



LM-79-08 Test and ISTMT Report

for

A.L.P. Lighting Components, Inc.

6333 Gross Point Road, Niles, IL 60714

2FT LED Linear Ambient Luminaire Direct

Model: 37022-3750LW-1

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ15060015f

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

Review by:

Engineer: April Zou
Jun. 26, 2015

Approved by:



Manager: Jim Zhang
Jun. 26, 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: 37022-3750LW-1

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
93.4	2667.6	28.57	0.9944
CCT (K)	CRI	Stabilization Time (Light & Power)	
5290	84.4	60	

Table 1: Executive Data Summary

Test specifications:

Date of Receipt	: Jun. 04, 2015
Date of Test	: Jun. 12, 2015 to Jun. 24, 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	: 2FT LED Linear Ambient Luminaire Direct
Model	: 37022-3750LW-1
Brand Name	: A.L.P Lighting
Electrical Ratings	: AC120~277V, 50/60 Hz, 37W
Product Description	: Wrap 370 base, 5000K, Dimmable Driver: PIFC-C201B Manufacturer of light source: LG INNOTEK Model of light source: LGIT 5630 G2 Quantity of light source: 56 pcs
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)	0.239	0.113
Power Factor	0.9944	0.9257
Test Power (W)	28.57	29.00
Off-State Power (W)	0	0
THD A%	6.21	18.25
Luminous Efficacy (lm/W)	93.4	91.9
Total Luminous Flux (lm)	2667.6	2666.2
Color Rendering Index (CRI)	84.4	
R9	12	
Correlated Color Temperature (CCT) (K)	5290	
Chromaticity (Chroma x, Chroma y)	(0.3375, 0.3466)	
Chromaticity (Chroma u, Chroma v)	(0.2082, 0.3207)	
Chromaticity (Chroma u', Chroma v')	(0.2082, 0.4811)	
Duv	0.0006	
Average Beam Angle (°)	111.9	
Center Beam Candle Power (cd)	852	
Spacing Criteria	1.22 (0°-180°)/ 1.24 (90°-270°)	
Zonal Lumens in the 0°-60°Zone	70.67%	
Zonal Lumens in the 60°-90°Zone	22.35%	
Zonal Lumens in the 90°-120°Zone	4.21%	
Zonal Lumens in the 120°-180°Zone	2.77%	

Special Rendering Indices	Color
R1	83
R2	89
R3	93
R4	85
R5	84
R6	85
R7	87
R8	69
R9	12
R10	74
R11	84
R12	69
R13	84
R14	96

