



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: 31424-4835LW-1

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ15060015c/R1

This report is replaced the old report No. HZ15060015c 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: 31424-4835LW-1

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
100.2	4812.1	48.04	0.9956
CCT (K)	CRI	Stabilization Time (Light & Power)	
3591	83.6	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

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Sample Photo



Figure 1- Overview of the sample

Equipment Under Test (EUT)

Name	: 4FT LED Linear Ambient Luminaire Direct
Model	: 31424-4835LW-1
Brand Name	: A.L.P Lighting
Electrical Ratings	: AC120~277V, 50/60 Hz, 48W
Product Description	: Wrap 314 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 25.4°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)	0.402	0.179
Power Factor	0.9956	0.9479
Test Power (W)	48.04	47.01
Off-State Power (W)	0	0
THD A%	7.08	11.90
Luminous Efficacy (lm/W)	100.2	102.3
Total Luminous Flux (lm)	4812.1	4809.3
Color Rendering Index (CRI)	83.6	
R9	10	
Correlated Color Temperature (CCT) (K)	3591	
Chromaticity (Chroma x, Chroma y)	(0.3989, 0.3841)	
Chromaticity (Chroma u, Chroma v)	(0.2343, 0.3383)	
Chromaticity (Chroma u', Chroma v')	(0.2343, 0.5075)	
Duv	0.0015	
Average Beam Angle (°)	109.4	
Center Beam Candle Power (cd)	1606	
Spacing Criteria	1.24 (0°-180°)/ 1.20 (90°-270°)	
Zonal Lumens in the 0°-60°Zone	72.65%	
Zonal Lumens in the 60°-90°Zone	22.48%	
Zonal Lumens in the 90°-120°Zone	3.06%	
Zonal Lumens in the 120°-180°Zone	1.81%	

Special Rendering Indices	Color
R1	82
R2	92
R3	96
R4	81
R5	83
R6	89
R7	84
R8	62
R9	10
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

