



LM-79-08 Test Report

for

A.L.P. Lighting Components, Inc.

6333 Gross Point Road, Niles, IL 60714

4FT LED Linear Ambient Luminaire Direct

Model: 37024-4835LW-1

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ15060015d/R1

This report is replaced the old report No. HZ15060015d dated Jun. 24, 2015

The laboratory that conducted the testing detailed in this report has been accredited for SSL by NVLAP.

Review by:

Engineer: April Zou
Aug. 06, 2015

Approved



Manager: Jim Zhang
Aug. 06, 2015

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: **37024-4835LW-1**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
92.3	4420.7	47.89	0.9956
CCT (K)	CRI	Stabilization Time (Light & Power)	
3593	83.7	60	

Table 1: Executive Data Summary

Test specifications:

Date of Receipt	: Jun. 04, 2015
Date of Test	: Jun. 12, 2015 to Aug. 04, 2015
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 ANSI/UL 8750-2011 Light Emitting Diode (LED) Equipment for Use in Lighting Products ANSI/UL 1598-2010 Standard for Safety of Luminaire

TABLE OF CONTENT

LM-79-08 Test Report.....	1
Test Summary.....	2
Sample Photo.....	4
TEST RESULTS	5
Spectral Power Distribution	6
Zonal Lumen Tabulation- Goniophotometer Method	7
Illuminance Plots.....	8
Luminous Intensity Distribution Plots.....	10
Luminous Intensity Data	11
ISTMT TEST DATA:	13
EQUIPMENT LIST	14
TEST METHODS	14
Seasoning of SSL Product.....	14
Goniophotometer Method	14
Photometric and Electrical Measurements.....	14
Color Characteristics Measurements.....	15
Color Spatial Uniformity	15
ISTMT.....	15

Sample Photo



Figure 1- Overview of the sample

Equipment Under Test (EUT)

Name	: 4FT LED Linear Ambient Luminaire Direct
Model	: 37024-4835LW-1
Brand Name	: A.L.P Lighting
Electrical Ratings	: AC120~277V, 50/60 Hz, 48W
Product Description	: Wrap 370 base, 3500K, Dimmable Driver: PIFN-X048A Manufacturer of light source: LG INNOTEK Model of light source: LGIT 5630 G2 Quantity of light source: 112 pcs
Manufacturer	: A.L.P. Lighting Components, Inc.
Address	: 6333 Gross Point Road, Niles, IL 60714

TEST RESULTS

Test ambient temperature was 25.2°C.

Sample orientation was light down. 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 95 minutes.

The photometric distance of Goniophotometer is 30m.

Luminous data was taken at 0.5°vertical intervals and 10°horizontal intervals.

Parameter	Result	
Test Voltage (V)	120.0	277.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.401	0.179
Power Factor	0.9956	0.9476
Test Power (W)	47.89	46.89
Off-State Power (W)	0	0
THD A%	6.82	12.15
Luminous Efficacy (lm/W)	92.3	94.2
Total Luminous Flux (lm)	4420.7	4416.4
Color Rendering Index (CRI)	83.7	
R9	11	
Correlated Color Temperature (CCT) (K)	3593	
Chromaticity (Chroma x, Chroma y)	(0.3986, 0.3836)	
Chromaticity (Chroma u, Chroma v)	(0.2343, 0.3382)	
Chromaticity (Chroma u', Chroma v')	(0.2343, 0.5073)	
Duv	0.0016	
Average Beam Angle (°)	116.0	
Center Beam Candle Power (cd)	1346	
Spacing Criteria	1.27 (0°-180°)/ 1.25 (90°-270°)	
Zonal Lumens in the 0°-60°Zone	69.45%	
Zonal Lumens in the 60°-90°Zone	23.20%	
Zonal Lumens in the 90°-120°Zone	4.50%	
Zonal Lumens in the 120°-180°Zone	2.85%	

Special Rendering Indices	Color
R1	82
R2	92
R3	96
R4	81
R5	83
R6	89
R7	84
R8	63
R9	11
R10	81
R11	80
R12	70
R13	85
R14	98

