



LM-79-08 Test and ISTMT Report

for

A.L.P. Lighting Components, Inc.

6333 Gross Point Road, Niles, IL 60714

4FT LED Linear Ambient Luminaire Direct

Model: 37024-4850LW-1

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ15060015h

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

Review by:

Engineer: April Zou
Jun. 24, 2015

Approved by:



Manager: Jim Zhang
Jun. 24, 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: 37024-4850LW-1

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
97.0	4638.8	47.81	0.9956
CCT (K)	CRI	Stabilization Time (Light & Power)	
5272	84.6	60	

Table 1: Executive Data Summary

Test specifications:

Date of Receipt	: Jun. 04, 2015
Date of Test	: Jun. 12, 2015 to Jun. 23, 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	: 37024-4850LW-1
Brand Name	: A.L.P Lighting
Electrical Ratings	: AC120~277V, 50/60 Hz, 48W
Product Description	: Wrap 370 base, 5000K, Dimmable Driver: PIFN-X048A Manufacturer of light source: LG INNOTEK Model of light source: LGIT 5630 G2 Quantity of light source: 112pcs
Manufacturer	: A.L.P. Lighting Components, Inc.
Address	: 6333 Gross Point Road, Niles, IL 60714

TEST RESULTS

Test ambient temperature was 25.3°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)	0.400	0.178
Power Factor	0.9956	0.9475
Test Power (W)	47.81	46.82
Off-State Power (W)	0	0
THD A%	6.77	12.27
Luminous Efficacy (lm/W)	97.0	99.0
Total Luminous Flux (lm)	4638.8	4637.2
Color Rendering Index (CRI)	84.6	
R9	13	
Correlated Color Temperature (CCT) (K)	5272	
Chromaticity (Chroma x, Chroma y)	(0.3380, 0.3476)	
Chromaticity (Chroma u, Chroma v)	(0.2081, 0.3211)	
Chromaticity (Chroma u', Chroma v')	(0.2081, 0.4816)	
Duv	0.0009	
Average Beam Angle (°)	116.0	
Center Beam Candle Power (cd)	1413	
Spacing Criteria	1.27 (0°-180°)/ 1.25 (90°-270°)	
Zonal Lumens in the 0°-60°Zone	69.55%	
Zonal Lumens in the 60°-90°Zone	23.20%	
Zonal Lumens in the 90°-120°Zone	4.44%	
Zonal Lumens in the 120°-180°Zone	2.81%	

Special Rendering Indices	Color
R1	83
R2	89
R3	93
R4	85
R5	84
R6	85
R7	87
R8	69
R9	13
R10	75
R11	85
R12	68
R13	85
R14	97