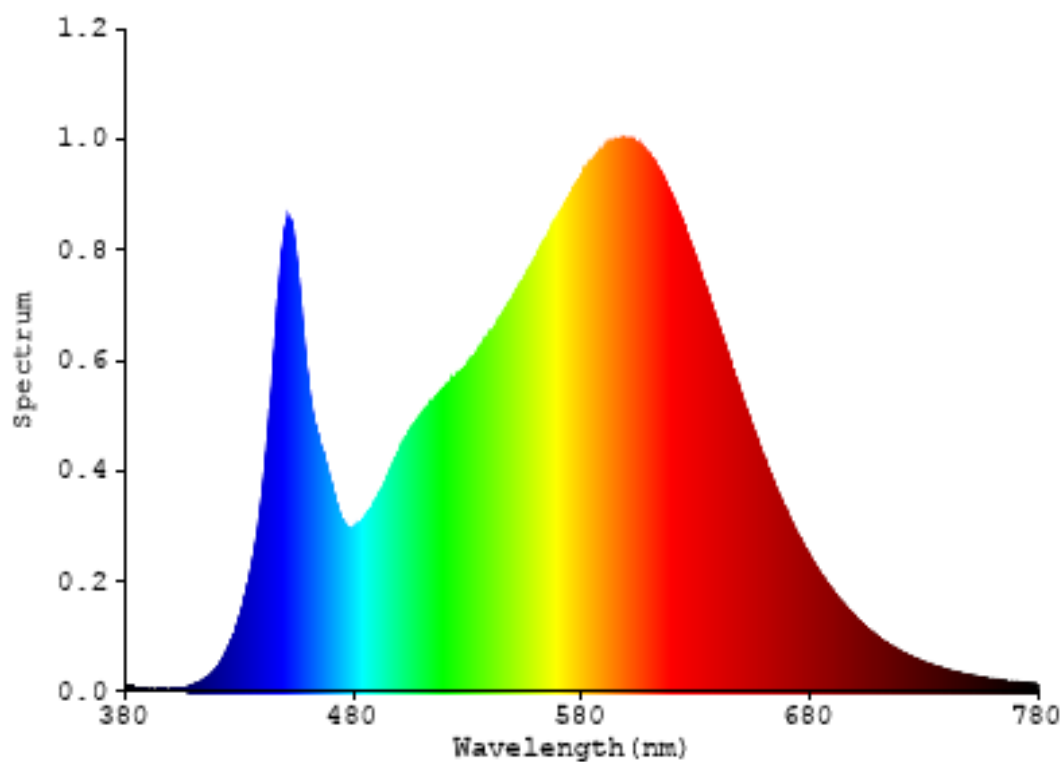


Chart 1: Spectral Power Distribution

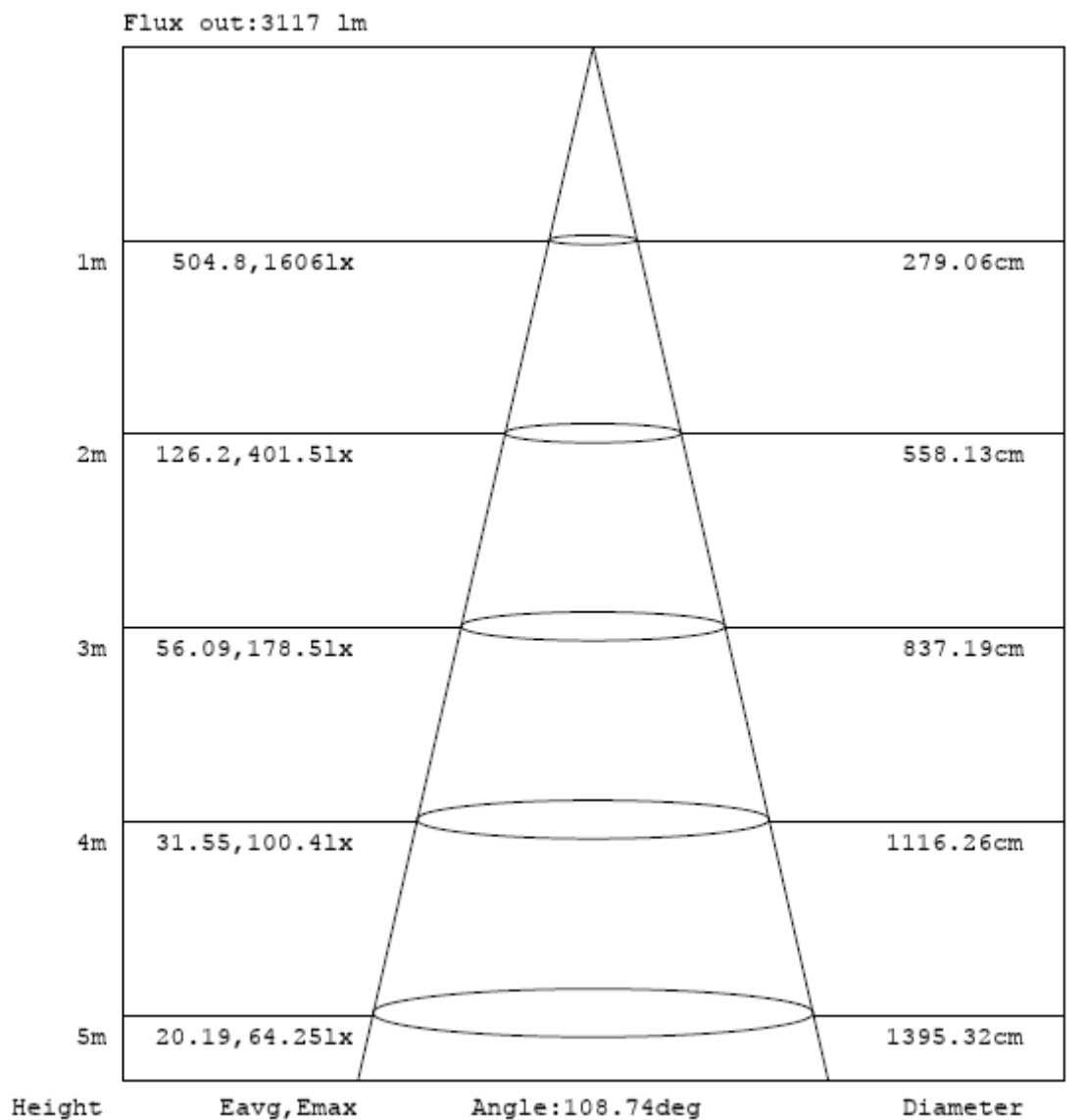
Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	151.675	3.15%
10- 20	431.835	8.97%
20- 30	647.1	13.45%
30- 40	767.161	15.94%
40- 50	784.649	16.31%
50- 60	713.651	14.83%
60- 70	577.212	12.00%
70- 80	385.302	8.01%
80- 90	119.022	2.47%
90-100	44.179	0.92%
100-110	56.129	1.17%
110-120	46.951	0.98%
120-130	36.268	0.75%
130-140	25.273	0.53%
140-150	15.311	0.32%
150-160	7.521	0.16%
160-170	2.483	0.05%
170-180	0.382	0.01%
Total	4812.1	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	3496.071	72.65%
60- 90	1081.536	22.48%
0-90	4577.607	95.13%
90- 180	234.497	4.87%
0- 180	4812.1	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

