



LM-79-08 Test Report

for

REVOLUTION LIGHTING TECHNOLOGIES, INC

2280 Ward Ave Simi Valley, CA 93065

Canopy Luminaires

Model: 111053-3X4

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ18040033g/R1

This report is replaced the old report No. HZ18040033g dated Apr. 20, 2018.

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

Reviewed by:

Engineer: April Zou
Apr. 27, 2018

Approved by:



Manager: Jim Zhang
Apr. 27, 2018

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: **111053-3X4**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
123.3	6454.8	52.35	0.9705
CCT (K)	CRI	Stabilization Time (Light & Power)	
4976	77.9	60	

Table 1: Executive Data Summary

Test specifications:

Date of Receipt : Apr. 17, 2018

Date of Test : Apr. 17, 2018

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
Luminous Intensity Distribution Plots.....	9
Luminous Intensity Data	10
EQUIPMENT LIST	12
TEST METHODS	12
Seasoning of SSL Product.....	12
Goniophotometer Method	12
Photometric and Electrical Measurements	12
Color Characteristics Measurements.....	13
Color Spatial Uniformity.....	13

Sample Photo

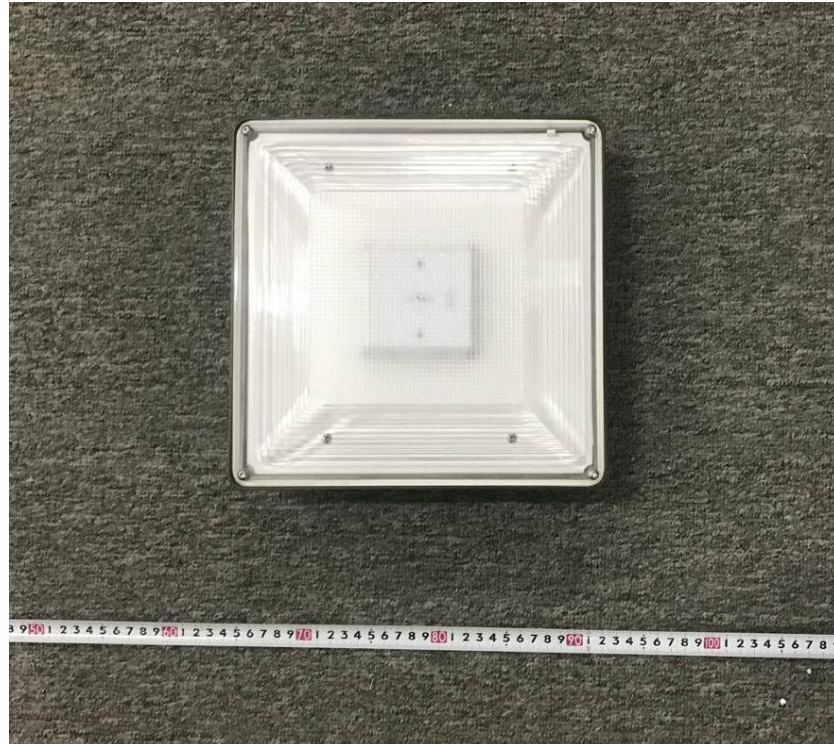


Figure 1- Overview of the sample

Equipment Under Test (EUT)

Name	: Canopy Luminaires
Model	: 111053-3X4
Electrical Ratings	: 347~480Vac, 50/60Hz, 58W
Product Description	: 5000K Manufacturer of the LED light source: Nichia Corporation Model of the LED light source: NF2L757GRT-V1
Manufacturer	: REVOLUTION LIGHTING TECHNOLOGIES, INC
Address	: 2280 Ward Ave Simi Valley, CA 93065

TEST RESULTS

Test ambient temperature was 25.1 °C.

