



LM-79-08 Test Report

for

ABBlighting, Inc.

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

35W TROFFER

Model: ABBRT24D3535

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.: HZ14100011b

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

Reviewed by:

Engineer: April Zou
Oct. 17, 2014



Manager: Jim Zhang
Oct. 17, 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: **ABBRT24D3535**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
100.3	3282.8	32.74	0.9921
CCT (K)	CRI	Stabilization Time (Light & Power)	
3422	81.7	60	

Table 1: Executive Data Summary

Test specifications:

Date of Receipt : Oct. 16, 2014

Date of Test : Oct. 16, 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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Figure 1- Overview of the sample

Equipment Under Test (EUT)

Name	: 35W TROFFER
Model	: ABBRT24D3535
Electrical Ratings	: 100~277V AC, 50/60Hz, 35W
Product Description	: 3500K, 2x4Luminaires 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
Manufacturer	: ABB Lighting (Shanghai) Co., Ltd.
Address	: Room 1012, North Minch Fortune 108 Plaza,# 1839 Qixin road, Shanghai

TEST RESULTS

Test ambient temperature was 24.5°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	79
Voltage frequency (Hz)	60	60	60	R2	88
Test Current (A)	0.275	0.333	0.127	R3	95
Power Factor	0.9921	0.9881	0.9467	R4	79
Test Power (W)	32.74	32.96	33.37	R5	79
THD A%	7.28	7.42	9.86	R6	83
Luminous Efficacy (lm/W)	100.3	100.5	100.7	R7	86
Total Luminous Flux (lm)	3282.8	3312.5	3360.4	R8	64
Color Rendering Index (CRI)	81.7			R9	11
R9	11			R10	71
Correlated Color Temperature (CCT) (K)	3422			R11	76
Chromaticity (Chroma x, Chroma y)	(0.4134, 0.4007)			R12	59
Chromaticity (Chroma u, Chroma v)	(0.2369, 0.3444)			R13	81
Chromaticity (Chroma u', Chroma v')	(0.2369, 0.5166)			R14	97
Duv	0.0026				
Average Beam Angle (°)	94.4				
Center Beam Candle Power (cd)	1435				
Spacing Criteria	1.25 (0°-180°)/ 1.20 (90°-270°)				
Zonal Lumens in the 0°-60°Zone	86.22%				
Zonal Lumens in the 60°-90°Zone	13.69%				
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