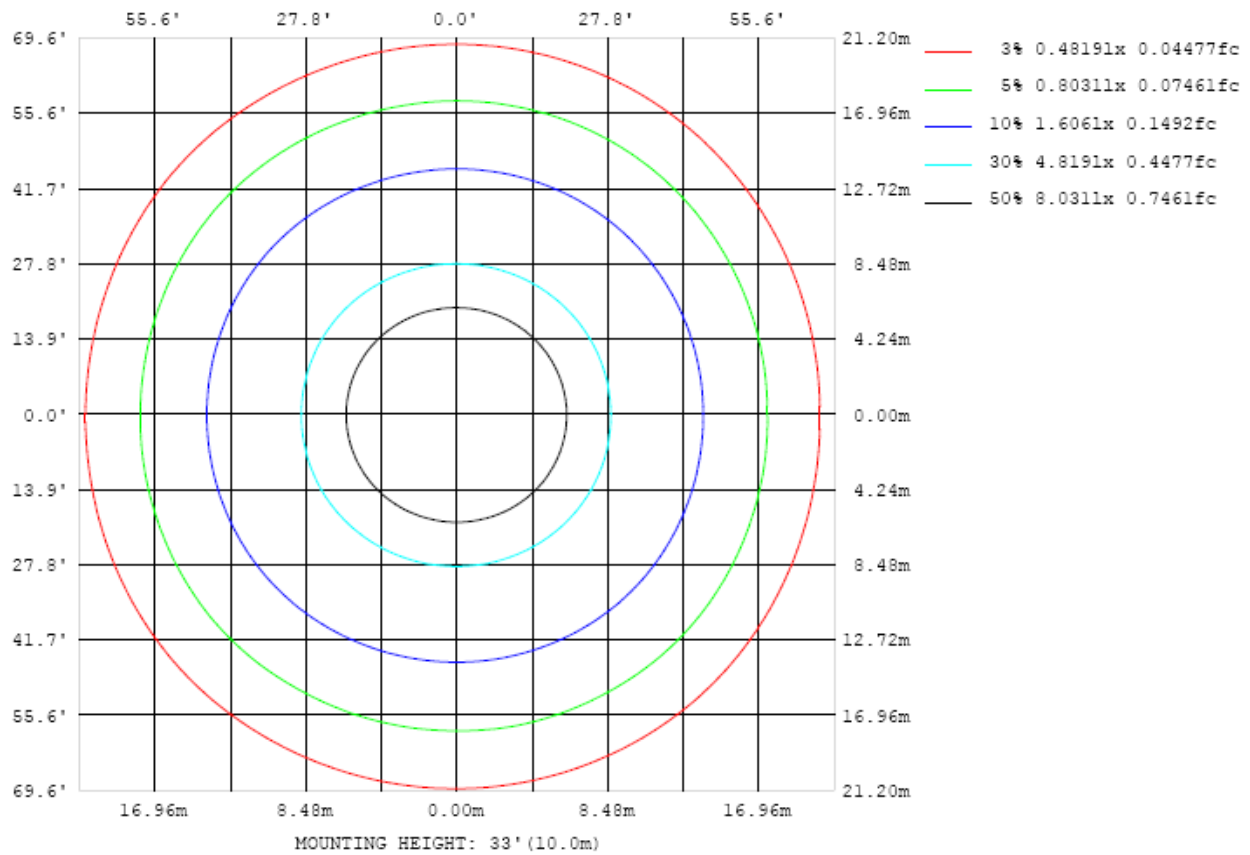


Chart 3: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots

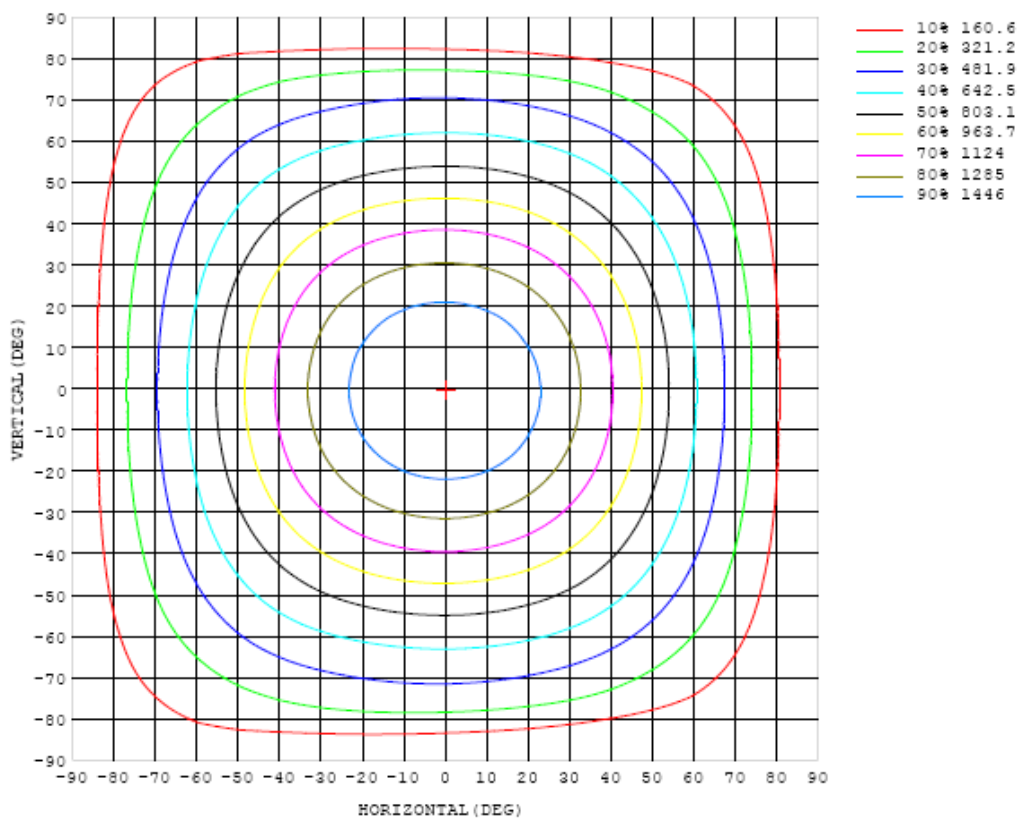


Chart 4: Isocandla Plot

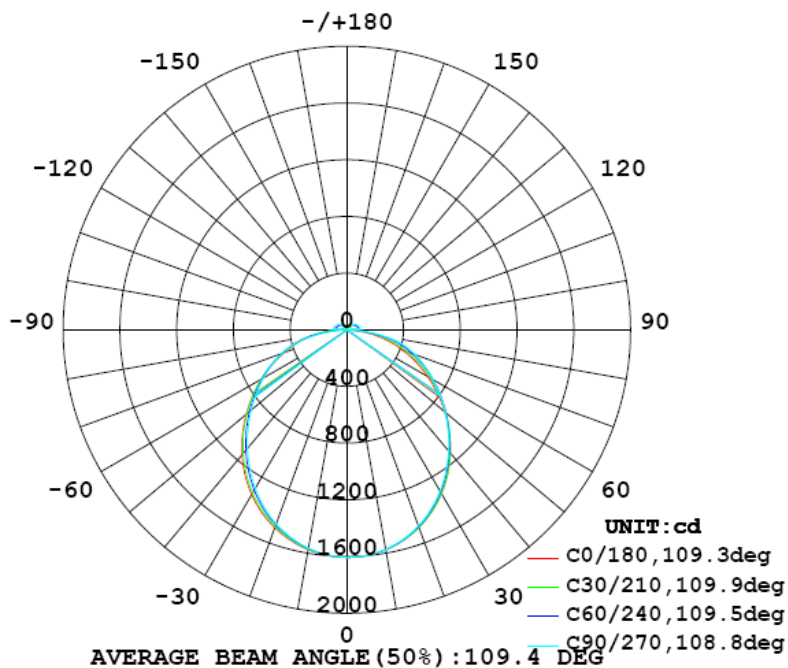


Chart 5: Polar Candela Distribution

Luminous Intensity Data

Table---1 UNIT: cd

C (DEG) γ (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	1606	1606	1606	1606	1606	1606	1606	1606	1606	1606	1606	1606	1606	1606	1606	1606	1606	1606	1606
5	1599	1599	1599	1599	1599	1599	1599	1599	1599	1598	1599	1599	1599	1599	1599	1599	1599	1599	1598
10	1576	1576	1577	1576	1576	1575	1574	1574	1574	1573	1574	1574	1575	1575	1575	1576	1576	1577	1575
15	1538	1539	1539	1538	1537	1535	1534	1533	1532	1531	1532	1533	1534	1535	1536	1538	1539	1539	1538
20	1484	1485	1485	1484	1482	1480	1477	1475	1474	1473	1473	1475	1477	1480	1483	1485	1486	1487	1486
25	1416	1418	1417	1415	1413	1410	1406	1403	1400	1399	1400	1403	1406	1410	1415	1418	1420	1421	1422
30	1334	1335	1336	1334	1331	1326	1322	1317	1314	1313	1314	1317	1322	1328	1334	1338	1341	1342	1343
35	1239	1241	1241	1239	1236	1231	1226	1221	1218	1217	1219	1223	1228	1235	1242	1247	1250	1251	1252
40	1133	1135	1136	1135	1133	1128	1123	1118	1116	1115	1117	1121	1128	1135	1142	1148	1150	1150	1151