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

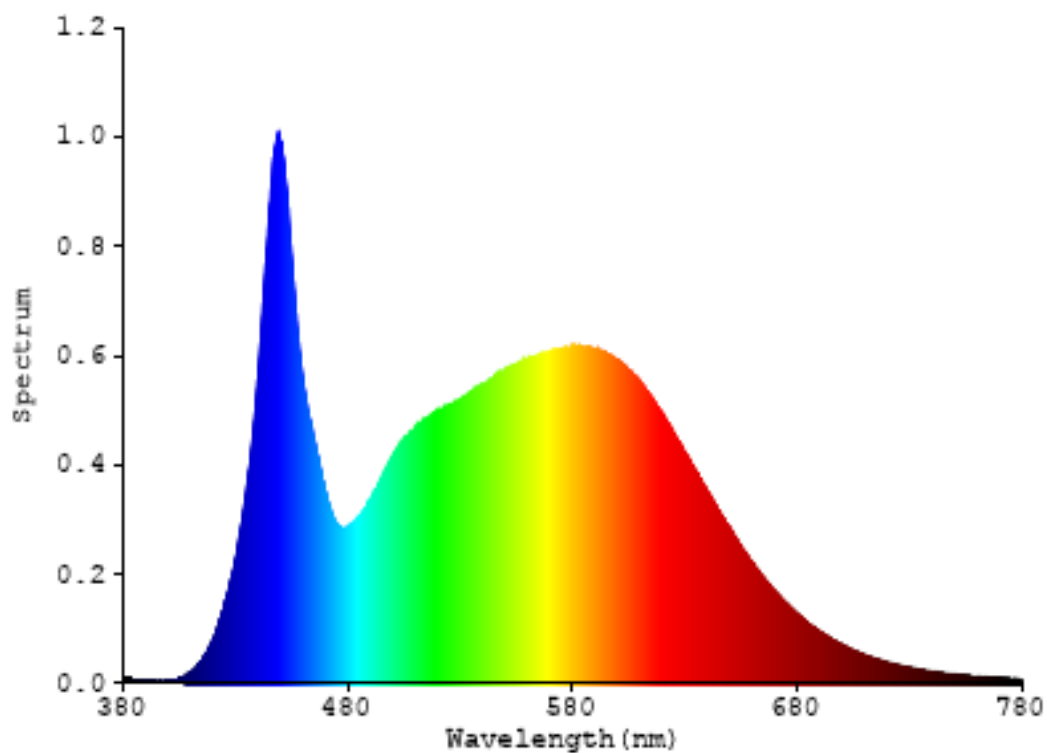


Chart 1: Spectral Power Distribution

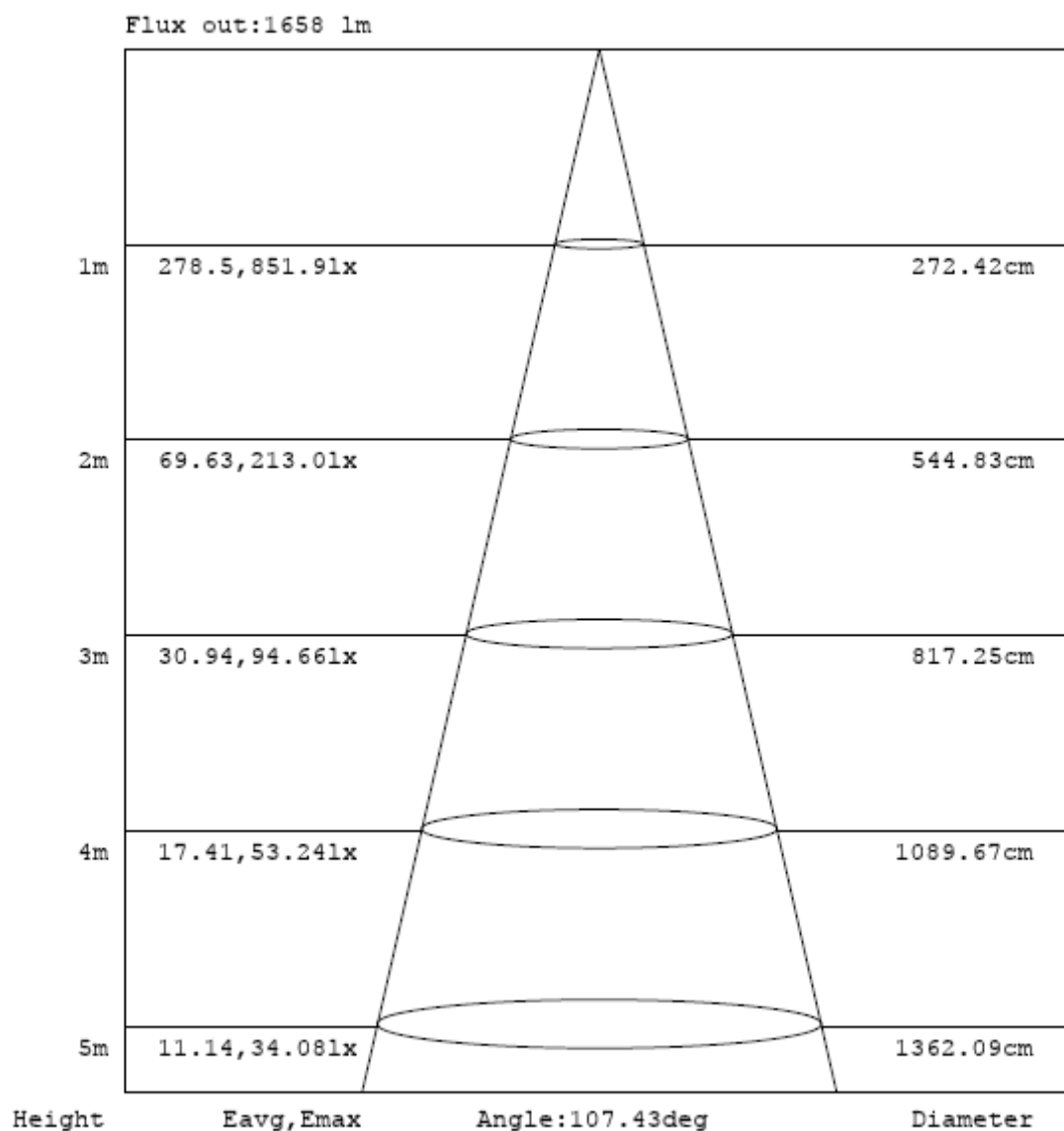
Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	80.481	3.02%
10- 20	229.578	8.61%
20- 30	345.148	12.94%
30- 40	412.59	15.47%
40- 50	426.619	15.99%
50- 60	390.698	14.65%
60- 70	314.812	11.80%
70- 80	211.111	7.91%
80- 90	70.246	2.63%
90-100	31.055	1.16%
100-110	43.428	1.63%
110-120	37.74	1.41%
120-130	29.95	1.12%
130-140	21.714	0.81%
140-150	13.423	0.50%
150-160	6.71	0.25%
160-170	1.793	0.07%
170-180	0.461	0.02%
Total	2667.6	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	1885.114	70.67%
60- 90	596.169	22.35%
0-90	2481.283	93.02%
90- 180	186.274	6.98%
0- 180	2667.6	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