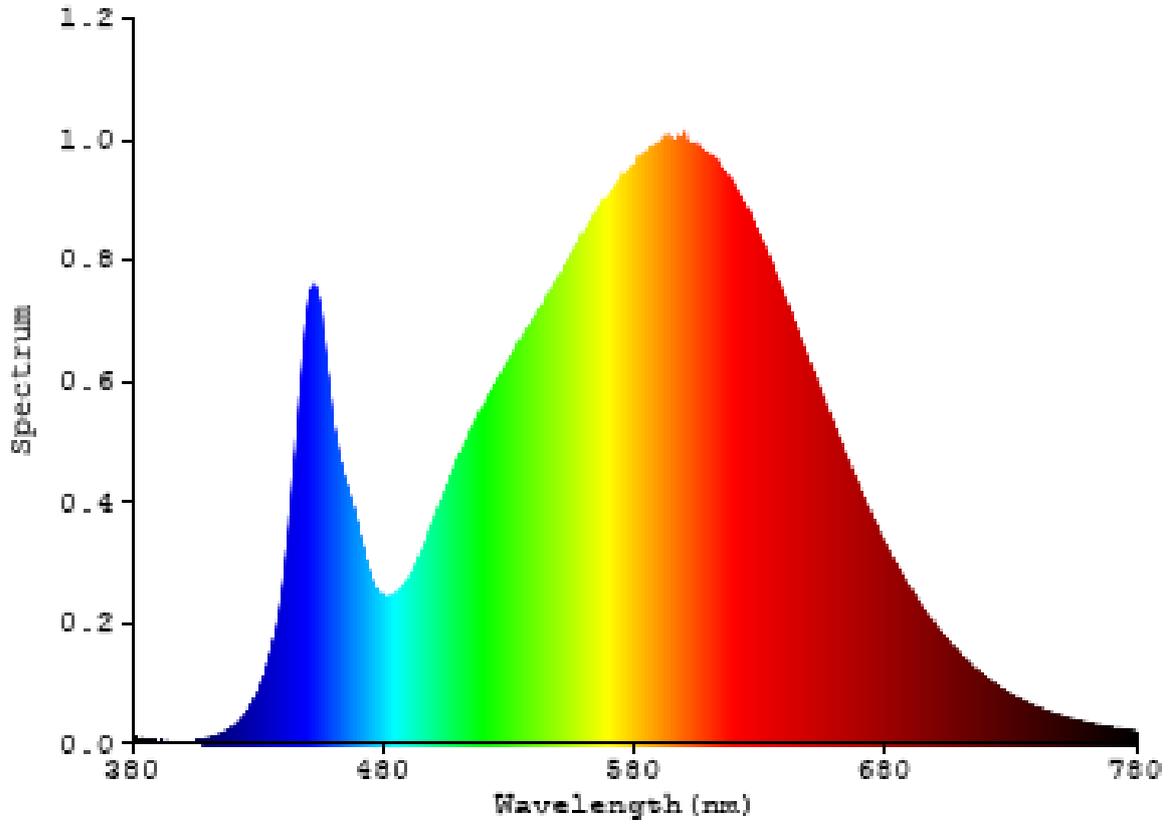


Chart 1: Spectral Power Distribution

Zonal Lumen Tabulation

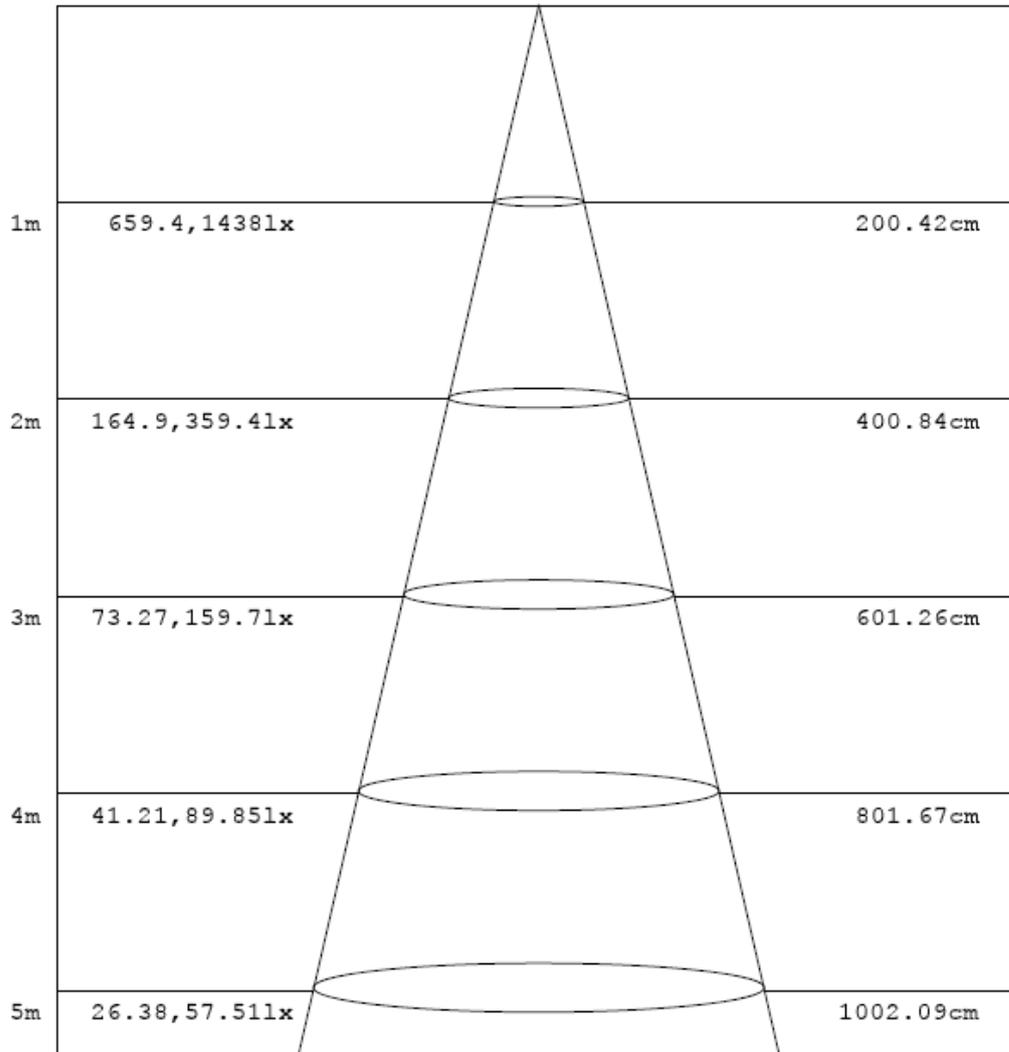
$\gamma(^{\circ})$	Lumens	% Total
0- 10	136.114	4.15%
10- 20	391.34	11.92%
20- 30	589.565	17.96%
30- 40	675.584	20.58%
40- 50	609.491	18.57%
50- 60	428.31	13.05%
60- 70	244.14	7.44%
70- 80	147.481	4.49%
80- 90	57.637	1.76%
90-100	0.592	0.02%
100-110	0.433	0.01%
110-120	0.408	0.01%
120-130	0.389	0.01%
130-140	0.389	0.01%
140-150	0.349	0.01%
150-160	0.277	0.01%
160-170	0.186	0.01%
170-180	0.07	0.00%
Total	3282.8	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	2830.404	86.22%
60- 90	449.258	13.69%
0-90	3279.662	99.91%
90- 180	3.093	0.09%
0- 180	3282.8	100%