45	1019	1021	1024	1024	1024	1021	1017	1013	1010	1010	1012	1017	1023	1031	1037	1042	1043	1042	1042
50	900	903	907	910	913	913	910	907	906	906	907	911	917	924	929	932	931	928	928
55	778	782	789	796	802	805	805	804	803	803	804	807	811	817	820	820	817	813	812
60	657	666	672	683	692	699	697	702	705	700	702	704	709	713	714	709	703	700	696
65	538	543	555	567	581	592	598	602	605	607	608	608	610	612	610	603	594	585	582
70	418	424	437	451	467	481	492	501	508	512	513	511	509	509	504	494	484	474	471
75	298	305	320	335	351	370	386	399	409	415	417	414	409	405	398	386	375	364	361
80	176	184	200	218	230	236	244	254	264	273	282	291	296	299	292	279	267	255	252
85	53.2	60.2	71.5	76.0	74.7	75.8	86.2	97.2	106	116	126	135	143	155	170	172	158	145	141
90	0.31	2.04	8.03	12.1	14.2	13.7	11.7	8.33	7.57	7.13	8.15	9.78	2.24	10.1	22.4	29.3	34.6	31.1	30.8
95	0.83	4.98	19.9	37.4	54.9	71.4	77.6	75.7	71.6	66.4	60.7	54.3	47.5	40.1	33.1	26.2	12.2	3.34	0.83
100	1.21	5.40	20.8	38.4	55.4	70.3	82.2	90.7	95.4	96.6	94.4	88.7	79.2	66.6	51.5	35.3	18.9	4.26	1.19
105	1.74	5.71	20.4	37.4	53.6	67.4	78.3	86.0	90.2	91.3	89.3	84.2	75.8	64.5	50.6	35.2	19.2	4.44	1.53
110	2.15	6.09	19.7	35.8	51.1	64.3	74.5	81.3	85.1	86.1	84.3	79.7	72.1	61.7	48.7	34.0	18.7	4.79	1.95
115	2.55	6.27	18.7	33.8	48.0	60.3	69.9	76.5	80.2	81.1	79.4	75.1	67.9	58.1	46.1	32.3	18.0	5.05	2.22