Base orientation was base up. 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)	347.0	480.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.156	0.124
Power Factor	0.9705	0.9076
Test Power (W)	52.35	53.78
THD A%	6.93	14.41
Luminous Efficacy (lm/W)	123.3	121.0
Total Luminous Flux (lm)	6454.8	6507.4
Color Rendering Index (CRI)	77.9	
R9	-17	
Correlated Color Temperature (CCT) (K)	4976	
Chromaticity (Chroma x, Chroma y)	(0.3460, 0.3551)	
Chromaticity (Chroma u, Chroma v)	(0.2107, 0.3243)	
Chromaticity (Chroma u', Chroma v')	(0.2107, 0.4865)	
Duv	0.0014	
Average Beam Angle (°)	157.8	
Center Beam Candle Power (cd)	1525	
Spacing Criteria	1.39 (0°-180°)/ 1.40 (90°-270°)	
Zonal Lumens in the 0°-60° Zone	61.69%	
Zonal Lumens in the 60°-90° Zone	34.93%	
Zonal Lumens in the 90°-120° Zone	3.27%	
Zonal Lumens in the 120°-180° Zone	0.11%	

Special Color Rendering Indices	
R1	75
R2	85
R3	91
R4	76
R5	76
R6	78
R7	84
R8	58
R9	-17
R10	63
R11	74
R12	52
R13	78
R14	95

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

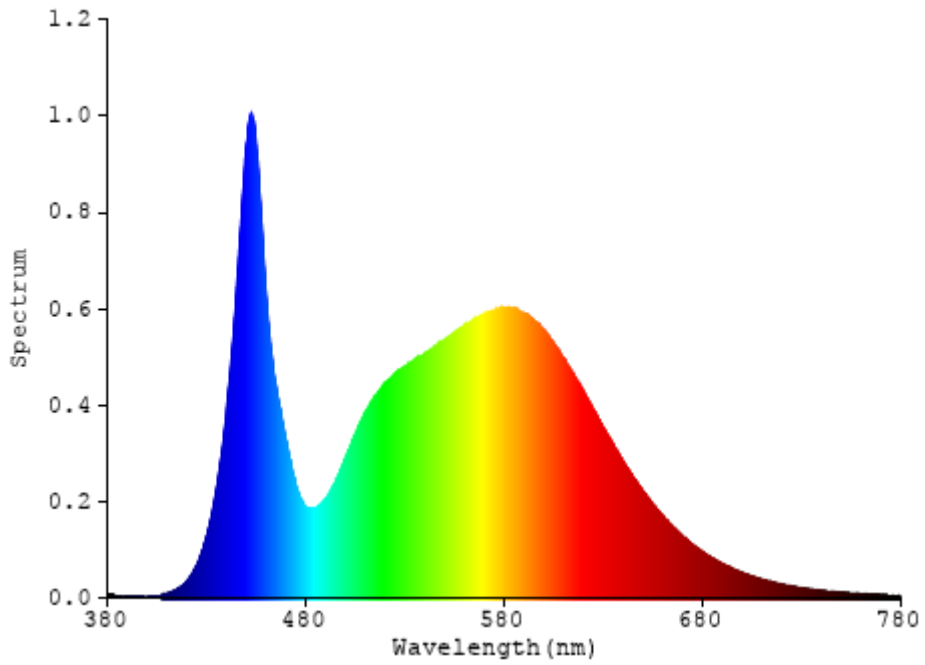


Chart 1: Spectral Power Distribution

Zonal Lumen Tabulation

$\gamma(^{\circ})$	Lumens	% Total
0- 10	146.409	2.27%
10- 20	433.748	6.72%
20- 30	691.107	10.71%
30- 40	876.038	13.57%
40- 50	946.316	14.66%
50- 60	888.51	13.77%
60- 70	886.553	13.73%
70- 80	945.002	14.64%
80- 90	422.968	6.55%
90-100	163.572	2.53%
100-110	37.357	0.58%
110-120	9.881	0.15%
120-130	3.709	0.06%
130-140	1.251	0.02%
140-150	0.954	0.01%
150-160	0.777	0.01%
160-170	0.503	0.01%
170-180	0.175	0.00%
Total	6454.8	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	3982.128	61.69%
60- 90	2254.523	34.93%
0-90	6236.651	96.62%
90- 180	218.179	3.38%
0- 180	6454.8	100%

