Quality Assured

NVLAP LAB CODE 200960-0

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: 37022-3735LW-1

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

No.1805, DongLiu road, BinJiang District, Hangzhou, China

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www.ledtestlab.com

Report No.: HZ15060015b

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

Review by: April Zou

Engineer: April Zou

Jun. 24, 2015

Approved by:

LEADING TESTING LABORATORIES

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: **37022-3735LW-1**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
88.9	2541.6	28.59	0.9944

CCT (K)	CRI	Stabilization Time (Light & Power)
3609	83.6	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

TABLE OF CONTENT

Sample Photo

Figure 1- Overview of the sample

Equipment Under Test (EUT)	
Name	: 2FT LED Linear Ambient Luminaire Direct
Model	: 37022-3735LW-1
Brand Name	: A.L.P Lighting
Electrical Ratings	: AC120~277V, 50/60 Hz, 37W
Product Description	: Wrap 370 base, 3500K, 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℃.

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)	0.240	0.113
Power Factor	0.9944	0.9257
Test Power (W)	28.59	29.02
Off-State Power (W)	0	0
THD A%	6.21	18.28
Luminous Efficacy (lm/W)	88.9	87.5
Total Luminous Flux (lm)	2541.6	2539.2
Color Rendering Index (CRI)	83.6	
R9	10	
Correlated Color Temperature (CCT) (K)	3609	
Chromaticity (Chroma x, Chroma y)	(0.3976, 0.3827)	
Chromaticity (Chroma u, Chroma v)	(0.2340, 0.3378)	
Chromaticity (Chroma u', Chroma v')	(0.2340, 0.5067)	
Duv	0.0018	
Average Beam Angle (°)	111.7	
Center Beam Candle Power (cd)	812	
Spacing Criteria	1.22 (0°-180°)/ 1.24 (90°-270°)	
Zonal Lumens in the 0°-60°Zone	70.64%	
Zonal Lumens in the 60°-90°Zone	22.34%	
Zonal Lumens in the 90°-120°Zone	4.22%	
Zonal Lumens in the 120°-180°Zone	2.80%	

Special Color Rendering Indices	
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