120	3.00	6.31	17.6	31.4	44.6	56.0	64.9	71.1	74.7	75.7	74.1	70.0	63.3	54.1	43.0	30.2	17.0	5.13	2.46
125	3.37	6.41	16.4	28.7	40.7	51.3	59.7	65.6	69.0	69.9	68.4	64.6	58.4	49.9	39.4	28.0	15.9	5.15	2.89
130	3.62	6.42	14.9	25.9	36.8	46.3	53.8	59.5	62.8	63.7	62.4	58.8	53.0	45.1	36.0	25.4	14.9	5.37	3.22
135	3.79	5.14	13.2	23.3	32.5	41.2	48.2	53.1	55.9	56.8	55.6	52.5	47.5	40.5	32.1	22.9	13.1	5.02	3.43
140	4.06	3.62	11.7	20.0	28.5	35.8	42.1	46.6	49.3	50.2	49.2	46.3	41.6	35.5	28.1	20.3	11.5	3.09	3.65
145	4.32	3.01	10.3	16.5	24.5	30.8	35.9	39.7	42.3	43.0	42.2	39.7	35.7	30.6	24.4	16.9	10.4	2.19	3.80
150	4.37	3.21	9.07	14.0	19.5	25.5	30.0	33.2	35.2	35.9	35.2	33.2	30.1	25.6	19.9	14.3	9.03	2.43	4.04
155	4.55	3.75	6.23	11.7	15.5	19.4	23.3	26.6	28.4	29.0	28.5	26.8	23.9	19.9	15.8	12.0	7.53	2.81	4.24
160	4.36	3.92	3.56	9.28	12.2	14.9	17.3	19.3	20.6	21.1	20.8	19.5	17.7	15.4	12.6	8.70	3.72	3.54	4.24
165	4.26	4.48	2.82	4.26	8.69	10.9	12.5	13.8	14.6	14.9	14.7	13.9	12.7	11.1	8.55	5.04	2.58	4.20	4.15
170	4.33	4.59	4.12	2.92	2.64	4.63	7.29	8.70	9.17	9.26	9.29	8.99	7.82	4.65	2.91	2.49	3.31	4.30	3.88
175	4.47	4.61	4.60	4.62	4.11	3.48	2.61	2.42	2.82	2.75	2.85	2.90	2.93	3.25	3.81	4.27	4.38	4.30	4.24
180	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35

