



LM-79-08 Test Report

for

REVOLUTION LIGHTING TECHNOLOGIES, INC

2280 Ward Ave Simi Valley, CA 93065

Canopy Luminaires

Model: 111013-3X4

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ18030017h

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

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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: **111013-3X4**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
118.5	6253.8	52.76	0.9971
CCT (K)	CRI	Stabilization Time (Light & Power)	
4913	77.5	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

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Sample Photo



Figure 1- Overview of the sample

Equipment Under Test (EUT)

Name	: Canopy Luminaires
Model	: 111013-3X4
Electrical Ratings	: 100~277V, 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 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	75
Voltage frequency (Hz)	60	60	60	R2	84
Test Current (A)	0.441	0.537	0.207	R3	91
Power Factor	0.9971	0.9955	0.9174	R4	75
Test Power (W)	52.76	53.49	52.51	R5	75
THD A%	3.79	3.49	14.04	R6	77
Luminous Efficacy (lm/W)	118.5	116.9	119.6	R7	84
Total Luminous Flux (lm)	6253.8	6249.8	6280.2	R8	59
Color Rendering Index (CRI)	77.5			R9	-18
R9	-18			R10	62
Correlated Color Temperature (CCT) (K)	4913			R11	73
Chromaticity (Chroma x, Chroma y)	(0.3480, 0.3571)			R12	48
Chromaticity (Chroma u, Chroma v)	(0.2112, 0.3252)			R13	77
Chromaticity (Chroma u', Chroma v')	(0.2112, 0.4878)			R14	95
Duv	0.0017				
Average Beam Angle (°)	158.5				
Center Beam Candle Power (cd)	1480				
Spacing Criteria	1.33 (0°-180°)/ 1.33 (90°-270°)				
Zonal Lumens in the 0°-60°Zone	59.15%				
Zonal Lumens in the 60°-90°Zone	37.21%				
Zonal Lumens in the 90°-120°Zone	3.53%				
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

