



LM-79-08 Test Report

for

REVOLUTION LIGHTING TECHNOLOGIES, INC

2280 Ward Ave Simi Valley, CA 93065

Canopy Luminaires

Model: 111053-3X2

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ18040033j/R1

This report is replaced the old report No. HZ18040033j 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: **111053-3X2**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
121.5	6453.7	53.12	0.9766
CCT (K)	CRI	Stabilization Time (Light & Power)	
4003	76.3	60	

Table 1: Executive Data Summary

Test specifications:

Date of Receipt : Mar. 05, 2017

Date of Test : Mar. 06, 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

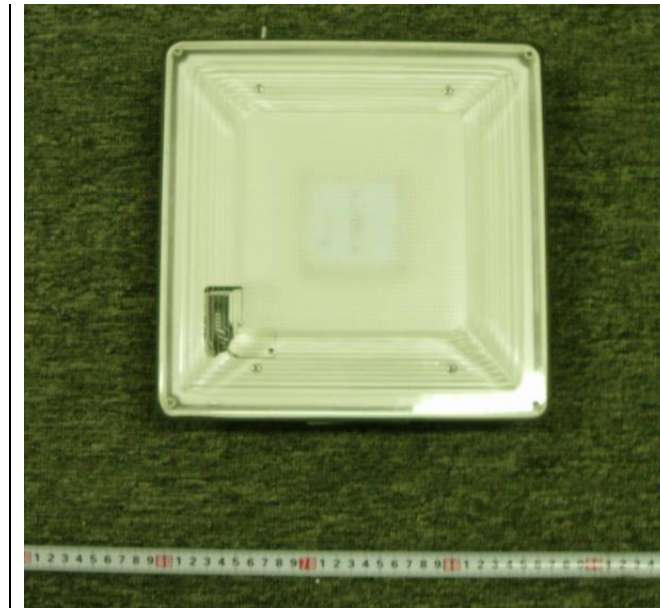


Figure 1- Overview of the sample

Equipment Under Test (EUT)

Name	: Canopy Luminaires
Model	: 111053-3X2
Electrical Ratings	: 347~480V, 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	
Test Voltage (V)	347.0	480.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.157	0.124
Power Factor	0.9766	0.9098
Test Power (W)	53.12	54.29
THD A%	7.51	15.70
Luminous Efficacy (lm/W)	121.5	120.0
Total Luminous Flux (lm)	6453.7	6504.6
Color Rendering Index (CRI)	76.3	
R9	-22	
Correlated Color Temperature (CCT) (K)	4003	
Chromaticity (Chroma x, Chroma y)	(0.3792, 0.3726)	
Chromaticity (Chroma u, Chroma v)	(0.2260, 0.3331)	
Chromaticity (Chroma u', Chroma v')	(0.2260, 0.4996)	
Duv	0.0016	
Average Beam Angle (°)	159.6	
Center Beam Candle Power (cd)	1539	
Spacing Criteria	1.33 (0°-180°)/ 1.34 (90°-270°)	
Zonal Lumens in the 0°-60° Zone	59.57%	
Zonal Lumens in the 60°-90° Zone	36.80%	
Zonal Lumens in the 90°-120° Zone	3.52%	
Zonal Lumens in the 120°-180° Zone	0.11%	

Special Color Rendering Indices	
R1	73
R2	86
R3	93
R4	72
R5	73
R6	79
R7	81
R8	52
R9	-22
R10	66
R11	69
R12	52
R13	76
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