Table 3: Zonal Lumen Data

Illuminance Plots

Flux out: 2145 lm



Height Eavg, Emax Angle: 90.12deg Diameter

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

Chart 2: Beam Angle

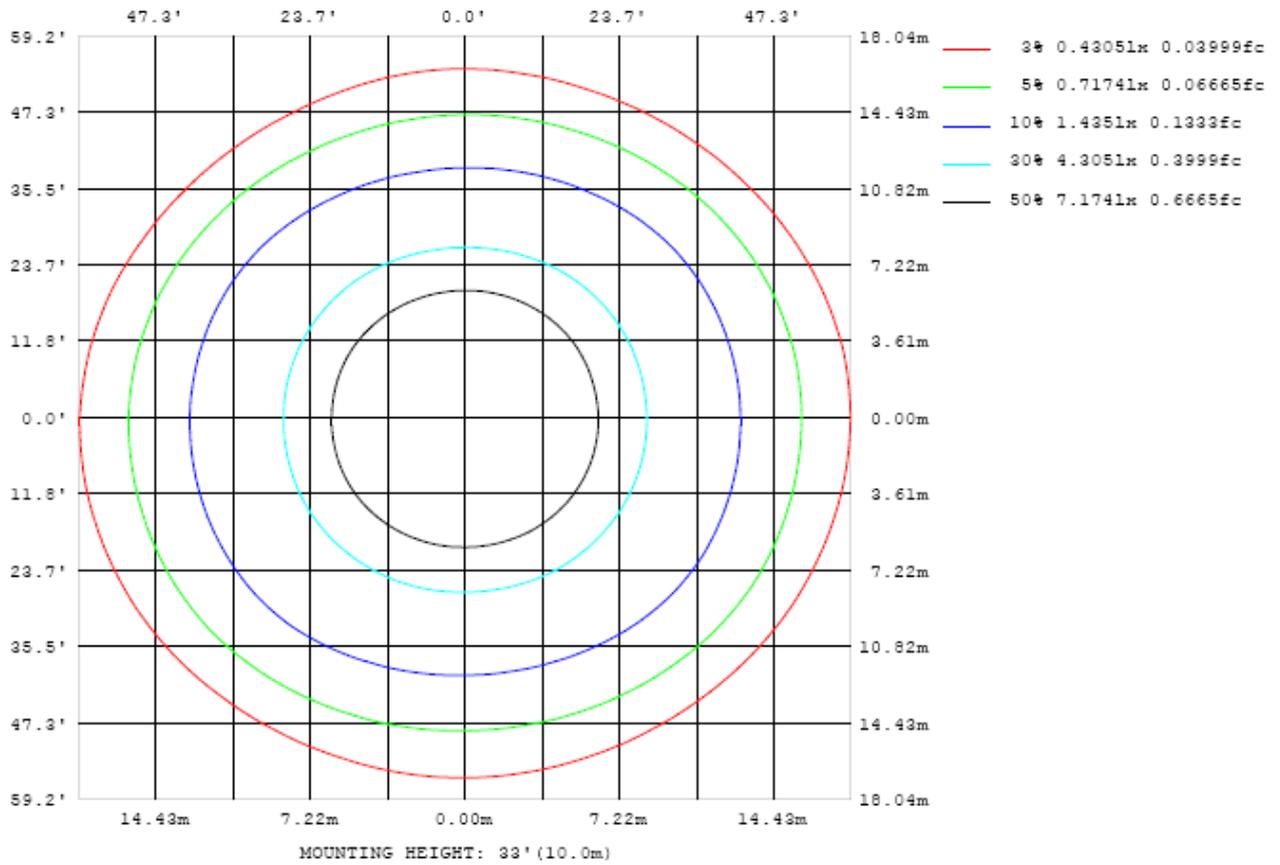


Chart 3: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots

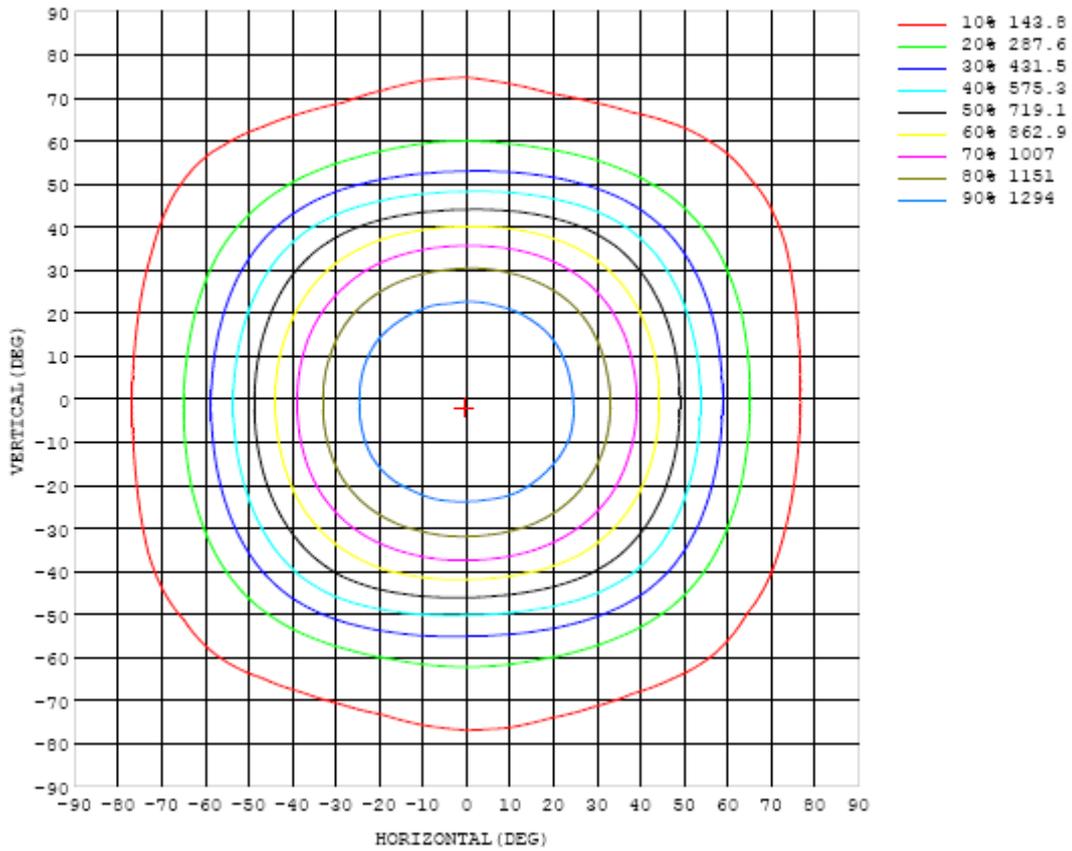


Chart 4: Isocandela Plot

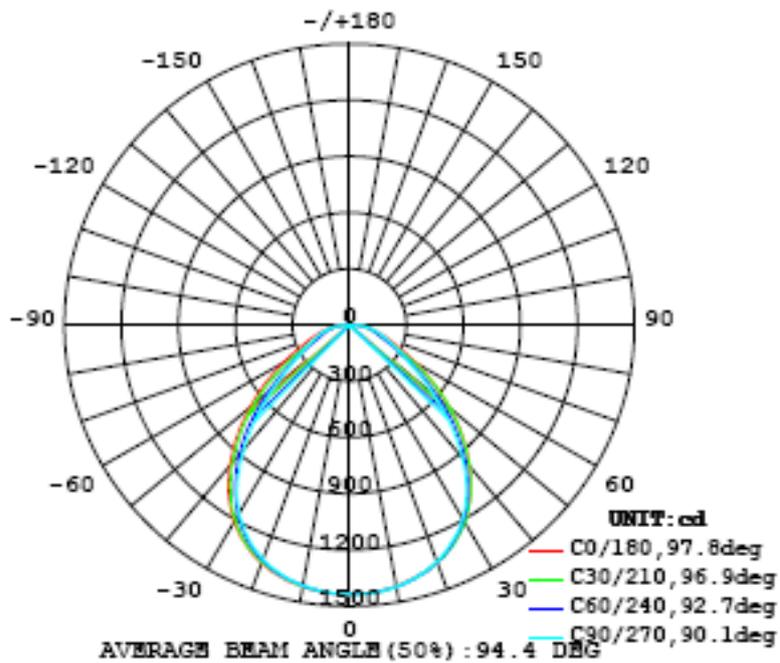


Chart 5: Polar Candela Distribution

Luminous Intensity Data

Table--1 UNIT: cd

C (DEG) y (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	1435	1435	1435	1435	1435	1435	1435	1435	1435	1435	1435	1435	1435	1435	1435	1435	1435	1435	1435
5	1432	1432	1433	1430	1430	1433	1434	1432	1432	1434	1433	1434	1435	1434	1432	1432	1434	1433	1432
10	1416	1418	1420	1418	1419	1417	1419	1416	1418	1418	1419	1420	1416	1421	1423	1420	1420	1419	1416
15	1388	1390	1392	1390	1393	1391	1387	1390	1390	1389	1392	1389	1392	1390	1394	1393	1394	1393	1391
20	1348	1348	1353	1345	1346	1347	1346	1344	1343	1344	1345	1347	1350	1354	1353	1354	1356	1351	1351
