



LM-79-08 Test Report

for

ABBlighting, Inc.

3 Adams St Belvidere, NJ 07823.

Troffer

Model: ABDT24D5541

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ15110005b

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

Reviewed by:

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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: **ABDT24D5541**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
87.7	4758.3	54.28	0.9930
CCT (K)	CRI	Stabilization Time (Light & Power)	
4012	83.6	60	

Table 1: Executive Data Summary

Test specifications:

Date of Receipt	: Nov. 05, 2015
Date of Test	: Nov. 12, 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

LM-79-08 Test Report.....	1
Test Summary.....	2
Sample Photo.....	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
Goniophotometer Method	13
Photometric and Electrical Measurements.....	13
Color Characteristics Measurements.....	14
Color Spatial Uniformity	14

Sample Photo



Figure 1- Overview of the sample

Equipment Under Test (EUT)

Name	: Troffer
Model	: ABDT24D5541
Electrical Ratings	: 100~277Vac, 50/60Hz, 55W
Product Description	: 4100K, Aluminum frame, Frosted Lens, SPCC with powder paint Manufacturer of light source: SSC Model of light source: 2835 Quantity of LED light source: 242pcs
Manufacturer	: ABB Lighting (shanghai) Co., Ltd.
Address	: Room 1012, North Minch Fortune 108 Plaza, # 1839 Qixin road, Shanghai

TEST RESULTS

Test ambient temperature was 25.3°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)	0.455	0.555	0.203	R3	95
Power Factor	0.9930	0.9896	0.9665	R4	82
Test Power (W)	54.28	54.93	54.44	R5	82
THD A%	6.81	7.17	8.13	R6	86
Luminous Efficacy (lm/W)	87.7	96.4	87.2	R7	87
Total Luminous Flux (lm)	4758.3	4748.2	4747.8	R8	66
Color Rendering Index (CRI)	83.6			R9	13
R9	13			R10	75
Correlated Color Temperature (CCT) (K)	4012			R11	80
Chromaticity (Chroma x, Chroma y)	(0.3808, 0.3798)			R12	62
Chromaticity (Chroma u, Chroma v)	(0.2241, 0.3353)			R13	84
Chromaticity (Chroma u', Chroma v')	(0.2241, 0.5030)			R14	97
Duv	0.0014				
Average Beam Angle (°)	114.1				
Center Beam Candle Power (cd)	1623				
Spacing Criteria	1.28 (0°-180°)/ 1.24(90°-270°)				
Zonal Lumens in the 0°-60°Zone	77.70%				
Zonal Lumens in the 60°-90°Zone	22.20%				
Zonal Lumens in the 90°-120°Zone	0.05%				
Zonal Lumens in the 120°-180°Zone	0.05%				