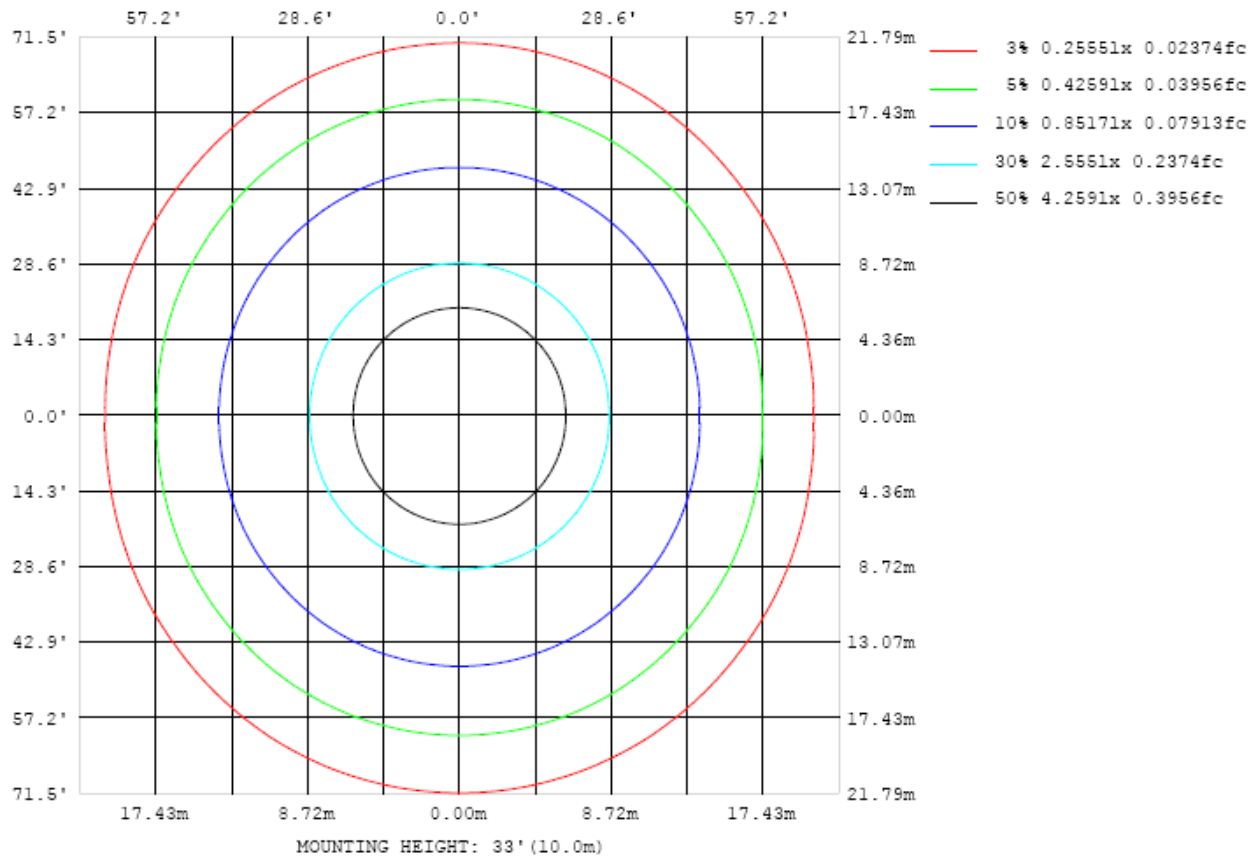


Chart 3: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots

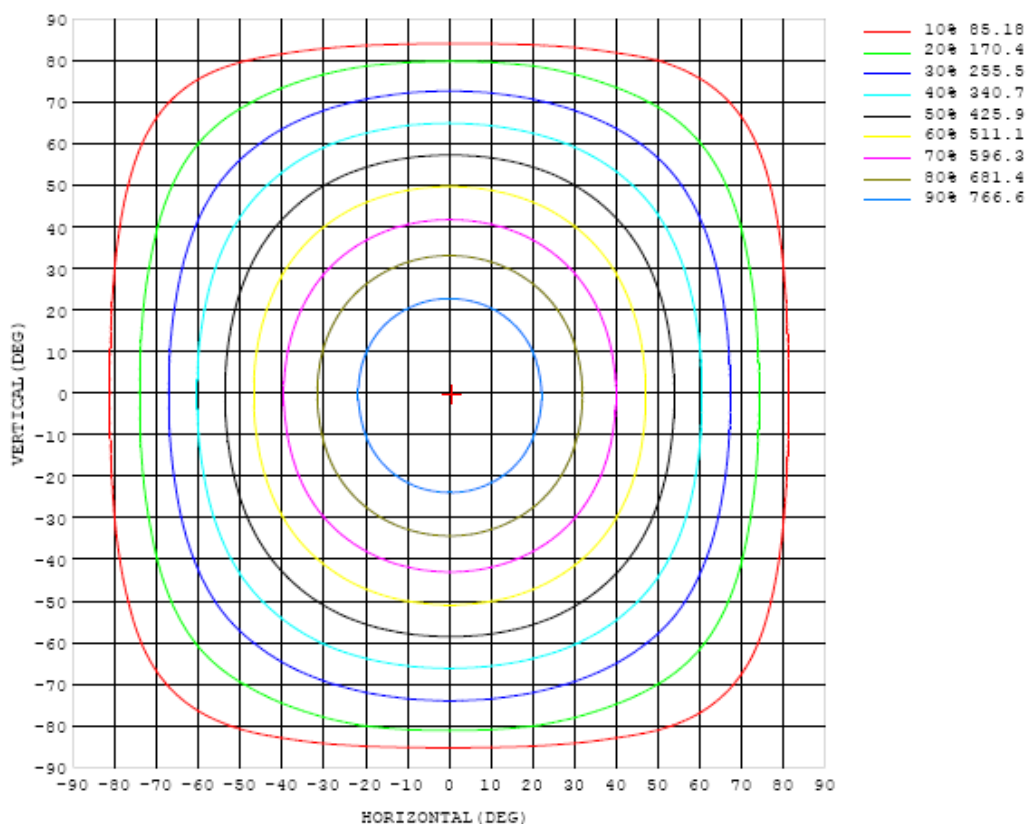


Chart 4: Isocandla Plot

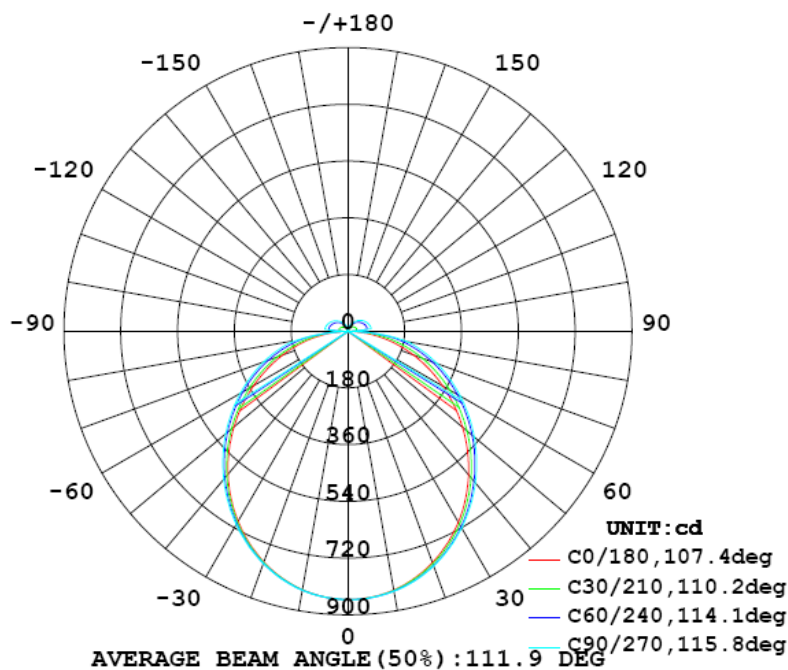


Chart 5: Polar Candela Distribution

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	852	852	852	852	852	852	852	852	852	852	852	852	852	852	852	852	852	852	852
5	847	847	847	848	848	848	848	848	848	848	848	848	848	848	848	847	847	847	847
10	834	834	835	835	836	836	837	837	838	838	837	837	837	836	835	834	834	833	833
15	812	812	813	814	816	817	818	819	819	819	819	818	817	816	815	813	812	811	810
20	781	782	783	786	788	790	791	792	793	793	793	792	791	789	787	784	782	780	779
25	744	745	747	750	753	755	757	758	759	759	759	758	756	754	751	748	745	742	741
30	699	701	704	707	711	714	716	718	720	720	720	718	716	713	710	706	702	698	697
35	649	651	655	659	664	668	671	674	676	676	675	673	670	667	663	658	653	648	647
40	594	597	601	606	612	617	621	625	627	628	627	624	620	616	611	605	599	594	592
45	535	539	544	550	557	563	569	573	576	576	575	572	568	562	556	549	542	536	533
50	474	478	485	492	499	507	513	519	522	522	521	518	513	505	498	490	482	475	472
