



LM-79-08 Test Report

for

ABBlighting, Inc.

3 Adams St Belvidere, NJ 07823.

Troffer

Model: ABDT22D4541

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ15110005a

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

Reviewed by:

April Zou

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Nov. 16, 2015

Jim Zhang

Manager: Jim Zhang
Nov. 16, 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: **ABDT22D4541**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
98.2	3767.7	38.35	0.9959
CCT (K)	CRI	Stabilization Time (Light & Power)	
3924	83.7	60	

Table 1: Executive Data Summary

Test specifications:

Date of Receipt	: Nov. 05, 2015
Date of Test	: Nov. 05, 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

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Sample Photo

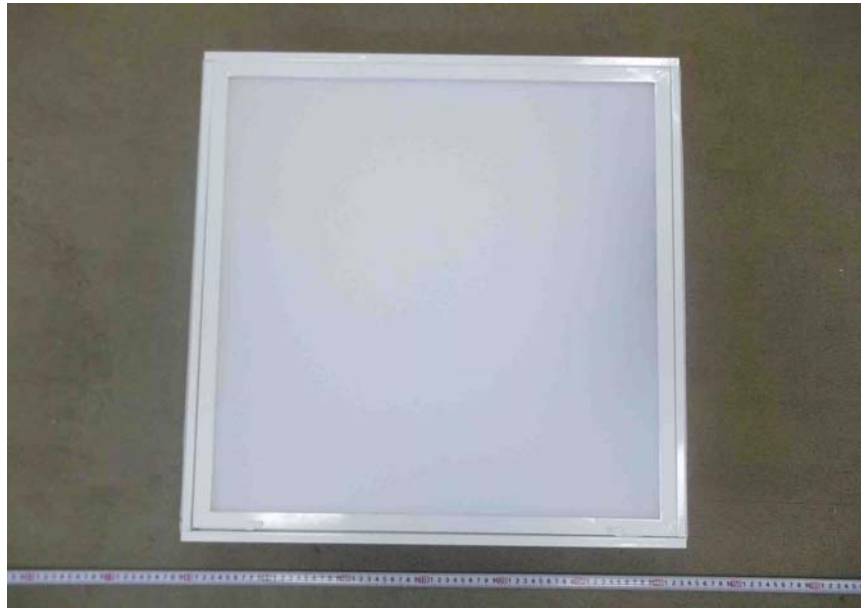


Figure 1- Overview of the sample

Equipment Under Test (EUT)

Name	: Troffer
Model	: ABDT22D4541
Electrical Ratings	: 100~277Vac, 50/60Hz, 45W
Product Description	: 4100K, Aluminum frame, Frosted Lens, SPCC with powder paint Manufacturer of light source: SSC Model of light source: 5630 Quantity of LED light source: 132pcs
Manufacturer	: ABB Lighting (shanghai) Co., Ltd.
Address	: Room 1012, North Minch Fortune 108 Plaza, # 1839 Qixin road, Shanghai

TEST RESULTS

Test ambient temperature was 25.4°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.

The photometric distance of Goniophotometer is 30 m.

Luminous data was taken at 0.5° vertical intervals and 10.0° horizontal intervals.

Parameter	Result			Special Color Rendering Indices	
Test Voltage (V)	120.0	100.0	277.0	R1	82
Voltage frequency (Hz)	60	60	60	R2	90
Test Current (A)	0.321	0.390	0.155	R3	96
Power Factor	0.9959	0.9919	0.9051	R4	82
Test Power (W)	38.35	38.71	38.76	R5	82
THD A%	6.47	6.79	11.12	R6	86
Luminous Efficacy (lm/W)	98.2	97.3	97.2	R7	87
Total Luminous Flux (lm)	3767.7	3766.4	3769.1	R8	66
Color Rendering Index (CRI)	83.7			R9	13
R9	13			R10	75
Correlated Color Temperature (CCT) (K)	3924			R11	81
Chromaticity (Chroma x, Chroma y)	(0.3855, 0.3846)			R12	63
Chromaticity (Chroma u, Chroma v)	(0.2253, 0.3371)			R13	84
Chromaticity (Chroma u', Chroma v')	(0.2253, 0.5057)			R14	98
Duv	0.0022				
Average Beam Angle (°)	110.2				
Center Beam Candle Power (cd)	1338				
Spacing Criteria	1.24 (0°-180°)/ 1.23(90°-270°)				
Zonal Lumens in the 0°-60°Zone	78.23%				
Zonal Lumens in the 60°-90°Zone	21.28%				
Zonal Lumens in the 90°-120°Zone	0.16%				
Zonal Lumens in the 120°-180°Zone	0.33%				