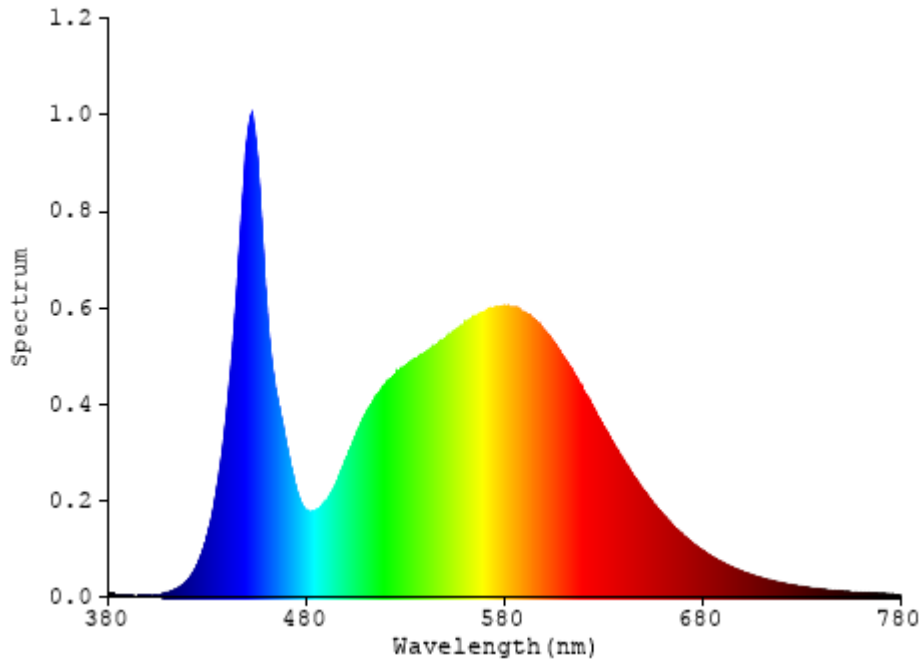


Chart 1: Spectral Power Distribution

Zonal Lumen Tabulation

$\gamma(^{\circ})$	Lumens	% Total
0- 10	140.855	2.25%
10- 20	410.69	6.57%
20- 30	639.713	10.23%
30- 40	796.438	12.74%
40- 50	863.314	13.80%
50- 60	848.219	13.56%
60- 70	915.476	14.64%
70- 80	989.258	15.82%
80- 90	422.099	6.75%
90-100	169.206	2.71%
100-110	39.506	0.63%
110-120	12.179	0.19%
120-130	4.175	0.07%
130-140	0.983	0.02%
140-150	0.69	0.01%
150-160	0.541	0.01%
160-170	0.349	0.01%
170-180	0.122	0.00%
Total	6253.8	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	3699.229	59.15%
60- 90	2326.833	37.21%
0-90	6026.062	96.36%
90- 180	227.751	3.64%
0- 180	6253.8	100%

