



LM-79-08 Test Report

for

REVOLUTION LIGHTING TECHNOLOGIES, INC

2280 Ward Ave Simi Valley, CA 93065

Canopy Luminaires

Model: 111011-3X2

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ18030017c

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: **111011-3X2**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
111.3	3257.0	29.26	0.9960
CCT (K)	CRI	Stabilization Time (Light & Power)	
4000	76.1	60	

Table 1: Executive Data Summary

Test specifications:

Date of Receipt : Feb. 13, 2017

Date of Test : Feb. 17, 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	: 111011-3X2
Electrical Ratings	: 100~277V, 60Hz, 30W
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)	0.245	0.298	0.112	R3	93
Power Factor	0.9960	0.9928	0.9402	R4	73
Test Power (W)	29.26	29.60	29.25	R5	73
THD A%	3.64	4.63	12.24	R6	78
Luminous Efficacy (lm/W)	111.3	109.6	110.9	R7	81
Total Luminous Flux (lm)	3257.0	3246.0	3245.6	R8	52
Color Rendering Index (CRI)	76.1			R9	-23
R9	-23			R10	65
Correlated Color Temperature (CCT) (K)	4000			R11	69
Chromaticity (Chroma x, Chroma y)	(0.3793, 0.3725)			R12	52
Chromaticity (Chroma u, Chroma v)	(0.2261, 0.3330)			R13	76
Chromaticity (Chroma u', Chroma v')	(0.2261, 0.4995)			R14	96
Duv	0.0017				
Average Beam Angle (°)	160.3				
Center Beam Candle Power (cd)	760				
Spacing Criteria	1.36 (0°-180°)/ 1.34 (90°-270°)				
Zonal Lumens in the 0°-60°Zone	58.91%				
Zonal Lumens in the 60°-90°Zone	37.26%				
Zonal Lumens in the 90°-120°Zone	3.72%				
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

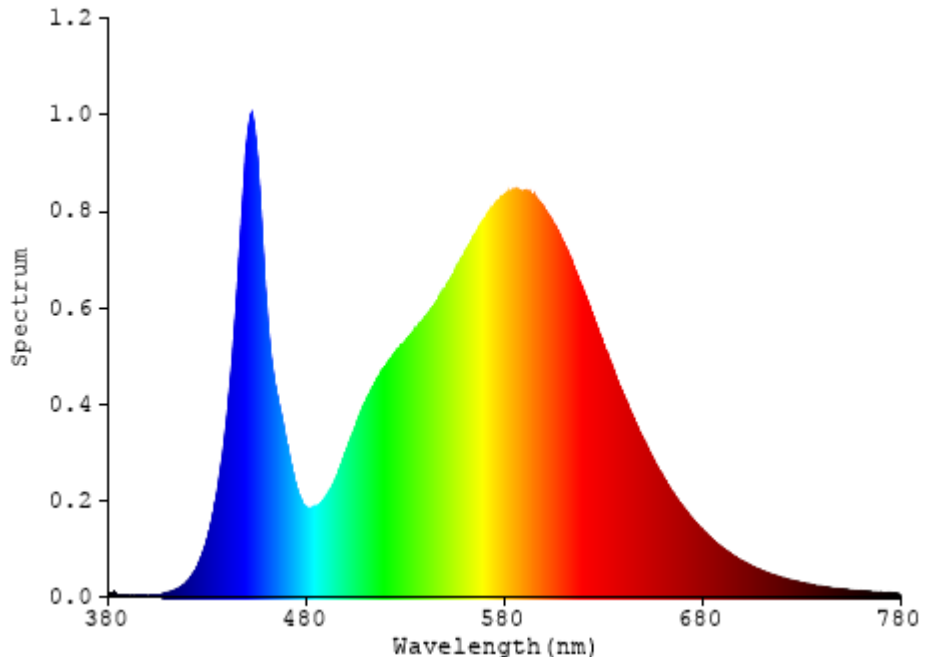


Chart 1: Spectral Power Distribution

Zonal Lumen Tabulation

$\gamma(^{\circ})$	Lumens	% Total
0- 10	72.368	2.22%
10- 20	211.268	6.49%
20- 30	329.922	10.13%
30- 40	412.694	12.67%
40- 50	449.601	13.80%
50- 60	442.703	13.59%
60- 70	449.595	13.80%
70- 80	530.234	16.28%
80- 90	233.864	7.18%
90-100	93.718	2.88%
100-110	21.469	0.66%
110-120	6.079	0.19%
120-130	2.092	0.06%
130-140	0.525	0.02%
140-150	0.35	0.01%
150-160	0.273	0.01%
160-170	0.176	0.01%
170-180	0.062	0.00%
Total	3257.0	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	1918.556	58.91%
60- 90	1213.693	37.26%
0-90	3132.249	96.17%
90- 180	124.744	3.83%
0- 180	3257.0	100%