Table 3: Zonal Lumen Data

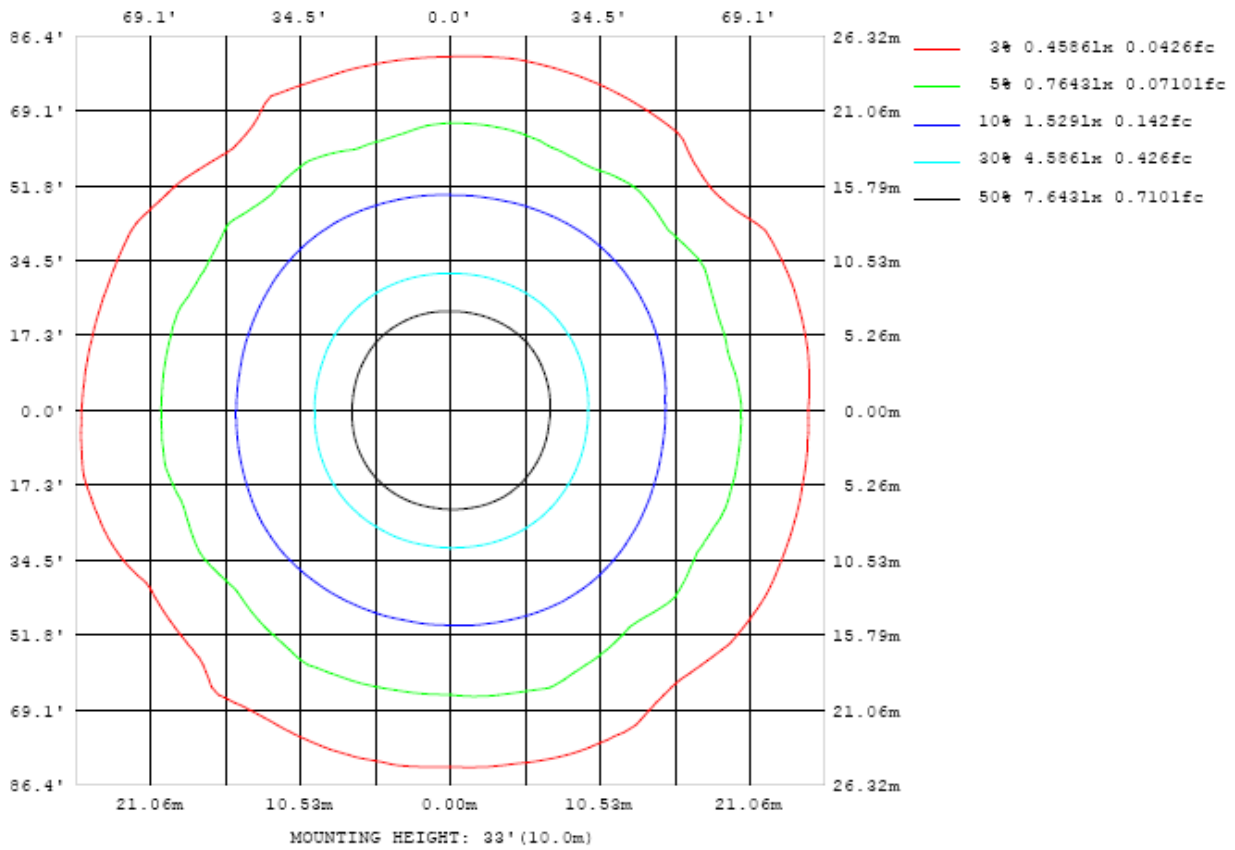


Chart 2: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots

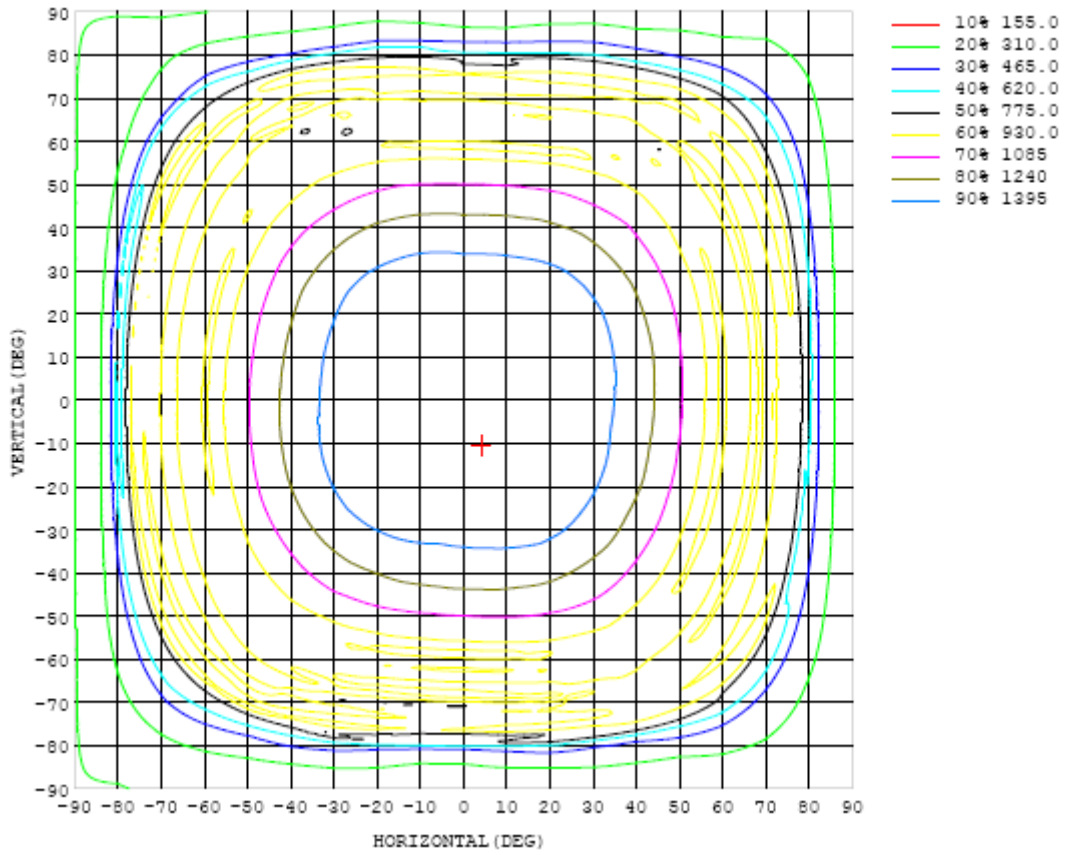


Chart 3: Isocandela Plot

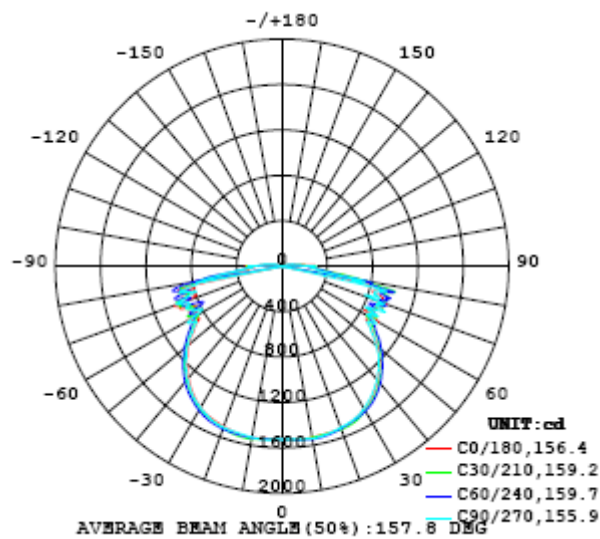


Chart 4: Polar Candela Distribution

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	1525	1525	1525	1525	1525	1525	1525	1525	1525	1525	1525	1525	1525	1525	1525	1525	1525	1525	1525
5	1537	1536	1534	1535	1535	1535	1534	1533	1531	1529	1527	1525	1522	1520	1521	1519	1520	1521	1521
10	1531	1528	1528	1532	1537	1543	1547	1548	1546	1542	1536	1533	1534	1535	1537	1536	1535	1534	1534
15	1524	1521	1522	1528	1534	1539	1542	1543	1539	1533	1527	1527	1534	1543	1548	1545	1537	1529	1525
20	1521	1517	1521	1528	1529	1526	1521	1521	1519	1513	1506	1509	1520	1529	1531	1527	1520	1508	1502
25	1498	1492	1502	1515	1514	1507	1499	1495	1496	1491	1484	1490	1500	1502	1500	1499	1497	1487	1478
30	1450	1446	1457	1469	1475	1478	1473	1463	1455	1446	1440	1451	1464	1463	1462	1461	1460	1448	1436
35	1393	1389	1402	1412	1419	1427	1423	1405	1391	1382	1377	1389	1400	1408	1412	1406	1396	1383	1371
40	1312	1309	1322	1336	1349	1354	1349	1331	1313	1305	1300	1310	1319	1330	1335	1327	1313	1299	1286