Table 3: Zonal Lumen Data

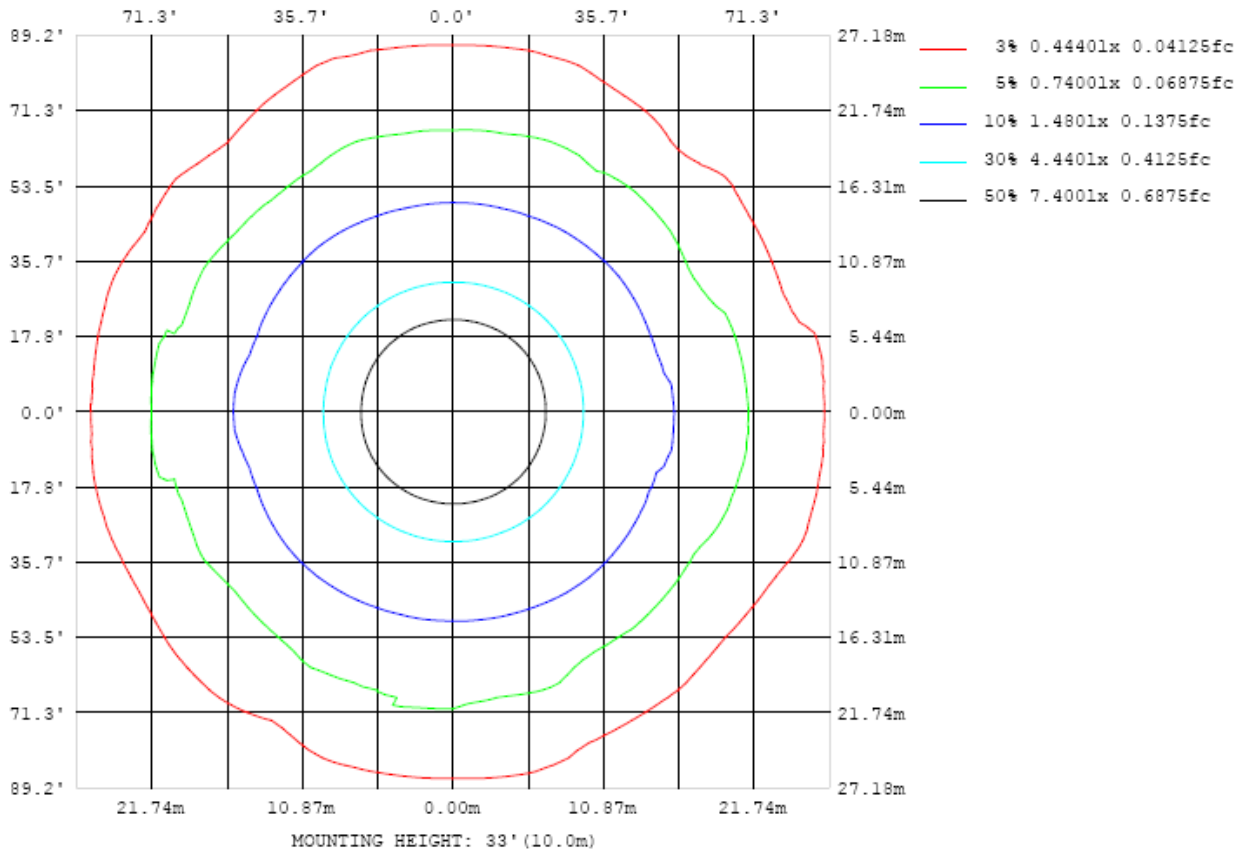


Chart 2: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots

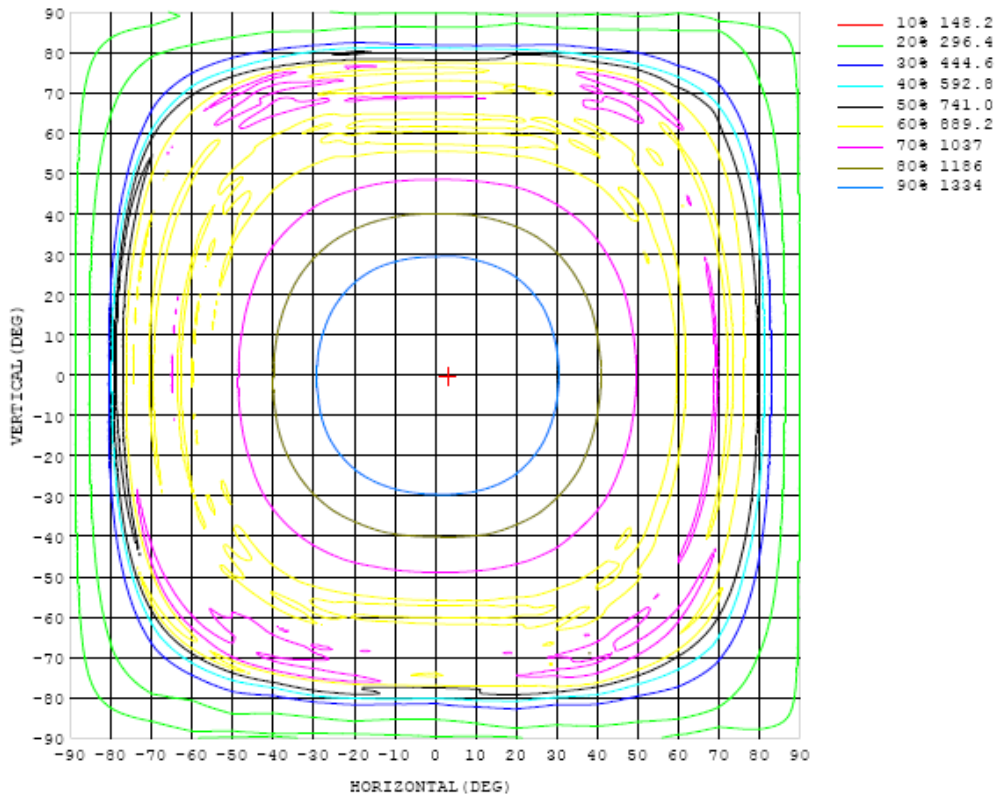


Chart 3: Isocandela Plot

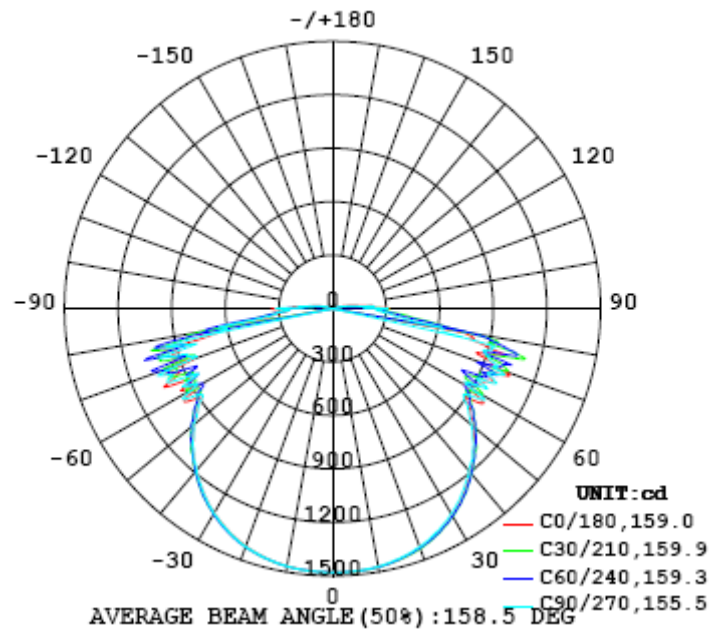


Chart 4: Polar Candela Distribution

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	1480	1480	1480	1480	1480	1480	1480	1480	1480	1480	1480	1480	1480	1480	1480	1480	1480	1480	1480
5	1480	1480	1480	1481	1478	1479	1478	1478	1477	1479	1479	1477	1477	1477	1478	1477	1477	1477	1477
10	1472	1473	1472	1473	1472	1473	1473	1472	1471	1469	1470	1469	1470	1470	1469	1470	1468	1467	1468
15	1457	1457	1457	1457	1456	1456	1456	1454	1452	1451	1451	1450	1451	1451	1452	1452	1450	1448	1449
20	1432	1432	1433	1434	1433	1432	1430	1428	1425	1423	1423	1423	1424	1425	1425	1425	1423	1420	1419
25	1391	1391	1393	1396	1397	1397	1392	1388	1385	1382	1382	1383	1386	1387	1388	1385	1383	1380	1377
30	1339	1339	1342	1345	1347	1348	1344	1338	1333	1330	1330	1332	1335	1339	1338	1337	1333	1329	1325
35	1272	1275	1279	1284	1285	1285	1282	1276	1268	1264	1265	1268	1273	1276	1276	1276	1270	1264	1259
40	1198	1199	1206	1207	1211	1212	1207	1201	1194	1188	1190	1196	1199	1204	1205	1203	1199	1191	1185
45	1116	1117	1123	1133	1131	1128	1124	1128	1112	1111	1112	1116	1121	1125	1122	1123	1117	1113	1112