55	410	415	424	432	441	449	457	463	466	467	465	462	456	447	438	430	420	412	409
60	346	352	362	372	380	390	400	406	410	411	409	405	398	389	378	369	358	349	345
65	283	289	300	311	320	331	342	349	353	355	353	349	341	330	318	308	297	287	282
70	221	227	238	250	260	272	284	292	298	300	298	292	283	271	257	247	236	225	220
75	159	166	177	189	200	213	226	236	243	246	243	236	225	211	197	186	175	164	160
80	99.2	106	117	129	140	153	168	181	188	190	188	180	167	152	137	126	115	104	100
85	40.8	46.6	55.6	65.8	74.0	78.2	86.0	91.4	93.4	93.7	93.6	92.1	86.9	78.8	72.7	63.8	53.4	45.4	42.0
90	0.22	1.27	2.04	4.88	5.46	3.03	6.41	6.83	6.91	4.11	6.81	6.79	6.37	3.02	5.45	4.72	1.68	2.01	0.27
95	0.38	3.39	12.3	22.2	33.1	44.9	48.1	49.9	49.9	49.8	50.0	50.2	48.5	44.8	33.0	22.2	12.1	1.68	0.54
100	0.75	3.66	15.9	28.2	40.3	51.5	61.2	68.4	72.4	73.6	72.1	68.0	60.7	51.0	39.8	27.7	15.4	1.87	0.93
105	1.26	3.77	16.4	28.7	40.7	51.4	60.2	66.7	70.5	71.7	70.3	66.3	59.7	50.8	40.1	28.1	15.8	2.21	1.43
110	1.86	4.08	16.1	28.0	39.6	49.8	58.3	64.5	68.1	69.3	67.9	64.1	57.9	49.3	39.0	27.5	15.6	2.72	1.95
115	2.19	4.29	15.6	26.8	37.8	47.5	55.6	61.6	65.2	66.3	65.0	61.3	55.3	47.2	37.4	26.5	15.2	2.93	2.21
120	2.59	3.23	14.8	25.3	35.6	44.8	52.5	58.2	61.6	62.7	61.5	57.9	52.2	44.6	35.4	25.1	14.6	1.99	2.70
