



LM-79-08 Test Report

for

REVOLUTION LIGHTING TECHNOLOGIES, INC

2280 Ward Ave Simi Valley, CA 93065

Canopy Luminaires

Model: 111013-3X2

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ18030017g

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

Reviewed by:

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Mar. 12, 2018

Approved by

Manager: Jim Zhang

Mar. 12, 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: **111013-3X2**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
118.4	6265.4	52.93	0.9973
CCT (K)	CRI	Stabilization Time (Light & Power)	
3992	76.1	60	

Table 1: Executive Data Summary

Test specifications:

Date of Receipt : Feb. 13, 2017

Date of Test : Feb. 24, 2017

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	: 111013-3X2
Electrical Ratings	: 100~277V, 60Hz, 58W
Product Description	: 4000K 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 24.6°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			Special Color Rendering Indices	
Test Voltage (V)	120.0	100.0	277.0	R1	73
Voltage frequency (Hz)	60	60	60	R2	85
Test Current (A)	0.442	0.547	0.205	R3	93
Power Factor	0.9973	0.9816	0.9256	R4	72
Test Power (W)	52.93	53.71	52.45	R5	73
THD A%	3.51	3.45	14.20	R6	79
Luminous Efficacy (lm/W)	118.4	116.5	119.4	R7	81
Total Luminous Flux (lm)	6265.4	6259.5	6265.1	R8	52
Color Rendering Index (CRI)	76.1			R9	-23
R9	-23			R10	65
Correlated Color Temperature (CCT) (K)	3992			R11	69
Chromaticity (Chroma x, Chroma y)	(0.3798, 0.3734)			R12	52
Chromaticity (Chroma u, Chroma v)	(0.2260, 0.3333)			R13	76
Chromaticity (Chroma u', Chroma v')	(0.2260, 0.5000)			R14	97
Duv	0.0014				
Average Beam Angle (°)	158.9				
Center Beam Candle Power (cd)	1470				
Spacing Criteria	1.34 (0°-180°)/ 1.33 (90°-270°)				
Zonal Lumens in the 0°-60°Zone	58.78%				
Zonal Lumens in the 60°-90°Zone	37.52%				
Zonal Lumens in the 90°-120°Zone	3.60%				
Zonal Lumens in the 120°-180°Zone	0.11%				