50	1030	1032	1033	1044	1041	1043	1041	1032	1022	1016	1019	1025	1035	1040	1045	1042	1027	1019	1013
55	920	924	937	948	959	957	943	936	918	906	909	924	939	957	955	945	932	909	900
60	855	860	907	968	862	885	857	950	948	900	922	991	884	858	864	898	942	889	887
65	977	977	934	929	797	927	838	920	944	999	1005	923	946	815	843	917	904	1034	1042
70	975	994	1040	1029	941	1059	888	1054	981	955	971	1012	1047	1001	1046	952	990	887	824
75	994	1021	1067	1107	1052	1013	983	1011	968	896	923	993	1026	1009	1055	979	985	974	913
80	698	709	766	739	778	814	775	737	676	623	657	728	721	643	671	685	679	609	552
85	334	340	393	403	376	388	360	381	342	314	315	333	315	307	329	306	325	318	306
90	306	315	326	312	274	268	272	300	313	309	325	333	316	269	286	298	375	338	326
95	187	179	172	139	125	125	118	139	158	157	152	145	117	112	111	119	141	146	157
100	101	103	97.3	77.8	56.5	55.2	57.6	86.9	95.6	91.1	90.3	84.7	66.6	50.4	52.4	60.2	78.3	87.3	88.9
105	46.3	45.1	39.6	28.7	18.5	14.5	20.5	28.9	35.6	36.9	36.4	33.3	25.2	18.0	18.8	22.9	31.7	40.8	41.8
110	16.7	16.6	16.0	14.0	13.4	13.3	13.3	14.6	16.0	16.5	16.4	16.3	14.5	14.9	14.5	15.5	16.2	17.3	17.2
115	14.3	14.1	13.0	11.6	9.08	8.48	9.12	12.0	13.8	14.8	14.8	15.1	16.5	16.4	10.5	10.9	13.0	13.9	14.0