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	1606	1606	1606	1606	1606	1606	1606	1606	1606	1606	1606	1606	1606	1606	1606	1606	1606		
5	1598	1597	1597	1596	1595	1595	1594	1594	1594	1594	1594	1595	1595	1596	1596	1597	1598		
10	1575	1573	1572	1570	1569	1567	1566	1565	1565	1565	1565	1566	1568	1569	1571	1572	1574		
15	1536	1534	1532	1529	1526	1523	1521	1519	1519	1519	1520	1521	1524	1527	1529	1532	1535		
20	1484	1481	1478	1474	1470	1465	1461	1459	1457	1458	1459	1462	1467	1471	1474	1478	1481		
25	1420	1416	1411	1405	1399	1393	1386	1383	1381	1382	1384	1388	1394	1399	1405	1410	1414		
30	1340	1336	1331	1323	1314	1306	1299	1294	1292	1293	1296	1301	1307	1314	1321	1327	1331		
35	1249	1245	1239	1230	1220	1210	1202	1196	1194	1195	1198	1203	1210	1218	1225	1232	1236		
40	1148	1144	1138	1129	1119	1108	1099	1093	1091	1091	1095	1099	1106	1113	1121	1127	1131		
45	1039	1036	1032	1024	1013	1003	994	988	985	986	989	994	999	1004	1009	1014	1018		
50	925	924	921	915	906	896	888	883	881	882	884	888	891	893	896	898	899		
55	810	810	809	806	799	791	783	779	779	780	782	784	785	784	781	781	779		
60	694	696	698	699	695	688	682	680	680	680	680	680	678	673	667	663	659		
65	581	584	589	594	592	587	584	584	584	582	580	576	570	562	553	546	540		
70	470	475	481	488	489	487	488	490	490	486	479	471	461	448	438	429	422		
75	361	366	372	381	386	387	389	387	383	378	372	363	349	333	322	312	302		
80	252	258	264	275	270	256	246	237	228	222	218	213	210	211	205	192	182		
85	142	149	150	139	117	104	95.3	81.5	68.5	59.5	54.9	51.3	53.0	57.2	62.0	63.6	57.9		
90	31.0	28.3	17.3	1.72	1.64	13.1	7.27	10.4	14.2	17.6	20.0	21.2	20.4	18.2	14.4	8.78	1.99		
95	4.20	16.6	32.7	44.7	54.5	63.3	71.0	77.5	82.8	87.1	89.3	85.3	71.3	54.9	37.4	19.8	4.17		
100	5.29	19.5	36.5	53.2	68.2	80.4	89.4	94.8	97.0	95.7	90.9	82.3	70.3	55.2	38.2	20.3	4.15		
105	5.31	19.2	35.6	51.4	65.2	76.4	84.5	89.4	91.3	90.2	85.9	78.2	67.3	53.2	36.8	19.7	4.36		
110	5.34	18.2	33.7	48.6	61.7	72.2	79.7	84.2	86.0	85.0	81.0	73.9	63.5	50.2	34.8	18.6	4.43		
115	5.36	17.0	31.5	45.4	57.6	67.4	74.5	78.7	80.4	79.4	75.7	68.9	59.1	46.7	32.3	17.3	4.43		
120	5.33	15.7	28.8	41.9	53.1	62.3	68.9	73.0	74.6	73.6	70.0	63.5	54.4	42.8	29.5	15.8	4.35		
125	5.09	14.6	26.3	37.8	48.4	56.9	63.1	66.9	68.5	67.4	64.0	58.0	49.2	38.8	26.7	14.4	4.13		
130	5.16	13.1	23.6	34.1	43.3	51.1	57.0	60.6	61.9	60.9	57.5	51.8	44.2	34.6	23.7	12.7	3.11		
135	5.11	11.6	20.8	30.1	38.4	45.5	50.5	53.7	54.8	53.9	51.1	46.0	38.9	30.2	21.0	11.0	2.74		
140	4.71	9.70	18.0	25.9	33.4	39.4	44.0	46.9	47.9	47.0	44.2	39.8	33.5	26.0	17.5	9.63	2.95		
145	3.69	8.40	15.0	22.0	28.1	33.4	37.4	39.9	40.7	40.0	37.5	33.5	28.3	21.9	14.0	8.23	3.31		
150	2.83	7.27	11.6	17.7	23.1	27.4	30.6	32.7	33.3	32.7	30.8	27.6	23.2	17.1	11.9	7.15	3.86		
155	2.85	5.99	9.57	12.9	17.3	21.1	23.9	25.7	26.3	25.8	24.2	21.3	17.3	13.6	9.94	4.69	4.16		
160	3.26	3.86	6.72	9.71	12.1	14.3	16.3	17.8	18.4	18.0	16.9	15.2	13.3	10.8	8.24	3.59	3.72		
165	3.84	2.78	3.77	5.95	7.97	9.47	10.8	11.8	12.4	12.3	11.9	11.0	9.63	8.16	4.96	2.92	3.90		
170	3.87	3.50	2.95	2.84	3.56	5.00	6.35	7.00	7.18	7.13	7.15	6.40	4.80	3.19	2.86	3.47	4.30		
175	4.23	4.24	4.15	3.83	3.54	3.24	3.09	3.13	3.09	3.09	3.22	2.82	3.04	3.57	4.08	4.42	4.44		
180	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35		