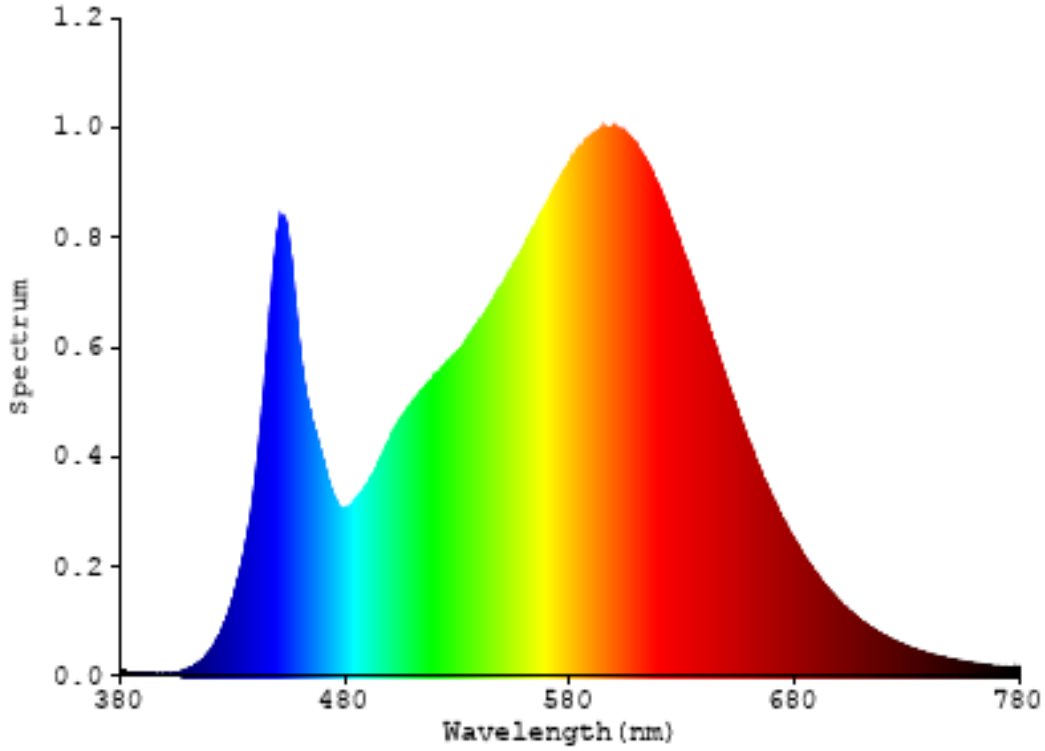


Chart 1: Spectral Power Distribution

Zonal Lumen Tabulation- Goniophotometer Method

γ(°)	Lumens	% Total
0- 10	76.777	3.02%
10- 20	218.948	8.61%
20- 30	328.968	12.94%
30- 40	392.942	15.46%
40- 50	406.05	15.98%
50- 60	371.725	14.63%
60- 70	299.573	11.79%
70- 80	201.088	7.91%
80- 90	67.051	2.64%
90-100	29.646	1.17%
100-110	41.576	1.64%
110-120	36.125	1.42%
120-130	28.687	1.13%
130-140	20.831	0.82%
140-150	12.928	0.51%
150-160	6.49	0.26%
160-170	1.752	0.07%
170-180	0.456	0.02%
Total	2541.6	100%

γ(°)	Lumens	% Total
0- 60	1795.41	70.64%
60- 90	567.712	22.34%
0-90	2363.122	92.98%
90- 180	178.491	7.02%
0- 180	2541.6	100%