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

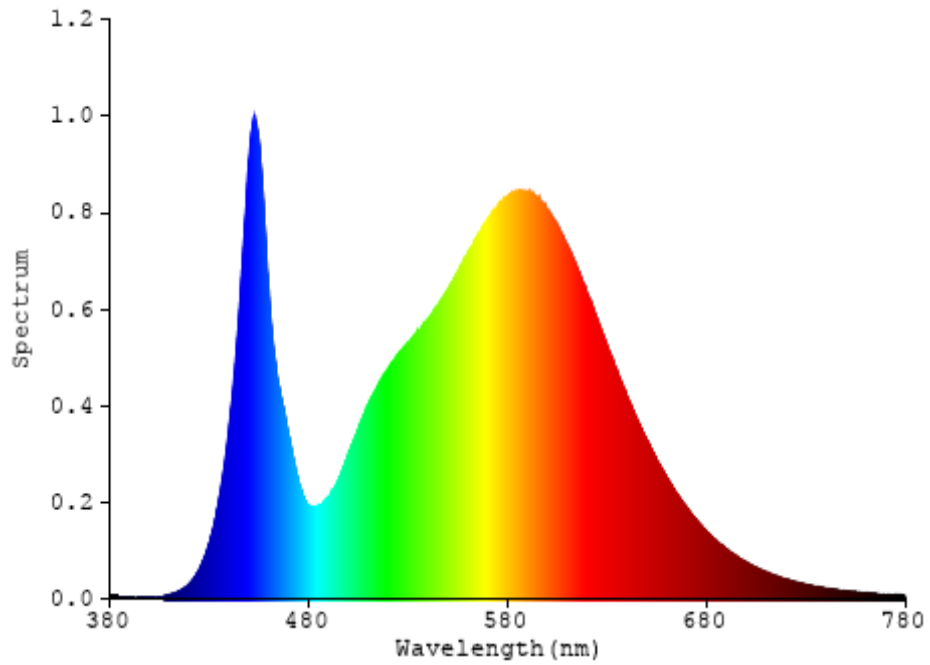


Chart 1: Spectral Power Distribution

Zonal Lumen Tabulation

$\gamma(^{\circ})$	Lumens	% Total
0- 10	139.891	2.23%
10- 20	407.992	6.51%
20- 30	635.501	10.14%
30- 40	791.692	12.64%
40- 50	859.381	13.72%
50- 60	848.034	13.54%
60- 70	923.664	14.74%
70- 80	999.094	15.95%
80- 90	427.987	6.83%
90-100	173.959	2.78%
100-110	39.962	0.64%
110-120	11.576	0.18%
120-130	4.022	0.06%
130-140	0.957	0.02%
140-150	0.686	0.01%
150-160	0.536	0.01%
160-170	0.346	0.01%
170-180	0.121	0.00%
Total	6265.4	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	3682.491	58.78%
60- 90	2350.745	37.52%
0-90	6033.236	96.29%
90- 180	232.165	3.71%
0- 180	6265.4	100%