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

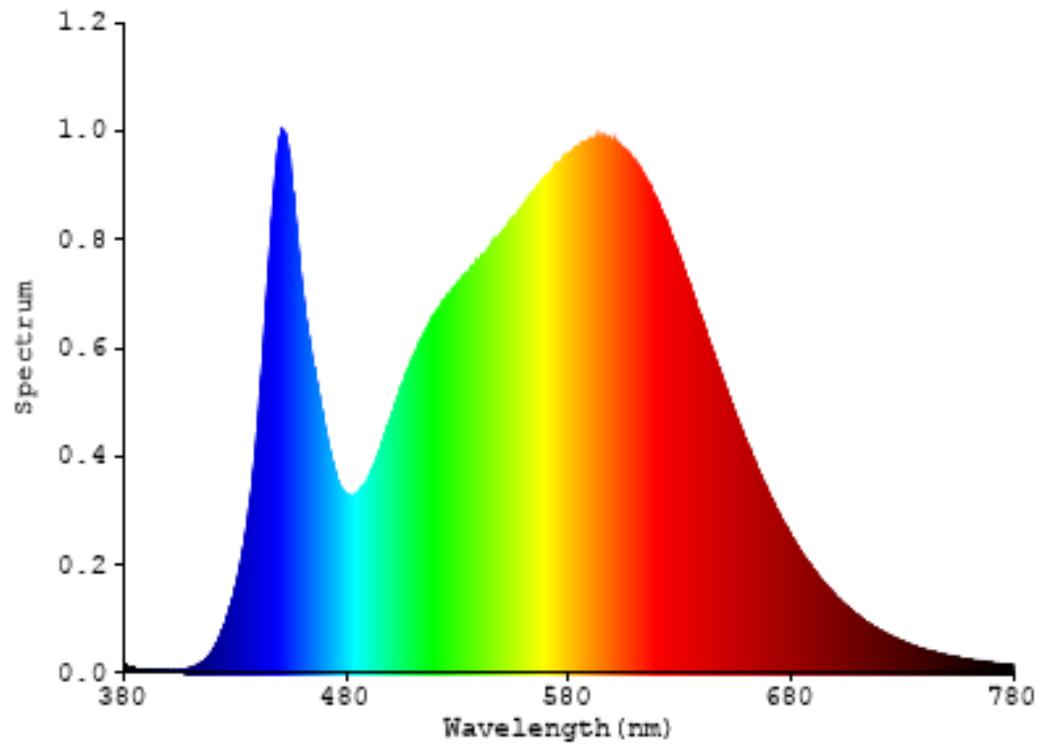


Chart 1: Spectral Power Distribution

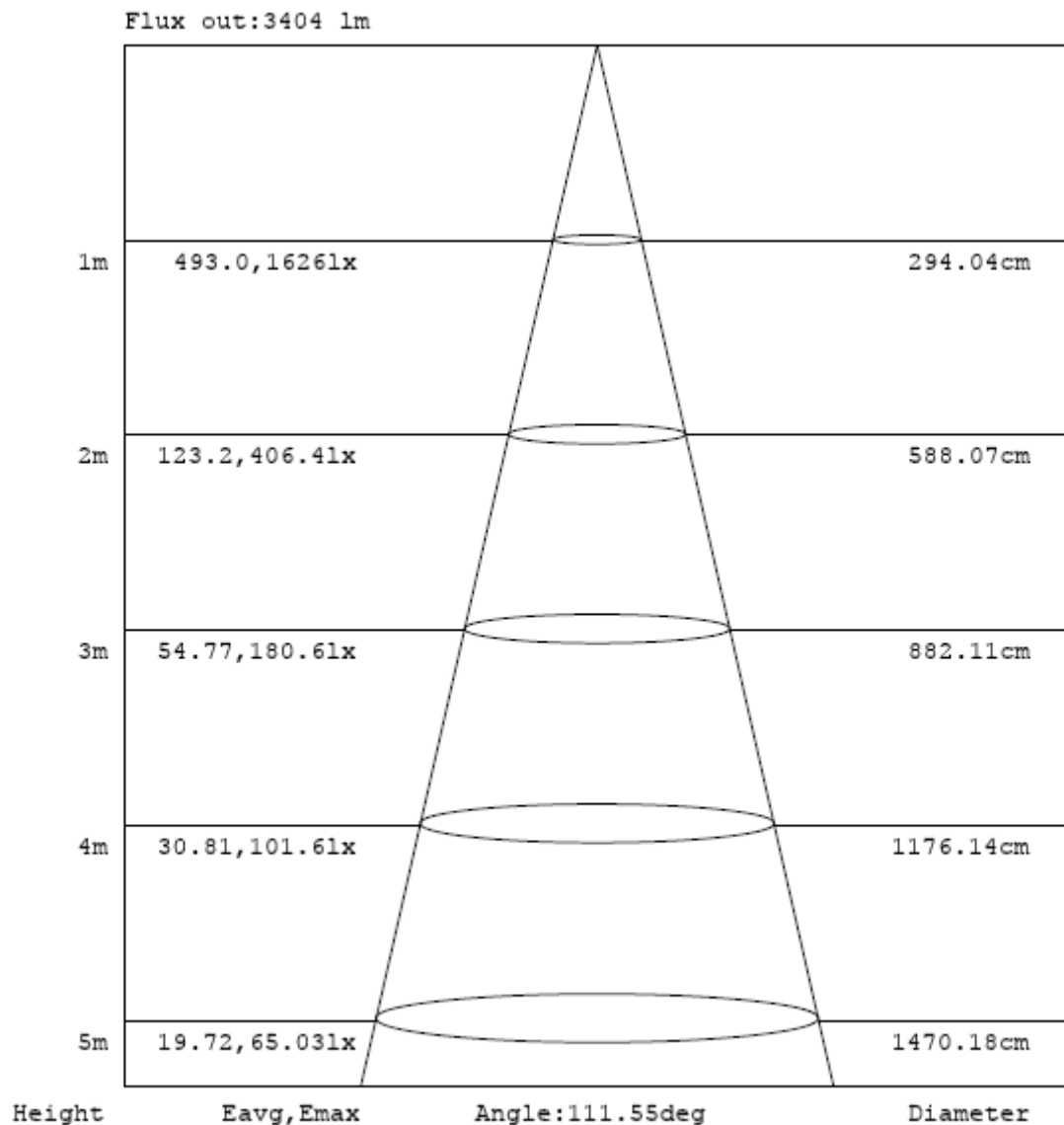
Zonal Lumen Tabulation

$\gamma(^{\circ})$	Lumens	% Total
0- 10	153.642	3.23%
10- 20	440.694	9.26%
20- 30	670.161	14.08%
30- 40	812.231	17.07%
40- 50	847.835	17.82%
50- 60	772.7	16.24%
60- 70	598.173	12.57%
70- 80	355.763	7.48%
80- 90	102.206	2.15%
90-100	0.879	0.02%
100-110	0.81	0.02%
110-120	0.718	0.02%
120-130	0.639	0.01%
130-140	0.6	0.01%
140-150	0.511	0.01%
150-160	0.387	0.01%
160-170	0.249	0.01%
170-180	0.095	0.00%
Total	4758.3	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	3697.263	77.70%
60- 90	1056.142	22.20%
0-90	4753.405	99.90%
90- 180	4.888	0.10%
0- 180	4758.3	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