25	1287	1293	1296	1294	1291	1287	1284	1280	1278	1278	1280	1281	1286	1294	1298	1299	1297	1293	1290
30	1210	1215	1215	1217	1213	1207	1202	1194	1190	1192	1194	1200	1205	1212	1217	1222	1220	1215	1211
35	1109	1111	1112	1110	1106	1096	1089	1079	1076	1074	1078	1084	1094	1107	1112	1116	1114	1111	1107
40	984	986	984	983	973	961	952	937	927	925	933	946	957	969	979	986	987	982	977
45	841	845	843	837	830	816	792	770	758	757	768	788	810	827	836	840	840	836	833
50	688	694	692	691	680	655	622	596	582	580	592	614	648	678	690	693	693	688	683
55	538	539	537	533	515	487	463	446	435	433	443	458	481	509	531	539	540	539	537
60	401	397	387	376	357	340	329	323	323	324	324	327	336	351	371	387	396	401	400
65	291	282	265	250	236	229	231	237	247	251	244	232	228	232	243	259	275	288	290
70	215	201	182	173	167	164	171	182	195	200	190	174	165	163	167	178	192	213	217
75	162	147	134	136	134	134	137	144	156	159	151	139	135	133	133	137	141	158	163
80	114	106	98.6	102	103	104	107	110	115	118	114	108	104	102	100	101	102	111	114