Table 3: Zonal Lumen Data

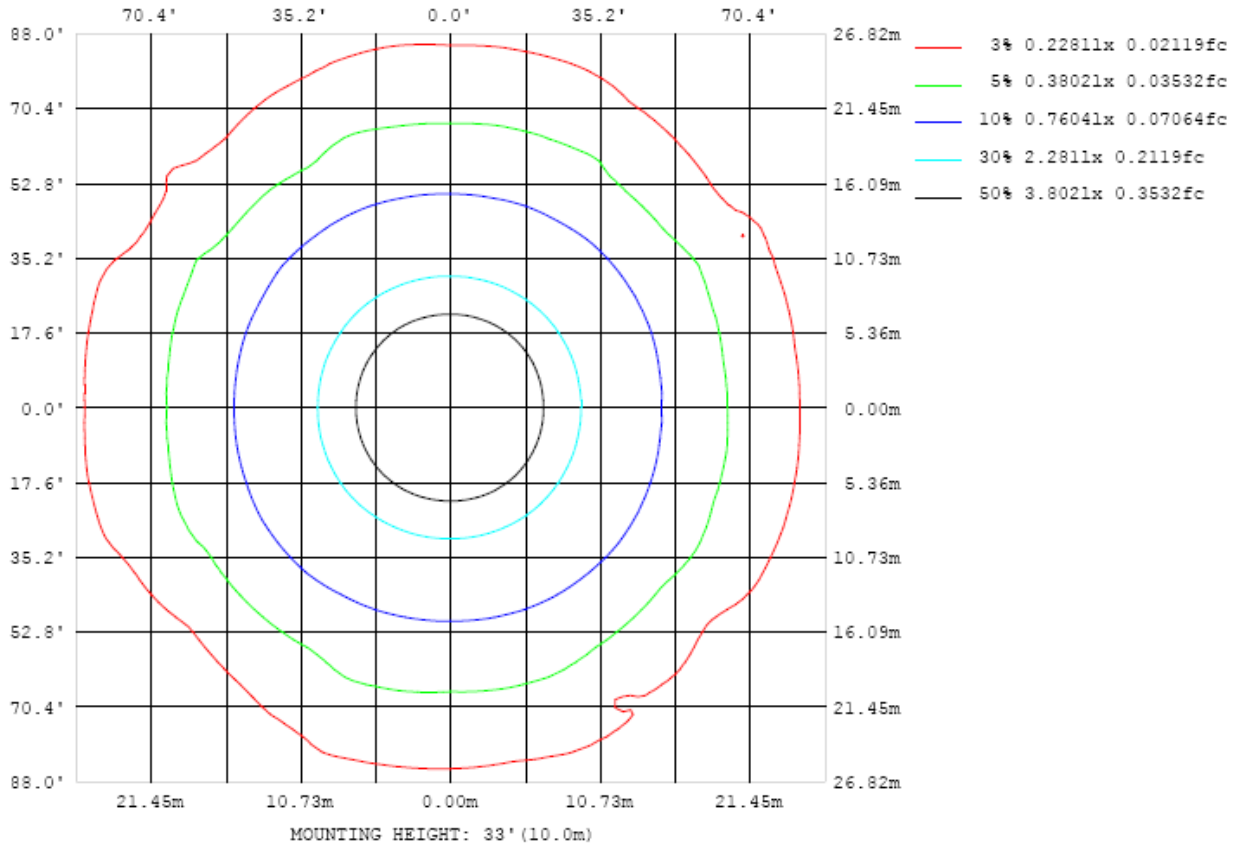


Chart 2: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots

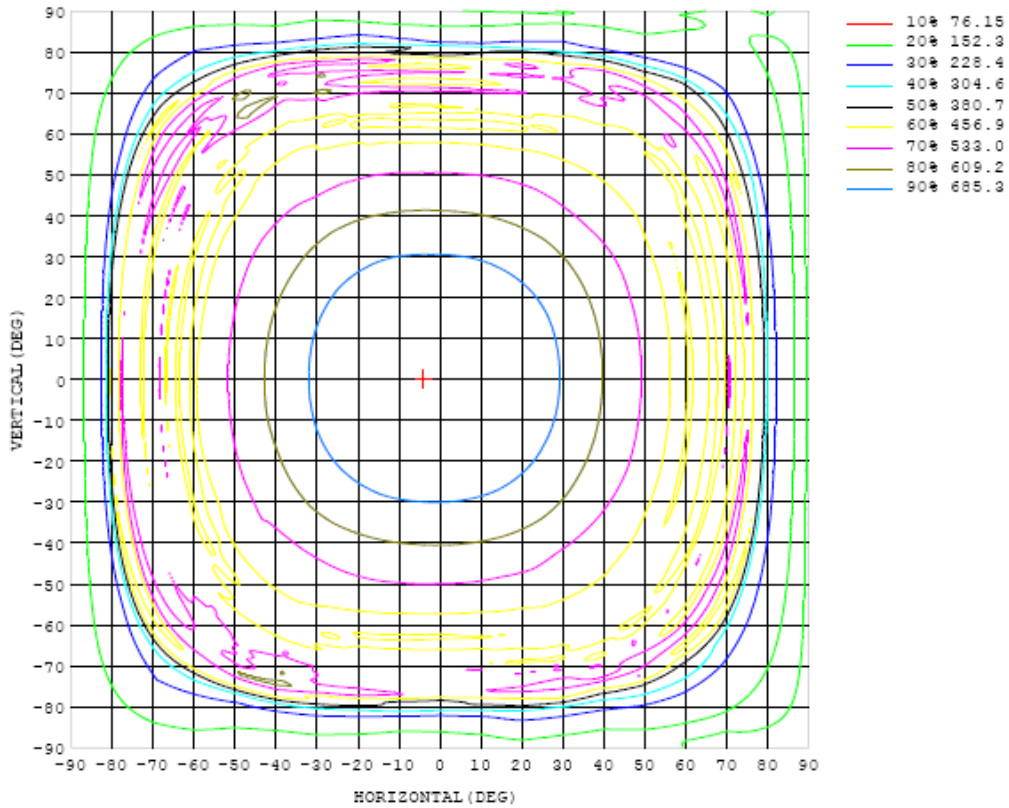


Chart 3: Isocandela Plot

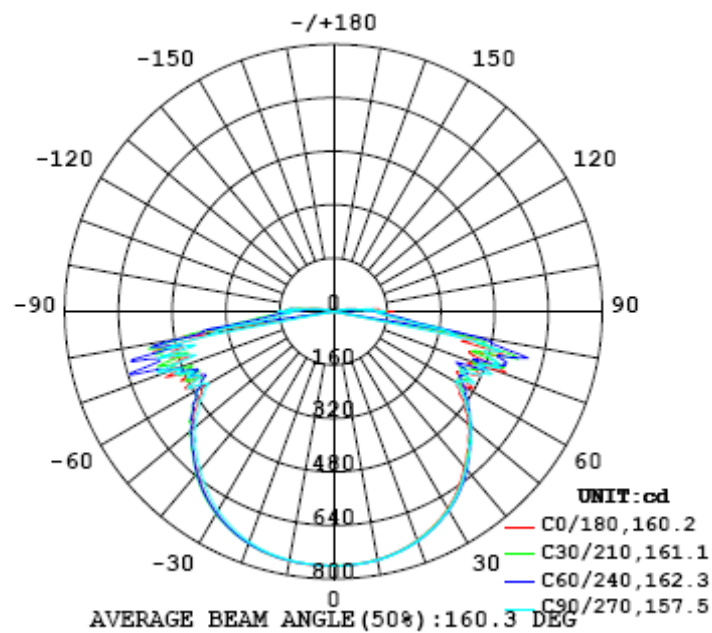


Chart 4: Polar Candela Distribution

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	760	760	760	760	760	760	760	760	760	760	760	760	760	760	760	760	760	760	760
5	759	759	759	758	759	759	759	759	759	759	760	760	760	760	760	760	760	760	761
10	754	754	754	754	754	754	755	755	754	755	755	756	756	757	758	758	758	758	758
15	744	744	744	744	745	745	745	745	745	746	746	747	748	749	751	751	750	750	751
20	727	727	729	729	731	731	732	731	730	732	731	733	735	737	738	739	739	739	739
25	707	708	709	709	711	712	712	712	711	711	713	715	717	719	721	721	722	721	720
30	680	681	682	684	686	686	687	686	685	686	687	690	693	695	697	698	698	697	697
35	646	646	649	651	654	656	656	655	653	652	654	659	663	666	669	669	668	668	666
40	607	607	609	613	617	619	619	616	614	614	615	621	626	631	634	634	632	630	629
45	571	572	569	572	573	576	575	576	573	573	575	581	584	589	595	594	594	591	591
50	523	525	530	527	529	529	537	533	533	532	537	541	549	547	549	559	552	555	550