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

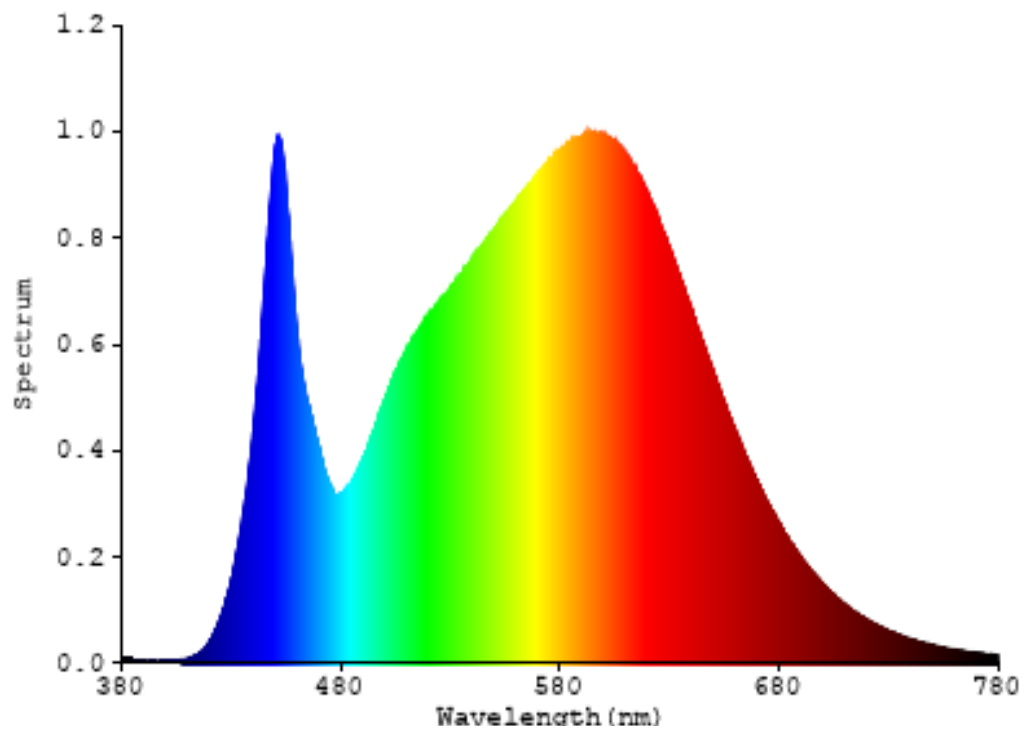


Chart 1: Spectral Power Distribution

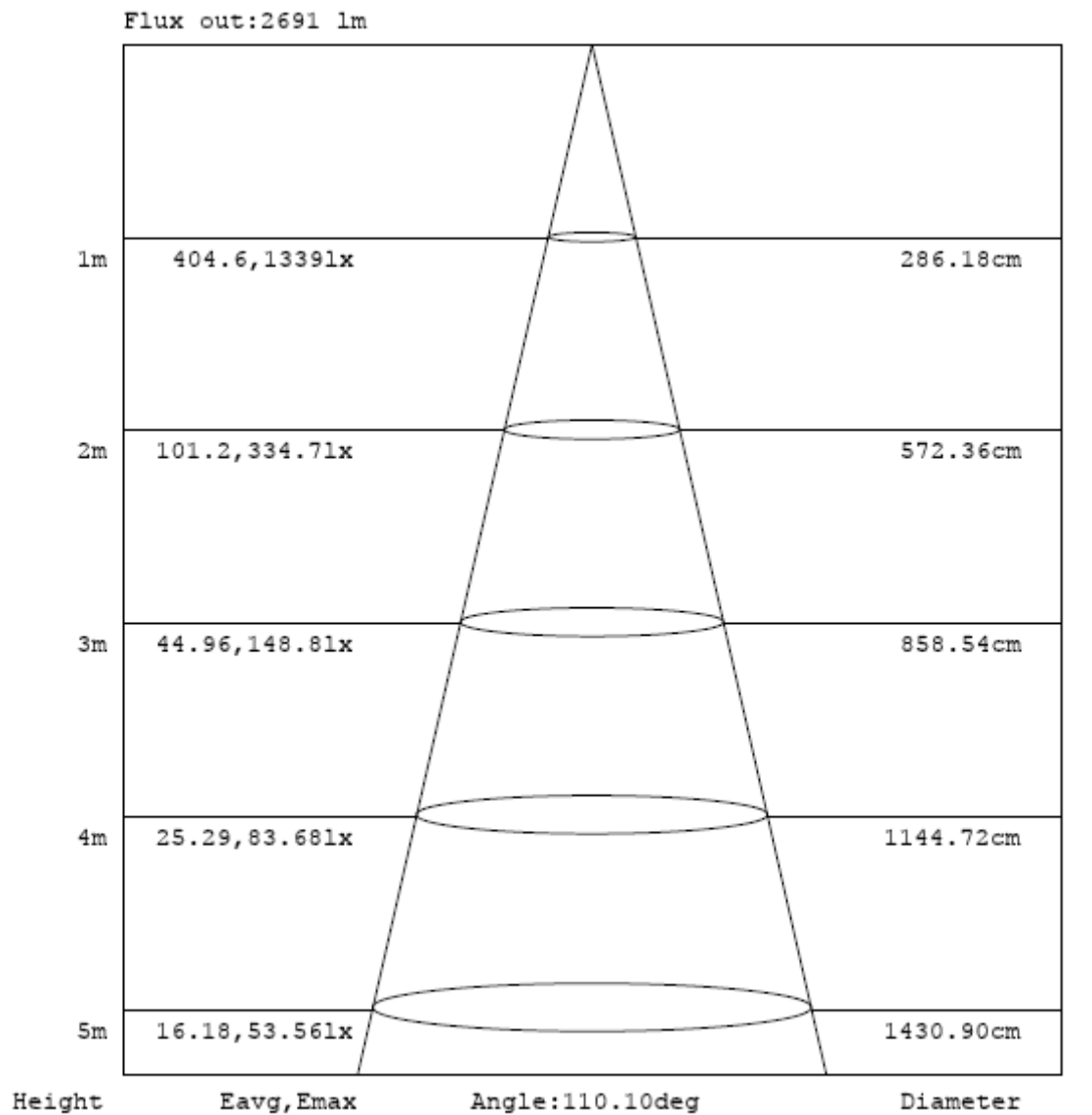
Zonal Lumen Tabulation

$\gamma(^{\circ})$	Lumens	% Total
0- 10	126.423	3.36%
10- 20	360.768	9.58%
20- 30	543.126	14.42%
30- 40	649.338	17.23%
40- 50	667.883	17.73%
50- 60	599.95	15.92%
60- 70	458.536	12.17%
70- 80	269.505	7.15%
80- 90	73.735	1.96%
90-100	1.098	0.03%
100-110	1.971	0.05%
110-120	2.862	0.08%
120-130	3.234	0.09%
130-140	3.192	0.08%
140-150	2.551	0.07%
150-160	2.058	0.05%
160-170	1.051	0.03%
170-180	0.393	0.01%
Total	3767.7	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	2947.488	78.23%
60- 90	801.776	21.28%
0-90	3749.264	99.51%
90- 180	18.41	0.49%
0- 180	3767.7	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