85	62.6	64.3	54.0	56.7	60.0	56.7	58.3	63.8	66.2	67.0	65.8	60.6	55.4	57.9	56.9	53.4	57.4	62.1	62.8
90	2.71	4.71	5.52	5.55	6.14	4.23	4.12	5.00	5.26	5.25	5.39	5.54	4.19	5.42	3.46	4.24	3.53	3.17	0.59
95	0.63	0.33	0.51	0.42	0.34	0.25	0.18	0.14	0.14	0.13	0.13	0.16	0.20	0.30	0.40	0.49	0.61	0.42	0.60
100	0.60	0.39	0.47	0.44	0.32	0.24	0.18	0.14	0.14	0.14	0.14	0.16	0.21	0.33	0.43	0.53	0.55	0.47	0.71
105	0.55	0.38	0.46	0.37	0.31	0.25	0.20	0.17	0.16	0.16	0.17	0.20	0.23	0.32	0.41	0.49	0.58	0.48	0.78
110	0.53	0.39	0.47	0.37	0.31	0.27	0.23	0.20	0.20	0.19	0.20	0.24	0.26	0.32	0.39	0.51	0.62	0.48	0.75
115	0.54	0.41	0.48	0.39	0.33	0.30	0.27	0.24	0.23	0.23	0.24	0.28	0.30	0.35	0.41	0.53	0.62	0.47	0.67
120	0.53	0.41	0.47	0.41	0.37	0.34	0.31	0.29	0.28	0.28	0.30	0.33	0.35	0.39	0.46	0.56	0.61	0.52	0.63
125	0.53	0.47	0.48	0.43	0.43	0.39	0.36	0.33	0.33	0.33	0.35	0.36	0.39	0.44	0.49	0.56	0.57	0.51	0.60
130	0.57	0.48	0.50	0.49	0.47	0.43	0.41	0.39	0.38	0.39	0.41	0.41	0.44	0.49	0.54	0.58	0.56	0.56	0.57