55	476	477	480	489	490	491	489	484	480	483	484	490	502	509	505	513	510	501	498
60	440	437	425	439	448	445	448	436	426	422	425	440	452	467	477	471	453	456	450
65	441	424	413	424	442	403	440	437	421	416	429	448	450	415	428	475	435	468	486
70	491	521	482	441	460	437	472	450	459	460	477	493	488	488	473	503	503	506	505
75	522	551	553	507	528	522	506	484	489	467	471	511	526	591	515	575	488	481	472
80	284	285	334	360	393	368	427	400	357	350	368	399	440	521	488	511	501	460	404
85	167	170	183	185	188	177	197	198	179	169	168	188	193	184	181	200	211	185	178
90	179	183	176	155	118	110	126	150	144	146	147	147	140	122	124	131	137	139	135
95	77.6	77.8	76.1	66.6	59.2	57.6	63.0	74.1	77.8	83.0	83.7	78.3	70.5	63.8	64.6	72.0	98.1	115	129
100	48.9	48.6	44.0	33.4	26.8	24.7	29.9	43.2	48.1	48.4	48.4	46.3	37.2	30.0	30.1	40.0	51.6	54.3	55.3
105	20.1	18.9	16.2	12.1	8.48	8.06	10.3	14.8	19.2	20.3	20.4	18.5	13.5	8.76	7.25	12.6	19.8	24.0	25.6
110	8.71	8.57	8.01	7.07	6.57	6.46	6.75	7.65	8.09	8.39	8.29	7.77	6.86	6.18	6.24	6.67	7.68	8.64	9.48
115	7.89	8.53	7.68	5.82	4.36	4.23	4.70	6.06	7.52	7.65	8.15	9.08	8.73	6.22	4.15	4.76	5.84	6.82	7.16