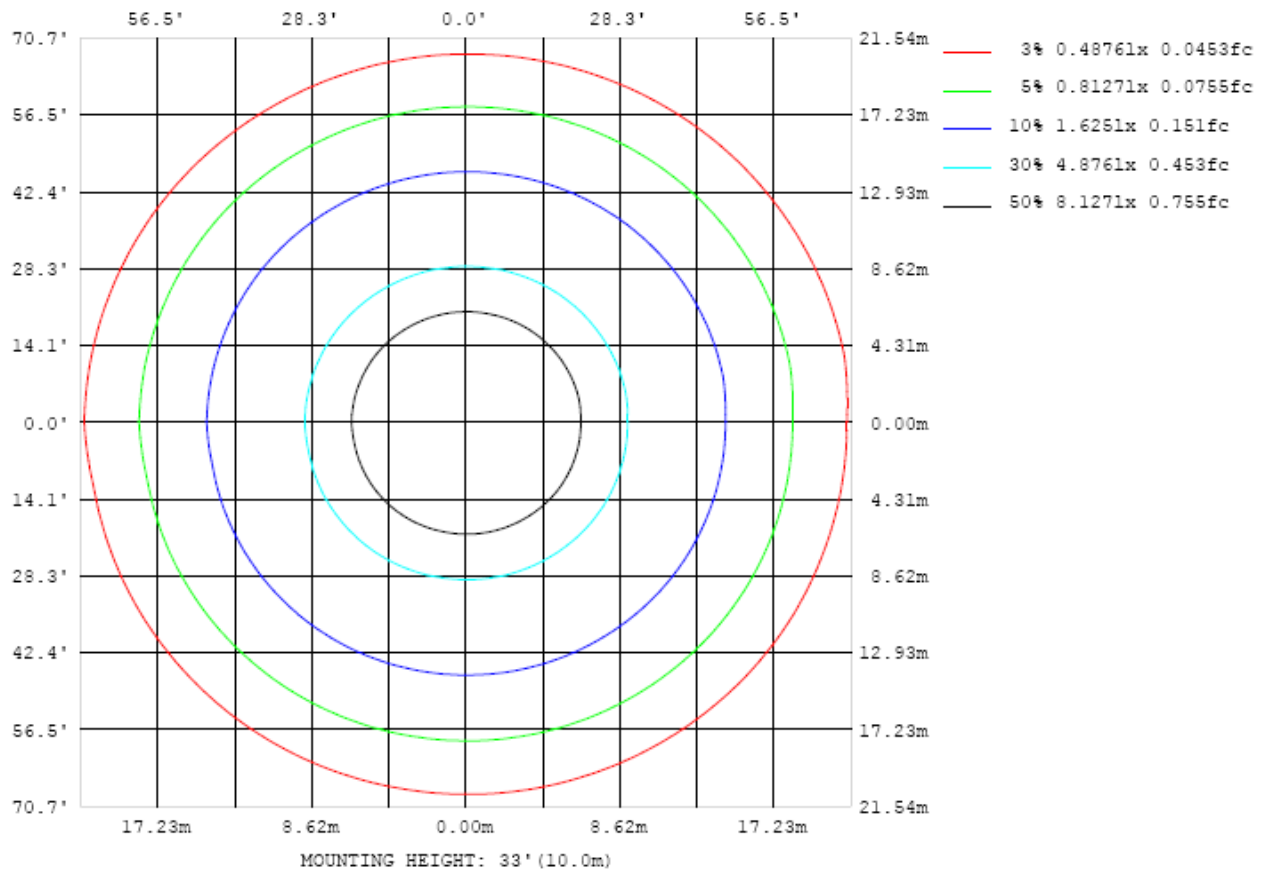


Chart 3: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots

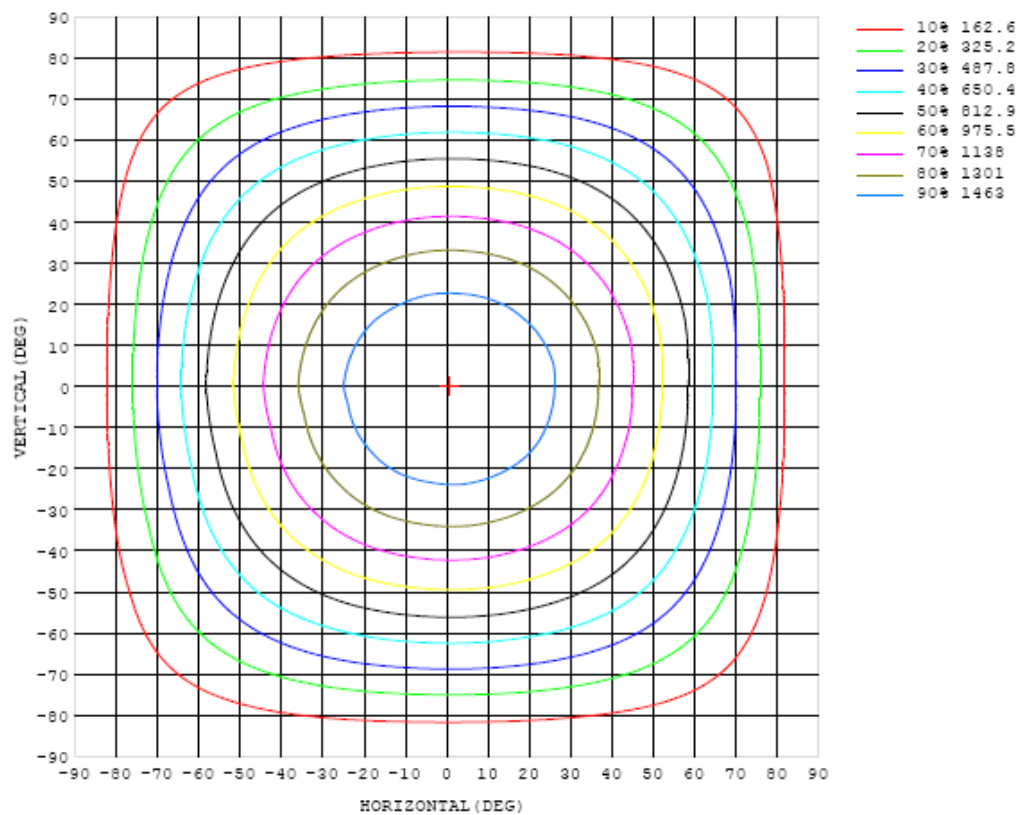


Chart 4: Isocandela Plot

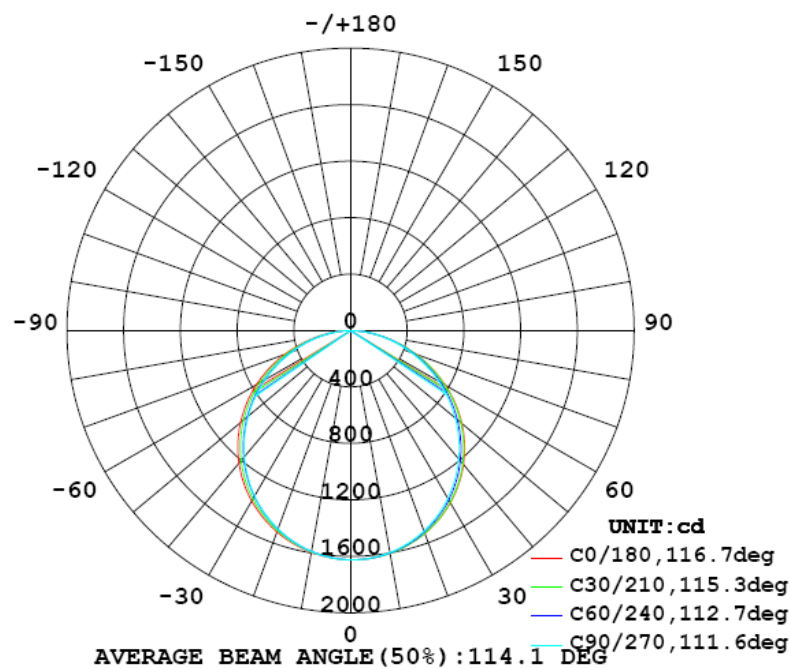


Chart 5: Polar Candela Distribution

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	1623	1623	1623	1623	1623	1623	1623	1623	1623	1623	1623	1623	1623	1623	1623	1623	1623	1623	1623
5	1619	1619	1620	1620	1620	1619	1619	1618	1618	1618	1617	1617	1617	1616	1616	1616	1615	1614	1616
10	1602	1602	1603	1602	1602	1601	1600	1599	1598	1597	1597	1596	1596	1595	1595	1595	1594	1593	1595
15	1572	1573	1573	1572	1571	1568	1567	1565	1563	1561	1561	1560	1560	1560	1560	1561	1561	1559	1562
20	1530	1531	1530	1528	1526	1522	1519	1516	1513	1512	1510	1511	1512	1512	1513	1514	1514	1513	1518
25	1475	1476	1475	1472	1468	1463	1458	1454	1450	1448	1447	1448	1450	1452	1453	1455	1456	1455	1461
30	1408	1409	1407	1404	1398	1391	1385	1380	1375	1372	1372	1373	1376	1379	1382	1385	1386	1385	1396
