



NVLAP LAB CODE 500080-0

Ref. No.: LCZF16070285

Version: 1.0

Date of issue: Jul. 20, 2016

Total pages: 12



Test report of

IES LM-79-08

Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products

Rendered to:

Elec-Tech International Co., Ltd.

No.1 Jinfeng Road, Tangjiawan Town, Xiangzhou District,
Zhuhai City, Guangdong Province, P.R.China

For products:

Four-Foot Linear Replacement Lamps

Models No.:

542222XX(XX=61-70)

Test Date: Jul. 20, 2016

Test Item: Total luminous flux, Luminous Efficacy, Electrical values, Luminous Intensity Distribution, Chromaticity coordinates, CCT and CRI, Spectral Power Distribution.

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Template No.: LC-RT-PL/LM79-08/01

Test Note:

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Jul. 20, 2016

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1. General

1.1 Product Information

Brand Name	ETI
Product Type	Four-Foot Linear Replacement Lamps
Model Number	542222XX(XX=61-70)
Rated Inputs	120VAC, 60Hz
Rated Power	12W
Rated Light output	1800lm
Declared CCT	5000K
Power Supply	Integral in lamps
LED Package, Array or Module	67-21S Series
Receipt Samples	1 unit
Date of Receipt Samples	Jul. 20, 2016
Note	-

1.2 Standards or methods

The following standards are partly or totally used or referenced for test:

No.	Name
ANSI/NEMA/ ANSLG C78.377-2011	Specifications for the Chromaticity of Solid State Lighting Products
ANSI C82.77-2002	Harmonic Emission Limits—Related Power Quality Requirements for Lighting Equipment
CIE Pub. No. 13.3-1995	Method of Measuring and Specifying Color Rendering of Light Sources
CIE Pub. No. 15:2004	Colorimetry
IES LM-79-08	Electrical and Photometric Measurements of Solid-State Lighting Products

1.3 Equipment list

Instrument	ID	Model name	Cal. date	Next cal. Date
AC Power supply	LC-I-923	CHP-500	2016-02-04	2017-02-03
AC Power supply	LC-I-987	APW-110N	2016-02-04	2017-02-03
Power analyzer	LC-I-928	WT210	2016-01-24	2017-01-24
Power analyzer	LC-I-954	WT210	2016-02-04	2017-02-03
Multimeter	LC-I-972	Fluke 17B	2015-08-17	2016-08-16
Photometric colorimetric electric system (2 meter sphere)	LC-I-900	SPR3000	Before use	Before use
Standard lamp	LC-I-917	24V100W	2015-10-09	2016-10-08
Luminous Flux Standard Lamp	LC-I-946	110V/200W	2015-10-17	2016-10-16
Goniophotometer(with mirror)	LC-I-902	GMS2000	2016-05-04	2017-05-05
Wireless temperature transmitter	LC-I-978	DWRF-B	2016-02-03	2017-02-02
Wireless temperature transmitter	LC-I-979	DWRF-B	2016-02-03	2017-02-02

2. Test conducted and method

The lamp/luminaire was operated at least 2 hours to reach stabilization and temperature equilibrium before test.

2.1 Ambient Condition

The ambient temperature in which measurements are being taken was maintained at $25\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$; the air flow around the sample(s) being tested did not affect the performance.

2.2 Power Supply Characteristics

The AC power supply had a sinusoidal voltage wave shape at the prescribed frequency (60 Hz) such that the RMS summation of the harmonic components does not exceed 3 percent of the fundamental during operation of the test item.

The voltage of AC power supply (RMS voltage) applied to the device under test was regulated to within ± 0.2 percent under load.

2.3 Seasoning and Stabilization

No seasoning was performed in accordance with IESNA LM-79-08. And before the measurement, the sample was stabilized until the light output and power variations were less than 0.5% in 30 minutes intervals (3 readings, 15 minutes apart).