120	5.65	5.33	4.53	3.42	2.33	2.23	3.04	4.24	5.19	5.43	5.60	4.80	3.74	2.32	2.14	2.75	3.95	4.74	5.38
125	3.43	3.27	2.80	2.00	1.07	0.80	1.71	2.62	3.16	3.41	3.35	3.05	2.28	1.24	0.68	1.46	2.33	2.89	3.24
130	2.04	1.92	1.51	0.95	0.46	0.42	0.75	1.39	1.87	2.11	2.01	1.71	1.13	0.52	0.41	0.51	1.12	1.54	1.86
135	0.84	0.78	0.57	0.44	0.44	0.44	0.44	0.48	0.78	0.93	0.89	0.68	0.43	0.43	0.43	0.43	0.43	0.51	0.74
140	0.47	0.47	0.47	0.47	0.47	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.45	0.45	0.58
145	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.64
150	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.67
155	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.48	0.49	0.48	0.49	0.48	0.69
160	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.50	0.50	0.50	0.50	0.50	0.50	0.51	0.51	0.50	0.70
165	0.53	0.53	0.53	0.54	0.53	0.53	0.54	0.54	0.54	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.71
170	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.71
175	0.62	0.62	0.62	0.62	0.63	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.70
180	0.65	0.65	0.65	0.65	0.65	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.63	0.63	0.63	0.63	0.63	0.65

