



LM-79-08 Test Report

for

REVOLUTION LIGHTING TECHNOLOGIES, INC

2280 Ward Ave Simi Valley, CA 93065

Canopy Luminaires

Model: 111012-3X4

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ18030017f

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: **111012-3X4**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
115.1	4727.1	41.07	0.9964
CCT (K)	CRI	Stabilization Time (Light & Power)	
4954	77.6	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	: 111012-3X4
Electrical Ratings	: 100~277V, 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 24.6°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)	0.343	0.428	0.159	R3	90
Power Factor	0.9964	0.9779	0.9178	R4	76
Test Power (W)	41.07	41.82	40.41	R5	75
THD A%	4.91	4.71	10.06	R6	77
Luminous Efficacy (lm/W)	115.1	113.0	117.2	R7	84
Total Luminous Flux (lm)	4727.1	4725.7	4736.1	R8	59
Color Rendering Index (CRI)	77.6			R9	-17
R9	-17			R10	62
Correlated Color Temperature (CCT) (K)	4954			R11	73
Chromaticity (Chroma x, Chroma y)	(0.3467, 0.3556)			R12	49
Chromaticity (Chroma u, Chroma v)	(0.2109, 0.3245)			R13	77
Chromaticity (Chroma u', Chroma v')	(0.2109, 0.4868)			R14	95
Duv	0.0014				
Average Beam Angle (°)	160.2				
Center Beam Candle Power (cd)	1113				
Spacing Criteria	1.35 (0°-180°)/ 1.34 (90°-270°)				
Zonal Lumens in the 0°-60°Zone	59.15%				
Zonal Lumens in the 60°-90°Zone	37.20%				
Zonal Lumens in the 90°-120°Zone	3.54%				
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

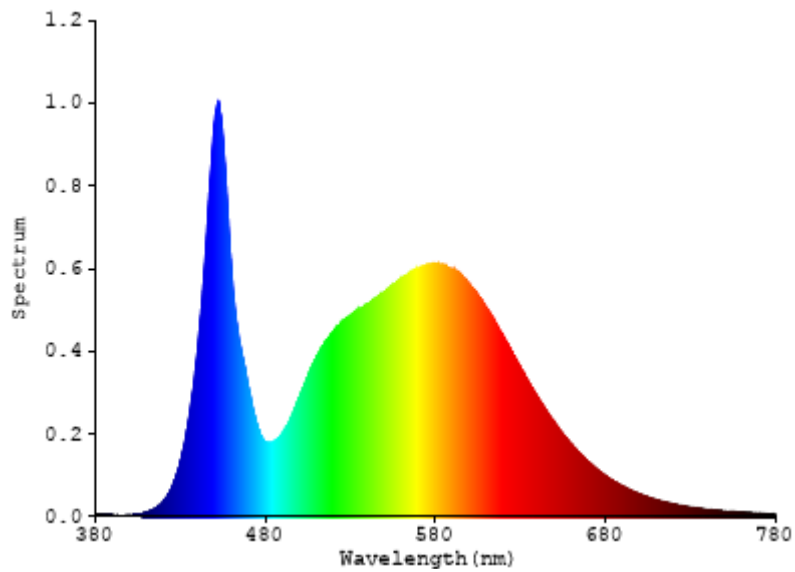


Chart 1: Spectral Power Distribution

Zonal Lumen Tabulation

$\gamma(^{\circ})$	Lumens	% Total
0- 10	106.01	2.24%
10- 20	309.387	6.54%
20- 30	482.72	10.21%
30- 40	602.703	12.75%
40- 50	654.513	13.85%
50- 60	640.898	13.56%
60- 70	661.292	13.99%
70- 80	773.343	16.36%
80- 90	323.676	6.85%
90-100	128.207	2.71%
100-110	29.595	0.63%
110-120	9.398	0.20%
120-130	3.292	0.07%
130-140	0.818	0.02%
140-150	0.519	0.01%
150-160	0.407	0.01%
160-170	0.263	0.01%
170-180	0.092	0.00%
Total	4727.1	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	2796.231	59.15%
60- 90	1758.311	37.20%
0-90	4554.542	96.35%
90- 180	172.591	3.65%
0- 180	4727.1	100%