45	1218	1216	1235	1241	1256	1258	1256	1240	1224	1206	1202	1218	1225	1234	1235	1227	1214	1205	1197
50	1097	1096	1114	1135	1149	1148	1142	1134	1101	1082	1079	1094	1117	1120	1122	1124	1106	1086	1075
55	958	958	973	1000	1024	1039	1018	1000	966	953	949	954	976	996	1007	994	974	949	941
60	980	977	951	868	897	912	896	933	952	906	908	951	919	878	892	880	856	955	964
65	901	900	903	911	846	890	858	873	868	900	906	861	843	852	876	805	891	831	820
70	977	981	969	906	980	958	944	916	964	909	895	943	967	902	883	983	1034	1015	971
75	837	832	861	917	973	965	895	871	882	848	812	849	926	1001	912	994	946	890	875
80	625	614	691	749	741	710	712	726	695	662	655	712	759	717	697	674	734	675	579
85	334	327	343	346	318	323	332	326	315	298	297	316	340	336	325	336	342	325	294
90	263	259	286	282	244	233	249	286	308	296	282	278	247	206	218	230	284	319	321
95	190	181	169	139	117	112	120	138	146	142	141	143	130	113	110	115	134	145	145
100	98.5	96.3	91.6	75.4	54.1	48.2	57.8	73.5	83.8	84.6	84.1	80.8	70.5	52.1	45.6	56.8	71.1	83.2	88.5
105	41.6	41.7	37.9	28.5	17.0	13.3	16.2	25.0	34.4	37.3	37.4	31.9	23.6	15.2	12.2	15.3	26.1	33.7	39.7
110	15.8	15.8	14.9	13.2	11.3	10.4	10.2	11.3	13.1	13.5	12.8	12.2	10.3	8.86	8.79	9.25	12.1	14.5	16.2
115	14.0	14.4	15.8	14.7	13.2	7.01	6.92	8.69	10.3	10.5	10.2	9.70	7.86	6.02	5.80	6.45	9.12	11.9	12.8