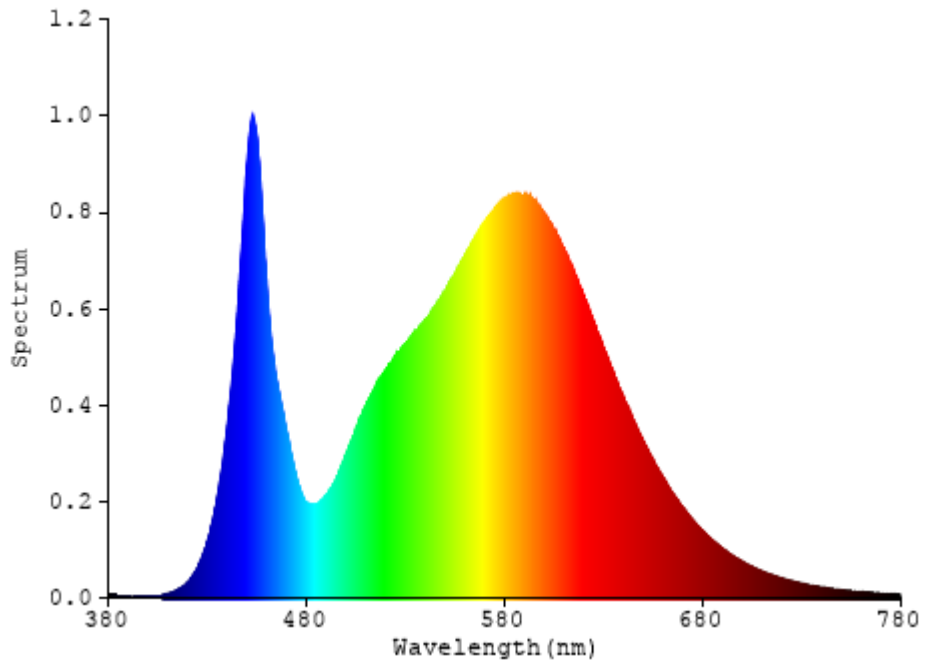


Chart 1: Spectral Power Distribution

Zonal Lumen Tabulation

$\gamma(^{\circ})$	Lumens	% Total
0- 10	146.536	2.27%
10- 20	427.194	6.62%
20- 30	665.482	10.31%
30- 40	828.935	12.84%
40- 50	898.802	13.93%
50- 60	877.301	13.59%
60- 70	917.592	14.22%
70- 80	1009.059	15.64%
80- 90	448.391	6.95%
90-100	176.27	2.73%
100-110	39.558	0.61%
110-120	11.647	0.18%
120-130	4.026	0.06%
130-140	1.064	0.02%
140-150	0.732	0.01%
150-160	0.577	0.01%
160-170	0.373	0.01%
170-180	0.13	0.00%
Total	6453.7	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	3844.25	59.57%
60- 90	2375.042	36.80%
0-90	6219.292	96.37%
90- 180	234.377	3.63%
0- 180	6453.7	100%