35	1329	1330	1328	1323	1316	1307	1300	1292	1287	1284	1284	1286	1289	1294	1299	1303	1304	1303	1316
40	1239	1239	1237	1231	1222	1212	1204	1195	1190	1186	1186	1189	1193	1199	1205	1210	1213	1212	1225
45	1137	1137	1135	1128	1118	1107	1097	1089	1082	1079	1079	1082	1087	1094	1101	1106	1109	1109	1125
50	1024	1025	1022	1015	1004	993	983	974	967	964	964	968	974	980	988	994	997	997	1014
55	902	903	900	893	883	872	861	852	846	842	843	846	853	859	867	873	876	876	895
60	770	772	769	762	754	743	733	725	719	716	716	720	725	732	739	744	747	747	767
65	632	634	631	627	620	611	602	595	590	587	587	591	595	601	607	612	614	613	633
70	490	492	491	487	482	475	468	462	458	456	456	459	463	467	471	475	475	474	495
75	347	349	349	348	345	341	336	332	329	328	328	330	332	335	337	338	337	335	357
80	210	213	214	214	213	212	209	207	206	205	205	207	208	208	208	207	205	202	224
85	85.6	88.6	90.7	91.9	91.6	90.4	89.6	88.8	87.7	87.4	88.0	89.2	90.0	90.4	90.5	89.2	85.6	82.3	102