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

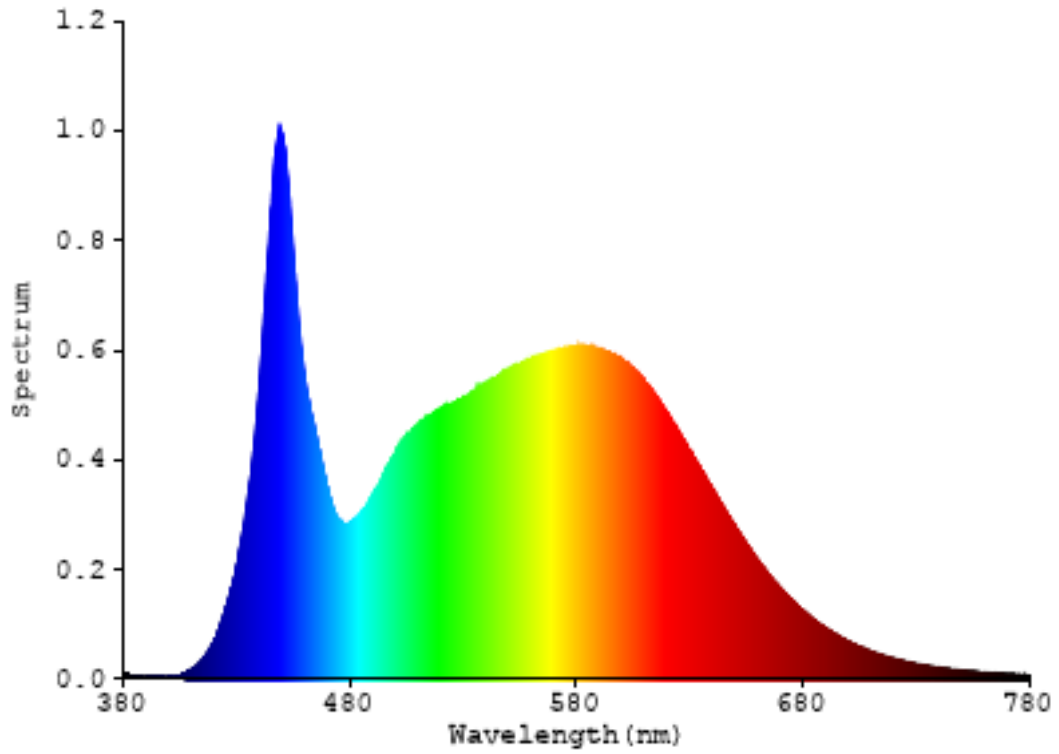


Chart 1: Spectral Power Distribution

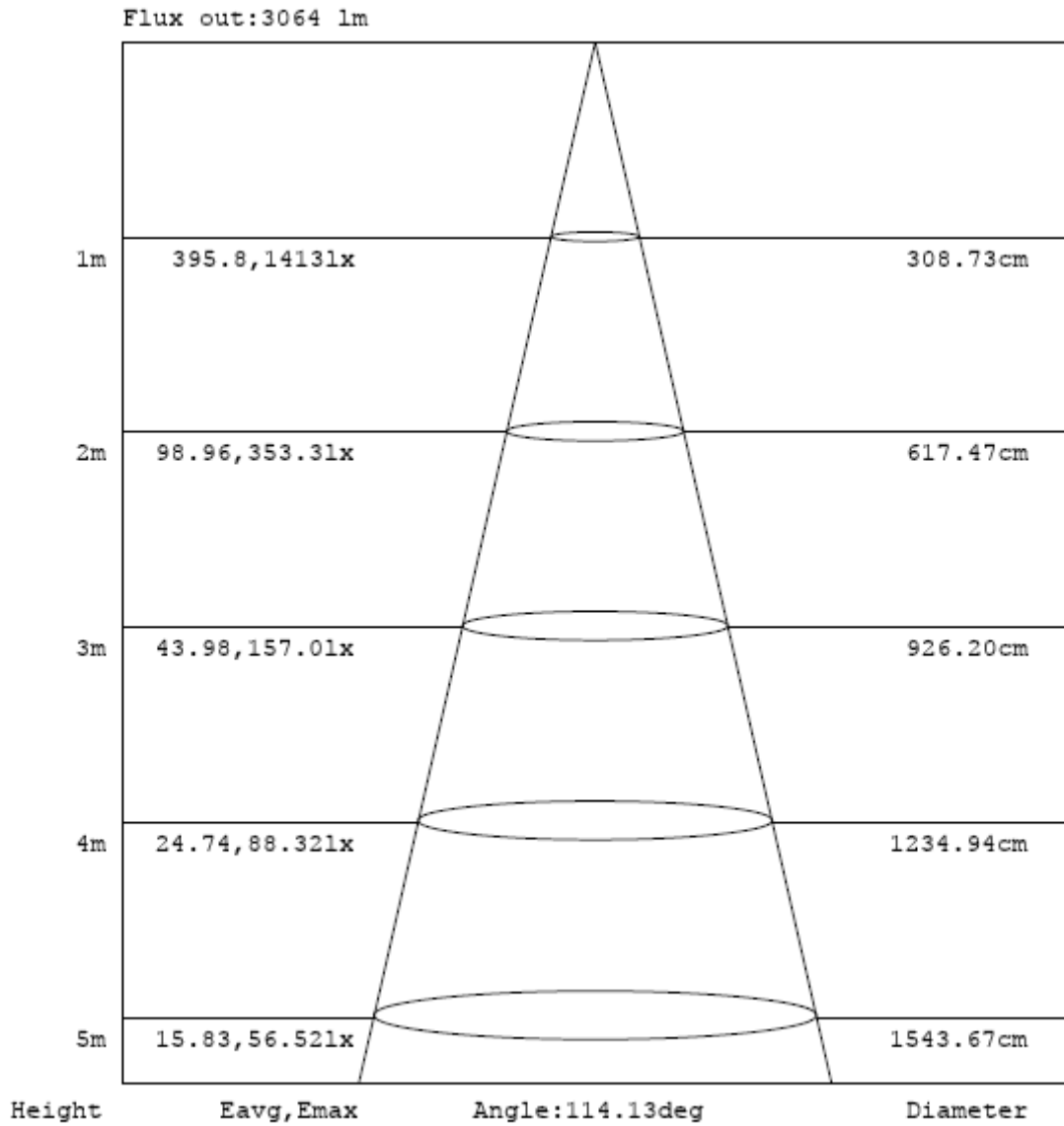
Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	133.714	2.88%
10- 20	383.3	8.26%
20- 30	581.493	12.54%
30- 40	703.668	15.17%
40- 50	738.082	15.91%
50- 60	685.922	14.79%
60- 70	560.055	12.07%
70- 80	381.163	8.22%
80- 90	135.144	2.91%
90-100	61.261	1.32%
100-110	77.729	1.68%
110-120	66.873	1.44%
120-130	52.949	1.14%
130-140	38.057	0.82%
140-150	23.731	0.51%
150-160	11.84	0.26%
160-170	2.994	0.06%
170-180	0.786	0.02%
Total	4638.8	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	3226.179	69.55%
60- 90	1076.362	23.20%
0-90	4302.541	92.75%
90- 180	336.22	7.25%
0- 180	4638.8	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