120	10.4	9.88	9.09	7.57	5.08	3.66	3.90	5.60	6.73	7.58	7.01	6.51	5.29	3.76	3.04	3.76	5.57	7.46	8.32
125	6.51	6.46	6.02	4.83	3.02	1.57	2.14	3.40	4.45	4.90	4.92	4.43	3.43	2.16	1.09	2.16	3.53	4.80	5.59
130	4.35	4.32	3.85	2.78	1.63	1.09	1.13	1.87	2.57	2.95	2.97	2.64	1.94	1.12	1.10	1.11	1.82	2.70	3.42
135	2.20	2.20	1.83	1.31	1.15	1.15	1.15	1.15	1.22	1.40	1.41	1.22	1.16	1.17	1.17	1.17	1.16	1.19	1.68
140	1.25	1.24	1.25	1.24	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.26	1.26	1.26	1.27	1.26	1.27	1.57
145	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.34	1.34	1.34	1.34	1.34	1.35	1.35	1.35	1.35	1.73
150	1.39	1.38	1.38	1.38	1.38	1.39	1.39	1.39	1.39	1.39	1.39	1.39	1.40	1.40	1.40	1.40	1.40	1.39	1.85
155	1.44	1.44	1.45	1.45	1.45	1.46	1.46	1.45	1.45	1.45	1.45	1.45	1.45	1.46	1.46	1.46	1.46	1.46	1.92
160	1.52	1.53	1.52	1.52	1.52	1.53	1.53	1.53	1.52	1.53	1.52	1.53	1.53	1.54	1.54	1.53	1.53	1.53	1.96
165	1.59	1.60	1.60	1.59	1.59	1.59	1.59	1.59	1.59	1.58	1.58	1.59	1.60	1.61	1.61	1.60	1.59	1.58	1.95
170	1.67	1.67	1.68	1.68	1.68	1.69	1.68	1.68	1.67	1.67	1.67	1.68	1.68	1.69	1.69	1.69	1.68	1.67	1.93
175	1.82	1.82	1.83	1.83	1.83	1.84	1.83	1.83	1.82	1.82	1.83	1.83	1.83	1.83	1.84	1.84	1.83	1.83	1.92
180	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85