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

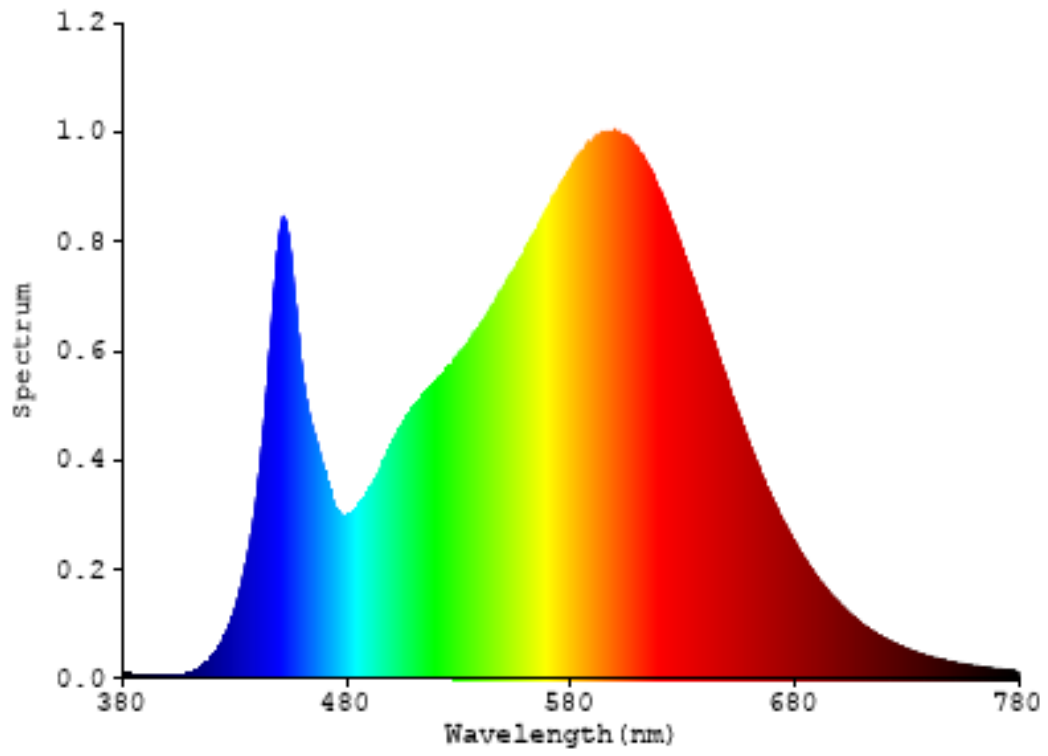


Chart 1: Spectral Power Distribution

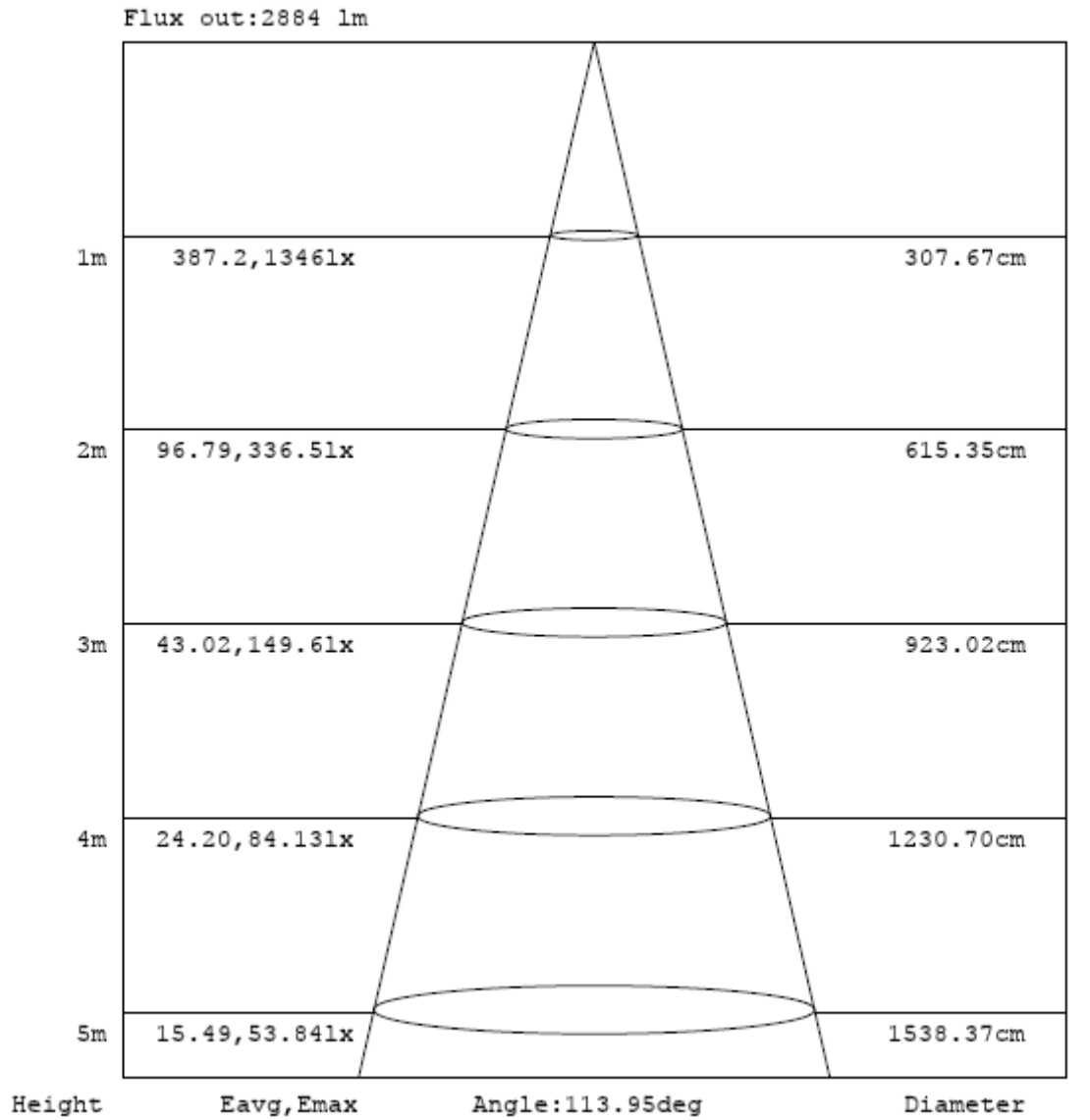
Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	127.361	2.88%
10- 20	365.011	8.26%
20- 30	553.574	12.52%
30- 40	669.626	15.15%
40- 50	702.164	15.88%
50- 60	652.483	14.76%
60- 70	533.024	12.06%
70- 80	363.427	8.22%
80- 90	129.227	2.92%
90-100	59.048	1.34%
100-110	75.155	1.70%
110-120	64.671	1.46%
120-130	51.191	1.16%
130-140	36.776	0.83%
140-150	22.923	0.52%
150-160	11.429	0.26%
160-170	2.868	0.06%
170-180	0.757	0.02%
Total	4420.7	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	3070.219	69.45%
60- 90	1025.678	23.20%
0-90	4095.897	92.65%
90- 180	324.818	7.35%
0- 180	4420.7	100%