Table 3: Zonal Lumen Data

Illuminance Plots

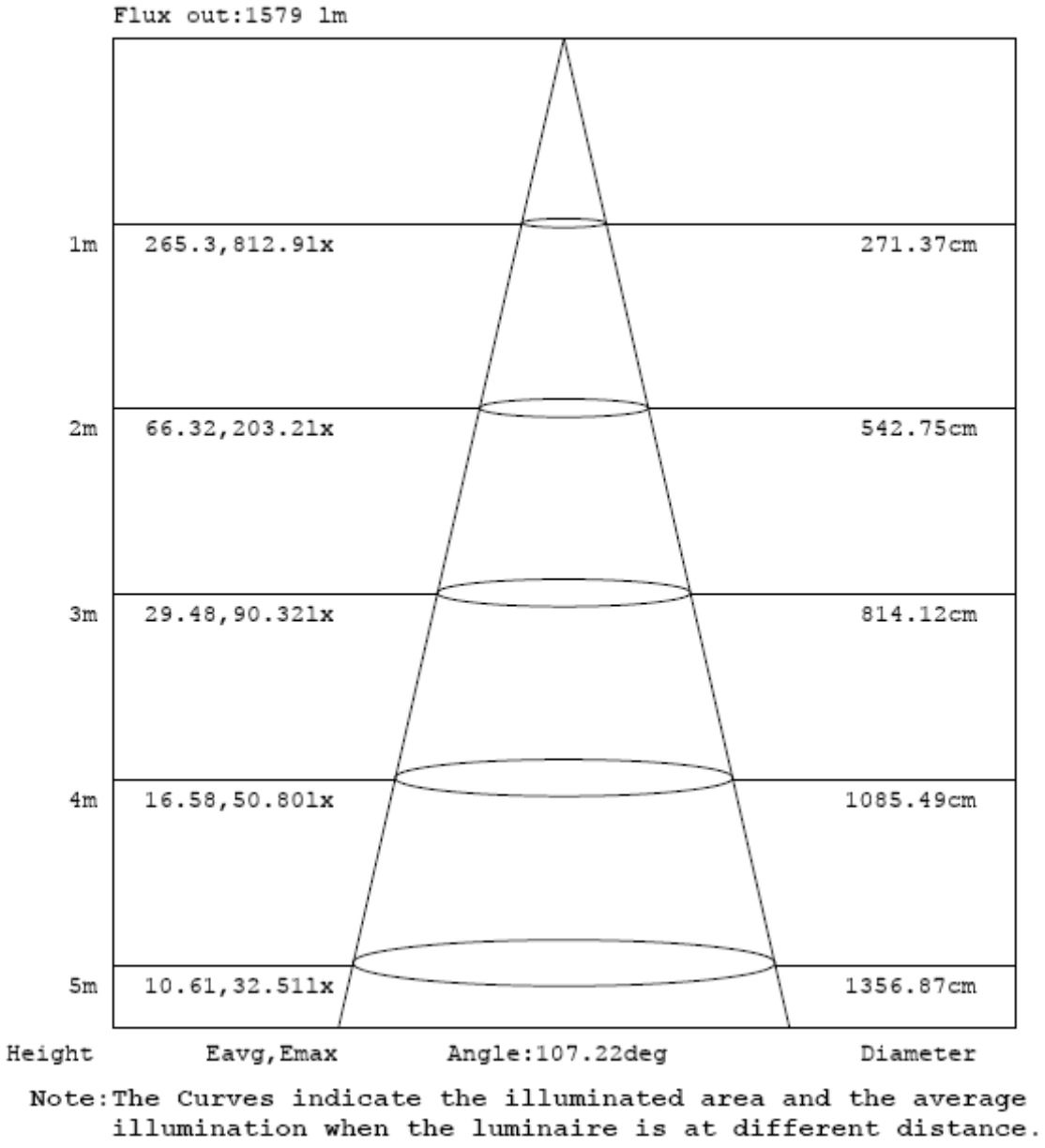


Chart 2: Beam angle

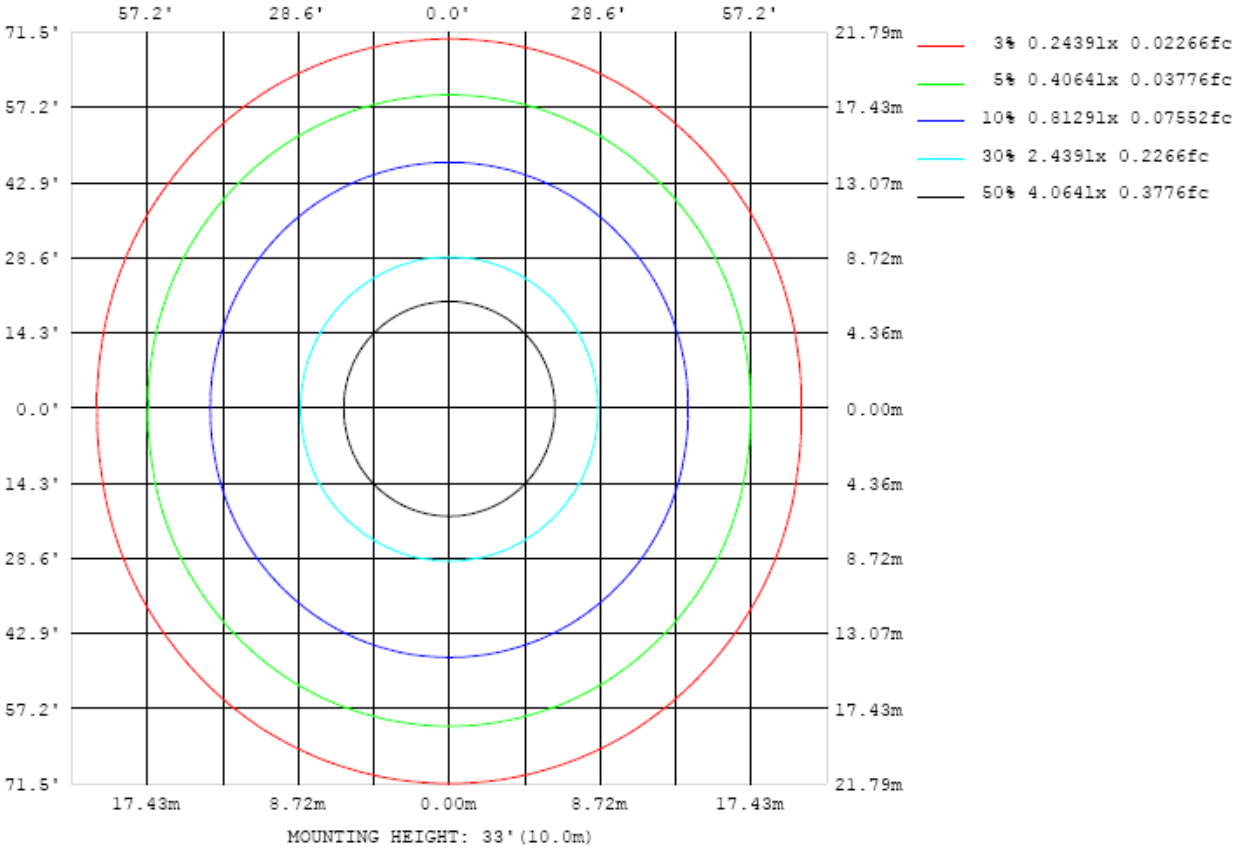


Chart 3: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots

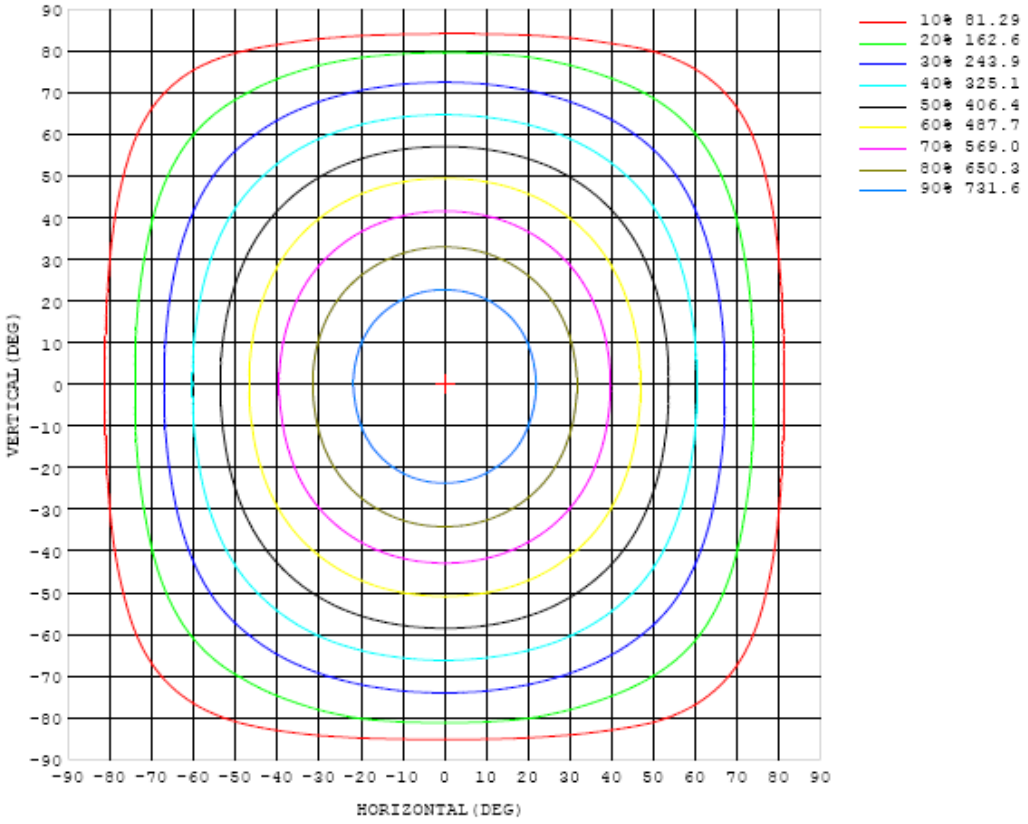


Chart 4: Isocandla Plot

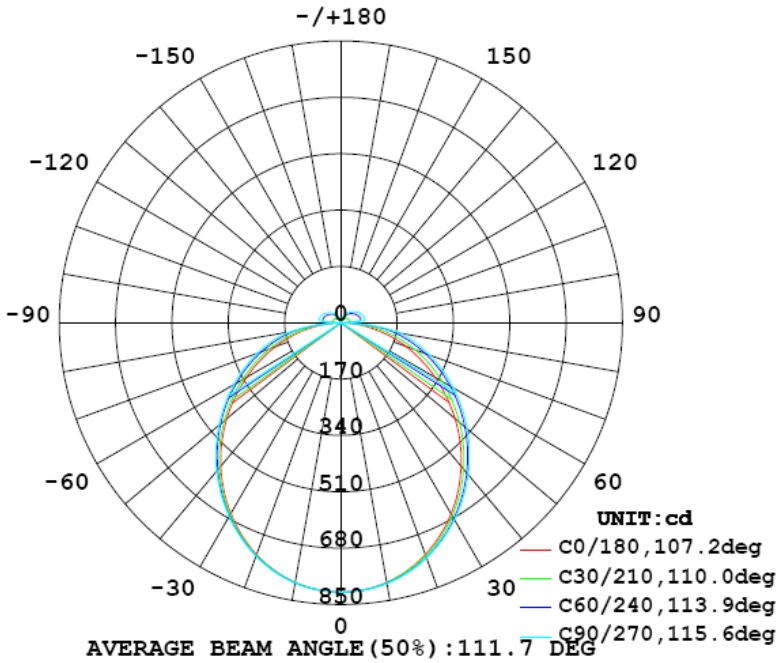


Chart 5: Polar Candela Distribution

Luminous Intensity Data

Table--1 UNIT: cd

γ (DEG) \ C (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	812	812	812	812	812	812	812	812	812	812	812	812	812	812	812	812	812	812	812
5	808	808	808	808	808	808	809	809	809	809	809	809	809	809	808	808	808	808	808
10	795	795	795	796	796	797	798	798	798	798	798	798	797	797	796	796	795	795	795
15	774	774	774	775	777	778	779	780	780	780	780	780	779	778	777	775	774	774	773
20	744	745	746	748	750	752	753	754	755	755	755	754	753	752	750	748	746	744	744
25	708	708	710	713	716	718	720	722	723	723	723	722	721	719	716	713	710	708	707
30	665	666	669	672	676	679	682	684	685	686	685	684	682	680	677	673	669	666	664
35	617	618	622	626	631	635	638	641	643	644	643	642	639	635	631	627	622	618	617
40	565	567	571	576	581	586	591	595	597	598	597	595	591	587	582	576	571	566	565
45	508	511	517	523	529	535	541	545	548	549	548	545	541	535	530	523	516	511	508