Table 3: Zonal Lumen Data

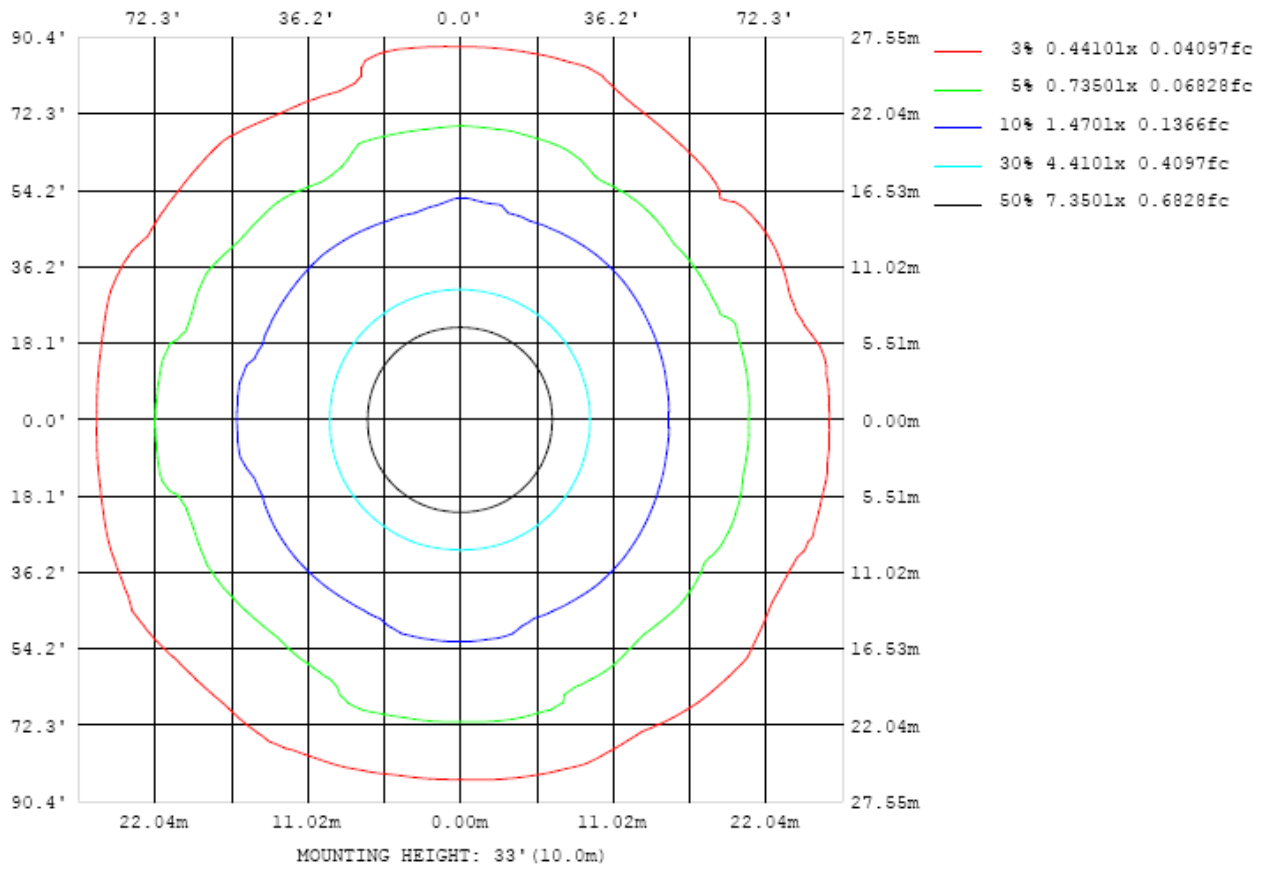


Chart 2: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots

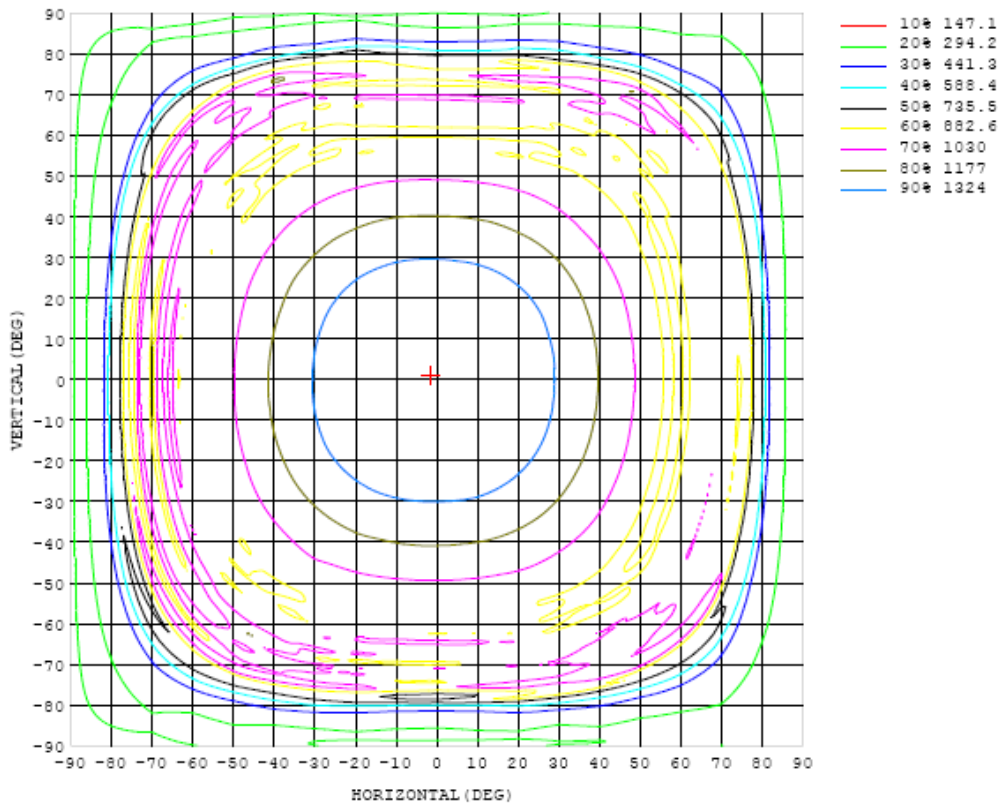


Chart 3: Isocandela Plot

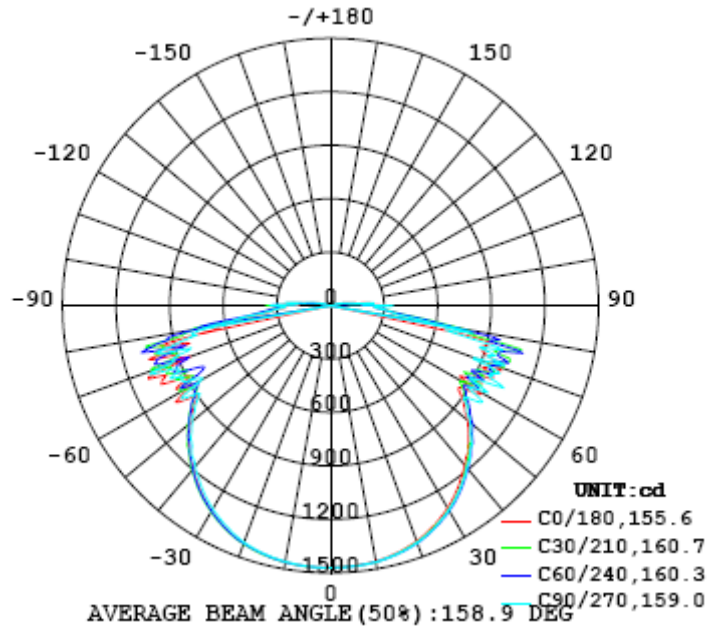


Chart 4: Polar Candela Distribution

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	1470	1470	1470	1470	1470	1470	1470	1470	1470	1470	1470	1470	1470	1470	1470	1470	1470	1470	1470
5	1465	1465	1466	1467	1466	1467	1468	1468	1469	1469	1469	1469	1470	1470	1470	1469	1469	1470	1470
10	1456	1457	1459	1460	1459	1459	1460	1460	1460	1461	1460	1463	1463	1463	1463	1464	1461	1462	1461
15	1437	1437	1439	1442	1443	1443	1444	1443	1443	1444	1444	1446	1447	1448	1448	1448	1447	1446	1445
20	1408	1408	1411	1414	1415	1416	1418	1417	1415	1417	1417	1421	1422	1424	1424	1425	1422	1421	1420
25	1364	1367	1370	1374	1377	1378	1379	1379	1376	1376	1378	1381	1384	1387	1389	1389	1386	1384	1379
30	1312	1313	1318	1322	1326	1329	1328	1329	1326	1325	1327	1331	1337	1340	1341	1341	1338	1335	1330
35	1244	1246	1252	1259	1264	1267	1269	1267	1263	1261	1264	1270	1277	1281	1281	1281	1277	1272	1268
40	1170	1172	1177	1182	1191	1196	1196	1197	1190	1187	1190	1200	1205	1210	1213	1210	1207	1202	1194
45	1090	1092	1104	1103	1110	1114	1117	1116	1114	1117	1117	1119	1135	1132	1129	1130	1131	1122	1119
50	1003	1005	1012	1026	1032	1035	1039	1026	1023	1019	1024	1032	1042	1046	1056	1053	1038	1035	1024
55	899	902	913	927	947	947	941	934	919	908	913	938	940	970	969	948	946	924	914
60	941	957	965	848	853	859	932	919	901	925	911	904	985	864	879	900	972	905	898
65	929	921	893	949	831	829	870	977	1064	1046	1066	1045	888	905	913	917	900	1033	1046
70	954	970	1032	991	1064	1008	995	939	875	855	843	884	1049	1028	1067	1103	964	855	836
75	883	911	983	965	1042	1068	995	996	982	942	920	902	956	1078	1159	1004	872	841	817
80	630	640	746	734	705	684	688	678	612	590	618	748	776	768	776	802	833	761	670