Table 3: Zonal Lumen Data

Illuminance Plots



Note: The Curves indicate the illuminated area and the average illumination when the luminaire is at different distance.

Chart 2: Beam angle

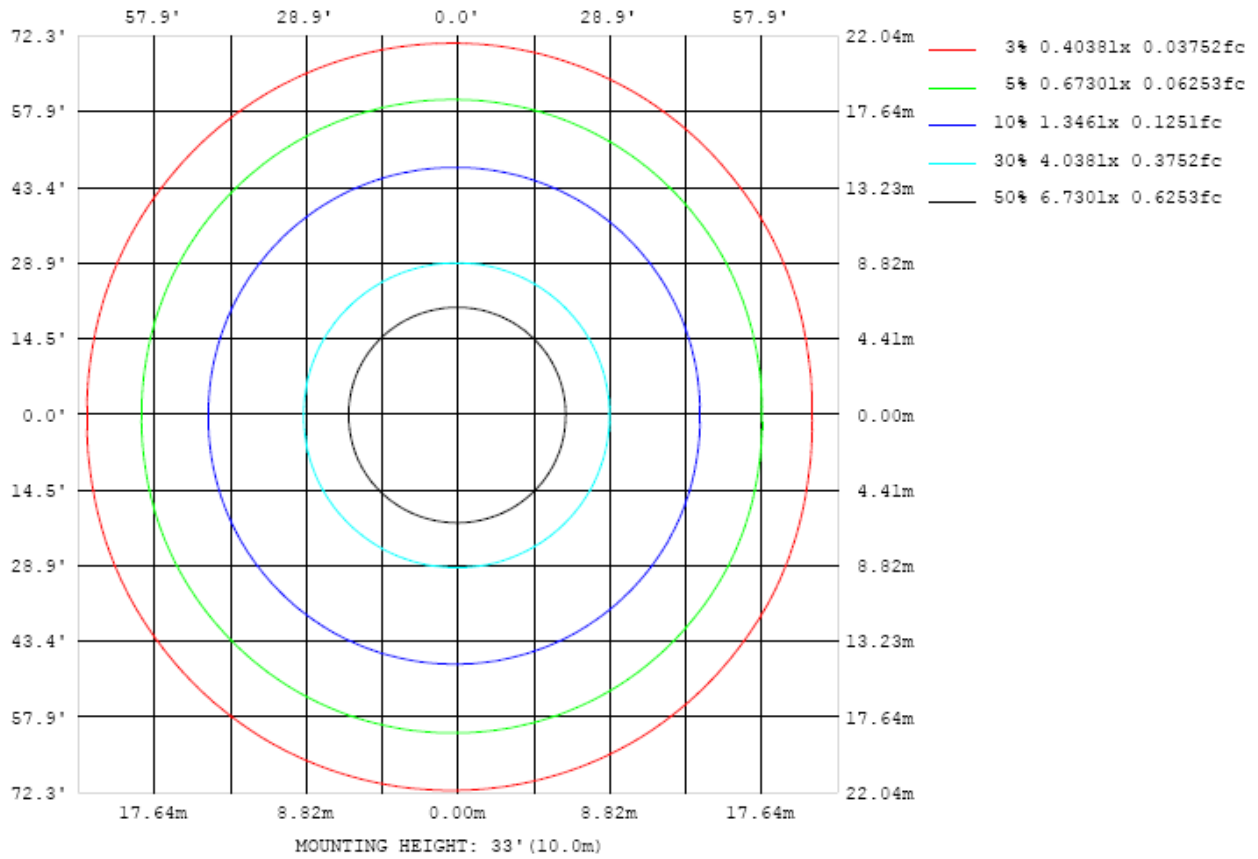


Chart 3: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots

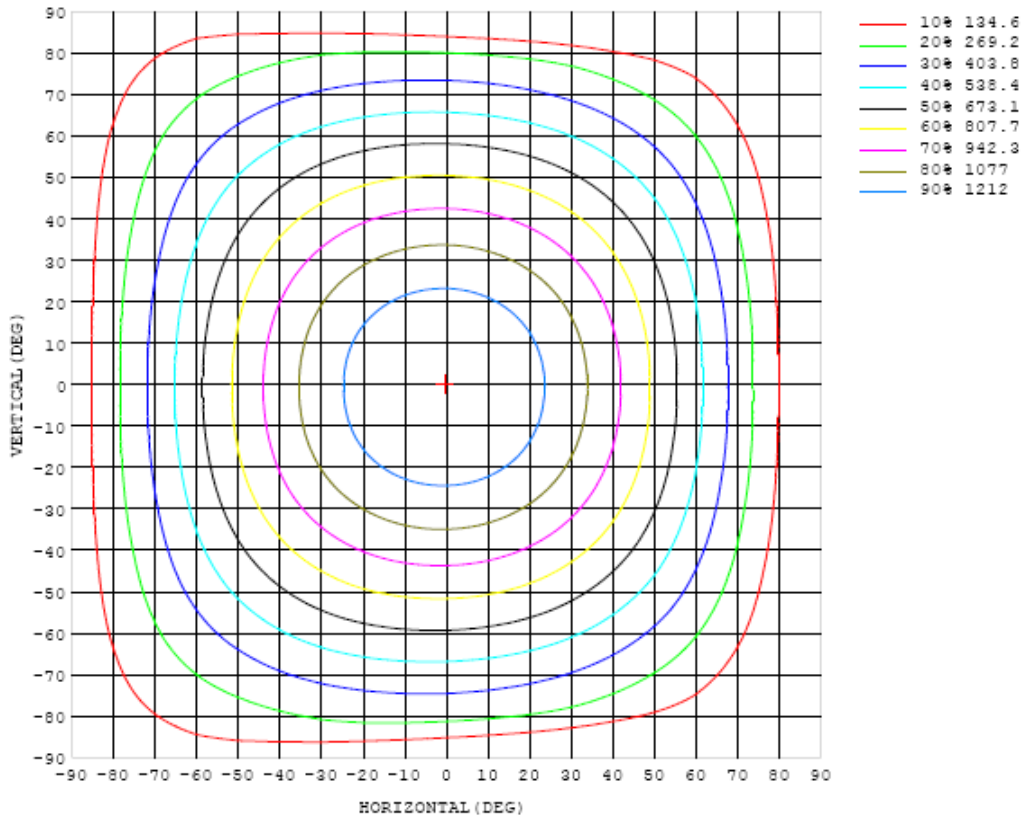


Chart 4: Isocandla Plot

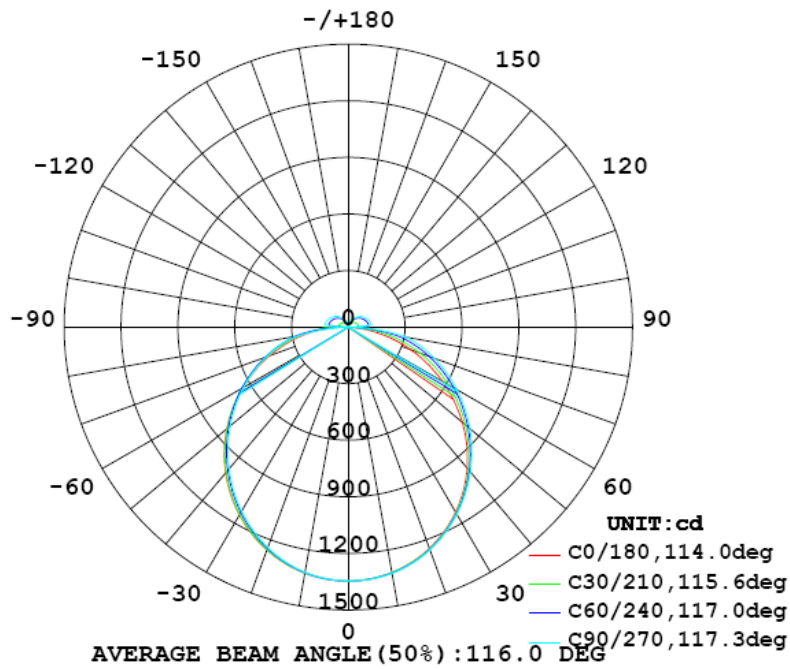


Chart 5: Polar Candela Distribution

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	1346	1346	1346	1346	1346	1346	1346	1346	1346	1346	1346	1346	1346	1346	1346	1346	1346	1346	1346
5	1339	1339	1339	1340	1340	1340	1340	1341	1341	1341	1341	1341	1341	1341	1341	1341	1341	1341	1341
10	1321	1321	1321	1322	1323	1324	1324	1325	1325	1326	1326	1326	1326	1326	1326	1326	1325	1325	1325
15	1290	1291	1291	1293	1294	1295	1296	1296	1297	1297	1298	1299	1299	1300	1299	1299	1298	1297	1297
20	1249	1249	1251	1252	1254	1255	1255	1256	1256	1257	1258	1259	1260	1261	1262	1262	1260	1259	1258
25	1196	1196	1199	1201	1202	1203	1203	1204	1204	1205	1207	1209	1211	1213	1214	1214	1212	1210	1209
30	1132	1133	1136	1139	1140	1141	1141	1142	1143	1145	1147	1149	1152	1154	1156	1156	1155	1152	1151
35	1059	1060	1064	1067	1069	1070	1071	1073	1075	1077	1079	1082	1084	1087	1089	1090	1089	1086	1084