90	3.27	3.96	4.46	5.91	5.74	6.00	3.20	3.48	3.69	3.85	3.96	4.11	4.01	3.72	3.62	5.75	4.24	3.31	8.29
95	0.58	0.91	0.74	0.61	0.47	0.37	0.31	0.28	0.23	0.22	0.23	0.29	0.36	0.53	0.69	0.86	0.73	0.66	0.99
100	0.70	1.14	0.92	0.70	0.56	0.45	0.37	0.33	0.28	0.28	0.29	0.35	0.41	0.55	0.70	0.89	0.87	0.71	1.08
105	0.67	1.12	0.96	0.82	0.70	0.53	0.43	0.38	0.33	0.34	0.36	0.42	0.47	0.60	0.74	0.97	0.85	0.70	1.14
110	0.65	0.94	0.91	0.85	0.69	0.57	0.49	0.44	0.39	0.39	0.42	0.47	0.50	0.60	0.79	0.89	0.80	0.70	1.00
115	0.73	0.96	0.82	0.77	0.68	0.59	0.54	0.48	0.44	0.46	0.48	0.52	0.56	0.64	0.76	0.87	0.75	0.70	0.88
120	0.79	0.98	0.82	0.77	0.71	0.68	0.61	0.55	0.53	0.52	0.56	0.57	0.63	0.66	0.76	0.81	0.83	0.73	0.85
125	0.78	0.95	0.79	0.77	0.77	0.73	0.69	0.62	0.61	0.61	0.62	0.62	0.68	0.71	0.77	0.84	0.78	0.73	0.78
130	0.77	0.88	0.80	0.82	0.81	0.76	0.73	0.68	0.68	0.68	0.67	0.66	0.71	0.76	0.81	0.87	0.76	0.76	0.78