2.4 Electrical Instrumentation

The calibration uncertainties of the instruments for AC voltage and current were less than 0.2 percent, and the calibration uncertainty of the AC power meter was less than 0.5 percent (95 % confidence interval, $k=2$).

2.5 Color Measurement Method

Spectral radiant flux was measured by a sphere (2 meter)-spectroradiometer system, and the color characteristics (Color rendering index, correlated color temperature, chromaticity coordinate) were calculated from these by software automatically.

2.6 Total Luminous Flux Measurement Method

Total luminous flux was measured by both sphere-spectroradiometer system and type C goniophotometer system.

Light intensity distribution was measured by a type C goniophotometer (with mirror) which can keep the sample in burn position when the tests conduct, and the total luminous flux was calculated from the intensity data by software automatically.

Spectral radiant flux was measured by a sphere (2 meter)-spectroradiometer system, and the total luminous flux was calculated from these by software automatically.

2.7 Luminous Intensity Distribution Measurement Method

Luminous intensity distribution was measured by a mirror-type goniophotometer (Type C) which can keep the sample in burn position when the tests conduct, and the kinds of graph were generated by software automatically.

2.8 Spatial Non-uniformity of Chromaticity

The customer did not require this measurement.

3. Test Result Summary

3.1 Electrical data

Criteria Item	Result(Sphere)	Result(Goniophotometer)
Input Voltage & Frequency	120.00 V~60Hz	120.00 V~60Hz
Input Current(A)	0.102	0.102
Total Power(W)	12.03	12.01
Power Factor	0.986	0.986
I-THD	16.00 %	-
Off-state Power(W)	-	-

3.2 Photometric data

Criteria Item	Result(Sphere)	Result(Goniophotometer)
Total Lumens(lm)	1821.10	1825.72
Luminaire Efficacy(Lm/W)	151.38	152.02
Correlated Color Temperature (CCT)(K)	4981	-
Color Rendering Index (CRI)	82.6	-
R9	8	-
Chromaticity Coordinate (x,y)	x = 0.3464 y = 0.3607	-
Chromaticity Coordinate (u,v)	u = 0.2088 v = 0.3261	-
Chromaticity Coordinate (u',v')	u' = 0.2088 v' = 0.4892	-
Duv	0.0040	-
Spacing Criteria(0-180°)	-	1.22
Spacing Criteria(90-270°)	-	1.46
Zone Lumens between 0-60 °	-	45.20%

3.3 Color Rendering Details

R1	R2	R3	R4	R5	R6	R7	R8
80	88	93	81	80	83	88	68
R9	R10	R11	R12	R13	R14	R15	-
8	71	79	54	83	96	75	-

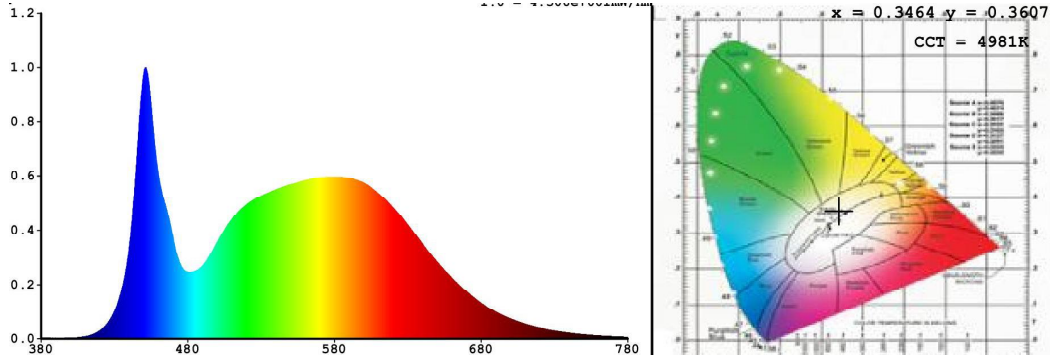
3.4 Electrical data at 277V

Criteria Item	Result(Sphere)	Result(Goniophotometer)
Input Voltage & Frequency	277.00 V~60Hz	-
Power Factor	0.926	-
I-THD	19.82 %	-

