



LM-79-08 Test Report

for

ABB Lighting, Inc.

1501 Industrial Way N. Toms River, NJ 08755

LS Parking Garage

Model: LSPKG65501

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ16060029e

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

Reviewed by:

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Jun. 30, 2016

Manager: Jim Zhang
Jun. 30, 2016

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: **LSPKG65501**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
111.6	7710.4	69.09	0.9924
CCT (K)	CRI	Stabilization Time (Light & Power)	
4799	81.8	60	

Table 1: Executive Data Summary

Test specifications:

Date of Receipt	: Jun. 20, 2016
Date of Test	: Jun. 27, 2016
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	: LS Parking Garage
Model	: LSPKG65501
Electrical Ratings	: 120~277Vac, 50/60Hz, 65W
Product Description	: 5000K, Aluminum Heat Sink, Black Coating, Plastic Lens Manufacturer of light source: Philips Lumileds Model of light source: LUXEON 3030 2D Quantity of LED light source: 120PCS (6S20P)
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.

The photometric distance of Goniophotometer is 2.47 m.

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

Parameter	Result	
Test Voltage (V)	120.0	277.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.580	0.258
Power Factor	0.9924	0.9542
Test Power (W)	69.09	68.31
THD A%	8.70	13.79
Luminous Efficacy (lm/W)	111.6	111.8
Total Luminous Flux (lm)	7710.4	7637.1
Color Rendering Index (CRI)	81.8	
R9	1	
Correlated Color Temperature (CCT) (K)	4799	
Chromaticity (Chroma x, Chroma y)	(0.3527, 0.3702)	
Chromaticity (Chroma u, Chroma v)	(0.2094, 0.3297)	
Chromaticity (Chroma u', Chroma v')	(0.2094, 0.4926)	
Duv	0.0061	
Average Beam Angle (°)	174.6	
Center Beam Candle Power (cd)	1010	
Spacing Criteria	1.76 (0°-180°)/ 1.89 (90°-270°)	
Zonal Lumens in the 0°-60°Zone	51.37%	
Zonal Lumens in the 60°-90°Zone	45.03%	
Zonal Lumens in the 90°-120°Zone	3.05%	
Zonal Lumens in the 120°-180°Zone	0.55%	

Special Color Rendering Indices	
R1	79
R2	89
R3	95
R4	78
R5	79
R6	84
R7	87
R8	64
R9	1
R10	73
R11	76
R12	54
R13	82
R14	97