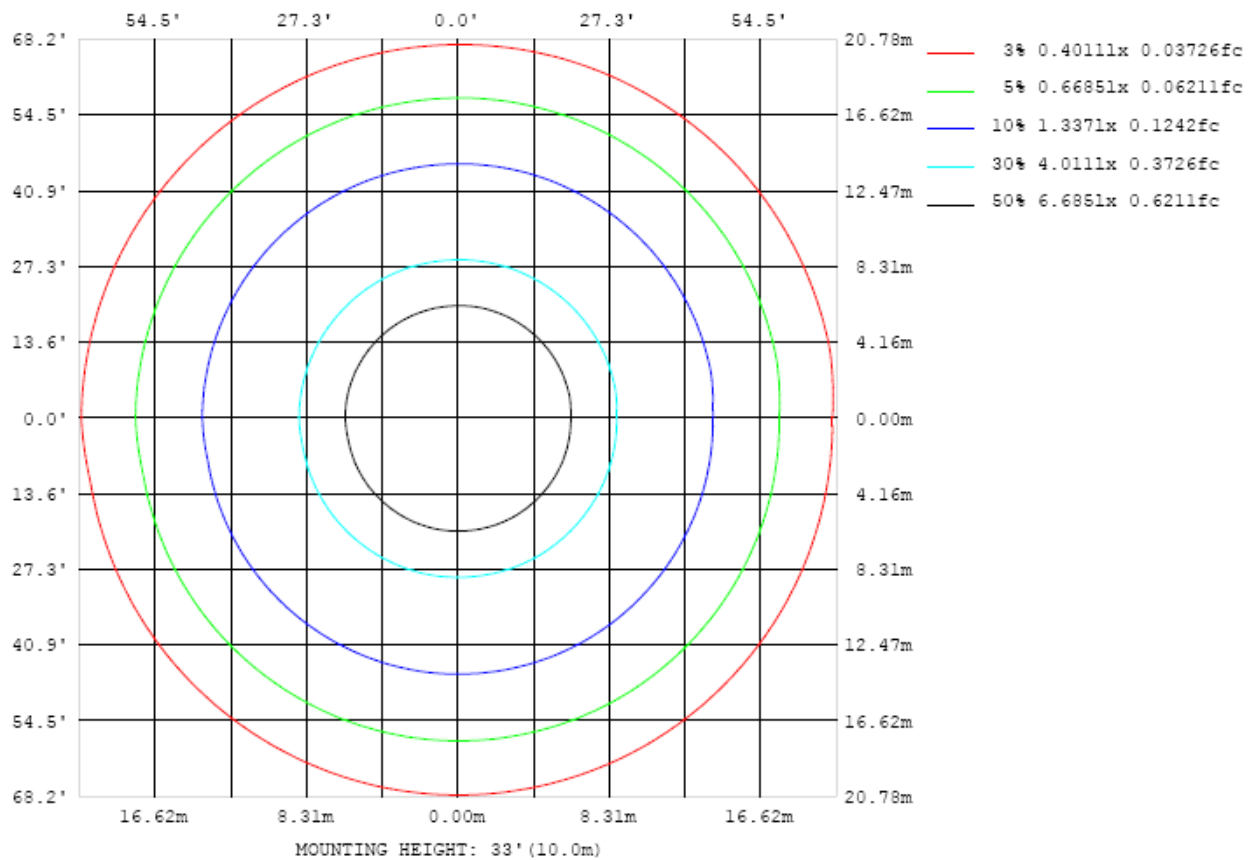


Chart 3: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots

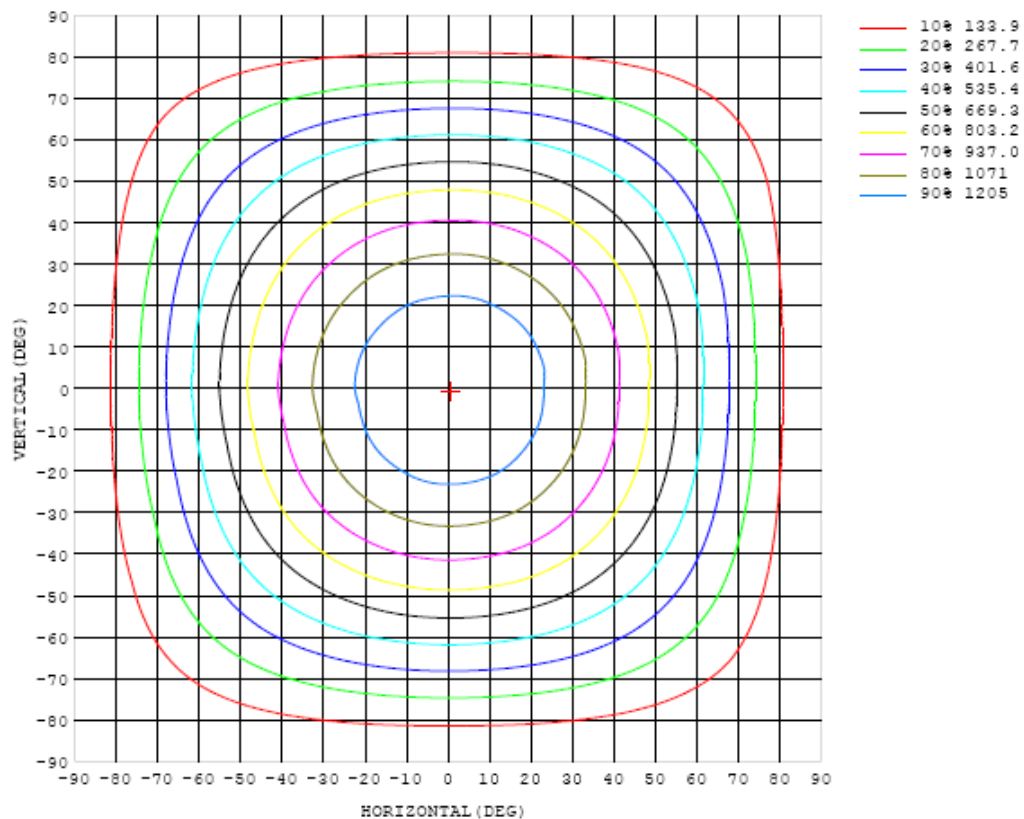


Chart 4: Isocandela Plot

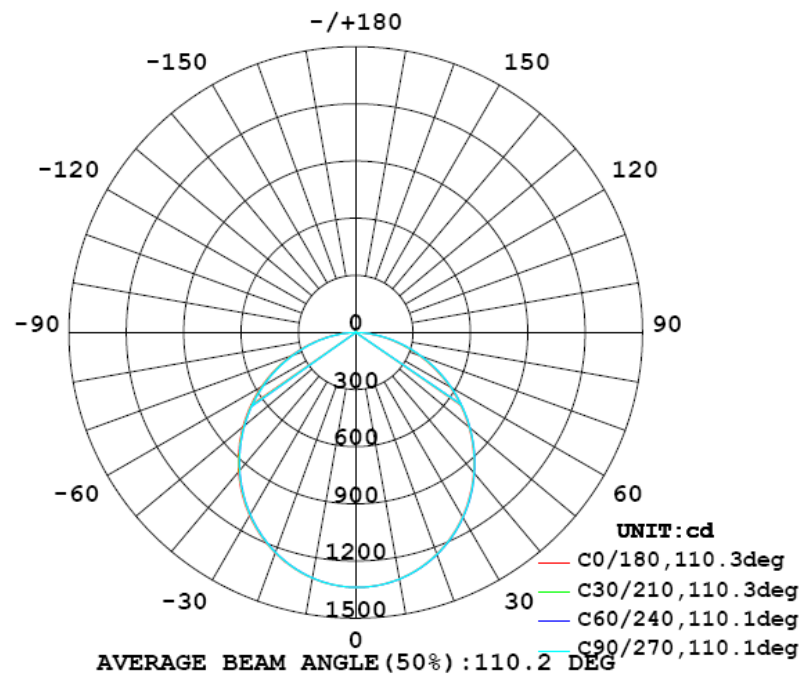


Chart 5: Polar Candela Distribution

Luminous Intensity Data

Table--1 UNIT: cd

C (DEG) y (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	1338	1338	1338	1338	1338	1338	1338	1338	1338	1338	1338	1338	1338	1338	1338	1338	1338	1338	1338
5	1332	1332	1332	1333	1333	1333	1333	1333	1333	1332	1332	1332	1332	1331	1331	1330	1330	1329	1330
10	1313	1314	1314	1314	1315	1315	1315	1315	1314	1314	1313	1312	1312	1311	1310	1309	1308	1307	1310
15	1281	1282	1283	1283	1284	1284	1284	1284	1283	1282	1282	1281	1279	1278	1277	1275	1274	1273	1277
20	1237	1239	1240	1241	1241	1241	1241	1241	1240	1239	1238	1236	1235	1234	1232	1230	1228	1227	1233
25	1182	1184	1185	1186	1187	1187	1187	1186	1185	1184	1183	1181	1180	1178	1176	1174	1171	1169	1177
30	1116	1118	1120	1121	1122	1122	1122	1121	1121	1119	1118	1116	1114	1112	1110	1107	1105	1103	1111
35	1041	1043	1045	1046	1047	1048	1048	1047	1046	1045	1043	1041	1040	1037	1035	1032	1029	1027	1037
40	958	960	962	964	965	966	966	965	964	963	961	959	957	955	952	949	947	944	955
45	868	870	873	874	875	876	876	875	875	874	872	870	868	866	863	860	857	854	866