120	11.3	10.5	9.19	6.88	4.23	3.75	5.80	8.62	10.4	10.8	10.4	9.55	7.53	5.31	4.93	6.33	8.23	9.52	10.4
125	5.90	5.68	4.91	3.44	1.62	1.13	2.92	4.82	6.23	6.64	6.49	5.70	4.42	2.27	1.30	3.33	4.95	5.90	6.64
130	3.01	2.83	2.18	1.11	0.81	0.81	1.07	2.27	3.24	3.65	3.54	2.88	1.84	0.83	0.82	1.17	2.34	3.25	3.89
135	0.86	0.85	0.84	0.84	0.84	0.85	0.84	0.85	1.06	1.34	1.25	0.91	0.85	0.85	0.85	0.85	0.85	1.07	1.60
140	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.91	0.91	0.91	0.91	0.91	0.91	1.17
145	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.95	0.94	0.94	0.94	0.95	0.95	0.95	0.95	0.95	0.95	0.95	1.27
150	0.94	0.94	0.94	0.94	0.95	0.95	0.95	0.95	0.95	0.94	0.94	0.95	0.95	0.95	0.95	0.95	0.95	0.95	1.34
155	0.95	0.95	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.97	0.97	0.97	0.97	0.96	1.37
160	0.99	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.01	1.00	1.00	1.00	1.40
165	1.04	1.04	1.05	1.05	1.05	1.06	1.05	1.06	1.06	1.06	1.05	1.05	1.05	1.05	1.06	1.06	1.06	1.05	1.40
170	1.11	1.12	1.12	1.12	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.39
175	1.23	1.23	1.23	1.23	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.25	1.24	1.24	1.24	1.24	1.23	1.38
180	1.28	1.28	1.28	1.28	1.28	1.27	1.27	1.27	1.27	1.27	1.27	1.28	1.27	1.26	1.25	1.25	1.25	1.25	1.28