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

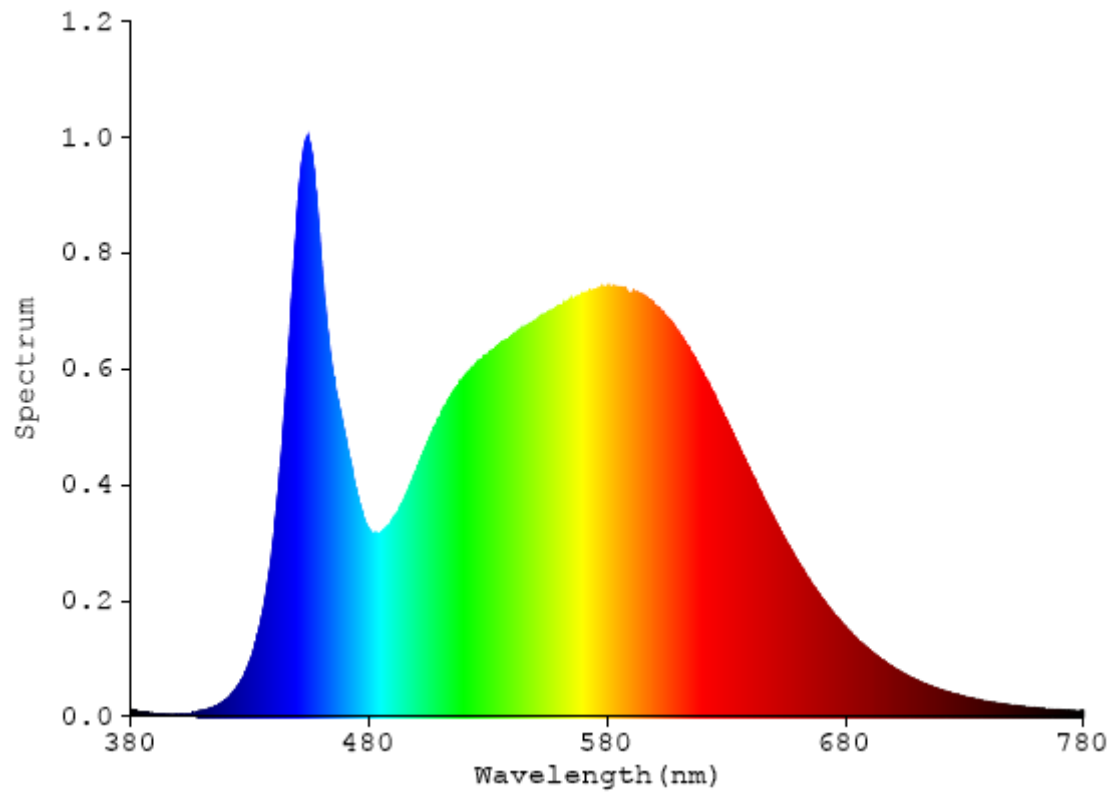


Chart 1: Spectral Power Distribution

Zonal Lumen Tabulation

$\gamma(^{\circ})$	Lumens	% Total
0- 10	76.879	1.00%
10- 20	214.786	2.79%
20- 30	413.877	5.37%
30- 40	723.151	9.38%
40- 50	1109.504	14.39%
50- 60	1422.737	18.45%
60- 70	1445.039	18.74%
70- 80	1246.847	16.17%
80- 90	780.414	10.12%
90-100	107.441	1.39%
100-110	80.022	1.04%
110-120	47.59	0.62%
120-130	23.748	0.31%
130-140	11.533	0.15%
140-150	4.383	0.06%
150-160	1.598	0.02%
160-170	0.669	0.01%
170-180	0.191	0.00%
Total	7710.4	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	3960.934	51.37%
60- 90	3472.3	45.03%
0-90	7433.234	96.41%
90- 180	277.175	3.59%
0- 180	7710.4	100%