50	772	775	777	778	780	781	781	780	780	778	777	775	773	771	768	765	762	759	772
55	671	674	676	678	680	681	681	680	680	679	678	676	674	672	669	666	663	660	673
60	567	570	573	574	576	577	577	577	577	576	574	573	571	569	567	564	561	557	572
65	459	463	466	468	471	471	472	472	471	471	470	468	467	465	463	460	456	452	467
70	354	354	358	360	363	366	366	366	366	366	365	363	362	361	358	354	350	346	361
75	248	249	252	255	258	261	263	263	263	263	262	261	260	258	254	250	246	242	260
80	147	149	152	155	158	161	164	165	164	164	164	164	162	159	155	152	147	146	161
85	56.5	58.5	61.4	64.1	65.1	66.9	67.9	68.8	69.0	68.7	68.7	68.6	67.4	65.8	63.9	61.6	58.3	55.3	67.9
90	2.52	2.11	2.42	2.45	4.04	4.23	2.26	2.42	2.46	2.32	2.36	2.36	2.61	4.30	2.95	2.41	2.05	1.07	0.86
95	1.04	1.45	1.41	0.94	0.86	0.75	0.63	0.44	0.41	0.34	0.44	0.55	0.78	0.98	1.08	1.18	1.39	1.45	1.10
100	1.62	1.51	1.96	1.52	1.67	1.60	1.30	0.94	0.67	0.54	0.62	0.79	1.06	1.28	1.37	1.34	1.39	1.37	1.18
105	2.59	1.88	3.12	3.00	2.78	2.33	1.87	1.37	0.92	0.71	0.76	1.07	1.37	1.64	1.68	1.68	1.76	1.35	1.42
110	4.39	2.47	4.58	4.36	4.16	3.21	2.69	1.95	1.24	0.97	1.04	1.41	1.76	1.98	2.12	2.12	1.88	2.07	1.47
115	5.25	2.79	5.31	5.26	4.93	4.34	3.64	2.78	1.72	1.31	1.37	1.84	2.18	2.41	2.52	2.54	2.18	1.81	1.81