Table 3: Zonal Lumen Data

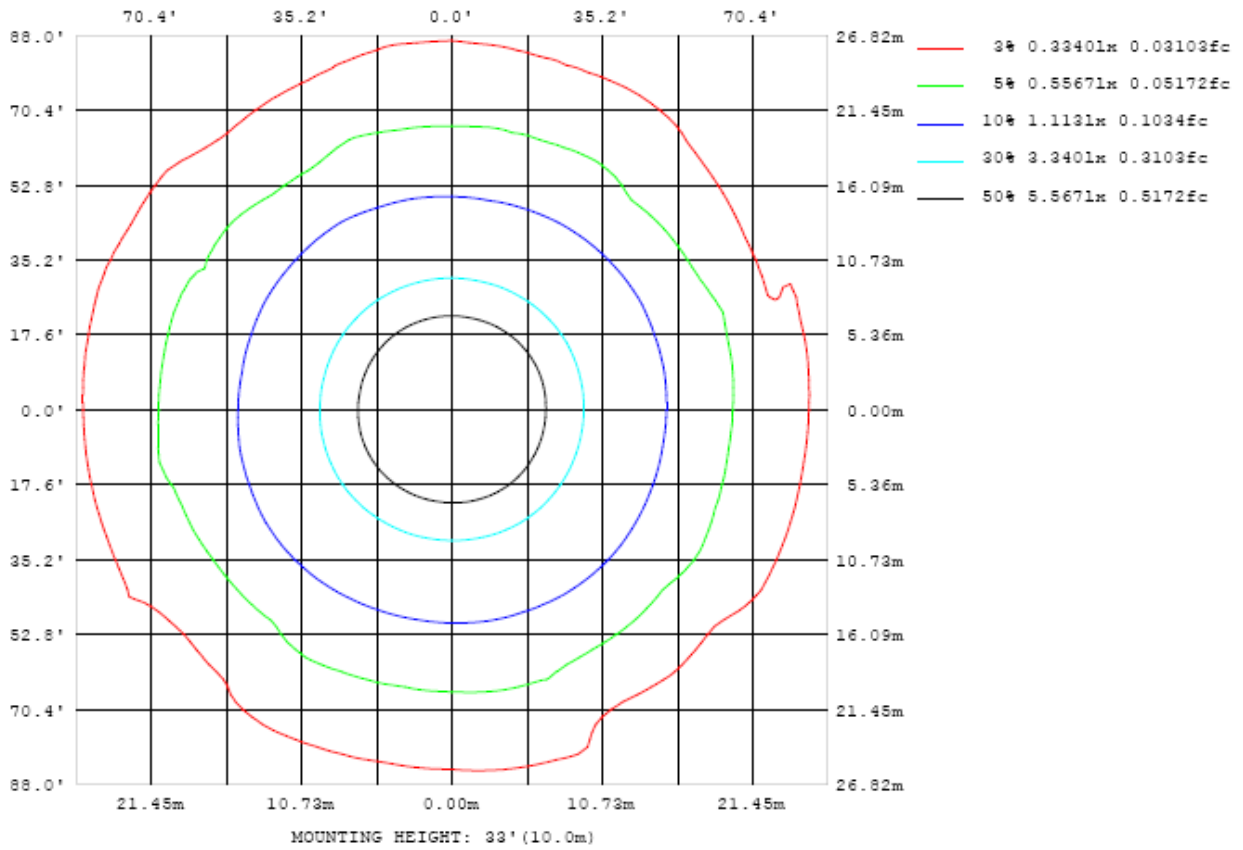


Chart 2: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots

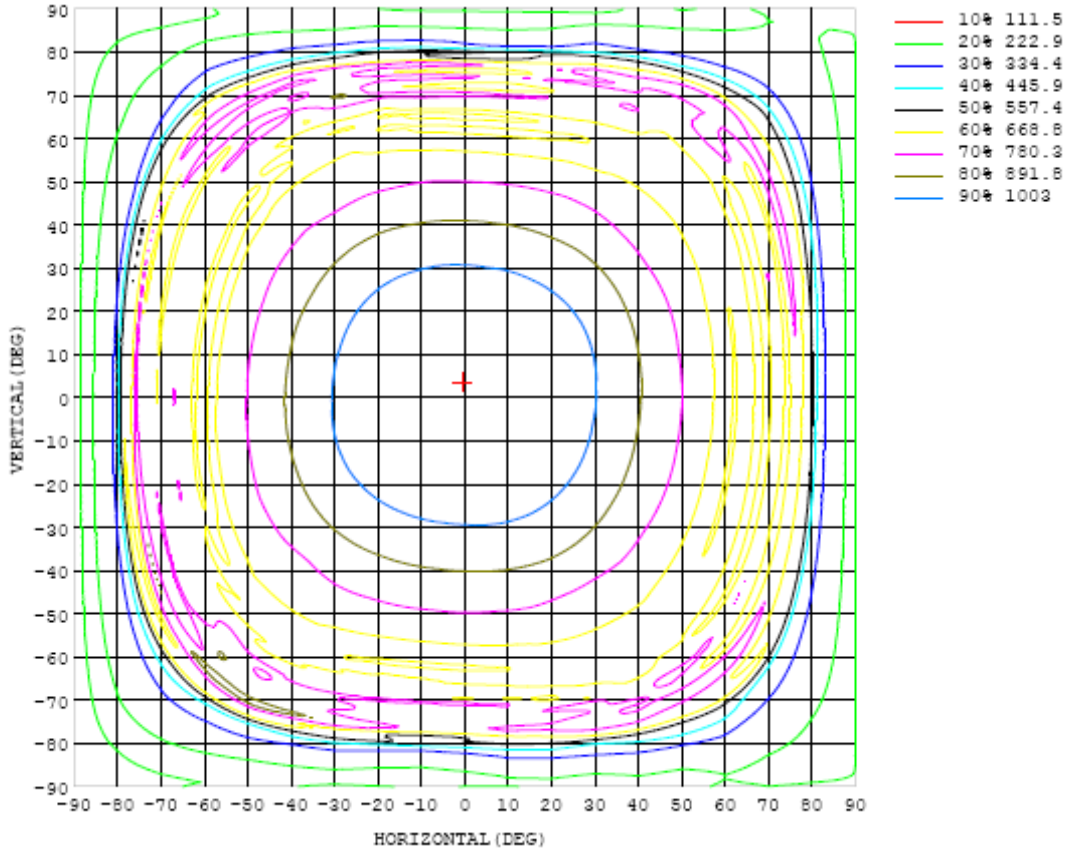


Chart 3: Isocandela Plot

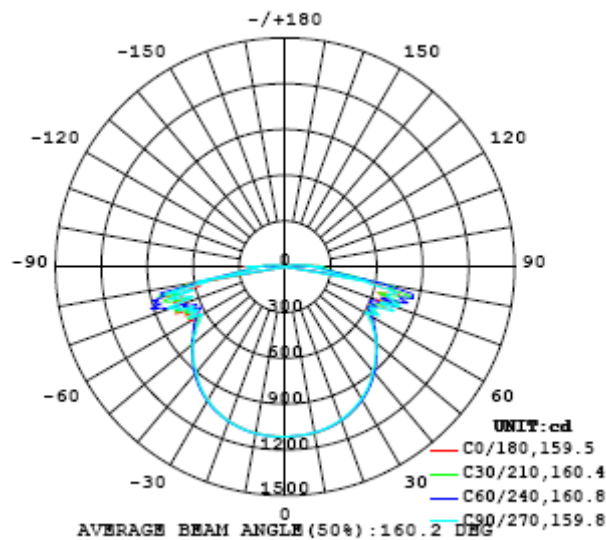


Chart 4: Polar Candela Distribution

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	1113	1113	1113	1113	1113	1113	1113	1113	1113	1113	1113	1113	1113	1113	1113	1113	1113	1113	1113
5	1112	1112	1112	1112	1111	1110	1111	1111	1111	1111	1110	1112	1110	1111	1111	1112	1113	1113	1112
10	1106	1106	1105	1106	1106	1105	1103	1104	1103	1102	1103	1104	1104	1105	1106	1106	1106	1107	1106
15	1094	1093	1092	1093	1093	1092	1092	1091	1090	1088	1088	1089	1091	1092	1093	1094	1094	1094	1093
20	1074	1072	1072	1073	1074	1073	1073	1071	1069	1067	1067	1070	1069	1072	1074	1075	1075	1075	1073
25	1044	1042	1043	1044	1045	1045	1044	1042	1039	1037	1036	1038	1041	1044	1046	1047	1047	1048	1046
30	1006	1004	1005	1007	1009	1009	1008	1006	1002	999	998	1000	1003	1006	1010	1013	1013	1012	1010
35	956	954	956	960	962	964	962	958	954	951	949	952	957	961	966	969	968	966	963
40	900	896	899	903	907	910	909	905	899	894	892	896	901	908	914	915	913	911	907