135	0.79	0.90	0.82	0.87	0.84	0.77	0.78	0.72	0.71	0.73	0.70	0.69	0.72	0.76	0.84	0.89	0.81	0.83	0.81
140	0.81	0.90	0.85	0.85	0.83	0.81	0.79	0.74	0.73	0.74	0.72	0.69	0.73	0.78	0.80	0.88	0.83	0.80	0.83
145	0.77	0.83	0.81	0.83	0.85	0.84	0.80	0.77	0.77	0.76	0.73	0.72	0.75	0.80	0.83	0.78	0.89	0.90	0.89
150	0.88	0.90	0.87	0.86	0.83	0.85	0.81	0.79	0.78	0.76	0.75	0.75	0.77	0.81	0.81	0.80	0.84	0.83	0.76
155	0.93	0.90	0.90	0.85	0.80	0.78	0.79	0.79	0.79	0.75	0.75	0.74	0.75	0.77	0.78	0.82	0.82	0.79	0.81
160	0.92	0.91	0.93	0.88	0.84	0.79	0.74	0.73	0.72	0.69	0.70	0.71	0.75	0.79	0.79	0.78	0.80	0.82	0.84
165	0.97	0.95	0.95	0.97	0.93	0.85	0.78	0.75	0.73	0.73	0.74	0.78	0.81	0.83	0.84	0.86	0.89	0.87	0.82
170	1.00	0.98	0.98	0.97	0.99	0.93	0.85	0.82	0.86	0.84	0.82	0.81	0.84	0.90	0.97	0.96	0.95	0.94	0.92
175	1.03	1.03	1.03	1.04	1.05	1.04	0.98	1.00	1.00	0.94	0.89	0.85	0.97	0.98	0.96	0.96	0.97	0.98	1.02
180	1.00	1.02	1.04	1.04	1.06	1.07	1.08	1.06	1.05	1.04	0.95	0.96	0.99	1.01	0.97	0.95	0.94	0.94	1.00

