



LM-79-08 Test Report

for

REVOLUTION LIGHTING TECHNOLOGIES, INC

2280 Ward Ave Simi Valley, CA 93065

Canopy Luminaires

Model: 111072-3X4

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ18040033f/R1

This report is replaced the old report No. HZ18040033f 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: **111072-3X4**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
116.0	4620.3	39.83	0.9760
CCT (K)	CRI	Stabilization Time (Light & Power)	
4932	77.7	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

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Sample Photo

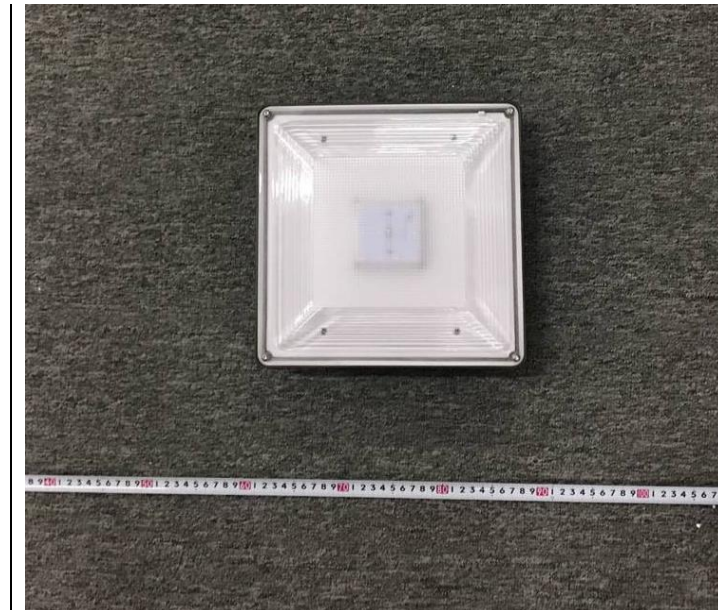


Figure 1- Overview of the sample

Equipment Under Test (EUT)

Name	: Canopy Luminaires
Model	: 111072-3X4
Electrical Ratings	: 347~480Vac, 50/60Hz, 40W
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 24.9°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)	0.118	0.090
Power Factor	0.9760	0.9301
Test Power (W)	39.83	40.24
THD A%	4.03	6.17
Luminous Efficacy (lm/W)	116.0	114.5
Total Luminous Flux (lm)	4620.3	4607.5
Color Rendering Index (CRI)	77.7	
R9	-18	
Correlated Color Temperature (CCT) (K)	4932	
Chromaticity (Chroma x, Chroma y)	(0.3473, 0.3562)	
Chromaticity (Chroma u, Chroma v)	(0.2111, 0.3248)	
Chromaticity (Chroma u', Chroma v')	(0.2111, 0.4872)	
Duv	0.0014	
Average Beam Angle (°)	158.7	
Center Beam Candle Power (cd)	1066	
Spacing Criteria	1.40 (0°-180°)/ 1.41 (90°-270°)	
Zonal Lumens in the 0°-60° Zone	61.00%	
Zonal Lumens in the 60°-90° Zone	35.66%	
Zonal Lumens in the 90°-120° Zone	3.22%	
Zonal Lumens in the 120°-180° Zone	0.11%	

Special Color Rendering Indices	
R1	75
R2	84
R3	90
R4	76
R5	76
R6	78
R7	84
R8	58
R9	-18
R10	62
R11	74
R12	51
R13	77
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