135	0.57	0.51	0.51	0.52	0.48	0.46	0.46	0.44	0.42	0.45	0.46	0.46	0.47	0.49	0.55	0.59	0.64	0.61	0.58
140	0.60	0.55	0.59	0.51	0.51	0.50	0.50	0.47	0.45	0.48	0.49	0.47	0.50	0.52	0.52	0.59	0.64	0.65	0.59
145	0.63	0.60	0.60	0.55	0.51	0.54	0.52	0.49	0.49	0.51	0.51	0.48	0.52	0.53	0.54	0.57	0.62	0.61	0.55
150	0.63	0.61	0.61	0.59	0.55	0.54	0.53	0.52	0.51	0.53	0.54	0.52	0.53	0.54	0.59	0.63	0.62	0.63	0.58
155	0.66	0.66	0.63	0.63	0.59	0.56	0.53	0.49	0.50	0.50	0.53	0.53	0.55	0.61	0.63	0.66	0.65	0.67	0.61
160	0.69	0.70	0.65	0.63	0.62	0.58	0.55	0.51	0.49	0.51	0.56	0.57	0.60	0.66	0.68	0.66	0.67	0.68	0.64
165	0.70	0.70	0.69	0.66	0.64	0.60	0.57	0.55	0.52	0.55	0.61	0.65	0.70	0.70	0.69	0.71	0.74	0.74	0.67
170	0.72	0.73	0.72	0.73	0.70	0.65	0.61	0.56	0.58	0.61	0.63	0.64	0.70	0.73	0.77	0.79	0.79	0.76	0.70
175	0.78	0.79	0.78	0.78	0.78	0.76	0.71	0.71	0.73	0.70	0.70	0.70	0.78	0.80	0.79	0.79	0.80	0.80	0.75
180	0.74	0.74	0.74	0.74	0.75	0.75	0.75	0.73	0.73	0.74	0.72	0.70	0.72	0.74	0.72	0.71	0.72	0.73	0.73