Table 5: Luminous Intensity Data

ISTMT TEST DATA:

Sample Tested: **31424-4835LW-1**

Test ambient temperature was 25.4°C.

Test orientation was Light Down.

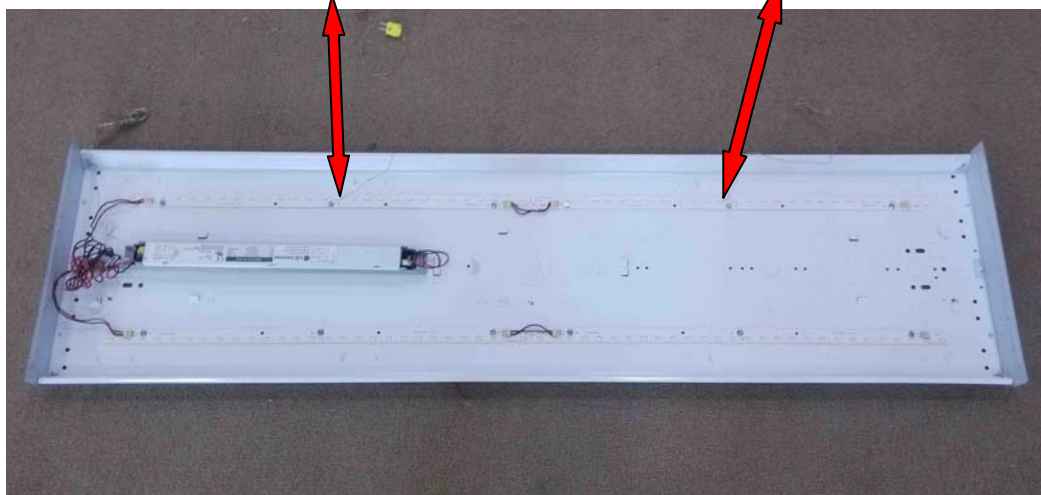
The stabilization time of the sample was 7.5 hours.



View of In-Situ Point- Ts

Point A Location

Point B Location



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	48.04	108.8	51.9	50.4	45.5
277.0	47.01	108.8	51.9	50.4	45.6

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 $k=2$.

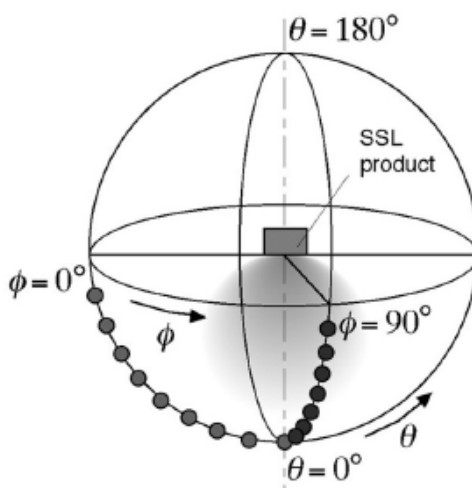
Color Characteristics Measurements

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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