125	2.99	1.90	13.6	23.9	33.1	41.8	49.0	54.2	57.5	58.6	57.5	54.1	48.8	41.6	33.0	23.8	14.3	2.47	3.08
130	3.58	2.57	13.7	21.5	30.7	38.3	44.9	49.9	52.9	54.0	53.0	49.9	44.8	38.3	30.7	21.5	13.9	5.23	3.73
135	3.80	4.38	12.7	20.1	27.5	35.0	40.8	45.2	47.8	48.8	47.9	45.2	40.8	35.1	27.5	20.8	12.8	5.08	4.25
140	4.14	4.63	5.88	18.6	25.3	30.7	36.7	40.3	42.7	43.5	42.7	40.4	36.7	30.8	25.5	18.8	4.88	5.65	4.18
145	4.50	5.40	1.52	16.5	22.3	27.7	31.1	34.7	36.9	37.8	37.0	34.8	31.4	28.0	22.7	16.7	1.39	5.60	4.65
150	4.55	5.59	5.42	6.73	19.1	23.8	27.6	30.4	32.1	32.7	32.2	30.6	27.9	24.2	19.5	7.64	5.71	5.78	4.50
155	4.84	5.77	6.80	1.37	13.5	19.5	22.8	25.1	26.6	27.1	26.7	25.3	23.1	20.0	14.9	1.65	6.98	5.17	4.34
160	5.20	5.61	6.93	7.66	1.76	5.45	17.4	19.6	20.8	21.2	20.9	19.7	17.9	4.50	1.63	8.26	6.99	5.60	5.34
165	4.95	5.44	6.20	6.99	7.24	3.16	1.45	1.40	3.11	6.00	3.89	1.95	1.27	2.10	8.02	7.38	5.87	4.93	4.73
170	4.49	4.66	5.43	6.00	6.58	6.87	6.99	7.54	7.71	7.84	7.84	7.81	7.59	6.98	6.36	5.40	4.64	4.20	3.93
175	3.69	3.77	4.00	4.42	4.74	4.99	4.96	4.77	4.87	4.94	5.08	5.00	4.80	4.24	3.84	3.54	3.31	3.12	2.89
180	3.72	3.57	3.52	3.32	3.19	3.35	3.26	2.98	2.77	3.44	2.92	2.17	3.31	3.55	3.47	3.57	3.88	3.82	3.68