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	1480	1480	1480	1480	1480	1480	1480	1480	1480	1480	1480	1480	1480	1480	1480	1480	1480		
5	1477	1476	1476	1476	1476	1476	1478	1477	1478	1479	1479	1479	1480	1479	1480	1480	1481		
10	1467	1467	1468	1468	1469	1468	1468	1468	1469	1471	1470	1472	1473	1473	1473	1473	1471		
15	1449	1448	1451	1450	1451	1450	1451	1450	1449	1452	1452	1454	1456	1457	1458	1457	1456		
20	1420	1422	1423	1423	1424	1423	1424	1421	1422	1426	1426	1429	1431	1432	1434	1434	1432		
25	1377	1379	1382	1384	1385	1384	1382	1381	1379	1383	1386	1390	1394	1396	1395	1393	1391		
30	1326	1327	1331	1333	1334	1333	1330	1327	1327	1331	1334	1339	1345	1347	1347	1343	1340		
35	1261	1264	1270	1271	1271	1270	1265	1261	1259	1264	1269	1277	1282	1284	1285	1281	1276		
40	1186	1192	1194	1197	1198	1195	1190	1187	1184	1190	1196	1203	1210	1212	1210	1206	1202		
45	1112	1109	1122	1117	1114	1112	1115	1103	1103	1106	1114	1122	1127	1126	1125	1130	1118		
50	1015	1020	1028	1028	1032	1031	1019	1014	1012	1016	1022	1035	1039	1043	1040	1037	1030		
55	903	923	926	951	949	931	922	909	899	906	924	932	950	952	955	942	929		
60	882	913	927	840	855	842	942	933	904	918	973	876	853	870	874	941	875		
65	1041	945	870	846	887	900	843	860	916	892	852	932	834	805	818	948	951		
70	829	906	1022	1001	1019	1023	1048	912	869	914	1025	966	963	966	849	1035	1027		
75	895	885	961	1054	1093	1070	919	861	827	904	994	979	1059	991	870	995	1005		
80	583	687	713	703	719	710	733	679	620	649	744	756	786	815	768	792	750		
85	310	332	329	332	336	336	344	324	312	315	344	347	356	351	374	404	362		
90	319	313	274	230	260	273	329	326	320	332	358	366	327	332	301	317	326		
95	148	147	121	114	112	121	144	163	160	164	176	145	135	136	133	195	191		
100	87.0	80.9	66.5	52.1	53.1	59.7	80.7	90.0	92.6	94.1	95.5	78.3	62.1	61.0	69.4	98.4	104		
105	39.7	33.2	24.7	18.7	19.2	25.5	35.3	42.3	46.6	46.7	41.6	30.7	20.9	17.9	25.7	37.0	42.6		
110	17.0	16.0	14.5	14.5	13.9	14.3	17.1	18.8	19.2	18.8	17.4	15.2	15.0	15.2	15.1	15.3	16.6		
115	13.5	13.1	12.4	10.3	9.46	9.84	12.8	14.3	14.9	14.7	13.7	11.2	9.97	10.1	10.2	12.3	13.9		
120	10.6	9.02	7.35	4.93	4.71	5.98	8.54	10.2	10.8	10.8	9.88	7.61	5.14	4.96	6.41	9.16	11.1		
125	6.54	5.77	4.45	2.42	1.44	3.25	4.87	5.81	6.26	6.17	5.59	4.29	2.41	1.05	3.13	4.80	5.75		
130	3.74	3.16	2.03	0.93	0.93	1.25	2.42	3.24	3.60	3.49	2.95	1.83	0.93	0.92	0.95	2.00	2.89		
135	1.53	1.11	1.04	1.04	1.04	1.04	1.04	1.16	1.43	1.32	1.05	1.04	1.04	1.04	1.04	1.04	1.04		
140	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.16	1.16	1.16	1.16	1.16	1.17	1.16	1.16	1.16	1.16		
145	1.27	1.28	1.28	1.28	1.28	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27		
150	1.34	1.34	1.34	1.34	1.34	1.34	1.34	1.34	1.34	1.33	1.34	1.34	1.34	1.34	1.33	1.33	1.33		
155	1.37	1.38	1.38	1.38	1.38	1.38	1.38	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37		
160	1.40	1.40	1.41	1.41	1.41	1.41	1.41	1.41	1.40	1.40	1.40	1.41	1.40	1.41	1.41	1.40	1.40		
165	1.40	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.40	1.40	1.41	1.41	1.41	1.41	1.41	1.41		
170	1.40	1.40	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.40	1.40	1.41	1.41	1.41	1.41	1.41	1.41		
175	1.38	1.39	1.39	1.39	1.40	1.40	1.40	1.40	1.39	1.39	1.39	1.39	1.40	1.40	1.40	1.39	1.39		
180	1.28	1.28	1.28	1.28	1.28	1.28	1.28	1.28	1.28	1.28	1.28	1.28	1.28	1.28	1.28	1.28	1.28		

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 $k=2$.

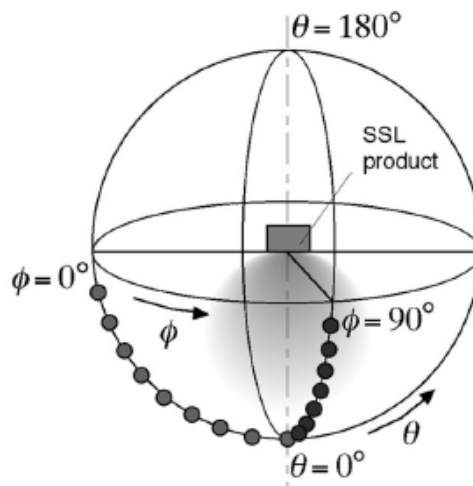
Color Characteristics Measurements

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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