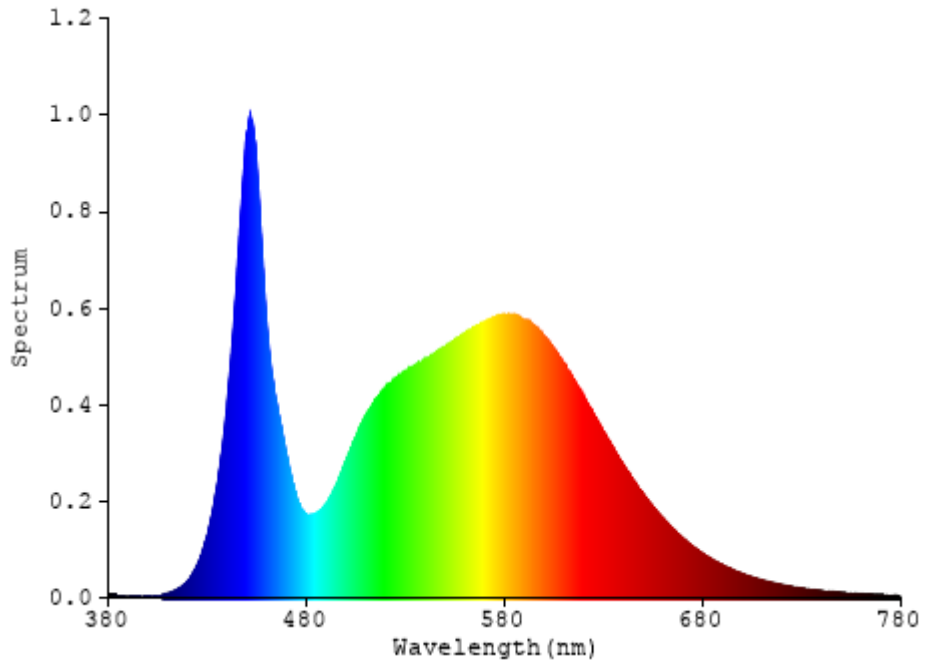


Chart 1: Spectral Power Distribution

Zonal Lumen Tabulation

$\gamma(^{\circ})$	Lumens	% Total
0- 10	102.343	2.22%
10- 20	304.013	6.58%
20- 30	486.378	10.53%
30- 40	619.752	13.41%
40- 50	671.938	14.54%
50- 60	634.164	13.73%
60- 70	634.899	13.74%
70- 80	714.231	15.46%
80- 90	298.665	6.46%
90-100	115.929	2.51%
100-110	26.601	0.58%
110-120	6.467	0.14%
120-130	2.441	0.05%
130-140	0.824	0.02%
140-150	0.673	0.01%
150-160	0.547	0.01%
160-170	0.354	0.01%
170-180	0.123	0.00%
Total	4620.3	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	2818.588	61.00%
60- 90	1647.795	35.66%
0-90	4466.383	96.67%
90- 180	153.959	3.33%
0- 180	4620.3	100%