120	5.87	2.73	6.12	6.08	5.65	4.90	4.02	3.31	2.37	1.93	1.81	2.40	2.66	2.93	2.98	2.99	2.90	1.31	1.02
125	1.15	1.67	6.47	6.30	5.80	5.73	4.74	3.98	2.94	2.58	2.35	3.00	3.34	3.41	3.35	3.34	3.39	2.36	2.98
130	6.83	4.51	6.54	6.89	6.17	5.78	4.88	4.66	3.62	3.24	2.98	3.39	3.96	3.99	3.93	3.92	3.21	3.47	3.17
135	7.46	5.77	4.74	6.51	6.47	5.81	5.47	5.39	4.16	3.91	3.70	3.81	4.34	4.64	4.63	4.48	2.54	1.40	2.69
140	6.64	6.40	3.15	6.75	6.59	5.47	5.52	5.21	4.68	4.51	4.32	4.17	4.62	5.10	5.22	4.45	1.79	2.47	2.43
145	7.28	7.34	2.92	4.54	5.75	6.28	6.05	5.14	5.17	5.11	4.98	4.72	4.96	5.11	5.35	3.58	3.40	3.36	2.01
150	1.04	1.11	1.94	2.63	4.90	6.03	6.16	5.35	5.56	5.59	5.44	5.26	5.07	5.25	3.94	2.93	4.62	5.87	2.78
155	6.45	6.71	5.85	3.69	3.22	4.28	4.87	5.47	5.89	5.91	5.74	5.40	4.78	3.65	3.11	3.46	5.48	5.77	5.54
160	6.36	6.57	6.70	5.45	3.80	3.10	3.04	3.43	4.02	4.19	4.06	3.74	3.14	2.96	3.22	4.60	5.92	5.95	5.90
165	6.50	6.25	6.27	6.14	5.20	4.33	3.59	3.31	3.28	3.21	3.02	2.02	1.29	2.29	3.89	5.80	2.70	0.96	1.06
170	5.94	5.93	5.98	6.06	6.19	6.24	6.08	5.79	5.62	5.47	5.40	5.53	3.67	2.06	1.05	0.98	0.96	0.95	1.08
175	6.49	6.49	6.46	6.49	6.54	6.59	6.61	6.61	6.58	6.50	6.23	4.16	1.58	0.93	1.05	1.88	2.88	3.33	1.07
180	6.57	6.58	6.57	6.59	6.60	6.59	6.59	6.56	6.53	4.33	0.97	1.15	5.70	6.57	6.62	6.61	6.61	6.63	6.57