Table 3: Zonal Lumen Data

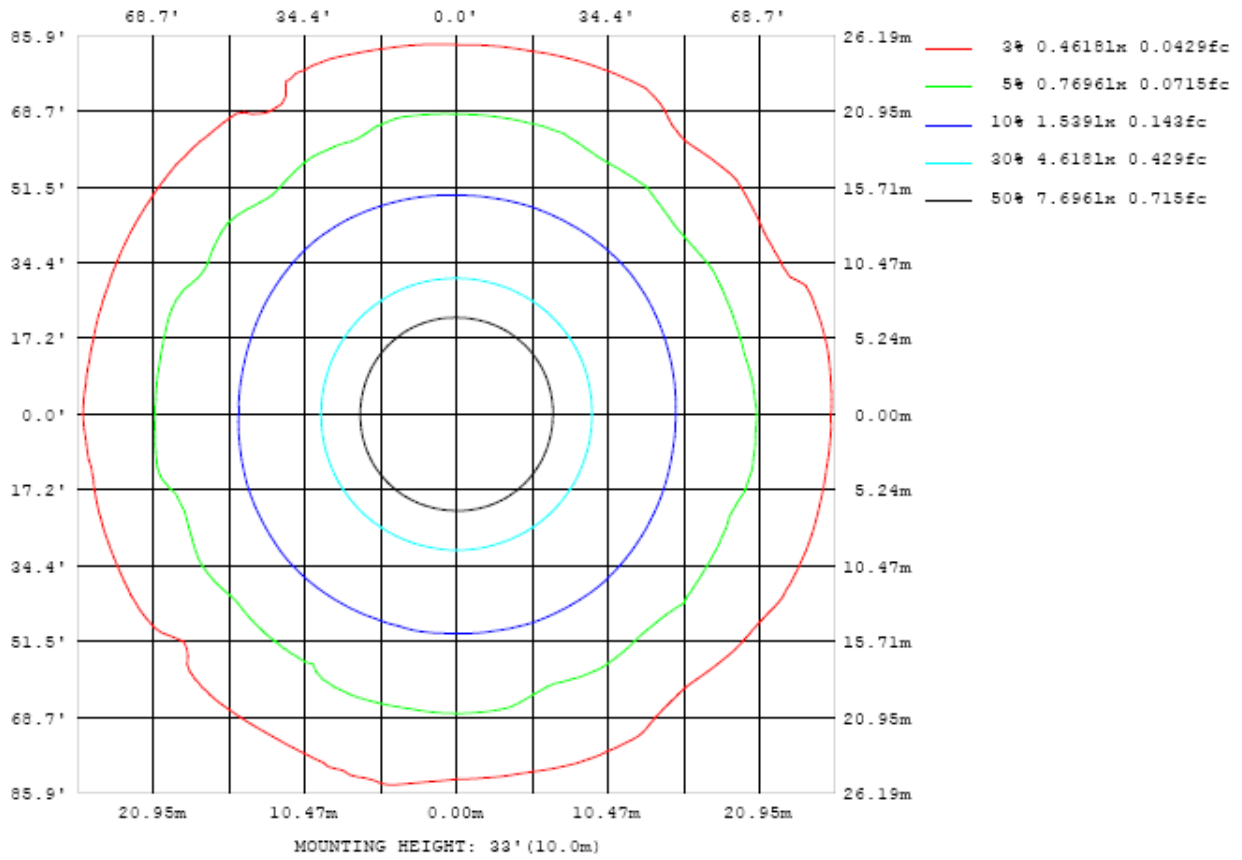


Chart 2: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots

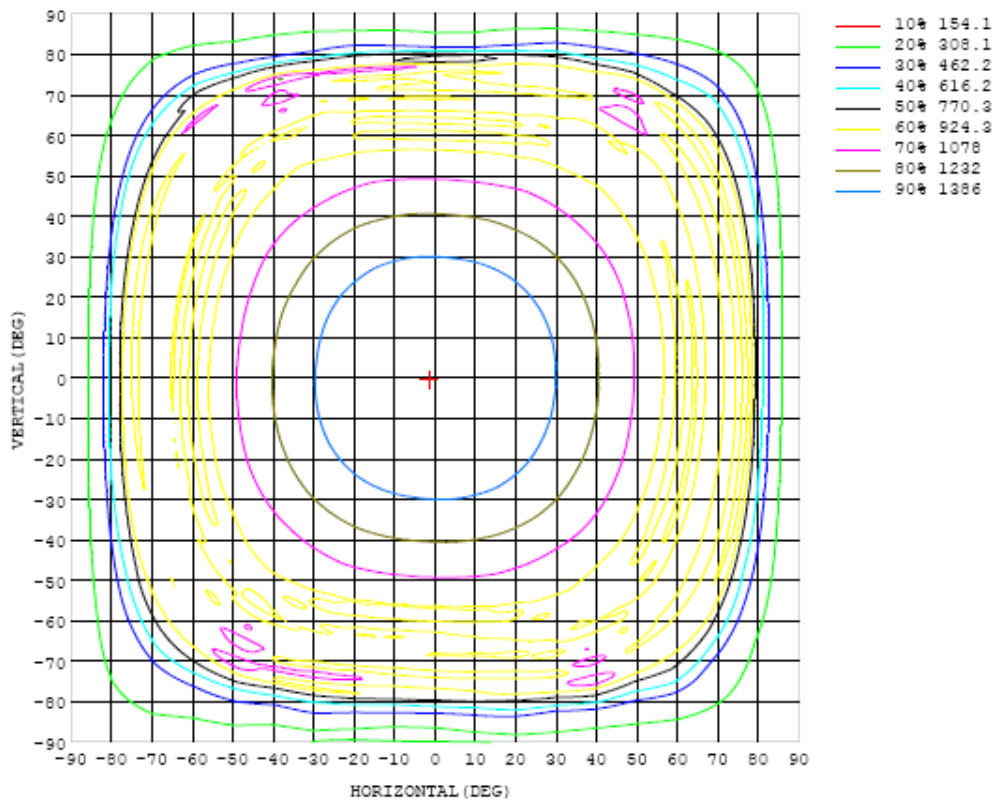


Chart 3: Isocandela Plot

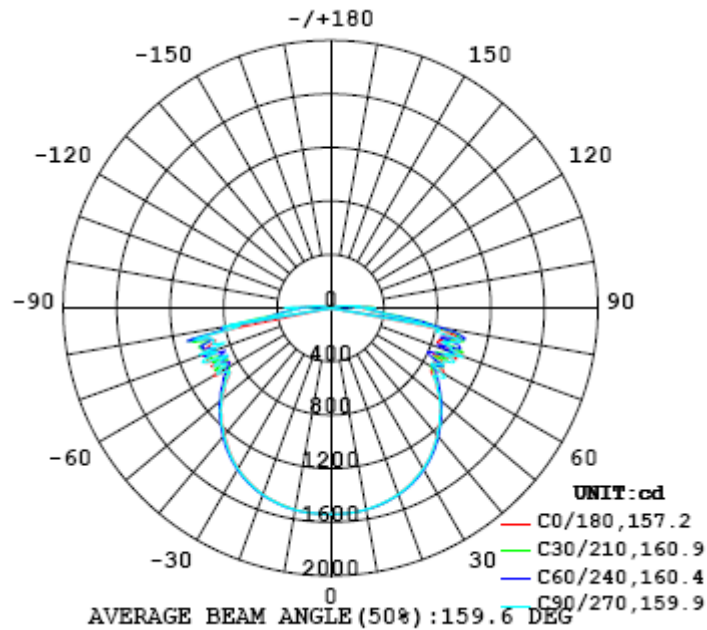


Chart 4: Polar Candela Distribution

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	1539	1539	1539	1539	1539	1539	1539	1539	1539	1539	1539	1539	1539	1539	1539	1539	1539	1539	1539
5	1536	1537	1537	1537	1537	1536	1538	1538	1538	1538	1538	1539	1539	1539	1538	1539	1539	1538	1538
10	1528	1528	1529	1530	1530	1528	1530	1528	1527	1527	1527	1528	1529	1530	1530	1531	1531	1529	1528
15	1509	1509	1511	1511	1512	1511	1511	1509	1507	1507	1507	1508	1510	1510	1510	1511	1511	1510	1509
20	1479	1480	1482	1482	1483	1482	1484	1483	1481	1480	1480	1482	1483	1483	1482	1483	1483	1482	1481
25	1439	1438	1442	1443	1445	1445	1448	1444	1441	1439	1438	1441	1444	1445	1444	1444	1442	1441	1437
30	1385	1385	1388	1390	1394	1394	1395	1391	1388	1386	1385	1388	1390	1395	1393	1393	1389	1386	1383
35	1317	1317	1321	1326	1331	1331	1332	1328	1323	1319	1318	1322	1326	1330	1329	1329	1323	1317	1315
40	1240	1240	1244	1250	1257	1257	1256	1249	1248	1242	1241	1246	1248	1253	1255	1253	1247	1241	1237