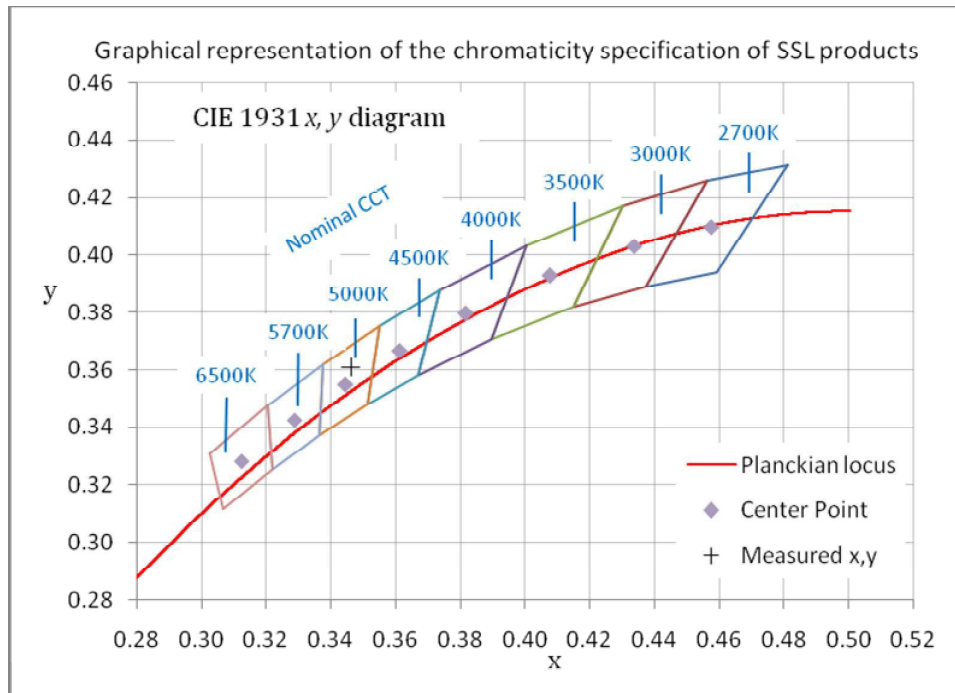
Note: N.A.

4. Test Data

4.1 Spectral Distribution



4.2 ANSI Chromaticity Quadrangles Diagram





4.3 Goniometry Test Data

CIE Type	Semi-Direct	Basic Luminous Shape	Rectangular w/Sides
Spacing Criteria (0-180)	1.22	Luminous Length	1.12 m
Spacing Criteria (90-270)	1.46	Luminous Width	0.02 m
Spacing Criteria (Diagonal)	1.50	Luminous Height	0.02 m
Test Distance	29.54 m		

4.4 Zonal Lumen Summary

Zone	Lumens	%Lamp	%Fixt
0-20	120.62	6.60	6.60
0-30	259.50	14.20	14.20
0-40	433.76	23.80	23.80
0-60	825.20	45.20	45.20
0-80	1182.21	64.80	64.80
0-90	1328.11	72.70	72.70
10-90	1297.13	71.00	71.00
20-40	313.13	17.20	17.20
20-50	506.91	27.80	27.80
40-70	579.48	31.70	31.70
60-80	357.01	19.60	19.60
70-80	168.97	9.30	9.30
80-90	145.90	8.00	8.00
90-110	234.51	12.80	12.80
90-120	322.55	17.70	17.70
90-130	390.68	21.40	21.40
90-150	471.24	25.80	25.80
90-180	497.61	27.30	27.30
110-180	263.10	14.40	14.40
0-180	1825.71	100.00	100.00