85	315	317	337	321	315	336	309	334	327	315	324	354	349	346	349	348	370	351	324
90	267	284	294	277	249	248	274	339	329	323	326	315	292	250	268	297	341	339	331
95	166	161	145	118	114	113	115	142	148	146	150	146	123	121	119	119	139	151	184
100	93.6	93.2	87.0	66.1	51.1	52.3	60.1	80.2	89.6	91.4	93.3	88.1	70.3	55.4	56.1	61.5	82.6	95.7	95.4
105	37.0	36.3	32.5	25.2	17.3	16.5	21.0	29.3	38.7	41.2	40.1	36.6	26.8	17.6	18.0	23.4	32.0	39.7	42.6
110	15.5	15.5	15.0	13.2	13.4	13.0	13.6	14.8	16.2	16.6	16.7	16.0	13.9	13.0	13.0	13.3	14.4	15.8	16.4
115	13.6	13.6	14.4	15.7	12.6	8.50	10.2	12.4	13.1	13.6	13.2	13.2	11.7	8.35	8.71	9.24	11.7	13.5	14.1
120	9.96	9.64	8.43	6.60	4.11	3.96	5.70	7.85	8.73	9.41	9.27	8.33	6.32	3.92	3.99	5.68	7.94	9.50	10.1
125	5.74	5.67	4.90	3.51	1.64	1.16	2.99	4.64	5.55	6.01	5.80	5.04	3.57	1.81	1.07	2.98	4.81	5.78	6.31
130	3.01	2.91	2.25	1.29	0.81	0.81	1.09	2.09	2.96	3.32	3.15	2.50	1.46	0.81	0.81	0.91	2.17	3.04	3.55
135	0.87	0.86	0.85	0.84	0.84	0.84	0.84	0.84	0.98	1.18	1.07	0.85	0.84	0.83	0.83	0.83	0.84	0.89	1.27
140	0.91	0.91	0.91	0.90	0.90	0.90	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.90	0.89	0.89	0.89	0.89	1.15
145	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.93	0.93	0.93	0.93	0.94	0.94	0.94	0.94	0.93	0.93	1.26
150	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.93	0.93	0.94	0.94	0.94	0.94	0.94	0.94	1.32
155	0.95	0.95	0.96	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	1.36
160	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.98	0.99	0.99	0.99	0.99	0.99	0.99	0.99	1.39
165	1.03	1.04	1.04	1.04	1.04	1.04	1.04	1.05	1.05	1.05	1.04	1.04	1.04	1.04	1.05	1.04	1.04	1.04	1.40
170	1.11	1.11	1.11	1.11	1.11	1.12	1.12	1.12	1.11	1.11	1.11	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.39
175	1.22	1.22	1.22	1.22	1.23	1.23	1.22	1.23	1.22	1.22	1.22	1.23	1.23	1.23	1.23	1.23	1.23	1.22	1.38
180	1.27	1.27	1.27	1.27	1.27	1.27	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.27