45	1163	1162	1168	1165	1170	1169	1173	1167	1164	1155	1155	1161	1171	1169	1165	1169	1163	1163	1152
50	1062	1062	1071	1081	1087	1080	1082	1081	1071	1065	1065	1069	1079	1077	1075	1078	1076	1066	1061
55	957	957	964	975	985	990	990	977	971	959	959	966	982	993	996	987	970	962	949
60	956	961	910	868	888	913	891	959	970	933	926	973	974	886	907	888	889	970	1010
65	906	919	961	866	903	884	809	896	942	943	940	915	948	820	966	847	924	946	900
70	1038	1027	983	948	947	1040	979	876	1041	1052	1047	1068	1025	956	1063	919	989	1050	1018
75	995	990	994	929	907	1147	847	903	986	996	1025	1100	1106	990	1030	975	964	982	912
80	681	667	758	809	800	899	823	793	787	724	682	738	771	724	822	786	759	711	646
85	322	320	350	391	375	370	374	412	397	352	343	375	399	366	375	370	381	369	336
90	263	262	277	279	264	280	287	306	309	317	328	343	310	264	242	243	267	286	274
95	201	204	206	179	145	136	138	156	188	190	181	168	140	121	118	122	133	160	171
100	96.6	97.8	97.9	87.4	70.3	63.5	69.4	87.3	103	101	99.3	96.1	77.7	57.9	50.6	54.6	72.9	91.8	91.6
105	47.0	48.1	45.2	36.2	24.9	17.0	22.4	32.3	40.2	41.1	40.1	36.3	28.1	18.5	15.3	17.0	25.6	33.8	37.5
110	17.7	17.5	16.5	14.4	13.4	13.9	14.2	14.5	15.8	16.7	16.9	16.2	14.3	13.0	12.7	12.8	13.5	15.1	15.8
115	15.2	15.3	14.2	11.6	9.30	9.17	9.51	11.4	14.0	15.1	16.1	17.4	14.8	9.89	7.91	8.28	10.0	13.8	14.8