Table 3: Zonal Lumen Data

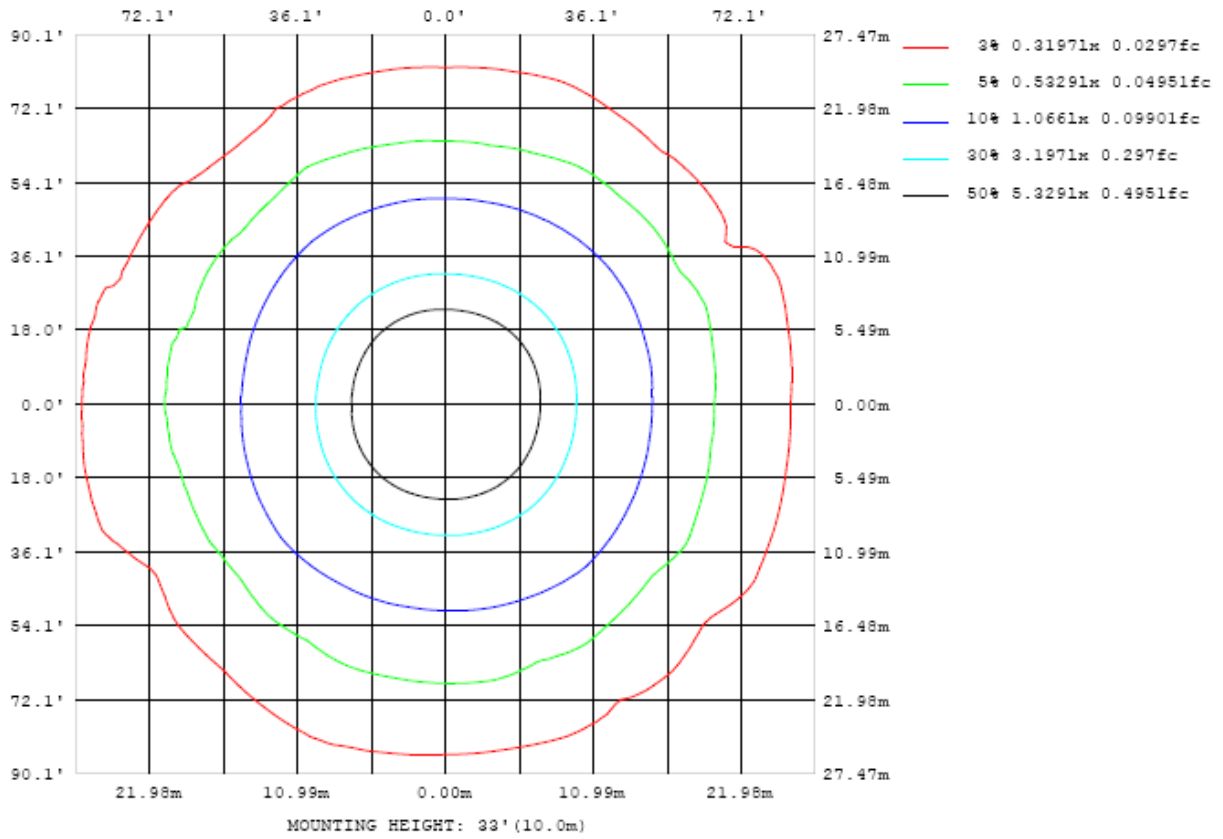


Chart 2: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots

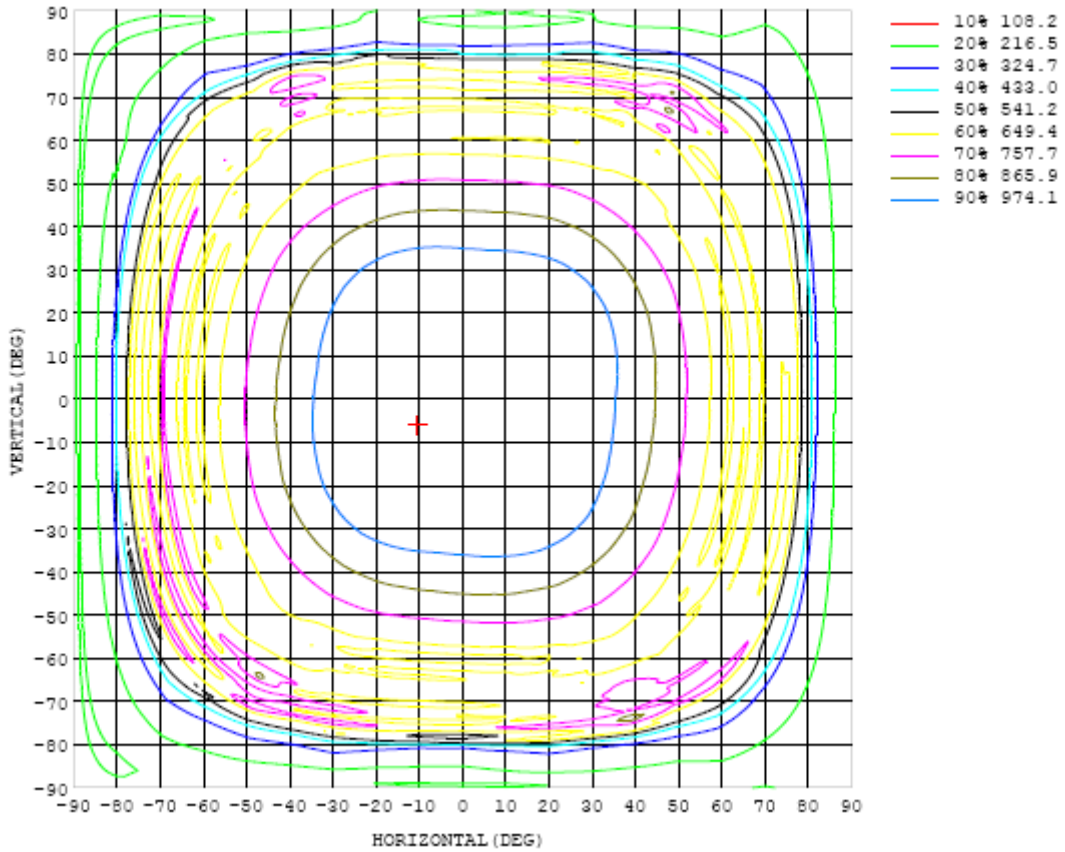


Chart 3: Isocandela Plot

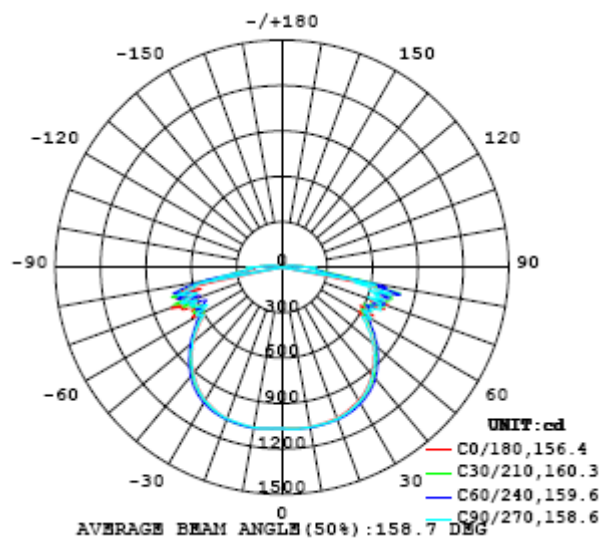


Chart 4: Polar Candela Distribution

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	1066	1066	1066	1066	1066	1066	1066	1066	1066	1066	1066	1066	1066	1066	1066	1066	1066	1066	1066
5	1068	1069	1069	1070	1071	1071	1071	1071	1071	1071	1071	1071	1072	1073	1072	1072	1071	1071	1070
10	1069	1071	1073	1075	1076	1077	1076	1074	1073	1071	1073	1074	1077	1079	1080	1081	1079	1077	1075
15	1065	1067	1069	1073	1075	1075	1075	1073	1071	1069	1069	1072	1076	1079	1080	1081	1078	1075	1072
20	1059	1060	1064	1067	1068	1070	1072	1072	1069	1066	1067	1070	1074	1075	1074	1073	1071	1068	1063
25	1040	1042	1048	1054	1060	1063	1062	1059	1054	1050	1049	1055	1062	1065	1064	1061	1055	1049	1043
30	1015	1017	1023	1030	1039	1044	1041	1035	1030	1024	1023	1030	1036	1041	1042	1036	1026	1020	1013
35	977	979	987	998	1009	1011	1009	1002	992	984	983	991	1000	1005	1003	1000	987	978	969
40	922	923	933	949	962	965	961	951	938	929	926	935	945	953	952	945	931	918	909
45	858	859	871	884	897	903	897	888	873	866	865	868	881	884	883	876	866	849	842