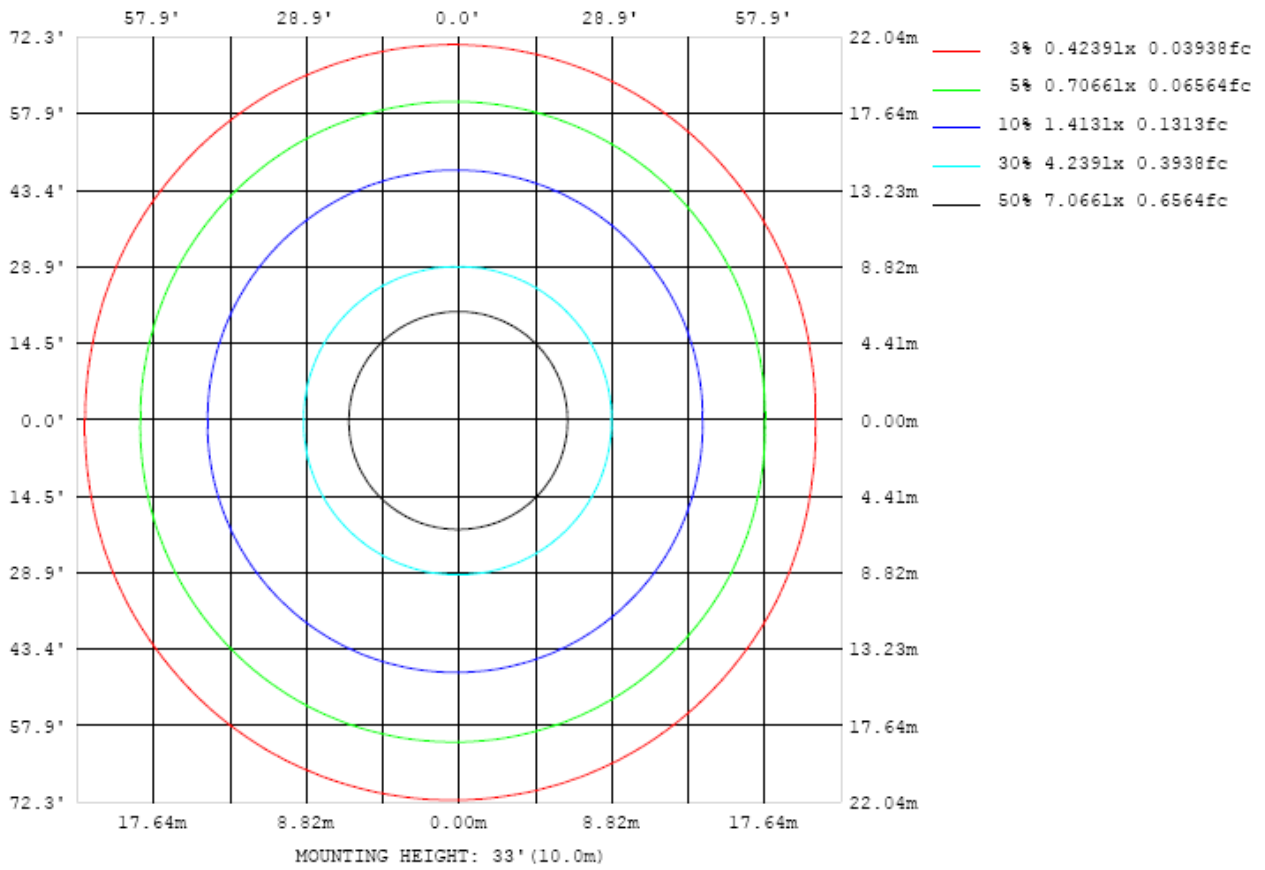


Chart 3: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots

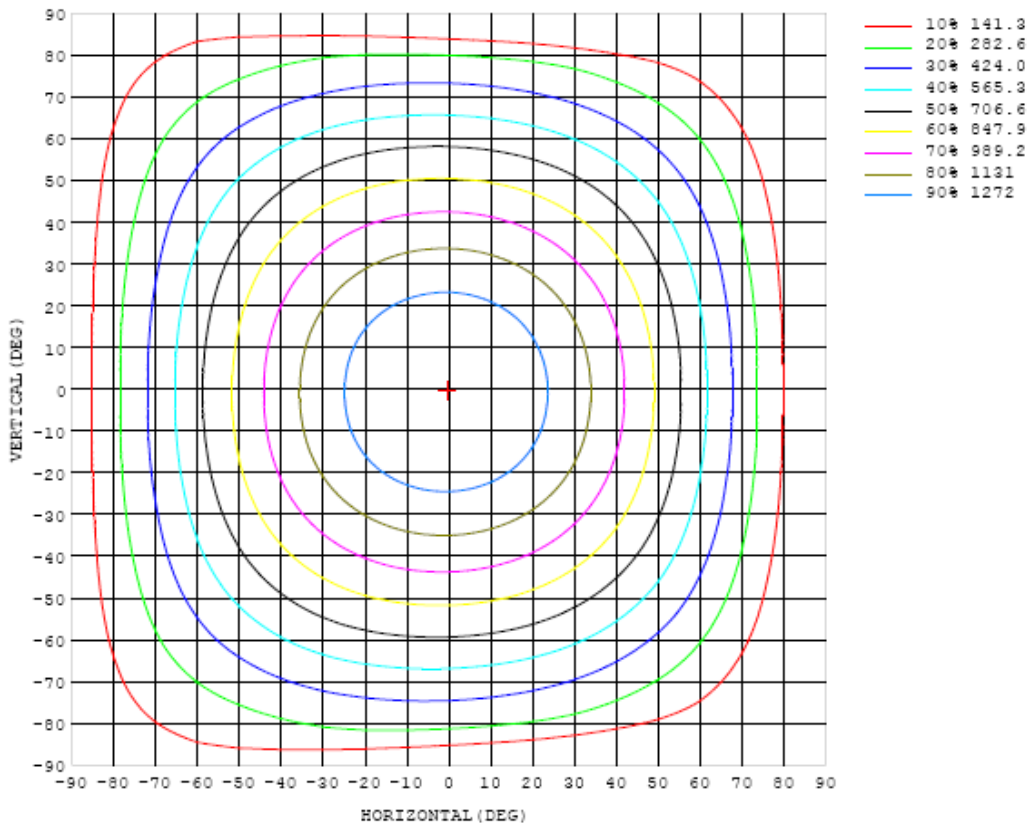


Chart 4: Isocandla Plot

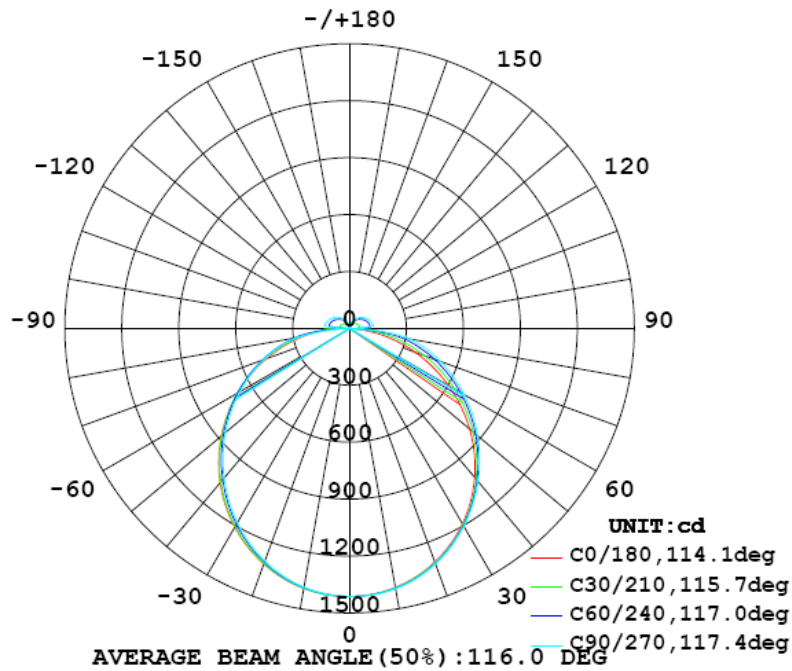


Chart 5: Polar Candela Distribution

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	1413	1413	1413	1413	1413	1413	1413	1413	1413	1413	1413	1413	1413	1413	1413	1413	1413	1413	1413
5	1406	1406	1406	1406	1407	1407	1407	1408	1408	1408	1408	1409	1409	1409	1409	1409	1408	1408	1408
10	1386	1387	1387	1388	1389	1390	1390	1391	1392	1392	1393	1393	1393	1393	1393	1392	1392	1392	1391
15	1355	1355	1356	1357	1359	1360	1361	1362	1362	1363	1364	1364	1365	1365	1365	1365	1364	1363	1362
20	1311	1312	1313	1315	1317	1318	1318	1319	1320	1320	1322	1323	1325	1326	1326	1326	1325	1323	1322
25	1255	1257	1259	1261	1263	1263	1264	1264	1265	1267	1268	1271	1273	1275	1276	1276	1275	1273	1271
30	1189	1191	1194	1196	1198	1198	1199	1200	1201	1203	1205	1208	1211	1214	1216	1217	1215	1212	1210
35	1112	1114	1118	1121	1123	1124	1126	1127	1129	1131	1134	1137	1141	1144	1146	1147	1146	1143	1140
40	1025	1028	1033	1037	1040	1042	1045	1047	1050	1053	1056	1060	1063	1066	1069	1070	1068	1065	1062
45	929	933	940	945	950	954	958	962	966	969	973	977	980	982	984	985	983	979	975