120	10.5	10.5	9.63	7.63	5.23	4.51	5.43	8.22	10.6	11.3	11.1	10.0	7.93	5.32	3.97	4.50	6.75	8.36	9.39
125	6.15	6.18	5.61	4.40	2.70	1.43	2.86	4.64	6.02	6.70	6.71	6.09	4.83	3.03	1.34	2.13	3.78	4.91	5.72
130	3.52	3.53	3.06	2.15	1.09	0.86	1.19	2.35	3.44	4.06	4.10	3.57	2.54	1.33	0.85	0.85	1.63	2.54	3.22
135	1.48	1.48	1.17	0.89	0.89	0.89	0.89	0.92	1.38	1.77	1.80	1.46	0.95	0.88	0.88	0.89	0.89	0.89	1.26
140	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.96	0.96	0.95	0.95	0.95	0.95	1.23
145	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	1.00	1.00	1.00	1.00	1.35
150	1.00	1.00	1.00	1.00	1.01	1.02	1.01	1.01	1.01	1.00	1.00	1.00	1.01	1.01	1.01	1.01	1.01	1.01	1.42
155	1.02	1.02	1.02	1.02	1.02	1.03	1.02	1.02	1.02	1.02	1.02	1.02	1.03	1.03	1.03	1.03	1.03	1.02	1.46
160	1.06	1.06	1.06	1.06	1.07	1.07	1.07	1.07	1.07	1.06	1.06	1.06	1.07	1.07	1.07	1.07	1.07	1.07	1.50
165	1.11	1.12	1.12	1.12	1.12	1.13	1.13	1.13	1.13	1.12	1.12	1.12	1.12	1.12	1.12	1.13	1.13	1.12	1.50
170	1.19	1.19	1.19	1.19	1.20	1.21	1.20	1.20	1.20	1.20	1.19	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.49
175	1.31	1.31	1.31	1.31	1.32	1.32	1.32	1.32	1.32	1.32	1.32	1.32	1.32	1.32	1.32	1.32	1.32	1.32	1.48
180	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37