40	976	978	983	987	989	992	994	997	999	1002	1005	1008	1010	1013	1015	1016	1014	1011	1009
45	884	888	894	899	904	908	911	915	919	922	925	928	931	933	935	935	933	929	926
50	785	790	798	806	813	819	824	830	834	838	841	845	847	849	849	849	846	841	838
55	680	687	698	709	718	726	734	741	746	750	755	758	760	760	760	758	754	748	744
60	572	580	594	608	619	630	641	650	656	661	666	669	671	670	667	664	658	650	645
65	461	470	488	505	518	533	547	558	566	572	577	580	581	578	573	568	560	550	544
70	349	360	380	400	416	435	453	466	477	484	488	491	490	485	477	470	461	448	442
75	238	250	272	294	315	336	358	376	388	397	401	402	399	391	381	373	362	347	340
80	128	140	164	189	212	237	259	278	293	306	313	314	308	297	285	275	263	247	239
85	23.7	31.6	44.8	57.8	65.3	71.8	89.2	108	126	144	165	185	196	198	190	179	164	148	140
90	0.50	4.39	17.2	29.0	30.2	25.6	22.1	15.3	8.57	2.64	4.76	10.5	18.8	33.9	50.8	63.7	61.1	48.2	43.4
95	1.12	5.71	29.0	52.9	74.1	92.4	107	116	103	88.7	75.2	62.8	51.2	41.1	33.9	24.2	10.3	3.08	0.59
100	1.86	6.45	28.6	53.7	74.8	92.2	106	115	120	122	119	113	102	87.6	69.7	49.1	25.8	6.71	1.29
105	2.71	7.21	27.8	52.1	72.7	89.7	103	112	117	118	116	110	99.7	86.3	69.6	49.2	25.2	7.39	1.89
110	3.36	7.75	27.0	50.0	69.6	86.2	99.0	108	113	114	111	106	96.2	83.3	67.1	47.2	24.6	7.99	2.62
115	3.96	7.84	26.4	47.5	66.0	81.8	94.0	103	107	108	106	101	91.8	79.3	63.9	44.9	23.9	8.54	3.06