50	825	831	839	848	854	860	866	872	876	881	885	889	892	894	895	895	892	887	882
55	715	722	734	745	754	763	771	778	784	789	794	798	801	801	801	799	795	789	784
60	601	610	625	639	650	662	673	683	690	696	700	704	707	706	704	701	694	687	681
65	485	494	513	531	544	560	575	586	595	602	607	611	612	609	604	600	592	581	574
70	367	378	399	420	437	457	475	490	501	509	514	517	516	511	503	497	487	474	466
75	250	262	285	309	330	353	375	394	408	417	422	423	420	412	402	393	383	367	359
80	134	147	171	198	222	247	271	291	307	321	329	330	325	314	301	290	278	261	252
85	24.1	33.0	56.9	60.2	68.5	76.4	94.5	115	134	155	177	196	207	210	200	189	174	156	147
90	0.54	4.19	17.2	32.7	31.1	26.9	22.3	16.7	9.68	3.54	5.85	4.52	20.7	36.6	53.1	67.5	64.3	51.1	45.4
95	1.25	5.43	28.9	53.2	74.8	93.6	109	119	109	93.0	78.5	65.4	53.5	43.2	35.7	25.3	12.0	3.46	0.64
100	2.07	6.25	28.7	54.0	75.6	93.5	107	117	123	124	121	115	104	89.2	71.2	50.5	26.7	7.45	1.36
105	3.00	7.05	27.9	52.6	73.6	91.1	105	114	119	120	118	112	101	87.8	70.9	50.3	26.2	8.09	1.98
110	3.75	7.64	27.3	50.6	70.6	87.7	101	110	115	116	114	108	97.9	84.9	68.4	48.2	25.6	8.66	2.75
115	4.41	7.43	26.8	48.2	67.1	83.3	95.9	105	110	111	109	103	93.7	81.0	65.3	46.0	25.0	8.85	3.21