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	1470	1470	1470	1470	1470	1470	1470	1470	1470	1470	1470	1470	1470	1470	1470	1470	1470		
5	1469	1469	1471	1469	1469	1469	1470	1468	1469	1467	1468	1467	1467	1466	1466	1465	1467		
10	1460	1462	1462	1462	1462	1462	1461	1459	1459	1458	1458	1458	1459	1458	1460	1457	1458		
15	1446	1447	1447	1445	1444	1444	1444	1443	1441	1439	1439	1441	1441	1440	1441	1438	1437		
20	1421	1422	1423	1422	1420	1420	1418	1416	1414	1413	1415	1416	1416	1415	1414	1410	1410		
25	1381	1384	1386	1386	1385	1382	1378	1373	1370	1369	1372	1375	1375	1375	1372	1368	1366		
30	1331	1334	1337	1338	1336	1332	1327	1322	1318	1317	1321	1323	1324	1325	1323	1316	1314		
35	1269	1273	1277	1276	1275	1272	1265	1257	1253	1253	1257	1261	1261	1260	1260	1252	1246		
40	1197	1204	1205	1205	1204	1199	1191	1183	1178	1179	1183	1184	1188	1188	1183	1176	1173		
45	1119	1122	1129	1128	1119	1116	1119	1103	1097	1097	1105	1106	1107	1102	1102	1104	1094		
50	1028	1035	1042	1039	1039	1033	1025	1014	1012	1011	1015	1024	1023	1018	1019	1014	1006		
55	919	936	940	958	955	949	932	915	908	909	920	927	937	938	932	916	906		
60	890	950	947	857	871	871	938	861	840	849	899	927	849	860	831	903	967		
65	1026	937	914	831	833	822	960	936	964	952	910	907	786	896	777	930	894		
70	864	969	1066	967	993	844	1059	1049	960	982	1040	993	912	1000	824	1019	991		
75	866	980	1005	1114	979	888	1023	1029	993	1025	1080	1045	1086	1034	932	979	931		
80	687	784	783	761	811	766	787	749	690	703	769	723	766	808	778	759	655		
85	327	366	353	363	350	376	402	357	329	337	381	390	366	374	354	377	337		
90	343	355	359	319	312	298	324	316	301	314	326	283	253	227	240	272	266		
95	189	189	135	135	136	147	212	204	225	202	188	136	121	123	116	144	180		
100	96.7	96.4	75.7	60.6	61.3	72.0	99.1	109	105	105	96.8	74.0	54.7	56.8	59.1	89.0	97.2		
105	41.6	37.7	29.5	20.7	19.2	27.9	39.1	47.0	46.7	45.3	38.3	27.2	17.0	13.4	20.4	30.6	36.0		
110	16.3	15.7	15.2	16.6	16.6	16.3	16.1	16.8	16.8	16.1	15.1	12.9	12.0	11.9	12.2	13.5	15.0		
115	14.1	13.3	11.0	11.5	11.8	11.9	13.9	14.5	14.4	14.6	12.8	10.1	7.51	7.33	8.26	10.9	12.8		
120	9.99	9.22	7.28	6.22	6.35	8.13	11.0	12.2	12.2	10.6	8.70	6.11	3.78	3.41	5.12	7.58	9.69		
125	6.19	5.47	4.19	2.43	2.38	4.41	5.83	6.54	6.59	6.11	5.05	3.48	1.75	1.09	2.73	4.38	5.56		
130	3.39	2.79	1.54	0.93	0.96	1.75	3.02	3.70	3.82	3.42	2.61	1.47	0.94	0.93	0.98	2.10	2.92		
135	1.17	1.03	1.03	1.04	1.04	1.04	1.09	1.32	1.45	1.27	1.08	1.04	1.04	1.04	1.04	1.04	1.04		
140	1.15	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.17	1.17	1.17	1.17	1.17	1.16		
145	1.26	1.26	1.26	1.26	1.27	1.27	1.27	1.26	1.26	1.26	1.27	1.27	1.27	1.27	1.27	1.27	1.27		
150	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33		
155	1.36	1.37	1.37	1.37	1.37	1.37	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36		
160	1.39	1.40	1.40	1.40	1.40	1.40	1.39	1.39	1.39	1.39	1.39	1.39	1.39	1.39	1.39	1.39	1.39		
165	1.40	1.40	1.41	1.41	1.41	1.40	1.40	1.40	1.39	1.39	1.39	1.40	1.39	1.40	1.40	1.40	1.39		
170	1.40	1.40	1.40	1.40	1.41	1.40	1.40	1.40	1.39	1.39	1.39	1.39	1.39	1.40	1.40	1.39	1.39		
175	1.38	1.38	1.39	1.39	1.39	1.39	1.39	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.39	1.38	1.38		
180	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27		