120	4.61	5.08	25.7	44.9	61.9	76.6	88.3	96.4	101	102	100	95.0	86.4	74.7	60.2	42.4	23.3	8.16	3.54
125	5.20	5.56	24.7	41.9	57.5	70.9	82.0	89.7	94.2	95.4	93.5	88.5	80.4	69.5	55.9	40.0	22.4	6.13	4.28
130	5.74	8.24	23.3	39.2	53.0	65.1	74.8	82.2	86.5	87.8	86.0	81.4	73.8	63.7	51.7	37.2	21.5	6.56	4.74
135	5.97	8.22	20.0	36.1	47.6	59.2	67.9	74.4	78.1	79.3	77.8	73.6	67.0	58.0	47.2	34.7	20.4	8.70	5.05
140	6.16	7.66	6.73	33.3	43.3	52.2	60.7	66.7	69.9	71.0	69.7	66.1	60.1	52.0	42.9	31.3	16.8	8.50	5.32
145	6.52	7.90	5.10	28.8	38.4	47.0	53.1	57.7	61.1	62.2	61.0	57.6	52.7	46.6	39.0	25.1	2.28	9.35	5.74
150	6.81	8.58	8.65	10.7	34.0	40.2	46.4	50.7	53.2	54.0	53.1	50.7	46.4	40.5	33.4	20.6	2.52	9.22	5.99
155	6.75	8.28	9.76	3.89	16.9	34.0	38.2	42.1	44.4	45.2	44.5	42.3	38.6	34.8	19.3	3.96	11.8	8.56	6.33
160	5.93	7.55	10.7	9.99	2.94	9.70	27.6	33.1	34.9	35.6	35.1	33.6	29.4	13.5	3.14	7.34	11.4	7.46	6.23
165	5.99	6.75	8.76	11.1	12.9	6.68	1.87	3.87	5.09	6.70	5.44	4.02	1.74	5.87	10.6	11.6	8.42	6.53	5.79
170	6.25	6.54	7.52	8.86	10.4	11.9	12.8	13.5	13.3	12.9	13.1	13.0	12.0	10.5	9.18	7.90	6.64	5.68	5.36
175	7.02	7.02	7.04	7.02	7.39	7.41	8.27	8.38	8.16	7.80	7.85	7.86	7.85	7.55	6.99	6.50	6.32	5.97	5.56
180	6.46	6.46	6.46	6.46	6.46	6.46	6.46	6.46	6.46	6.46	6.46	6.46	6.46	6.46	6.46	6.46	6.46	6.46	6.46