Table 3: Zonal Lumen Data

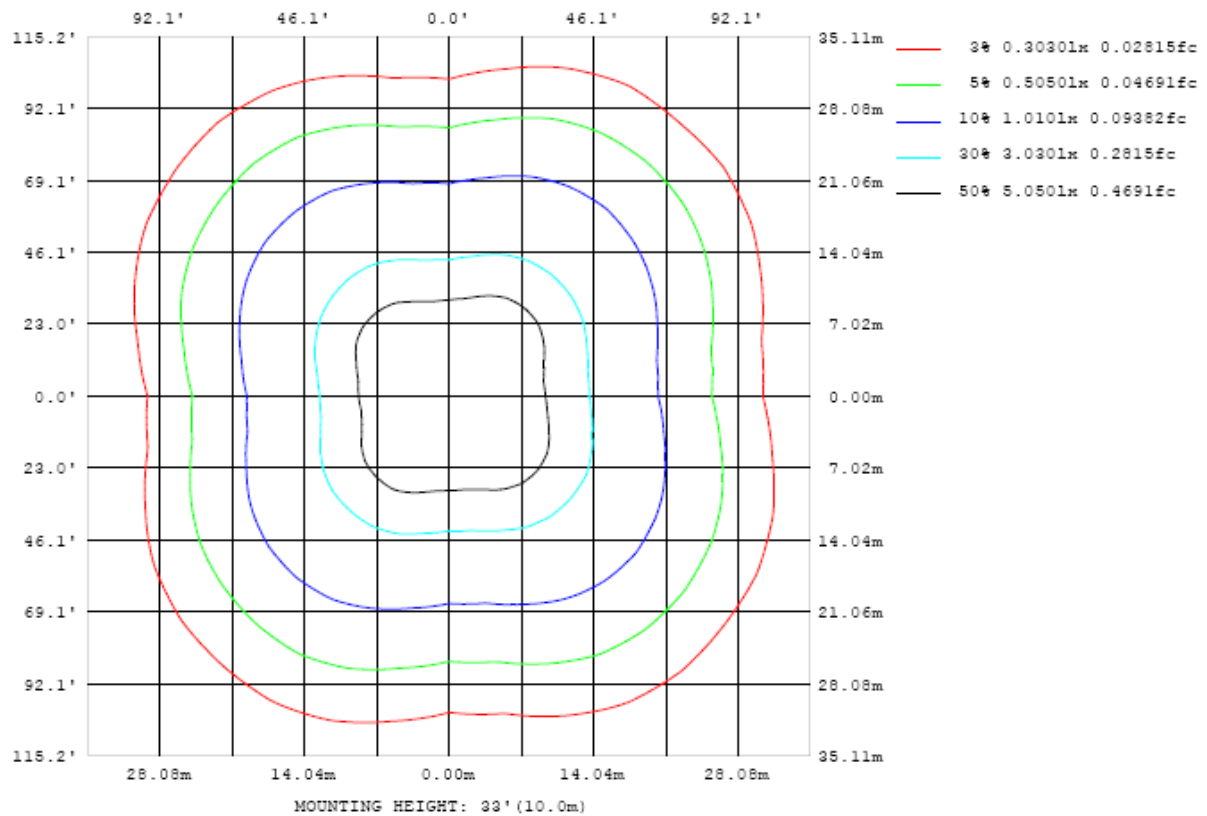


Chart 2: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots

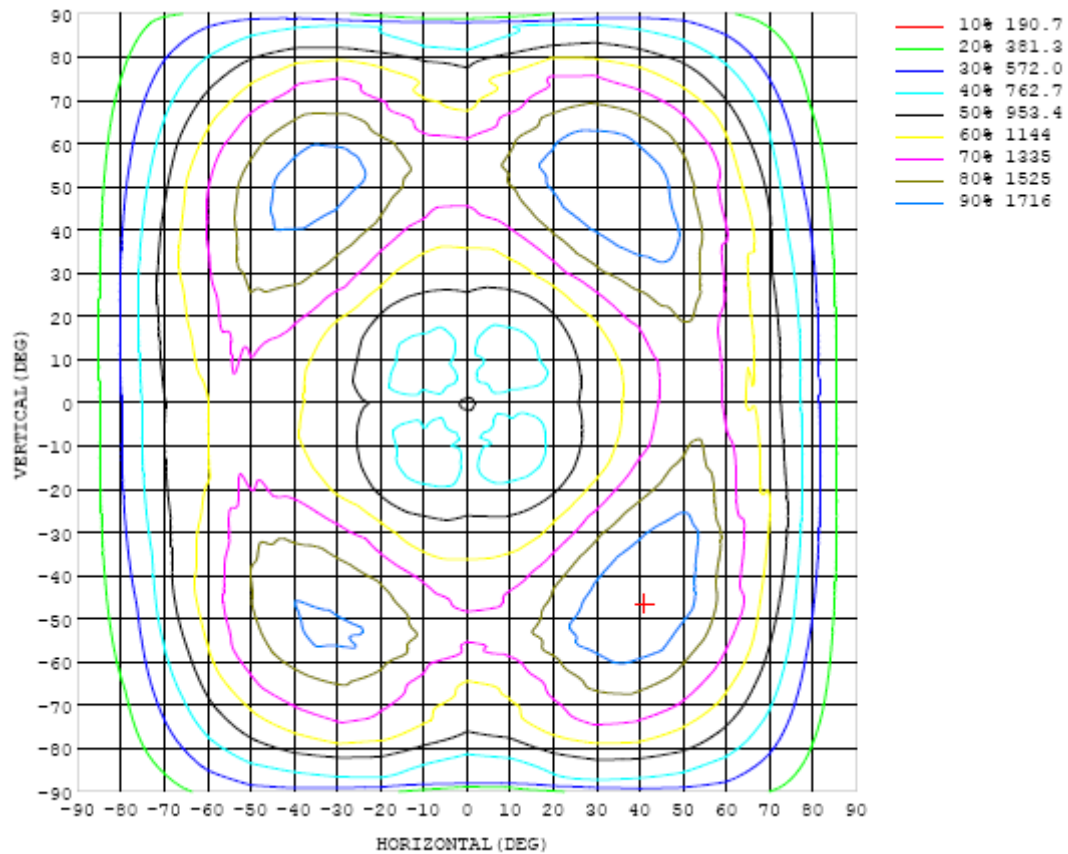


Chart 3: Isocandela Plot

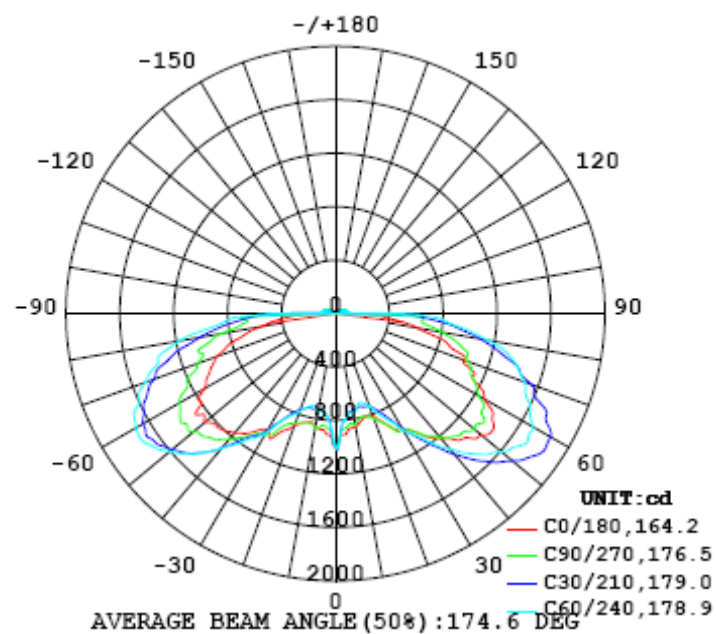


Chart 4: Polar Candela Distribution

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	1010	1010	1010	1010	1010	1010	1010	1010	1010	1010	1010	1010	1010	1010	1010	1010	1010	1010	1010
5	916	888	833	807	796	795	806	849	894	871	851	801	788	788	792	811	859	907	899
10	873	795	755	743	724	733	762	773	854	856	774	759	732	724	744	758	782	877	873
15	818	765	729	728	733	711	698	726	761	807	729	704	712	736	732	727	748	817	848
20	827	793	775	748	730	734	747	766	805	845	772	753	750	731	745	776	776	847	900
25	933	894	872	837	826	845	870	871	905	929	876	875	842	831	831	855	877	935	994
30	1001	984	1000	1002	1002	1003	1018	1003	1000	1010	991	1023	1007	991	987	1012	979	968	1016
35	1115	1120	1131	1180	1219	1203	1153	1124	1100	1106	1090	1128	1168	1208	1167	1088	1057	1060	1098
40	1233	1259	1318	1388	1441	1402	1336	1262	1221	1221	1233	1288	1338	1380	1334	1257	1180	1153	1176
45	1342	1389	1478	1578	1625	1595	1502	1388	1318	1306	1342	1432	1518	1525	1497	1407	1283	1223	1229