45	839	836	837	843	843	846	846	841	839	833	832	836	842	846	851	853	854	851	855
50	782	778	780	778	784	778	779	786	779	777	775	779	783	791	784	789	792	793	785
55	703	702	703	717	720	713	718	718	705	700	698	703	714	726	730	731	727	715	710
60	627	619	627	637	655	662	648	639	629	614	608	617	635	663	666	670	650	664	702
65	596	605	608	607	657	603	609	640	608	641	657	660	631	667	592	673	660	717	674
70	633	646	664	670	689	611	735	684	659	704	704	686	703	780	726	805	715	749	746
75	669	683	714	697	707	836	774	704	744	712	674	699	756	828	831	803	735	745	692
80	577	559	590	647	629	666	647	605	580	524	522	573	591	581	572	505	512	504	430
85	265	257	271	306	297	300	290	291	289	254	238	244	263	251	249	249	257	247	232
90	223	230	223	235	200	204	177	212	226	225	213	229	250	218	204	203	242	271	258
95	137	135	129	121	102	91.0	95.1	101	114	115	114	111	106	89.7	86.4	83.9	104	115	109
100	77.9	76.4	74.7	67.9	49.1	40.8	43.6	54.3	73.2	70.8	68.4	68.3	61.2	44.9	38.1	40.7	53.5	64.1	64.8
105	33.1	33.5	31.8	26.7	17.9	11.2	11.9	18.6	25.3	28.5	28.3	26.9	24.1	15.9	12.2	13.6	19.0	25.8	29.3
110	12.9	13.1	12.7	11.7	10.5	9.98	9.70	10.4	11.5	12.2	12.3	12.1	11.2	10.0	9.95	10.1	11.0	12.8	13.2
115	11.4	11.7	11.8	10.4	8.54	6.54	6.36	7.55	9.36	10.3	10.4	10.5	10.8	10.8	7.05	6.98	8.86	10.5	11.1