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	1346	1346	1346	1346	1346	1346	1346	1346	1346	1346	1346	1346	1346	1346	1346	1346	1346		
5	1341	1341	1340	1340	1340	1340	1339	1339	1339	1339	1339	1338	1338	1338	1339	1339	1339		
10	1324	1324	1323	1323	1322	1321	1321	1320	1320	1319	1319	1319	1319	1319	1319	1320	1320		
15	1296	1296	1295	1294	1293	1291	1290	1289	1288	1287	1287	1287	1288	1288	1289	1289	1289		
20	1257	1257	1256	1254	1252	1249	1247	1245	1244	1243	1243	1244	1245	1245	1246	1247	1247		
25	1208	1208	1206	1203	1200	1197	1194	1191	1190	1189	1189	1189	1191	1192	1193	1194	1194		
30	1150	1149	1147	1143	1139	1135	1132	1129	1127	1126	1125	1125	1126	1128	1129	1130	1131		
35	1083	1082	1079	1075	1070	1066	1062	1059	1056	1055	1054	1053	1054	1055	1056	1057	1058		
40	1008	1006	1004	999	995	991	986	983	980	978	976	975	975	975	975	976	975		
45	925	925	922	918	914	910	906	902	899	896	894	892	890	889	888	886	885		
50	837	837	835	832	829	826	822	818	814	811	808	804	801	798	794	791	787		
55	743	745	744	742	741	739	735	731	726	723	719	714	708	702	697	690	684		
60	646	649	651	650	650	649	646	642	638	633	627	621	613	604	596	587	577		
65	546	551	555	556	558	559	557	554	549	543	536	527	516	504	493	480	467		
70	445	453	458	461	465	468	468	466	461	455	445	433	418	403	389	373	357		
75	344	354	361	365	372	377	380	379	375	367	355	339	320	301	284	265	247		
80	243	255	264	270	279	287	287	279	268	257	246	232	217	199	179	157	139		
85	145	158	168	171	161	148	130	110	90.4	74.9	62.9	56.2	48.7	48.9	48.6	40.9	31.6		
90	46.3	50.2	43.3	45.6	10.2	24.3	6.12	9.83	15.8	22.0	27.2	31.5	35.0	38.0	35.6	19.9	4.16		
95	4.60	20.0	38.8	53.2	66.7	80.0	93.3	106	120	126	122	111	96.2	77.5	55.3	28.1	7.19		
100	6.46	29.0	51.6	72.4	90.4	105	115	122	125	124	119	109	95.9	78.2	55.8	27.2	7.74		
105	6.70	28.5	51.1	71.1	88.1	102	112	118	121	120	115	106	93.1	75.8	53.6	26.3	8.26		
110	6.95	26.9	48.8	68.1	84.6	98.0	108	113	116	115	110	102	89.0	72.3	50.7	25.3	8.53		
115	7.14	25.4	46.0	64.5	80.3	93.0	102	108	110	109	105	96.3	84.0	68.1	47.5	24.4	7.60		
120	7.18	24.1	42.9	60.3	75.3	87.3	96.0	102	104	103	98.2	90.1	78.4	63.1	44.3	23.3	7.92		
125	5.00	22.3	39.8	55.5	69.6	80.9	89.2	94.4	96.5	95.4	91.0	83.3	71.9	58.1	40.8	21.9	8.84		
130	3.21	20.9	36.4	50.7	63.4	73.9	81.7	86.6	88.5	87.4	83.0	75.7	65.5	52.6	37.7	20.2	8.17		
135	3.80	19.1	33.0	45.8	57.2	66.7	73.6	78.0	79.7	78.7	74.8	68.2	58.5	47.3	34.7	8.43	7.84		
140	6.71	17.4	29.7	40.3	50.4	59.2	65.5	69.4	70.8	69.8	66.5	59.8	51.8	42.1	30.9	5.35	7.71		
145	6.67	8.01	24.1	36.2	44.1	50.9	56.2	59.9	61.1	60.1	56.6	52.2	45.5	37.0	20.1	8.79	8.03		
150	7.50	2.24	18.7	30.6	37.7	44.0	48.5	51.2	52.3	51.6	49.1	44.7	38.4	31.9	8.34	9.18	8.50		
155	7.28	6.19	5.57	19.0	31.1	35.4	39.4	41.9	42.8	42.2	40.0	36.2	32.2	14.6	4.73	10.2	8.50		
160	6.66	8.52	4.91	3.30	12.8	25.4	29.8	31.6	32.6	32.2	30.8	26.4	11.3	2.66	9.25	10.9	8.14		
165	5.92	6.78	8.07	7.64	5.49	2.39	3.06	5.05	6.81	5.44	3.46	2.61	4.49	10.4	11.3	9.47	7.94		
170	5.41	5.66	6.17	6.96	7.95	8.37	9.52	9.93	10.4	10.7	11.3	11.4	11.1	10.3	9.12	8.06	7.16		
175	5.51	5.67	5.97	6.17	6.41	6.85	7.13	7.24	7.26	7.24	7.37	7.50	7.18	6.49	7.18	6.93	6.93		
180	6.46	6.46	6.46	6.46	6.46	6.46	6.46	6.46	6.46	6.46	6.46	6.46	6.46	6.46	6.46	6.46	6.46		