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	852	852	852	852	852	852	852	852	852	852	852	852	852	852	852	852	852		
5	847	847	847	847	847	847	847	847	847	847	847	847	847	847	847	847	847		
10	833	833	833	833	834	834	834	834	835	835	835	835	834	834	834	834	834		
15	810	811	811	812	812	813	813	813	813	814	814	814	813	813	812	812	811		
20	779	780	781	782	783	784	784	784	784	785	785	784	784	783	783	782	781		
25	741	743	744	745	746	747	748	749	749	749	749	748	747	747	746	745	744		
30	697	699	701	702	704	705	706	708	708	708	707	706	705	704	702	701	699		
35	647	649	652	654	656	658	660	662	663	662	661	659	657	655	653	651	650		
40	592	595	598	601	604	607	610	612	613	613	611	609	606	603	600	597	595		
45	534	537	541	545	550	554	557	560	560	560	558	555	551	547	543	540	537		
50	473	477	482	487	493	499	503	505	506	506	503	500	495	489	484	480	476		
55	411	416	422	428	435	442	446	449	450	450	447	443	436	430	424	418	413		
60	348	354	361	368	377	385	390	393	394	393	390	385	377	370	363	356	350		
65	285	293	300	308	318	327	333	337	339	337	333	327	318	310	302	294	286		
70	224	231	240	247	259	269	277	282	284	282	276	269	259	249	241	232	224		
75	163	171	179	187	199	211	220	227	229	227	220	210	199	189	180	171	164		
80	104	112	120	127	140	150	159	163	164	163	159	151	140	130	121	112	104		
85	44.2	49.1	55.6	57.6	55.6	57.4	59.0	59.3	59.4	61.1	62.2	62.2	60.7	61.9	57.7	49.3	44.0		
90	0.29	0.50	2.17	4.35	5.81	6.01	7.22	7.74	7.61	6.97	5.84	5.78	5.40	1.25	0.54	0.31	0.26		
95	4.26	13.7	24.7	36.5	48.5	59.9	66.8	67.1	66.8	66.0	64.2	57.6	45.6	33.5	21.9	11.5	1.58		
100	4.90	16.6	29.1	41.2	52.3	61.5	68.2	72.0	73.1	71.5	67.2	60.0	50.2	38.9	26.7	14.4	1.50		
105	4.78	16.7	29.1	41.0	51.5	60.1	66.2	69.9	71.0	69.4	65.3	58.8	49.7	38.9	26.9	14.5	1.70		
110	4.92	16.2	28.1	39.5	49.6	57.8	63.8	67.3	68.3	66.8	62.9	56.5	47.9	37.5	26.0	14.0	2.05		
115	4.93	15.3	26.7	37.5	47.1	55.0	60.7	64.0	65.0	63.5	59.7	53.6	45.4	35.6	24.6	13.3	2.10		
120	4.69	14.2	24.9	35.2	44.2	51.6	57.0	60.3	61.2	59.8	56.1	50.3	42.5	33.2	22.9	12.5	2.49		
125	1.82	13.5	23.2	32.4	40.9	47.9	53.0	56.0	56.8	55.5	52.0	46.6	39.3	30.6	20.9	11.7	4.13		
130	2.48	12.9	20.6	29.8	37.4	43.7	48.5	51.3	52.1	50.8	47.6	42.5	35.8	28.0	19.1	10.9	3.61		
135	4.67	11.7	19.3	26.3	33.8	39.4	43.6	46.1	46.8	45.7	42.8	38.2	32.3	24.5	17.6	9.43	3.57		
140	4.08	9.85	17.3	23.7	29.3	35.1	38.7	40.8	41.4	40.4	37.9	33.5	27.7	22.2	15.6	2.36	4.22		
145	4.88	2.46	14.9	20.6	25.9	29.2	32.7	34.8	35.4	34.4	32.0	28.5	24.8	19.3	13.3	2.02	4.70		
150	4.88	1.79	11.3	17.3	21.9	25.6	28.1	29.6	30.0	29.3	27.4	24.6	20.8	16.1	2.23	5.38	4.74		
155	4.69	5.11	2.73	13.4	17.2	20.4	22.6	24.0	24.3	23.8	22.3	19.9	16.7	10.2	1.71	5.69	5.06		
160	5.26	5.65	6.19	2.56	4.74	14.0	16.6	18.0	18.3	18.0	16.9	14.2	5.39	2.51	6.69	5.83	5.27		
165	4.87	4.95	5.69	5.74	3.21	1.56	2.49	2.57	2.56	2.45	2.52	2.36	1.75	6.62	5.92	5.61	5.31		
170	3.99	4.13	4.32	5.04	5.51	5.82	6.04	6.22	6.42	6.44	6.31	6.16	5.97	5.69	5.36	5.03	4.77		
175	2.90	3.08	3.16	3.31	3.51	3.94	4.20	4.52	4.67	4.55	4.53	4.28	4.38	4.32	4.25	4.08	3.77		
180	3.66	3.61	3.58	3.36	3.22	3.28	2.96	2.58	2.62	2.71	2.92	3.12	3.39	3.59	3.56	3.65	3.77		