120	8.55	8.84	8.02	6.77	4.57	3.22	3.28	5.27	7.36	7.99	7.95	7.32	6.56	4.41	3.14	3.57	5.50	6.94	8.07
125	4.84	4.90	4.56	3.72	2.46	1.11	1.37	2.78	3.95	4.66	4.71	4.28	3.52	2.34	1.03	1.65	3.16	4.21	4.97
130	2.71	2.81	2.54	1.87	1.01	0.62	0.62	1.12	2.03	2.53	2.63	2.36	1.74	0.88	0.61	0.67	1.47	2.31	2.99
135	1.06	1.12	0.93	0.65	0.64	0.64	0.64	0.64	0.64	0.78	0.90	0.74	0.63	0.63	0.63	0.63	0.63	0.89	1.42
140	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.67	0.87
145	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.96
150	0.71	0.71	0.71	0.72	0.72	0.72	0.72	0.72	0.72	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.72	1.01
155	0.72	0.72	0.72	0.72	0.72	0.73	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	1.03
160	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	1.05
165	0.78	0.79	0.79	0.79	0.79	0.79	0.80	0.80	0.80	0.80	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	1.06
170	0.84	0.84	0.84	0.85	0.85	0.85	0.85	0.85	0.85	0.84	0.84	0.84	0.85	0.84	0.85	0.84	0.85	0.85	1.05
175	0.93	0.92	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	1.04
180	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.96	0.96	0.97	0.97	0.97	0.97	0.97	0.97	0.96