Table 5: Luminous Intensity Data

ISTMT TEST DATA:

Sample Tested: **37024-4835LW-1**

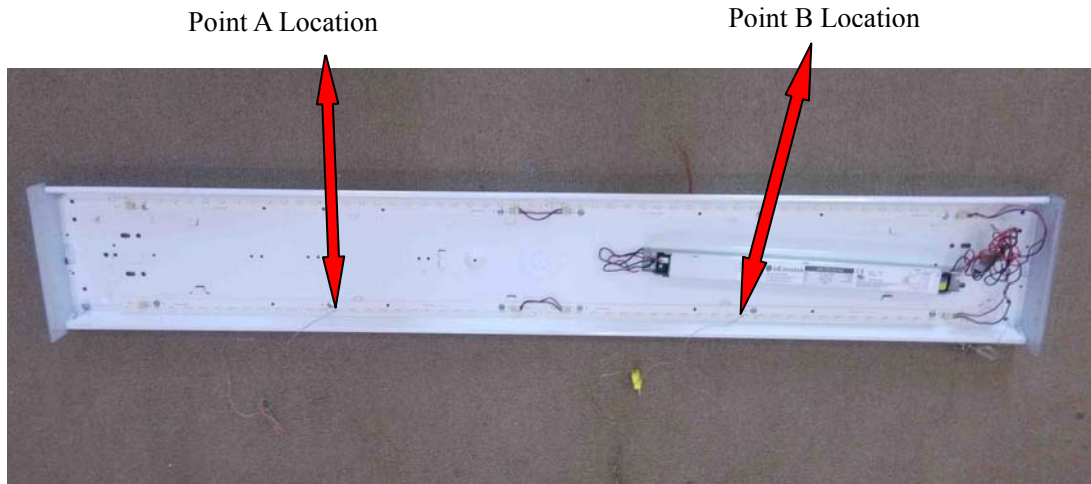
Test ambient temperature was 25.2°C.