120	5.16	5.20	26.1	45.7	63.0	78.2	90.2	98.6	103	105	103	97.1	88.3	76.4	61.6	43.5	24.4	8.75	3.75
125	5.81	6.06	25.3	42.8	58.7	72.5	83.9	91.8	96.5	97.8	95.8	90.6	82.4	71.2	57.3	41.2	23.5	6.51	4.50
130	6.37	8.78	23.9	40.1	54.3	66.7	76.7	84.3	88.7	90.1	88.2	83.4	75.8	65.4	53.2	38.5	22.7	7.71	4.99
135	6.64	8.76	18.9	37.1	49.1	60.8	69.8	76.4	80.3	81.5	79.9	75.6	68.9	59.8	48.7	35.9	21.1	9.41	5.30
140	6.77	8.26	6.84	34.3	44.6	54.0	62.4	68.5	72.0	73.1	71.7	68.0	61.9	53.7	44.6	32.1	15.3	9.49	5.52
145	7.18	8.46	6.15	28.4	39.7	48.4	54.8	59.6	63.1	64.1	63.0	59.5	54.4	48.2	40.4	25.7	2.14	10.0	5.91
150	7.53	9.14	9.19	10.9	35.0	41.5	47.9	52.3	54.9	55.7	54.8	52.3	48.0	42.0	33.5	20.5	4.87	9.75	6.21
155	7.44	8.93	10.7	4.99	16.7	34.9	39.5	43.5	45.9	46.8	46.1	43.8	39.9	35.7	19.8	4.14	12.9	9.19	6.66
160	6.57	8.09	11.4	11.2	3.79	8.94	26.6	34.2	36.1	36.9	36.4	35.0	27.9	12.4	4.31	9.42	11.9	7.98	6.49
165	6.66	7.18	9.40	11.9	13.6	8.15	2.63	4.17	5.29	6.74	5.56	4.07	2.24	7.22	11.9	12.2	8.99	6.96	5.97
170	6.92	7.11	8.18	9.58	11.2	12.7	13.3	12.5	11.9	11.9	11.7	12.1	12.9	11.0	9.66	8.30	6.95	5.89	5.41
175	7.67	7.62	7.67	7.71	8.22	8.25	9.21	9.14	8.74	8.16	8.18	8.16	8.20	7.99	7.42	6.92	6.70	6.26	5.76
180	6.98	6.98	6.98	6.98	6.98	6.98	6.98	6.98	6.98	6.98	6.98	6.98	6.98	6.98	6.98	6.98	6.98	6.98	6.98