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	760	760	760	760	760	760	760	760	760	760	760	760	760	760	760	760	760		
5	761	760	759	759	760	760	759	759	759	759	759	759	758	759	759	758	758		
10	757	757	757	757	757	757	756	755	756	755	755	755	754	755	754	754	754		
15	751	750	750	751	751	750	749	748	748	747	747	746	746	746	745	744	743		
20	738	739	740	739	740	739	736	735	734	733	734	734	734	733	731	730	728		
25	721	722	722	723	722	721	718	715	714	713	714	714	713	713	711	710	708		
30	698	699	700	700	699	697	694	690	688	688	689	689	689	688	687	684	682		
35	668	670	671	672	671	668	664	658	656	656	657	658	658	657	655	652	648		
40	630	633	635	637	636	633	626	621	618	617	619	620	622	621	616	612	608		
45	591	595	595	596	596	591	588	583	583	581	579	581	580	578	575	570	571		
50	554	556	557	554	551	556	548	541	537	536	542	538	534	531	536	531	525		
55	502	509	512	521	508	509	499	491	490	489	489	496	498	493	490	479	479		
60	450	457	464	473	474	467	451	437	431	430	437	442	455	449	442	433	427		
65	468	438	485	432	439	456	452	448	458	450	443	454	426	412	415	404	415		
70	500	508	510	528	482	502	510	501	516	514	499	494	500	443	452	424	466		
75	515	554	510	573	567	544	529	545	543	536	550	512	579	514	465	475	522		
80	408	440	445	491	516	449	395	365	361	372	415	400	424	398	426	416	335		
85	181	211	231	214	193	202	211	177	163	169	188	196	181	169	189	194	181		
90	138	137	138	136	122	134	136	140	146	158	170	148	127	140	145	161	147		
95	129	123	103	73.8	71.1	77.2	106	109	100	90.7	86.3	77.2	64.9	63.8	71.3	81.7	82.7		
100	54.4	53.7	45.3	34.2	32.1	41.2	51.5	51.9	51.7	51.6	49.4	41.8	31.7	28.8	34.9	48.8	50.1		
105	25.1	21.6	17.8	10.4	8.90	16.6	20.7	23.8	25.3	23.5	20.8	16.1	10.2	9.10	12.7	17.7	19.6		
110	9.24	8.42	7.62	6.87	6.81	6.99	8.05	8.89	9.15	8.72	7.91	7.30	7.14	7.26	7.41	7.99	8.49		
115	7.10	6.66	6.14	4.43	4.18	4.75	6.09	7.03	7.50	7.28	6.36	5.03	4.57	4.53	5.29	6.59	7.33		
120	5.32	4.83	3.57	2.13	1.89	2.76	3.95	4.69	4.98	4.71	4.00	3.04	2.04	2.23	3.51	4.83	5.54		
125	3.20	2.88	2.04	1.05	0.51	1.36	2.15	2.64	2.86	2.72	2.31	1.50	0.62	0.95	1.99	2.85	3.33		
130	1.83	1.50	0.94	0.46	0.46	0.47	0.91	1.28	1.44	1.33	1.00	0.50	0.47	0.47	0.87	1.50	1.96		
135	0.72	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.53	0.53	0.53	0.53	0.60	0.84		
140	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59		
145	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.65	0.65	0.65		
150	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.68	0.68	0.68	0.68	0.68	0.68	0.68		
155	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.70	0.70	0.70		
160	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		
165	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	0.72	0.71	0.71		
170	0.71	0.71	0.71	0.72	0.71	0.71	0.71	0.71	0.71	0.70	0.71	0.71	0.71	0.71	0.71	0.71	0.71		
175	0.70	0.70	0.71	0.71	0.71	0.71	0.71	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70		
180	0.65	0.65	0.65	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64		

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 $k=2$.

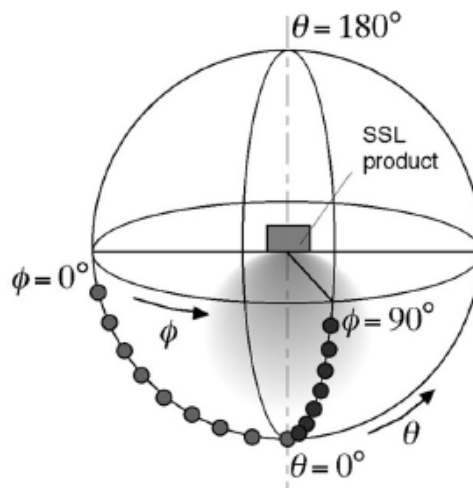
Color Characteristics Measurements

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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