Test orientation was Light Down.

The stabilization time of the sample was 7.5 hours.



View of In-Situ Point- Ts



Location of In-Situ Point from overall view

Input Voltage (V)	Input Power (W)	Tested LED source current (mA)	Measured Driver Temp Maximum Temperature (Corrected to Ta=25°C)	Measured In-Situ Maximum Temperature (Corrected to Ta=25°C)	
				Point A	Point B
120.0	47.89	108.4	42.5	46.6	55.1
277.0	46.89	108.5	42.4	46.6	55.1

Table 6: ISTMT test data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Sep. 18, 2014	Sep. 17, 2015
Digital Power Meter	PF2010A	HZTE028-01	Sep. 18, 2014	Sep. 17, 2015
AC Power Supply	PCR 500L	HZTE001-08	Sep. 18, 2014	Sep. 17, 2015
DC Power Supply	WY12010	HZTE004-03	Sep. 18, 2014	Sep. 17, 2015
Temperature Meter	TES1310	HZTE017-01	Sep. 18, 2014	Sep. 17, 2015
Standard source	D908	HZTE012-01	Sep. 18, 2014	Sep. 17, 2015
Digital Power Meter	WT210	HZTE008-01	Sep. 18, 2014	Sep. 17, 2015
AC Power Supply	PCR 500L	HZTE001-07	Sep. 18, 2014	Sep. 17, 2015
DC Power Supply	6154	HZTE004-04	Sep. 18, 2014	Sep. 17, 2015
Temperature and humidity recorder	JR900	HZTE018-01	Sep. 18, 2014	Sep. 17, 2015
Multi-Meter	FLUKE 289	HZTE020-03	Nov. 09, 2014	Nov. 08, 2015

Table 7: 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 $k=2$.

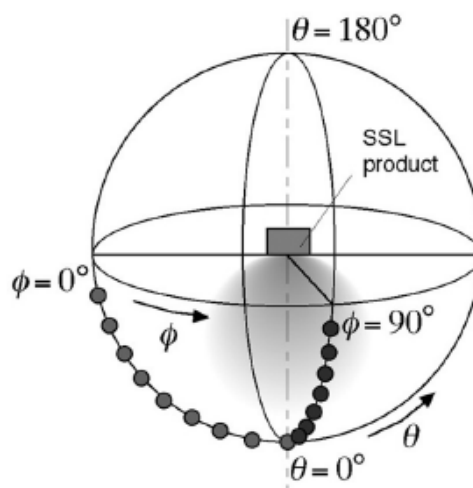
Color Characteristics Measurements

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.



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The luminaire was installed to simulate intended usage, in accordance with the manufacturer's instructions.

Temperatures were measured after they stabilized, when the test was run for a minimum of 7.5 h.

The tests were conducted in an ambient temperature of 25 ± 5 °C. Ambient temperature variations above or below 25°C were respectively subtracted from or added to temperatures recorded at points on the luminaire. Temperatures recorded at points on a luminaire were measured by means of thermocouples.

The thermocouples had conductors no larger than No. 24 AWG (0.21mm^2) and no smaller than No. 30 AWG (0.05mm^2). Thermocouples complied with the requirements specified in ASTM MNL 12 and thermocouples as listed in the table of the limits of error specified in NIST ITS 90, or ISA MC96.1.

The luminaire was installed in the test box in the configuration that resulted in the highest operating temperatures, considering different trim and maximum lamp wattage combinations, lampholder adjustment heights, and the like.

The test box was constructed of 12mm thick plywood as described below:

The test box was rectangular and had four sides and a bottom.

The four sides of the test box for a ceiling-mounted luminaire were a minimum distance of 8.5 in (215mm) from the nearest part of the lamp housing or heat-producing parts. The top edge of the sides of the test box were a minimum of 8.5 in (215mm) above the highest point of any permanently attached part of the lamp housing.

Thermal insulation of the loose-fill type was poured into the test box through the open top, until level with the top, without applying any compacting procedure.

The thermal insulation was conditioned to the density specified by the insulation manufacturer to obtain a required rated thermal resistance of Rsi 0.56 to 0.678 (R3.2 to R3.85).

All spaces around the luminaire and between it and the sides of the box were filled with the thermal insulation.

*** End of Report ***

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