Table 5: Luminous Intensity Data

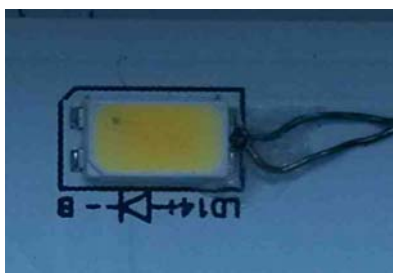
ISTMT TEST DATA:

Sample Tested: **37022-3750LW-1**

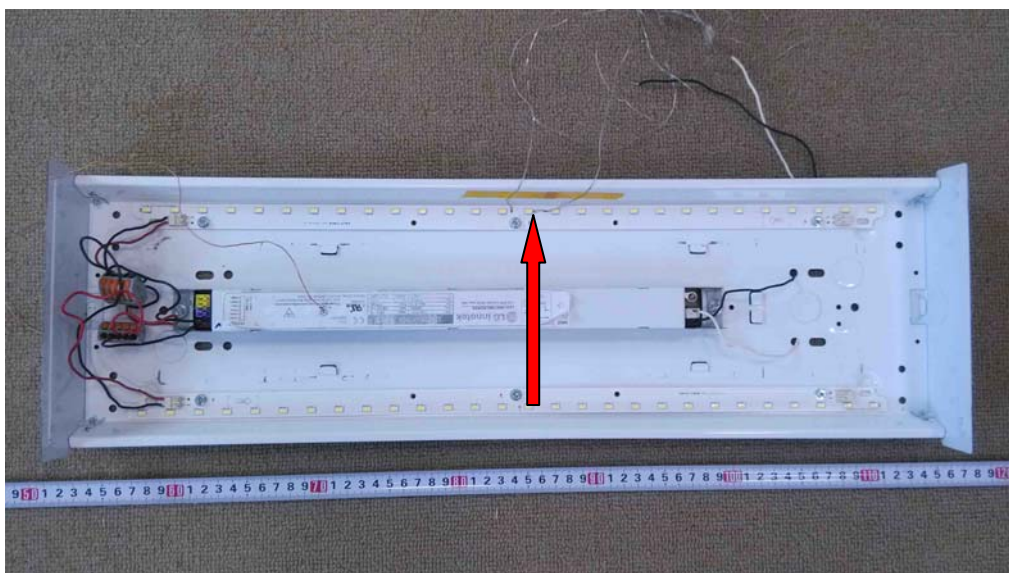
Test ambient temperature was 27.8°C.

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	28.57	144.5	49.7	49.5
277.0	29.00	144.3	49.8	49.7

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 $k=2$.

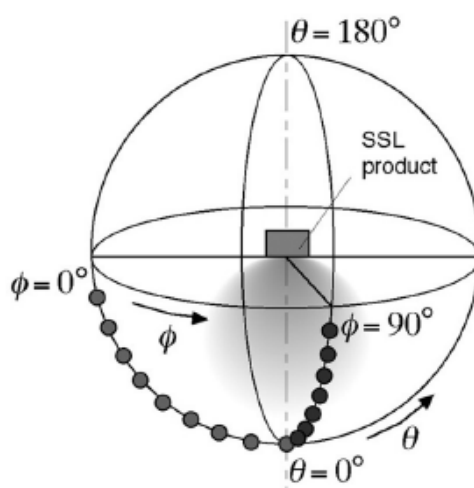
Color Characteristics Measurements

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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