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	1338	1338	1338	1338	1338	1338	1338	1338	1338	1338	1338	1338	1338	1338	1338	1338	1338		
5	1330	1330	1329	1329	1329	1329	1329	1329	1330	1330	1330	1331	1331	1332	1332	1333	1333		
10	1309	1309	1308	1308	1307	1307	1308	1308	1308	1309	1310	1311	1312	1313	1314	1315	1316		
15	1276	1275	1274	1274	1273	1273	1273	1274	1275	1276	1277	1278	1280	1281	1283	1284	1286		
20	1231	1230	1229	1228	1227	1227	1227	1228	1229	1230	1232	1234	1236	1238	1240	1242	1243		
25	1175	1173	1172	1171	1170	1170	1170	1171	1172	1174	1176	1178	1180	1183	1185	1187	1190		
30	1109	1107	1106	1104	1103	1103	1103	1104	1105	1107	1109	1112	1115	1117	1120	1123	1125		
35	1034	1032	1030	1029	1028	1027	1028	1028	1030	1031	1034	1037	1040	1043	1046	1049	1052		
40	952	949	948	946	945	944	944	945	946	948	951	954	957	960	964	967	970		
45	863	861	858	856	855	854	854	855	856	858	861	864	867	871	874	878	881		
50	769	766	764	762	760	759	759	760	761	763	766	769	772	776	779	782	786		
55	670	667	665	663	661	660	660	660	661	663	666	669	672	675	679	683	686		
60	569	565	563	561	559	557	557	557	558	560	562	565	569	572	576	579	582		
65	464	462	460	457	455	454	453	453	453	455	458	461	463	467	470	473	476		
70	358	356	354	353	351	350	349	349	349	351	353	356	359	361	363	366	368		
75	255	253	251	250	250	249	248	247	248	249	251	253	255	257	258	260	262		
80	157	156	154	153	153	152	151	150	150	152	154	156	157	158	159	161	163		
85	66.2	64.9	63.7	62.2	60.8	59.7	59.4	58.7	58.7	59.9	61.3	62.7	64.5	66.2	67.8	68.7	69.9		
90	1.33	1.20	0.97	0.86	0.72	0.56	0.45	0.33	0.33	0.36	0.43	0.52	0.66	0.86	0.96	1.40	1.67		
95	1.63	1.55	1.19	1.12	0.98	0.79	0.63	0.56	0.53	0.67	0.68	0.70	0.87	1.00	1.23	1.46	1.55		
100	1.67	1.60	1.28	1.37	1.16	1.01	0.91	0.89	0.94	1.20	1.44	1.59	1.72	1.82	1.70	1.97	2.00		
105	1.78	1.82	1.50	1.60	1.38	1.29	1.28	1.34	1.44	1.76	2.11	2.33	2.63	2.90	2.24	2.88	2.87		
110	2.12	2.00	1.72	1.80	1.72	1.69	1.78	1.90	1.73	2.26	2.71	3.06	3.23	3.32	2.78	3.90	4.55		
115	2.42	2.31	2.10	2.13	2.14	2.15	2.34	2.35	1.81	2.40	2.79	3.12	3.30	3.72	3.23	4.95	5.49		
120	1.28	1.36	2.41	2.56	2.63	2.74	2.91	2.57	2.24	2.39	2.63	3.18	3.77	4.33	4.06	5.72	6.17		
125	3.15	2.80	1.78	3.01	3.18	3.37	3.41	2.85	2.81	2.78	2.98	3.60	4.19	4.71	1.34	1.18	3.02		
130	2.55	3.56	2.11	2.42	3.75	3.95	3.71	3.27	3.36	3.32	3.40	4.02	4.72	2.18	5.68	6.50	4.08		
135	1.36	1.00	1.26	1.42	2.67	4.37	3.94	3.69	3.88	3.81	3.99	3.84	2.21	3.85	6.22	6.39	4.99		
140	2.49	3.83	1.36	4.58	2.46	1.95	2.64	3.18	3.55	3.14	2.67	1.64	0.91	5.57	6.63	4.29	5.89		
145	2.81	1.26	3.43	5.45	4.96	3.48	2.25	1.19	1.80	1.90	2.63	4.64	5.35	0.98	3.05	4.12	6.59		
150	2.23	1.35	4.30	4.46	4.25	4.94	3.31	2.68	4.66	4.84	4.81	5.60	5.86	6.04	1.91	1.13	1.33		
155	2.80	1.27	3.28	4.37	5.30	4.94	1.94	4.06	5.62	5.62	5.30	5.33	6.26	4.89	3.87	4.40	4.92		
160	4.23	1.28	1.81	2.59	4.25	3.50	1.39	4.91	5.90	5.97	5.65	4.84	4.18	3.55	4.17	5.52	6.72		
165	1.08	1.04	1.05	1.11	1.59	1.19	1.68	3.61	4.18	4.18	3.82	3.55	3.51	3.62	4.22	5.72	7.04		
170	1.08	1.07	1.08	1.08	1.10	1.15	1.12	1.51	2.62	3.95	4.05	4.04	4.19	4.74	5.27	5.88	5.92		
175	1.07	1.08	1.05	1.06	1.32	1.33	1.09	1.03	1.01	1.53	5.22	6.14	6.40	6.52	6.52	6.47	6.43		
180	6.56	6.58	6.58	6.60	6.60	6.60	6.58	6.56	6.46	4.17	1.05	1.73	5.73	6.58	6.60	6.60	6.60		