50	1430	1497	1632	1732	1773	1724	1623	1480	1374	1359	1417	1539	1629	1653	1607	1507	1368	1282	1278
55	1446	1564	1725	1854	1861	1824	1724	1545	1383	1349	1450	1620	1699	1714	1683	1583	1436	1285	1261
60	1289	1434	1675	1861	1900	1860	1713	1473	1274	1237	1358	1570	1718	1741	1698	1577	1356	1167	1135
65	1132	1287	1515	1745	1787	1764	1603	1369	1174	1127	1259	1448	1622	1651	1615	1468	1259	1077	1039
70	1031	1169	1369	1561	1590	1608	1502	1307	1107	1052	1193	1378	1497	1495	1464	1340	1175	990	945
75	872	1013	1202	1349	1416	1441	1387	1233	1039	983	1121	1295	1363	1342	1292	1182	1004	813	771
80	625	767	954	1107	1175	1227	1160	1028	859	810	925	1076	1164	1128	1066	945	780	606	567
85	396	519	694	834	882	898	873	789	679	646	730	824	864	840	808	703	557	411	381
90	203	280	381	457	516	510	455	357	276	263	322	426	490	511	492	417	319	225	195
95	14.5	21.1	31.5	40.4	58.2	66.5	67.7	66.9	62.8	62.8	63.7	71.4	72.9	62.5	57.0	27.1	19.3	10.3	12.7
100	65.4	59.1	61.9	84.4	97.3	102	63.2	35.4	25.3	24.6	26.4	33.9	73.0	94.3	86.5	85.9	69.4	63.9	76.6
105	44.4	39.7	48.9	81.0	105	103	90.5	87.8	84.4	82.9	85.2	84.0	94.1	100.0	90.9	71.2	46.9	42.9	52.0
110	31.0	27.5	32.4	55.5	63.7	76.4	79.0	86.0	84.2	82.8	83.7	79.4	74.2	66.2	58.5	45.7	31.1	29.1	35.6
115	21.4	18.6	20.9	33.7	44.7	53.5	70.1	78.9	80.9	80.8	79.0	71.5	57.3	46.7	37.7	28.1	20.1	19.8	23.9