50	450	453	460	467	474	482	489	494	497	498	497	494	489	482	474	467	459	453	450
55	389	393	402	410	418	427	435	441	444	445	444	441	435	427	418	410	401	393	390
60	328	333	343	353	362	371	381	387	391	392	391	387	381	371	361	352	342	333	329
65	268	274	284	295	305	315	326	333	337	339	337	333	326	316	304	294	283	273	269
70	209	215	226	238	247	259	271	279	285	287	285	279	271	259	246	236	225	214	210
75	151	157	168	180	190	203	216	226	233	235	233	226	216	203	189	178	167	157	153
80	94.0	100.0	111	122	133	146	160	173	180	183	181	173	161	146	132	121	110	99.9	95.9
85	38.7	44.0	52.2	62.5	71.1	74.8	80.8	85.5	87.4	87.4	87.5	86.9	83.2	76.6	70.5	61.9	51.6	43.6	40.3
90	0.14	2.03	1.82	4.29	4.75	2.38	2.97	3.14	2.90	2.75	3.07	3.16	3.07	2.43	4.91	4.22	1.49	1.91	0.26
95	0.38	3.25	11.9	21.9	32.9	44.3	47.5	49.5	49.9	49.9	50.2	50.1	48.5	45.3	33.5	22.6	12.5	1.78	0.54
100	0.76	3.53	15.5	27.8	40.0	51.2	61.0	68.2	72.2	73.6	72.3	68.3	61.2	51.6	40.4	28.3	15.9	1.99	0.93
105	1.28	3.72	15.8	28.2	40.2	50.9	59.8	66.3	70.1	71.5	70.2	66.4	60.0	51.2	40.6	28.6	16.1	2.44	1.42
110	1.89	4.18	15.3	27.3	38.9	49.1	57.6	63.9	67.5	68.9	67.6	64.0	57.9	49.5	39.3	27.8	15.8	3.04	1.93
115	2.19	4.29	14.9	26.0	36.9	46.7	54.8	60.8	64.4	65.7	64.5	60.9	55.1	47.2	37.5	26.5	15.4	3.29	2.20