50	787	789	801	817	822	822	824	811	804	786	783	797	800	808	801	799	785	775	765
55	691	692	706	731	742	753	738	725	705	687	685	697	717	718	730	716	704	679	671
60	594	594	607	635	658	672	657	626	665	680	678	661	618	642	660	638	606	615	632
65	645	653	615	611	627	586	635	668	662	648	639	645	653	607	576	636	639	644	619
70	676	656	638	700	715	726	720	680	689	675	661	717	747	699	695	707	798	771	732
75	644	634	657	716	760	829	654	654	647	595	580	602	688	788	801	753	605	555	553
80	482	486	532	621	573	636	558	570	506	453	431	482	518	488	536	506	566	526	495
85	238	240	243	258	234	248	245	254	227	217	219	233	264	246	240	232	245	224	213
90	211	204	220	207	177	158	175	202	210	197	186	182	164	140	148	155	172	186	191
95	113	110	108	101	87.8	86.2	91.3	110	112	107	107	109	98.8	82.2	82.0	81.4	100.0	107	104
100	71.2	70.9	66.7	57.5	41.6	37.8	45.3	58.5	65.4	66.0	67.5	64.3	55.7	39.0	34.6	41.4	53.0	61.9	64.3
105	29.4	28.8	26.5	20.6	12.5	8.05	12.0	19.5	27.0	28.1	27.4	25.8	19.8	11.5	8.94	11.4	18.8	24.4	28.0
110	10.1	10.3	9.83	8.26	6.72	5.95	6.31	7.52	8.81	9.22	9.12	8.87	7.89	6.45	6.08	6.72	8.24	9.47	9.77
115	8.26	8.59	8.69	9.47	4.63	3.87	4.11	5.49	6.56	7.00	7.39	7.03	6.02	4.30	3.97	4.59	6.21	7.32	7.73