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	1525	1525	1525	1525	1525	1525	1525	1525	1525	1525	1525	1525	1525	1525	1525	1525	1525		
5	1523	1525	1527	1528	1529	1529	1531	1533	1535	1538	1540	1541	1544	1544	1543	1541	1539		
10	1538	1541	1544	1543	1540	1534	1529	1527	1529	1534	1539	1544	1547	1548	1546	1542	1538		
15	1529	1536	1543	1544	1540	1532	1523	1517	1517	1523	1529	1532	1532	1532	1533	1534	1531		
20	1506	1514	1518	1520	1522	1524	1522	1512	1510	1517	1523	1523	1520	1519	1523	1528	1529		
25	1481	1489	1490	1491	1498	1507	1508	1495	1486	1494	1502	1505	1507	1509	1510	1510	1508		
30	1440	1449	1454	1461	1466	1467	1463	1449	1439	1445	1453	1463	1479	1488	1479	1467	1461		
35	1372	1382	1394	1411	1415	1407	1402	1392	1379	1384	1394	1409	1426	1433	1427	1414	1404		
40	1288	1299	1315	1332	1338	1334	1323	1312	1300	1305	1317	1337	1354	1358	1356	1342	1324		
45	1197	1205	1220	1232	1238	1239	1224	1220	1205	1212	1227	1241	1260	1262	1261	1247	1237		
50	1076	1092	1112	1128	1129	1131	1116	1100	1087	1092	1111	1135	1152	1154	1155	1139	1117		
55	940	955	985	1004	1009	1002	994	964	955	959	974	1013	1025	1031	1028	1005	980		
60	969	944	854	877	898	886	916	966	920	931	985	912	902	920	895	874	937		
65	833	878	883	849	849	768	846	899	893	890	893	859	798	885	836	853	911		
70	977	1019	938	948	930	908	851	955	993	1008	995	938	906	943	931	900	954		
75	910	956	933	891	930	849	832	902	891	927	978	911	852	990	930	874	887		
80	603	672	717	731	765	766	780	740	685	694	772	803	788	792	808	761	702		
85	293	318	351	351	346	352	397	382	346	344	388	410	376	379	375	396	382		
90	323	342	314	260	249	255	281	295	279	281	294	283	246	240	256	274	275		
95	148	151	147	135	130	132	154	177	164	163	162	143	131	127	134	146	161		
100	89.3	89.8	78.6	63.9	56.6	64.6	89.2	104	102	101	99.6	80.4	59.6	56.3	61.9	85.1	103		
105	39.5	36.0	27.8	20.1	14.2	21.1	31.9	40.8	42.8	42.8	39.6	30.1	19.7	12.8	20.2	30.3	40.2		
110	16.2	14.4	12.3	10.6	10.5	11.1	12.5	14.0	15.9	15.9	14.1	12.4	11.0	11.0	11.8	13.3	16.1		
115	12.8	11.6	9.29	7.20	6.87	7.36	9.26	11.1	11.9	12.5	12.1	10.8	7.39	7.16	8.07	10.6	13.2		
120	8.25	7.38	5.83	4.01	3.65	4.67	6.77	8.48	9.35	9.23	7.92	6.15	4.23	3.89	5.05	7.57	9.74		
125	5.52	4.97	3.76	2.33	1.33	2.68	4.13	5.16	5.59	5.49	4.91	3.75	2.28	1.62	3.24	4.87	6.03		
130	3.39	2.93	2.05	1.24	1.22	1.30	2.24	3.04	3.42	3.35	2.84	1.99	1.21	1.20	1.81	2.97	4.03		
135	1.67	1.43	1.38	1.38	1.38	1.38	1.38	1.44	1.61	1.57	1.39	1.37	1.37	1.36	1.36	1.58	2.14		
140	1.57	1.57	1.57	1.57	1.57	1.56	1.56	1.56	1.56	1.55	1.55	1.55	1.55	1.55	1.54	1.54	1.53		
145	1.74	1.74	1.74	1.74	1.73	1.73	1.72	1.73	1.72	1.72	1.72	1.72	1.72	1.72	1.71	1.70	1.70		
150	1.85	1.85	1.85	1.85	1.85	1.84	1.84	1.84	1.84	1.84	1.84	1.84	1.83	1.83	1.82	1.82	1.82		
155	1.92	1.92	1.92	1.92	1.92	1.91	1.91	1.91	1.92	1.91	1.91	1.92	1.91	1.91	1.90	1.89	1.89		
160	1.97	1.97	1.98	1.97	1.97	1.96	1.95	1.96	1.96	1.96	1.96	1.97	1.97	1.96	1.96	1.95	1.94		
165	1.96	1.97	1.97	1.97	1.97	1.96	1.96	1.96	1.96	1.95	1.95	1.96	1.96	1.96	1.96	1.95	1.94		
170	1.94	1.94	1.94	1.95	1.95	1.95	1.94	1.94	1.94	1.93	1.93	1.94	1.94	1.95	1.94	1.93	1.93		
175	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.92	1.92	1.93	1.93	1.94	1.94	1.93	1.92		
180	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85		