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	1623	1623	1623	1623	1623	1623	1623	1623	1623	1623	1623	1623	1623	1623	1623	1623	1623		
5	1615	1614	1614	1614	1613	1613	1613	1613	1614	1614	1615	1616	1616	1617	1618	1619	1620		
10	1594	1593	1592	1590	1589	1588	1588	1588	1589	1590	1592	1593	1596	1597	1600	1602	1603		
15	1561	1558	1556	1554	1551	1550	1548	1548	1550	1551	1554	1557	1561	1565	1568	1572	1575		
20	1515	1512	1508	1504	1500	1498	1496	1495	1496	1498	1502	1507	1513	1519	1525	1530	1534		
25	1458	1453	1448	1443	1438	1434	1431	1430	1431	1434	1439	1445	1453	1461	1468	1475	1480		
30	1391	1385	1378	1371	1364	1358	1354	1353	1354	1357	1364	1372	1382	1392	1402	1410	1416		
35	1311	1304	1295	1286	1278	1270	1265	1263	1264	1268	1276	1286	1298	1310	1321	1331	1339		
40	1220	1212	1202	1191	1181	1173	1167	1164	1165	1170	1178	1189	1203	1217	1230	1241	1250		
45	1119	1110	1099	1087	1076	1066	1059	1056	1058	1062	1071	1084	1098	1113	1128	1141	1150		
50	1008	998	987	974	962	952	944	941	942	947	956	969	985	1000	1016	1029	1039		
55	888	878	866	854	841	831	824	820	821	826	836	849	864	880	895	909	919		
60	760	751	739	727	715	705	698	694	695	700	709	721	736	752	766	779	789		
65	627	618	607	596	585	575	569	566	567	571	579	590	604	618	631	643	652		
70	489	481	472	463	453	445	440	437	438	442	449	458	469	481	493	503	511		
75	351	345	338	331	324	318	314	312	312	315	321	328	337	345	354	362	369		
80	219	214	209	204	200	196	192	192	192	195	199	204	209	215	221	227	231		
85	99.2	95.0	91.4	87.6	84.8	80.9	78.7	77.8	78.3	80.1	83.5	87.6	92.1	96.5	99.7	103	105		
90	3.31	2.09	1.14	0.89	0.71	0.57	0.48	0.46	0.48	0.53	0.66	0.85	1.41	2.09	2.92	3.91	8.47		
95	1.26	1.21	1.10	0.94	0.78	0.65	0.57	0.52	0.52	0.52	0.57	0.59	0.67	0.78	0.87	0.83	0.97		
100	1.52	1.39	1.14	0.96	0.81	0.70	0.63	0.59	0.61	0.58	0.62	0.66	0.74	0.86	0.96	1.00	1.11		
105	1.46	1.37	1.19	1.01	0.84	0.74	0.66	0.65	0.67	0.63	0.66	0.72	0.80	0.92	1.11	0.97	1.10		
110	1.21	1.21	1.09	0.92	0.81	0.72	0.64	0.65	0.64	0.62	0.65	0.69	0.78	0.98	1.02	0.91	1.06		
115	1.08	0.98	0.92	0.84	0.73	0.70	0.63	0.63	0.57	0.57	0.61	0.63	0.67	0.86	0.96	0.86	0.99		
120	1.03	0.96	0.81	0.77	0.65	0.65	0.58	0.56	0.51	0.52	0.55	0.58	0.60	0.73	0.83	0.86	0.91		
125	0.95	0.87	0.79	0.72	0.67	0.64	0.56	0.54	0.48	0.50	0.54	0.58	0.59	0.70	0.80	0.78	0.88		
130	0.89	0.88	0.84	0.77	0.71	0.68	0.61	0.61	0.57	0.57	0.61	0.63	0.63	0.73	0.80	0.77	0.85		
135	0.89	0.93	0.87	0.78	0.73	0.72	0.70	0.71	0.69	0.68	0.70	0.72	0.69	0.80	0.83	0.85	0.88		
140	0.85	0.89	0.90	0.80	0.78	0.73	0.75	0.76	0.79	0.77	0.76	0.77	0.77	0.73	0.85	0.84	0.88		
145	0.86	0.91	0.82	0.87	0.85	0.80	0.78	0.82	0.85	0.83	0.83	0.83	0.85	0.81	0.77	0.73	0.79		
150	0.76	0.82	0.86	0.88	0.87	0.86	0.80	0.91	0.91	0.87	0.89	0.88	0.86	0.86	0.82	0.82	0.83		
155	0.78	0.81	0.85	0.86	0.90	0.81	0.86	0.89	0.91	0.89	0.89	0.89	0.91	0.88	0.87	0.85	0.87		
160	0.82	0.82	0.83	0.86	0.88	0.85	0.92	0.94	0.93	0.96	0.95	0.94	0.93	0.93	0.92	0.92	0.92		
165	0.82	0.84	0.86	0.90	0.93	0.91	0.88	0.92	0.94	0.93	0.92	0.93	0.94	0.95	0.95	0.93	0.92		
170	0.92	0.95	1.00	1.04	1.08	1.07	1.00	0.94	0.97	1.00	0.98	0.97	0.97	1.00	1.01	1.00	0.98		
175	1.02	1.04	1.07	1.09	1.11	1.13	1.09	1.07	1.02	1.01	1.07	1.04	1.02	1.04	1.04	1.01	0.99		
180	1.00	1.02	1.04	1.05	1.06	1.07	1.07	1.05	1.04	1.02	0.93	0.98	0.98	1.00	0.97	0.95	0.95		

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 $k=2$.

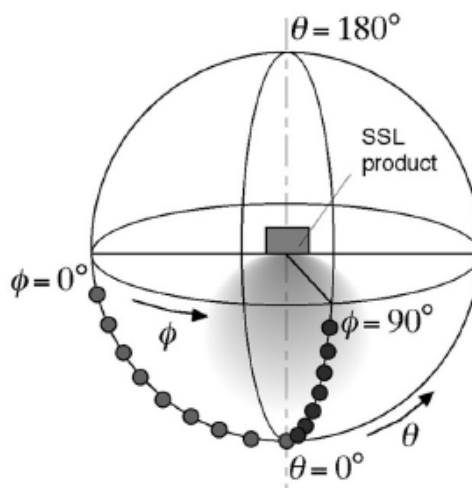
Color Characteristics Measurements

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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