120	13.2	11.3	11.9	18.3	29.6	45.6	57.5	63.1	64.4	64.5	62.5	58.3	49.7	34.9	23.3	16.1	12.4	12.9	14.6
125	5.26	4.27	4.27	10.5	22.0	35.4	43.3	47.8	49.5	49.7	48.1	44.7	37.8	27.4	14.7	6.95	5.15	5.68	6.48
130	2.51	2.78	4.01	8.64	17.3	25.1	32.1	36.5	38.7	39.1	37.7	34.2	27.7	20.1	12.0	4.61	3.36	2.57	2.59
135	4.39	4.55	5.79	6.66	11.8	18.3	23.4	26.5	28.5	29.0	27.6	24.8	20.3	14.3	7.77	5.74	4.66	3.16	3.36
140	4.96	4.69	5.53	5.62	6.81	11.4	15.4	18.1	20.1	20.5	19.3	16.9	13.2	8.41	5.58	4.27	4.30	3.99	4.37
145	2.35	2.33	3.57	5.29	5.41	5.71	8.40	10.6	12.2	12.5	11.6	9.78	6.85	5.22	5.01	4.83	3.26	2.56	2.54
150	3.96	3.80	3.72	4.29	4.35	4.41	4.39	4.54	5.43	5.73	4.93	4.34	4.33	4.33	4.21	3.91	3.50	3.63	3.87
155	3.34	3.26	3.11	3.22	3.33	3.23	3.28	3.40	3.58	3.59	3.50	3.44	3.57	3.57	3.45	3.06	3.16	3.21	3.38
160	2.87	2.90	2.89	2.54	2.54	2.60	2.60	2.66	2.87	2.90	2.91	2.65	2.77	2.77	2.67	2.67	2.97	2.84	2.92
165	2.53	2.50	2.58	2.59	2.22	2.05	2.06	2.14	2.20	2.19	2.24	2.19	1.99	2.09	2.24	2.57	2.42	2.26	2.38
170	2.24	2.19	2.09	2.16	2.26	2.15	2.08	2.08	2.10	2.09	2.15	2.24	2.30	2.33	2.31	2.04	1.88	1.92	1.99
175	2.18	2.13	2.08	2.03	1.96	1.85	1.77	1.78	1.84	1.87	1.81	1.77	1.76	1.78	1.82	1.88	1.90	1.85	1.80
180	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05