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	1435	1435	1435	1435	1435	1435	1435	1435	1435	1435	1435	1435	1435	1435	1435	1435	1435		
5	1431	1432	1432	1429	1430	1430	1429	1429	1427	1426	1424	1425	1428	1431	1429	1428	1433		
10	1417	1415	1414	1413	1412	1411	1409	1411	1411	1409	1408	1410	1410	1410	1412	1414	1417		
15	1390	1387	1385	1384	1387	1383	1381	1380	1379	1379	1380	1380	1380	1380	1384	1381	1383		
20	1349	1348	1346	1343	1342	1336	1332	1329	1331	1329	1332	1335	1338	1340	1343	1342	1345		
25	1288	1288	1287	1282	1275	1269	1264	1259	1257	1259	1264	1269	1273	1280	1281	1281	1283		
30	1208	1207	1200	1193	1184	1172	1164	1161	1161	1164	1168	1179	1189	1197	1202	1202	1207		
35	1102	1099	1090	1080	1064	1050	1039	1030	1028	1032	1045	1059	1072	1085	1093	1101	1104		
40	974	967	955	939	923	901	881	870	866	874	892	914	933	951	965	975	978		
45	829	819	806	789	766	735	707	688	686	696	720	750	782	804	819	831	839		
50	676	666	651	629	595	560	536	521	519	530	549	577	615	646	665	676	685		
55	526	510	489	459	430	404	388	382	381	387	399	421	448	480	506	523	534		
60	387	365	335	311	293	283	282	287	288	284	285	295	309	330	356	380	397		
65	271	247	222	206	199	199	210	222	224	216	207	205	208	220	240	264	286		
70	194	176	163	154	152	154	164	177	180	170	160	156	155	162	171	187	208		
75	148	141	135	129	127	124	130	139	142	134	125	124	126	131	136	142	157		
80	110	104	98.7	93.0	91.1	91.2	97.1	101	102	97.8	91.3	88.1	92.3	97.3	99.5	104	114		
85	60.7	47.5	47.7	46.7	39.6	41.0	48.5	49.8	50.1	49.2	44.2	39.8	45.8	48.9	48.3	59.8	66.8		
90	0.51	0.62	0.53	0.42	0.33	0.28	0.24	0.24	0.24	0.24	0.25	0.28	0.37	0.46	0.57	0.72	1.03		
95	0.52	0.68	0.57	0.46	0.37	0.31	0.28	0.27	0.27	0.27	0.29	0.32	0.40	0.50	0.61	0.77	0.63		
100	0.62	0.66	0.59	0.49	0.40	0.34	0.30	0.30	0.30	0.30	0.32	0.35	0.44	0.52	0.62	0.67	0.63		
105	0.66	0.67	0.55	0.49	0.42	0.37	0.34	0.33	0.33	0.34	0.36	0.39	0.46	0.52	0.61	0.67	0.61		
110	0.63	0.65	0.53	0.46	0.40	0.38	0.35	0.33	0.34	0.35	0.37	0.39	0.45	0.50	0.57	0.67	0.58		
115	0.57	0.59	0.51	0.42	0.38	0.36	0.33	0.32	0.32	0.34	0.37	0.39	0.43	0.47	0.52	0.62	0.52		
120	0.52	0.55	0.47	0.39	0.35	0.34	0.30	0.30	0.30	0.32	0.35	0.39	0.43	0.45	0.51	0.58	0.49		
125	0.51	0.54	0.48	0.43	0.37	0.35	0.32	0.32	0.31	0.33	0.36	0.40	0.44	0.46	0.50	0.57	0.49		
130	0.50	0.56	0.52	0.47	0.40	0.38	0.38	0.39	0.38	0.39	0.41	0.43	0.47	0.49	0.51	0.54	0.50		
135	0.54	0.57	0.54	0.48	0.46	0.45	0.45	0.47	0.45	0.46	0.48	0.50	0.51	0.50	0.54	0.55	0.52		
140	0.56	0.62	0.55	0.50	0.52	0.51	0.52	0.55	0.53	0.52	0.55	0.56	0.50	0.52	0.56	0.58	0.56		
145	0.56	0.58	0.57	0.56	0.53	0.52	0.56	0.60	0.60	0.57	0.58	0.55	0.56	0.55	0.57	0.56	0.56		
150	0.58	0.61	0.59	0.60	0.60	0.55	0.58	0.59	0.58	0.53	0.56	0.61	0.61	0.57	0.58	0.57	0.55		
155	0.62	0.62	0.62	0.63	0.61	0.58	0.62	0.61	0.60	0.59	0.60	0.63	0.62	0.63	0.63	0.61	0.59		
160	0.64	0.62	0.63	0.67	0.66	0.62	0.61	0.63	0.60	0.59	0.61	0.65	0.66	0.67	0.67	0.65	0.63		
165	0.67	0.68	0.66	0.67	0.70	0.71	0.69	0.69	0.66	0.62	0.63	0.65	0.67	0.66	0.66	0.65	0.62		
170	0.71	0.74	0.76	0.78	0.77	0.75	0.72	0.73	0.73	0.70	0.66	0.69	0.70	0.71	0.74	0.68	0.66		
175	0.75	0.76	0.78	0.78	0.79	0.81	0.77	0.74	0.75	0.78	0.77	0.73	0.74	0.75	0.75	0.73	0.72		
180	0.73	0.74	0.74	0.74	0.74	0.75	0.74	0.72	0.73	0.74	0.71	0.71	0.72	0.74	0.72	0.71	0.72		

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 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

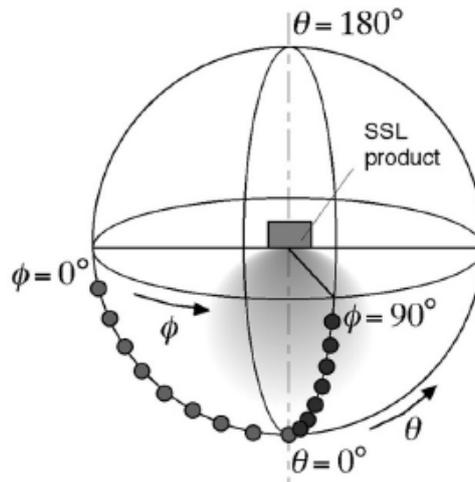
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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