120	2.57	3.55	13.8	24.3	34.6	43.8	51.5	57.2	60.6	61.9	60.8	57.4	51.9	44.3	35.2	25.0	14.6	2.35	2.60
125	2.99	2.25	13.7	23.3	32.0	40.7	47.8	53.1	56.4	57.6	56.6	53.4	48.2	41.2	32.6	23.9	14.4	2.78	3.00
130	3.55	2.03	13.0	20.3	29.9	37.1	43.6	48.6	51.7	52.8	51.9	49.0	44.0	37.7	30.6	20.9	14.0	4.60	3.60
135	3.77	3.50	12.0	19.8	26.1	34.2	39.6	43.8	46.5	47.6	46.7	44.1	40.0	34.8	26.7	20.8	12.9	4.34	4.14
140	4.10	3.84	6.42	17.8	24.6	29.2	35.8	39.5	41.7	42.6	41.9	39.8	36.2	29.8	25.3	18.7	4.97	5.63	4.20
145	4.50	5.05	1.49	15.7	21.7	27.1	29.6	33.2	35.5	36.4	35.7	33.6	30.2	27.6	22.5	16.4	1.26	5.63	4.67
150	4.48	5.31	3.90	7.64	18.4	23.1	27.0	29.7	31.4	32.1	31.7	30.1	27.6	23.8	19.1	8.30	4.79	5.71	4.49
155	5.06	5.46	5.40	1.16	13.7	18.8	22.0	24.4	26.0	26.6	26.2	24.6	22.4	19.5	15.3	1.44	6.46	5.06	4.42
160	5.27	5.35	6.47	6.29	1.56	6.15	16.8	18.8	20.0	20.5	20.2	19.1	17.5	5.96	1.52	6.86	6.71	5.09	5.40
165	5.09	5.28	5.87	6.20	5.97	2.30	1.26	2.86	3.83	3.80	4.37	2.33	1.15	1.51	6.83	6.97	5.60	4.65	4.83
170	4.60	4.63	5.06	5.53	5.96	5.91	5.95	6.49	6.61	6.63	6.71	6.92	6.95	6.45	5.88	5.00	4.10	3.97	3.94
175	3.73	3.71	3.74	3.91	4.06	4.17	4.09	3.79	4.00	4.11	4.34	4.32	4.13	3.75	3.47	3.27	3.11	2.98	2.86
180	3.71	3.50	3.49	3.30	3.08	3.16	2.73	2.79	2.27	2.90	3.27	2.02	3.50	3.70	3.44	3.63	3.91	3.48	3.66