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	1113	1113	1113	1113	1113	1113	1113	1113	1113	1113	1113	1113	1113	1113	1113	1113	1113		
5	1112	1113	1113	1114	1114	1114	1114	1113	1114	1114	1113	1112	1113	1113	1114	1113	1114		
10	1107	1107	1109	1109	1110	1110	1109	1110	1109	1108	1109	1108	1109	1110	1109	1109	1109		
15	1094	1095	1096	1097	1098	1098	1098	1097	1097	1096	1097	1097	1098	1098	1098	1097	1096		
20	1075	1076	1077	1079	1079	1079	1080	1079	1077	1076	1077	1077	1079	1079	1080	1078	1076		
25	1045	1047	1049	1052	1052	1052	1051	1050	1047	1046	1048	1050	1051	1052	1052	1050	1048		
30	1009	1012	1015	1017	1018	1016	1015	1013	1010	1009	1010	1013	1015	1017	1016	1014	1010		
35	962	964	969	971	972	970	968	966	962	960	962	966	971	972	971	968	963		
40	906	908	913	917	920	917	912	908	905	902	906	909	915	918	916	909	905		
45	854	857	853	858	856	854	852	847	847	847	846	850	851	853	853	848	843		
50	784	786	799	795	788	788	788	791	781	779	785	788	795	786	784	789	781		
55	709	710	719	732	737	733	729	709	706	704	707	715	724	720	724	719	713		
60	707	688	648	656	666	675	640	633	625	624	624	640	654	663	665	644	641		
65	670	686	722	635	637	654	644	673	699	682	668	640	667	595	613	630	596		
70	724	753	792	764	702	761	733	800	805	804	770	707	750	643	714	662	641		
75	648	663	734	852	811	861	848	793	702	686	762	804	780	729	817	653	661		
80	412	466	535	535	573	577	592	596	584	543	559	588	607	631	655	616	635		
85	226	238	266	265	253	248	268	261	238	227	238	279	273	269	272	288	290		
90	243	250	236	172	171	175	221	266	260	271	271	281	191	230	209	233	237		
95	105	108	108	90.0	82.3	82.1	98.7	115	114	113	114	119	96.2	96.5	105	116	133		
100	64.5	62.1	59.0	44.8	38.8	40.7	55.1	65.3	66.3	66.7	66.7	64.6	51.8	43.3	50.6	65.4	79.1		
105	28.5	25.9	21.7	15.7	13.9	15.7	23.4	25.4	29.4	30.9	29.0	24.6	19.0	13.3	17.4	23.8	31.0		
110	13.0	12.7	11.7	11.1	11.1	11.0	12.2	13.7	14.9	15.0	13.3	12.2	11.1	11.1	11.3	11.3	12.1		
115	11.3	10.7	10.3	9.47	7.30	7.33	9.08	12.0	12.6	12.8	12.2	10.3	7.87	7.41	7.50	8.60	10.5		
120	8.67	7.56	6.35	4.90	3.73	3.86	5.64	7.63	8.58	8.59	8.02	6.77	4.68	3.75	4.17	6.06	7.83		
125	5.20	4.84	4.11	2.94	1.38	1.86	3.22	4.37	5.03	5.07	4.75	3.92	2.66	1.30	1.88	3.33	4.39		
130	3.13	2.86	2.29	1.31	0.69	0.80	1.64	2.43	2.90	3.00	2.73	2.11	1.27	0.70	0.71	1.55	2.35		
135	1.52	1.32	0.91	0.77	0.77	0.77	0.78	1.12	1.42	1.50	1.33	0.94	0.78	0.78	0.78	0.78	0.90		
140	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.88	0.88		
145	0.95	0.95	0.96	0.96	0.96	0.96	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.96	0.96		
150	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.00	1.00	1.00	1.01	1.01	1.01	1.00	1.01	1.01	1.01		
155	1.03	1.04	1.04	1.04	1.04	1.04	1.04	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03		
160	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06		
165	1.06	1.06	1.06	1.07	1.07	1.07	1.06	1.06	1.06	1.06	1.06	1.05	1.06	1.06	1.06	1.06	1.06		
170	1.06	1.06	1.06	1.07	1.07	1.07	1.06	1.06	1.06	1.06	1.05	1.06	1.06	1.06	1.06	1.06	1.06		
175	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05		
180	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96		

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 $k=2$.

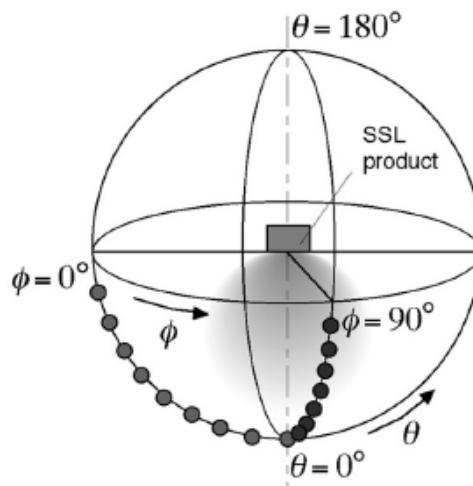
Color Characteristics Measurements

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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