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	1010	1010	1010	1010	1010	1010	1010	1010	1010	1010	1010	1010	1010	1010	1010	1010	1010		
5	848	788	779	775	770	770	795	839	853	826	789	772	775	779	784	808	890		
10	787	750	729	724	734	753	769	815	876	787	771	743	716	706	721	738	812		
15	739	729	737	745	736	723	735	767	853	759	723	713	728	733	722	719	789		
20	784	779	773	755	765	787	782	816	882	813	778	764	750	751	774	763	798		
25	887	890	863	857	860	868	876	897	941	878	877	860	853	853	871	876	905		
30	958	1023	1023	1007	1014	1040	1041	1013	1040	1010	1045	1021	1012	1016	1023	993	982		
35	1066	1091	1146	1223	1215	1167	1132	1100	1122	1121	1170	1202	1241	1206	1155	1126	1099		
40	1187	1247	1325	1388	1397	1329	1263	1224	1239	1263	1331	1404	1453	1417	1343	1274	1222		
45	1269	1369	1495	1549	1550	1502	1395	1322	1326	1374	1493	1590	1636	1607	1517	1405	1335		
50	1336	1463	1599	1670	1673	1620	1494	1398	1389	1453	1605	1730	1775	1754	1673	1521	1424		
55	1371	1527	1666	1746	1766	1717	1583	1443	1420	1526	1683	1831	1856	1858	1762	1601	1455		
60	1267	1477	1666	1775	1810	1729	1549	1386	1350	1477	1673	1856	1897	1877	1726	1498	1312		
65	1175	1376	1581	1693	1746	1632	1442	1276	1226	1365	1568	1782	1798	1762	1574	1348	1164		
70	1096	1295	1449	1548	1589	1514	1340	1157	1100	1252	1444	1615	1616	1592	1423	1232	1068		
75	923	1129	1279	1381	1398	1378	1279	1113	1062	1213	1343	1408	1414	1377	1245	1073	906		
80	706	894	1031	1137	1200	1190	1073	909	866	1023	1160	1201	1182	1103	985	824	661		
85	493	649	770	856	892	860	790	687	663	769	866	898	889	831	719	573	427		
90	269	355	417	473	475	411	316	259	251	290	385	457	489	484	404	295	196		
95	26.1	34.7	43.1	42.4	48.7	53.7	53.0	49.2	49.5	50.2	53.8	51.2	42.7	38.8	26.8	25.0	9.80		
100	66.5	69.6	94.1	103	113	108	88.2	73.5	72.4	80.4	100	118	104	88.2	80.1	60.8	55.2		
105	45.0	54.9	82.2	105	101	89.3	91.6	90.2	89.4	93.4	89.7	98.9	107	90.9	65.5	41.6	39.6		
110	30.4	36.2	55.2	61.2	71.2	79.2	90.6	90.6	90.2	92.8	88.9	74.1	67.5	57.8	42.6	28.3	28.7		
115	20.1	23.1	33.2	42.5	50.1	65.7	75.5	77.9	78.3	77.5	71.6	56.4	44.5	35.5	26.1	18.4	20.5		
120	12.1	13.4	18.8	28.3	43.6	55.5	61.7	63.6	63.9	63.0	59.2	49.5	33.6	20.9	14.2	10.7	13.0		
125	5.34	4.05	10.5	21.2	34.4	42.7	47.4	49.3	49.7	48.5	45.6	38.4	27.3	14.3	5.93	4.15	4.89		
130	2.83	3.42	7.83	16.9	24.9	31.8	36.2	38.3	38.6	37.0	33.8	27.4	20.2	11.6	4.27	3.15	1.91		
135	3.60	5.20	5.91	11.2	18.3	23.8	26.9	28.8	28.9	27.5	24.9	20.3	13.7	7.25	5.76	4.82	3.79		
140	3.88	3.63	4.71	6.66	11.1	15.9	19.0	20.7	20.8	19.3	16.8	12.5	7.62	5.03	5.29	4.49	4.94		
145	2.10	3.96	4.84	5.07	5.78	8.40	10.8	12.4	12.6	11.1	9.03	6.44	5.23	5.01	4.27	2.19	2.33		
150	3.57	3.48	3.96	4.37	4.49	4.32	4.50	5.42	5.65	4.90	4.38	4.36	4.32	4.12	3.60	3.56	4.08		
155	3.46	3.00	3.09	3.53	3.66	3.57	3.36	3.66	3.64	3.56	3.30	3.37	3.40	3.24	3.01	3.21	3.51		
160	3.05	2.90	2.53	2.55	2.66	2.62	2.74	3.00	2.95	2.94	2.78	2.72	2.64	2.61	2.66	2.94	3.02		
165	2.44	2.42	2.38	2.18	1.88	1.76	2.14	2.24	2.23	2.21	2.15	2.04	2.03	2.19	2.41	2.59	2.62		
170	2.04	1.98	1.98	1.96	1.96	1.97	1.89	1.84	1.79	1.85	1.84	1.73	1.85	2.03	2.17	2.27	2.28		
175	1.85	1.85	1.91	1.94	1.95	1.97	1.98	1.95	2.00	2.08	2.11	2.18	2.17	2.15	2.18	2.24	2.22		
180	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05		

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

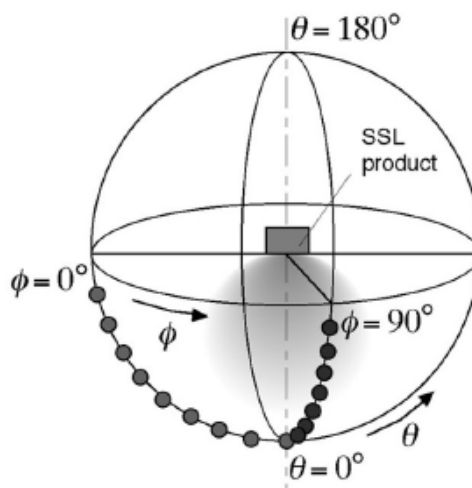
Color Characteristics Measurements

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 ($C=0^\circ/180^\circ$ 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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