
115	0.56	0.62	0.54	0.46	0.42	0.40	0.36	0.32	0.33	0.34	0.37	0.40	0.43	0.47	0.50	0.57	0.52		
120	0.54	0.58	0.51	0.44	0.40	0.37	0.33	0.31	0.31	0.32	0.35	0.39	0.43	0.46	0.48	0.56	0.50		
125	0.49	0.53	0.52	0.46	0.41	0.38	0.35	0.34	0.32	0.33	0.37	0.41	0.44	0.46	0.48	0.56	0.51		
130	0.51	0.51	0.54	0.50	0.43	0.41	0.39	0.40	0.39	0.39	0.41	0.44	0.48	0.49	0.56	0.53	0.51		
135	0.51	0.60	0.53	0.52	0.48	0.47	0.46	0.48	0.46	0.47	0.49	0.50	0.52	0.53	0.52	0.53	0.53		
140	0.57	0.62	0.53	0.51	0.53	0.51	0.50	0.55	0.53	0.53	0.54	0.56	0.53	0.51	0.56	0.59	0.57		
145	0.56	0.58	0.55	0.53	0.54	0.54	0.54	0.59	0.59	0.57	0.57	0.57	0.54	0.52	0.57	0.58	0.60		
150	0.55	0.59	0.58	0.61	0.55	0.52	0.56	0.60	0.59	0.55	0.55	0.56	0.58	0.57	0.58	0.57	0.57		
155	0.60	0.62	0.61	0.61	0.62	0.55	0.57	0.56	0.56	0.54	0.56	0.62	0.62	0.61	0.62	0.61	0.61		
160	0.60	0.59	0.61	0.63	0.65	0.61	0.61	0.64	0.60	0.58	0.60	0.65	0.65	0.65	0.68	0.65	0.65		
165	0.64	0.63	0.61	0.62	0.66	0.70	0.68	0.67	0.64	0.60	0.60	0.64	0.67	0.67	0.66	0.66	0.64		
170	0.67	0.71	0.74	0.75	0.72	0.72	0.69	0.71	0.72	0.69	0.65	0.65	0.68	0.70	0.72	0.71	0.67		
175	0.74	0.76	0.78	0.79	0.79	0.79	0.76	0.70	0.71	0.75	0.76	0.72	0.72	0.73	0.74	0.72	0.70		
180	0.70	0.71	0.71	0.70	0.71	0.72	0.70	0.69	0.69	0.72	0.68	0.67	0.69	0.71	0.69	0.67	0.67		

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.

### 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 expended 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**

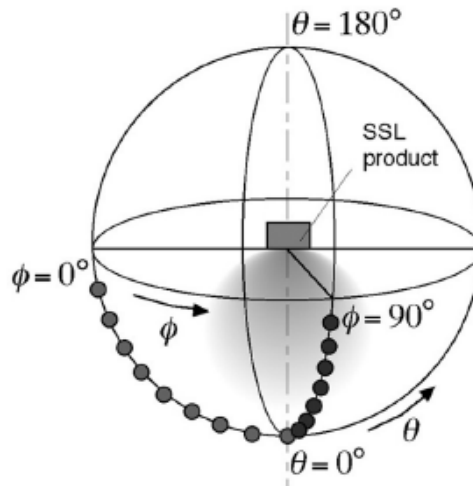
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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

This report is considered invalidated without the Special Seal for Inspection of the LTL. This report shall not be altered, increased or deleted. The results shown in this test report refer only to the sample(s) tested. Without written approval of LTL, this test report shall not be copied except in full and published as advertisement