Table 5: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Jul. 17, 2015	Jul. 16, 2016
Digital Power Meter	PF2010A	HZTE028-01	Jul. 17, 2015	Jul. 16, 2016
AC Power Supply	PCR 500L	HZTE001-08	Jul. 17, 2015	Jul. 16, 2016
DC Power Supply	WY12010	HZTE004-03	Jul. 17, 2015	Jul. 16, 2016
Temperature Meter	TES1310	HZTE017-01	Jul. 17, 2015	Jul. 16, 2016
Standard Source	D908	HZTE012-01	Jul. 23, 2015	Jul. 22, 2016
Standard source	SCL-1400	HZTE012-02	Oct. 21, 2015	Oct. 20, 2016

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 expanded uncertainty is 1.94% with a coverage factor $k=2$.

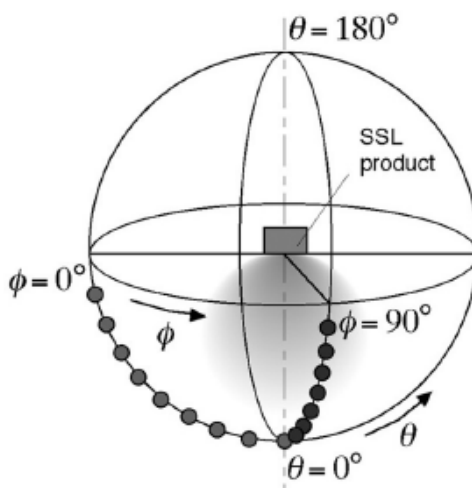
Color Characteristics Measurements

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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