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	1413	1413	1413	1413	1413	1413	1413	1413	1413	1413	1413	1413	1413	1413	1413	1413	1413		
5	1408	1408	1407	1407	1407	1406	1406	1406	1405	1405	1405	1405	1405	1405	1405	1405	1406		
10	1390	1390	1389	1389	1388	1387	1387	1386	1385	1385	1385	1385	1385	1385	1385	1385	1386		
15	1361	1361	1360	1358	1357	1356	1354	1353	1352	1351	1351	1351	1352	1352	1352	1353	1353		
20	1321	1320	1319	1317	1314	1312	1309	1307	1306	1305	1305	1305	1306	1307	1308	1309	1309		
25	1270	1269	1267	1264	1261	1257	1254	1251	1249	1248	1248	1248	1249	1251	1252	1253	1254		
30	1209	1208	1205	1201	1197	1193	1188	1185	1183	1182	1181	1181	1182	1184	1185	1186	1187		
35	1138	1137	1134	1130	1125	1120	1115	1112	1109	1107	1106	1106	1106	1108	1109	1110	1111		
40	1060	1058	1055	1051	1045	1040	1036	1032	1029	1027	1025	1024	1023	1023	1024	1024	1024		
45	974	972	970	965	960	956	952	947	943	941	939	936	934	933	932	931	929		
50	881	880	878	875	871	867	863	858	854	851	848	844	840	837	834	830	827		
55	783	783	783	780	778	775	772	766	762	758	754	749	743	737	731	725	719		
60	680	682	684	683	682	681	678	673	669	663	658	651	642	633	625	616	606		
65	575	579	583	584	585	586	584	580	575	569	561	552	541	528	517	504	491		
70	468	475	480	483	487	490	490	487	482	475	466	453	438	422	407	391	375		
75	361	371	377	382	388	394	396	395	391	383	370	354	334	315	297	278	260		
80	255	267	275	282	290	298	298	289	277	266	255	241	225	207	186	164	145		
85	151	163	174	177	166	151	133	111	90.7	74.8	73.3	56.4	49.3	49.3	49.2	42.2	32.7		
90	47.7	51.0	43.9	46.1	10.1	3.31	6.18	9.53	16.2	22.5	28.1	32.4	36.8	40.1	37.9	21.5	4.69		
95	4.56	20.5	39.9	55.0	69.0	83.1	96.7	110	124	133	128	117	101	81.9	58.5	30.1	7.85		
100	6.36	29.7	53.5	75.6	94.8	110	121	128	131	130	125	115	101	82.4	59.0	29.1	8.33		
105	6.47	29.2	52.9	74.2	92.3	107	117	124	127	126	121	112	97.8	79.7	56.4	28.1	9.02		
110	6.85	27.7	50.4	70.9	88.5	103	113	119	122	121	116	107	93.4	75.9	53.3	27.0	9.37		
115	6.97	26.0	47.4	67.0	83.8	97.3	107	113	116	115	110	101	88.1	71.4	49.8	26.2	8.15		
120	7.05	24.7	44.1	62.5	78.4	91.1	100	106	109	108	103	94.3	82.0	66.0	46.6	25.0	8.32		
125	5.34	22.7	41.0	57.4	72.3	84.3	93.1	98.7	101	99.7	95.2	87.0	75.1	60.8	42.7	23.4	9.43		
130	3.35	21.2	37.2	52.5	65.7	76.8	85.1	90.3	92.3	91.2	86.6	78.9	68.5	54.8	39.6	21.6	8.63		
135	3.67	19.4	33.7	47.1	59.4	69.3	76.5	81.2	82.9	81.9	78.0	71.3	60.9	49.5	36.3	10.7	8.50		
140	5.72	17.4	30.3	41.4	52.0	61.5	68.3	72.3	73.9	72.9	69.5	62.0	54.0	44.2	32.4	5.69	8.18		
145	6.43	9.41	24.8	37.1	45.6	52.4	58.0	62.0	63.3	62.2	58.5	54.4	47.5	38.6	21.9	8.36	8.50		
150	6.93	2.30	19.1	31.2	38.8	45.5	50.3	53.2	54.3	53.7	51.1	46.6	40.0	33.2	9.06	9.49	9.07		
155	7.21	5.16	7.31	20.5	31.7	36.5	40.8	43.5	44.4	43.8	41.6	37.7	33.3	16.8	5.18	10.4	9.10		
160	6.58	8.09	4.68	4.91	14.6	26.2	30.6	32.5	33.7	33.3	31.9	27.4	13.3	3.38	9.22	11.4	8.71		
165	5.94	6.64	7.81	7.14	4.72	2.89	4.30	7.82	9.46	8.52	5.16	2.87	4.54	9.47	11.8	9.97	8.47		
170	5.40	5.63	6.12	6.80	7.64	8.19	8.86	9.00	9.11	9.43	10.7	11.6	11.2	10.7	9.58	8.56	7.78		
175	5.70	5.84	6.09	6.29	6.53	6.98	7.31	7.51	7.48	7.55	7.64	7.60	6.98	6.33	7.46	7.40	7.51		
180	6.98	6.98	6.98	6.98	6.98	6.98	6.98	6.98	6.98	6.98	6.98	6.98	6.98	6.98	6.98	6.98	6.98		