120	6.03	6.11	5.54	4.44	2.78	1.98	2.50	3.80	4.54	5.09	5.25	4.80	4.05	2.54	1.84	2.79	4.04	4.84	5.20
125	3.78	3.83	3.59	2.72	1.58	0.74	1.29	2.25	2.88	3.29	3.40	3.16	2.45	1.42	0.73	1.36	2.41	3.10	3.45
130	2.20	2.24	1.97	1.39	0.77	0.77	0.77	1.07	1.60	1.88	1.95	1.77	1.23	0.82	0.78	0.78	1.01	1.54	1.90
135	0.87	0.89	0.82	0.81	0.81	0.81	0.81	0.81	0.82	0.86	0.90	0.84	0.82	0.82	0.82	0.82	0.82	0.82	0.97
140	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.89	0.89	0.89	0.89	0.89	0.89	1.10
145	0.94	0.93	0.93	0.93	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.95	0.95	0.95	0.95	0.95	0.95	1.21
150	0.97	0.97	0.97	0.97	0.97	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.99	0.99	0.99	0.98	0.98	1.29
155	1.02	1.02	1.02	1.02	1.02	1.03	1.03	1.02	1.02	1.02	1.02	1.02	1.02	1.03	1.03	1.03	1.03	1.03	1.34
160	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.08	1.07	1.07	1.08	1.08	1.08	1.08	1.08	1.07	1.37
165	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.11	1.12	1.13	1.13	1.14	1.13	1.12	1.11	1.37
170	1.17	1.17	1.18	1.18	1.18	1.19	1.18	1.18	1.18	1.18	1.18	1.18	1.19	1.19	1.20	1.19	1.19	1.18	1.35
175	1.28	1.28	1.28	1.29	1.29	1.29	1.29	1.29	1.28	1.29	1.29	1.29	1.29	1.29	1.30	1.30	1.29	1.29	1.35
180	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	1.32	1.32	1.32	1.32	1.32