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	1539	1539	1539	1539	1539	1539	1539	1539	1539	1539	1539	1539	1539	1539	1539	1539	1539		
5	1537	1538	1537	1538	1536	1538	1538	1538	1538	1538	1537	1537	1537	1536	1537	1537	1536		
10	1528	1529	1529	1530	1530	1532	1532	1531	1530	1530	1530	1531	1532	1529	1531	1530	1529		
15	1508	1510	1511	1513	1512	1515	1515	1513	1512	1511	1512	1513	1515	1514	1515	1513	1511		
20	1479	1482	1484	1486	1485	1486	1486	1484	1483	1482	1483	1485	1487	1486	1488	1485	1483		
25	1437	1440	1444	1446	1445	1447	1445	1443	1441	1440	1442	1444	1446	1446	1446	1445	1441		
30	1383	1386	1391	1394	1394	1396	1392	1390	1386	1386	1389	1392	1395	1395	1395	1392	1388		
35	1314	1319	1325	1330	1330	1331	1328	1323	1320	1319	1323	1327	1330	1330	1331	1327	1321		
40	1238	1241	1245	1252	1255	1256	1250	1246	1243	1243	1245	1249	1254	1255	1254	1249	1243		
45	1152	1163	1163	1168	1168	1173	1166	1166	1156	1155	1166	1165	1171	1170	1169	1165	1166		
50	1059	1064	1078	1081	1079	1081	1085	1069	1060	1059	1068	1084	1081	1080	1086	1081	1069		
55	947	960	972	991	1006	987	982	963	959	958	960	977	985	991	988	979	964		
60	1022	973	877	892	911	896	877	959	984	982	939	879	899	917	897	866	910		
65	900	934	956	850	870	849	961	920	874	878	927	913	879	818	890	884	939		
70	1014	1033	937	962	939	990	906	943	1001	992	960	961	994	936	986	1003	1038		
75	896	929	934	998	1104	926	917	920	915	956	1022	1015	1005	1031	958	997	1020		
80	650	722	795	753	789	777	850	868	815	786	816	828	799	843	758	774	709		
85	328	341	349	326	339	352	349	342	316	322	347	388	388	386	384	398	356		
90	278	292	297	243	249	254	278	303	282	273	268	247	229	252	239	257	272		
95	168	151	129	116	114	121	148	169	159	158	178	152	127	130	130	160	191		
100	89.9	85.5	71.0	51.1	47.5	59.4	76.6	91.3	93.8	94.9	93.7	80.9	65.5	56.5	67.7	82.7	96.5		
105	36.7	32.8	25.0	17.2	12.8	18.4	27.8	37.8	41.8	42.0	38.5	29.8	21.3	15.7	22.3	33.9	43.2		
110	15.7	14.9	13.1	11.6	11.2	12.0	13.7	16.3	16.9	17.1	16.1	14.0	12.8	12.7	12.6	14.6	16.8		
115	16.9	18.3	16.0	10.9	6.97	7.82	11.1	13.0	14.0	14.0	13.5	12.2	9.71	8.31	8.93	11.5	14.3		
120	9.06	8.33	6.57	4.29	3.28	4.32	6.59	8.47	9.95	9.88	9.07	6.93	4.66	4.17	4.97	7.44	9.70		
125	5.68	5.12	3.84	2.19	0.93	2.30	3.94	5.32	6.01	6.04	5.48	4.26	2.66	1.42	2.73	4.40	5.68		
130	3.15	2.70	1.82	0.97	0.97	0.99	1.93	2.91	3.45	3.53	3.07	2.16	1.12	0.97	1.22	2.29	3.19		
135	1.25	1.10	1.10	1.10	1.10	1.10	1.10	1.15	1.46	1.50	1.21	1.10	1.10	1.10	1.10	1.10	1.42		
140	1.23	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.23	1.23	1.23	1.24	1.23	1.24	1.24	1.23	1.23		
145	1.35	1.35	1.36	1.36	1.36	1.36	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35		
150	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.42	1.42	1.42	1.42	1.43	1.42	1.42	1.42		
155	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47		
160	1.50	1.50	1.51	1.51	1.51	1.51	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50		
165	1.50	1.51	1.51	1.51	1.51	1.52	1.51	1.50	1.50	1.50	1.50	1.50	1.50	1.51	1.51	1.51	1.50		
170	1.50	1.50	1.51	1.51	1.51	1.51	1.51	1.50	1.50	1.50	1.50	1.50	1.50	1.51	1.51	1.50	1.50		
175	1.48	1.49	1.49	1.49	1.49	1.50	1.49	1.49	1.49	1.48	1.48	1.48	1.49	1.49	1.49	1.49	1.49		
180	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37		

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.

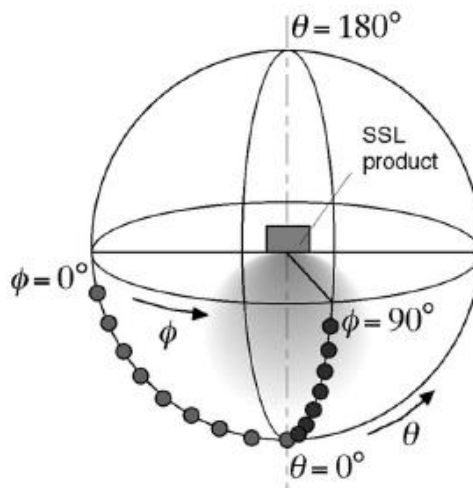
Color Characteristics Measurements

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 ***

This report is considered invalidated without the Special Seal for Inspection of the LTL. This report shall not be altered, increased or deleted. The results shown in this test report refer only to the sample(s) tested. Without written approval of LTL, this test report shall not be copied except in full and published as advertisement.