Table 5: Luminous Intensity Data

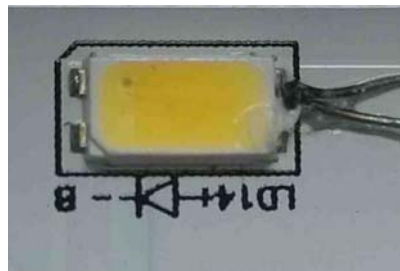
ISTMT TEST DATA:

Sample Tested: **37024-4850LW-1**

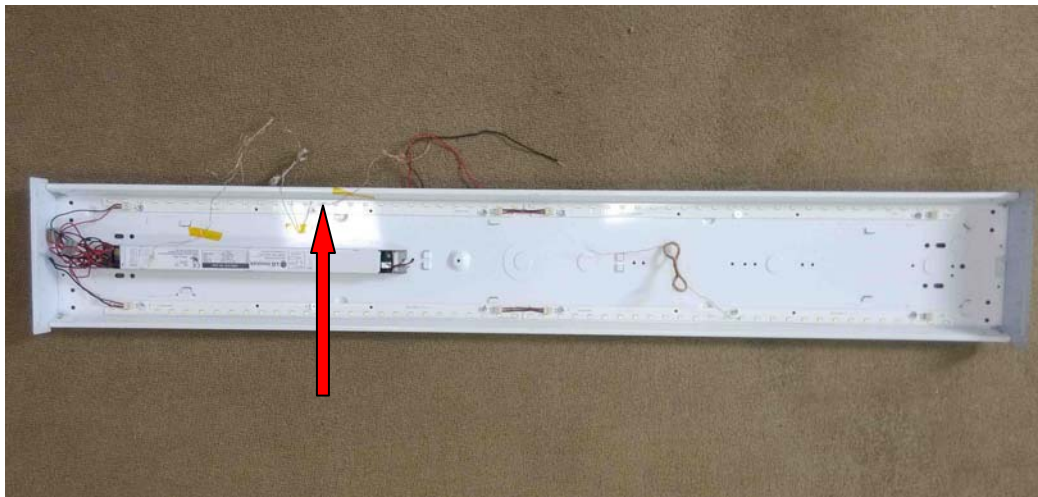
Test ambient temperature was 27.2°C.

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

To get the maximum temperature, Ts point is middle of the LED board.

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)
120.0	47.81	109.2	41.4	54.6
277.0	46.82	109.1	41.6	54.7

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 $k=2$.

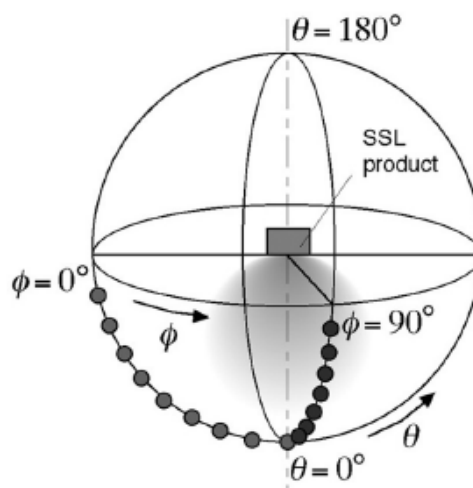
Color Characteristics Measurements

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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