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	1066	1066	1066	1066	1066	1066	1066	1066	1066	1066	1066	1066	1066	1066	1066	1066	1066		
5	1070	1070	1070	1069	1070	1070	1070	1070	1069	1069	1069	1069	1069	1068	1068	1068	1067		
10	1075	1075	1077	1079	1080	1079	1077	1076	1074	1074	1074	1075	1076	1076	1075	1073	1071		
15	1071	1073	1077	1080	1080	1078	1074	1070	1068	1067	1069	1073	1075	1076	1075	1073	1068		
20	1061	1066	1071	1072	1071	1070	1069	1066	1063	1062	1065	1067	1068	1069	1070	1069	1064		
25	1041	1048	1053	1057	1059	1059	1056	1050	1045	1044	1050	1056	1059	1060	1059	1056	1048		
30	1011	1019	1024	1032	1037	1036	1029	1022	1016	1016	1023	1030	1039	1043	1038	1031	1024		
35	967	975	984	994	999	996	990	981	973	973	983	995	1005	1009	1007	998	988		
40	908	917	929	942	946	943	933	923	915	916	928	944	956	963	961	949	936		
45	841	847	862	870	874	871	866	853	847	848	860	879	889	896	893	883	873		
50	763	773	783	792	791	791	787	779	775	778	787	803	811	814	814	816	798		
55	671	679	700	710	721	710	704	687	678	680	699	715	731	741	733	728	709		
60	623	599	600	627	644	635	602	628	643	634	615	621	651	663	644	626	609		
65	619	667	593	636	570	572	541	604	622	636	612	552	644	576	640	585	584		
70	739	774	671	665	670	659	583	658	701	708	687	639	635	599	735	638	640		
75	571	650	756	693	743	636	687	723	715	740	773	743	610	889	640	686	684		
80	484	520	517	517	600	525	562	478	432	421	464	529	525	636	553	592	532		
85	213	224	257	245	244	240	277	256	241	237	253	284	267	275	263	291	262		
90	193	204	189	159	152	167	217	227	225	196	228	202	163	165	165	213	213		
95	105	107	105	88.7	88.4	94.1	108	120	113	110	114	103	91.4	87.9	92.6	104	113		
100	62.6	62.2	56.1	42.6	38.2	44.0	62.4	71.2	68.6	69.0	66.7	56.1	42.3	38.8	42.5	61.8	75.1		
105	27.9	24.0	18.8	12.1	10.2	13.8	21.6	26.2	27.5	27.0	25.3	20.0	12.3	8.78	13.9	21.9	28.1		
110	9.70	9.13	7.94	7.02	7.23	8.15	9.53	10.6	11.0	10.9	10.4	9.11	7.70	6.79	7.21	8.55	9.76		
115	7.72	7.13	5.84	4.67	4.39	5.31	7.08	8.35	9.28	10.0	9.84	7.93	4.97	4.37	4.82	6.19	7.72		
120	5.10	4.75	3.78	2.53	2.15	3.37	4.96	6.30	6.88	6.73	6.00	4.69	3.16	2.34	2.84	4.53	5.84		
125	3.38	3.00	2.24	1.20	0.99	2.02	3.20	4.08	4.49	4.45	3.99	3.07	1.93	0.96	1.52	2.78	3.56		
130	1.86	1.56	0.99	0.86	0.86	1.07	1.83	2.52	2.90	2.87	2.48	1.76	1.04	0.86	0.85	1.40	2.03		
135	0.97	0.98	0.98	0.98	0.98	0.98	0.99	1.27	1.50	1.49	1.24	0.98	0.97	0.97	0.97	0.96	0.96		
140	1.10	1.11	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.11	1.10	1.10	1.09	1.09	1.09		
145	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.21	1.21	1.20		
150	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.29	1.29	1.29		
155	1.35	1.35	1.35	1.35	1.35	1.34	1.34	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.34	1.34	1.34		
160	1.38	1.39	1.39	1.38	1.38	1.38	1.37	1.38	1.38	1.38	1.38	1.39	1.39	1.38	1.38	1.38	1.37		
165	1.37	1.37	1.38	1.38	1.38	1.38	1.37	1.38	1.38	1.37	1.37	1.38	1.38	1.38	1.38	1.37	1.37		
170	1.36	1.36	1.36	1.37	1.37	1.37	1.36	1.36	1.36	1.36	1.36	1.37	1.37	1.37	1.37	1.36	1.36		
175	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.35	1.35	1.35	1.36	1.36	1.36	1.37	1.36	1.35		
180	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	1.32	1.32	1.32		

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 $k=2$.

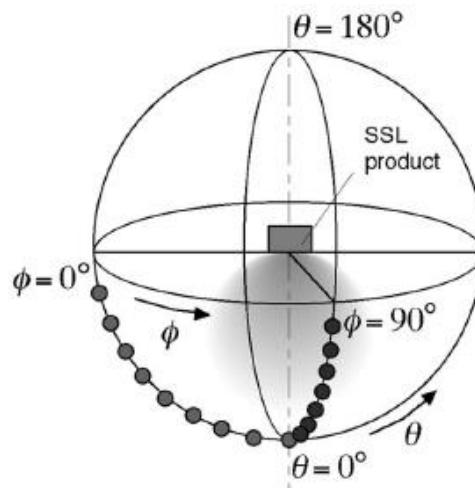
Color Characteristics Measurements

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 ***

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.