Table 4: Luminous Intensity Data

Table--2 UNIT: cd

γ (DEG) \ C (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	812	812	812	812	812	812	812	812	812	812	812	812	812	812	812	812	812		
5	808	808	808	808	808	808	808	808	809	808	808	808	808	808	808	808	808		
10	795	795	795	796	796	796	797	797	797	797	797	797	796	796	795	795	795		
15	774	774	775	775	776	776	776	777	777	777	777	776	776	775	775	774	774		
20	744	745	746	747	748	748	749	749	749	749	749	748	748	747	746	745	744		
25	708	709	711	712	713	713	714	715	715	714	714	713	713	712	711	709	708		
30	665	667	669	670	672	673	674	675	675	675	674	673	672	670	669	667	666		
35	617	619	622	624	626	627	629	631	631	631	630	628	626	624	622	620	618		
40	565	567	570	573	576	579	581	583	584	583	582	579	576	573	571	568	566		
45	510	512	516	520	524	527	531	533	533	533	531	528	524	520	516	513	510		
50	452	455	460	464	469	474	478	480	481	480	478	475	470	465	460	456	452		
55	392	396	402	407	414	420	424	427	428	427	424	420	414	408	403	397	392		
60	332	338	344	350	358	365	370	373	374	373	370	365	358	351	345	338	332		
65	272	279	286	293	302	310	316	320	321	320	316	310	302	294	287	279	272		
70	213	221	228	235	246	255	262	267	269	267	262	255	246	237	229	221	213		
75	156	163	171	178	189	200	209	215	217	215	209	200	189	180	171	163	156		
80	99.0	106	114	121	132	143	149	153	155	154	151	144	133	123	114	106	98.6		
85	42.3	46.9	53.0	54.7	54.2	55.9	57.6	57.9	58.2	59.6	60.9	60.4	58.1	58.7	55.0	47.3	42.2		
90	0.29	0.61	2.29	5.27	6.01	6.51	7.66	8.23	8.15	7.59	6.42	6.08	5.54	3.28	0.60	0.32	0.25		
95	3.72	12.3	22.4	33.1	44.1	54.5	61.7	62.0	61.6	61.1	59.6	52.7	41.8	30.7	20.3	10.7	1.54		
100	4.32	14.8	26.2	37.3	47.4	55.9	62.1	65.6	66.7	65.4	61.6	55.0	46.1	35.8	24.7	13.5	1.56		
105	4.33	15.0	26.3	37.2	46.8	54.8	60.5	63.9	65.0	63.6	59.9	54.0	45.8	35.9	25.0	13.8	1.79		
110	4.42	14.7	25.5	36.0	45.2	52.8	58.5	61.8	62.8	61.4	57.9	52.1	44.2	34.8	24.3	13.5	2.08		
115	4.47	14.0	24.4	34.3	43.2	50.4	55.7	59.0	59.9	58.6	55.2	49.6	42.1	33.2	23.2	12.9	2.12		
120	4.24	13.2	23.0	32.4	40.7	47.6	52.6	55.7	56.6	55.3	52.0	46.7	39.6	31.2	21.8	12.2	2.47		
125	1.38	12.6	21.4	30.0	37.9	44.3	49.1	51.9	52.8	51.6	48.4	43.5	36.8	28.9	20.1	11.5	4.20		
130	2.00	12.1	19.4	27.7	34.8	40.6	45.1	47.8	48.5	47.4	44.5	39.8	33.8	26.5	18.4	10.8	4.17		
135	4.99	11.1	18.1	24.9	31.5	36.9	40.8	43.1	43.8	42.8	40.3	36.1	30.5	23.6	17.0	8.79	4.12		
140	4.75	8.95	16.3	22.3	27.7	32.8	36.2	38.4	39.0	38.0	35.7	31.8	26.6	21.3	15.2	1.78	4.49		
145	4.98	1.78	14.2	19.5	24.4	27.9	31.1	33.0	33.6	32.7	30.6	27.4	23.6	18.6	12.9	2.04	4.86		
150	4.99	2.08	10.0	16.5	20.8	24.1	26.5	27.9	28.4	27.7	26.1	23.5	20.0	15.7	1.78	6.12	4.89		
155	4.79	5.87	2.01	12.4	16.6	19.4	21.4	22.8	23.2	22.7	21.4	19.3	16.4	8.36	1.59	6.44	5.40		
160	5.40	5.82	6.89	2.06	3.87	13.7	15.8	17.4	17.8	17.5	16.5	13.8	4.38	2.04	7.45	6.37	5.57		
165	5.05	5.20	5.94	6.59	4.32	1.48	1.66	1.81	2.07	1.85	1.83	1.77	1.94	7.34	6.64	6.07	5.60		
170	3.99	4.28	4.58	5.45	5.89	6.18	6.83	7.10	7.25	7.26	7.16	6.94	6.63	6.33	5.91	5.53	5.20		
175	2.88	3.13	3.26	3.46	3.76	4.33	4.70	5.08	5.29	5.23	5.27	5.11	5.16	5.10	4.91	4.58	4.02		
180	3.63	3.55	3.55	3.32	3.09	3.11	2.83	2.56	2.49	2.69	3.06	3.13	3.42	3.70	3.61	3.61	3.72		