Table 5: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Jul. 27, 2016	Jul. 26, 2017
Digital Power Meter	PF2010A	HZTE028-01	Jul. 27, 2016	Jul. 26, 2017
AC Power Supply	PCR 500L	HZTE001-08	Jul. 27, 2016	Jul. 26, 2017
DC Power Supply	WY12010	HZTE004-03	Jul. 27, 2016	Jul. 26, 2017
Temperature Meter	TES1310	HZTE017-01	Jul. 27, 2016	Jul. 26, 2017
Standard Source	D908	HZTE012-01	Jul. 27, 2016	Jul. 26, 2017
Standard source	SCL-1400	HZTE012-02	Jul. 27, 2016	Jul. 26, 2017

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 $k=2$.

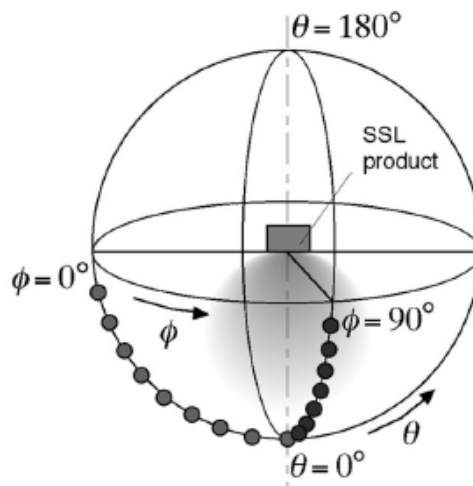
Color Characteristics Measurements

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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