Table 5: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Aug. 23, 2017	Aug. 22, 2018
Digital Power Meter	PF2010A	HZTE028-01	Aug. 10, 2017	Aug. 09, 2018
AC Power Supply	DPS1060	HZTE001-06	Aug. 10, 2017	Aug. 09, 2018
DC Power Supply	WY12010	HZTE004-03	Aug. 10, 2017	Aug. 09, 2018
Standard Source	D908	HZTE012-01	Aug. 20, 2017	Aug. 19, 2018
Standard source	SCL-1400	HZTE012-02	Aug. 20, 2017	Aug. 19, 2018
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 16, 2017	Aug. 15, 2018
Temperature recorder	JM624U	HZTE018-08	Aug. 17, 2017	Aug. 16, 2018

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 2.3% with a coverage factor k=2.

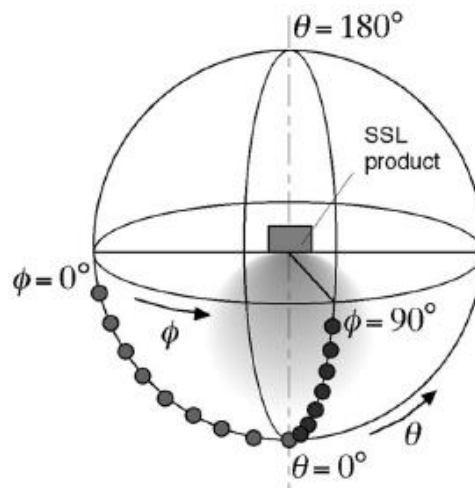
Color Characteristics Measurements

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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