Table 5: Luminous Intensity Data

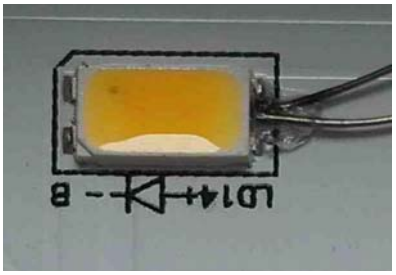
ISTMT TEST DATA:

Sample Tested**: 37022-3735LW-1**

Test ambient temperature was 27.2℃.

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℃)	Measured In-Situ Maximum Temperature (Corrected to Ta=25℃)
120.0	28.59	148.0	45.8	52.2
277.0	29.02	148.0	45.9	52.1

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.

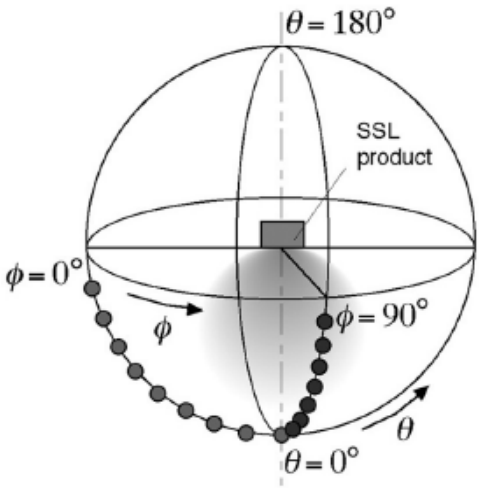
The uncertainty of goniophotometer system reported in this document is expended uncertainty is 1.94% with a coverage factor k=2.

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°/180° and C=90°/270°) 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, Δu'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.



ISTMT

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 werea 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 ***