Total Luminaire Efficiency = 100.00%

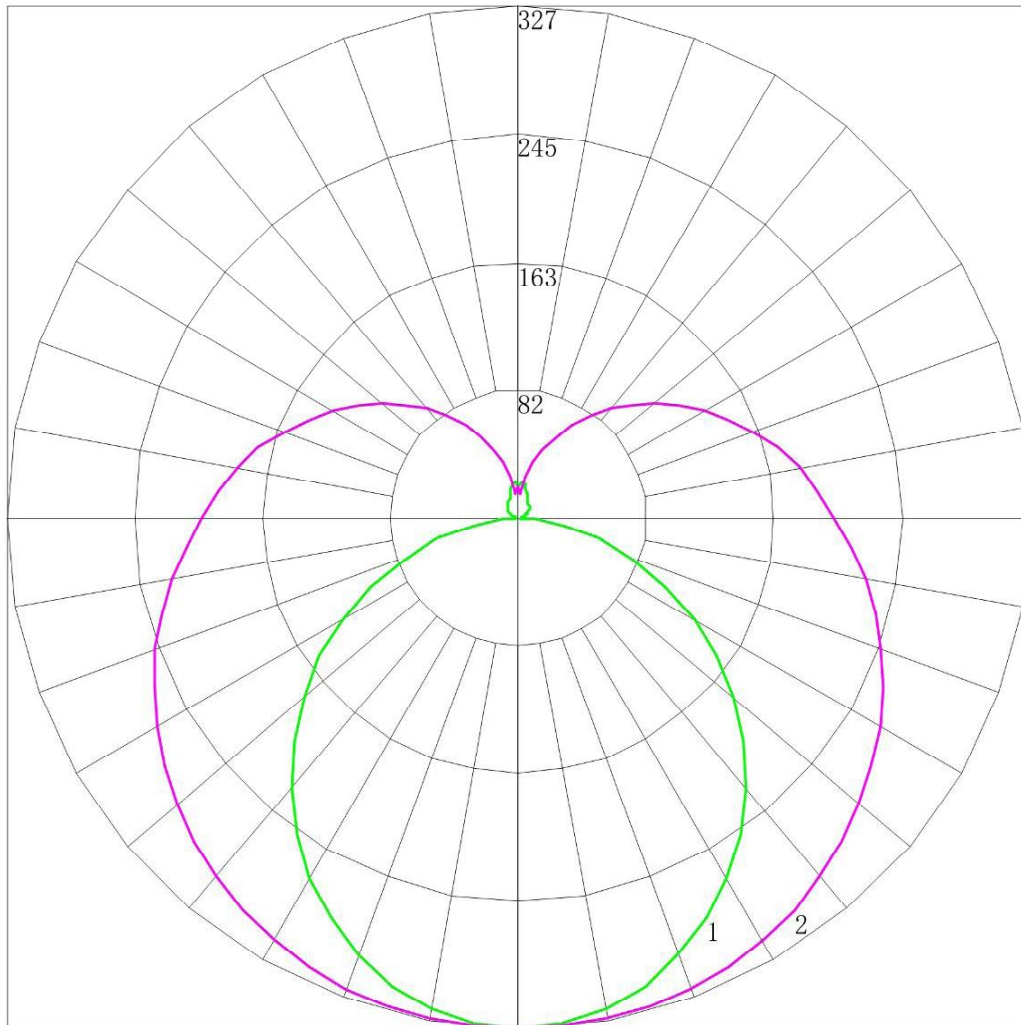
ZONAL LUMEN SUMMARY

Zone	Lumens
0-10	30.97
10-20	89.65
20-30	138.88
30-40	174.26
40-50	193.78
50-60	197.67
60-70	188.04
70-80	168.97
80-90	145.90
90-100	126.51
100-110	107.99
110-120	88.04
120-130	68.13
130-140	48.94
140-150	31.62
150-160	17.20
160-170	7.24
170-180	1.92



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4.5 Polar Curves



Maximum Candela = 326.61 Located At Horizontal Angle = 0, Vertical Angle = 0

1 - Vertical Plane Through Horizontal Angles (0 - 180)

2 - Vertical Plane Through Horizontal Angles (90 - 270)



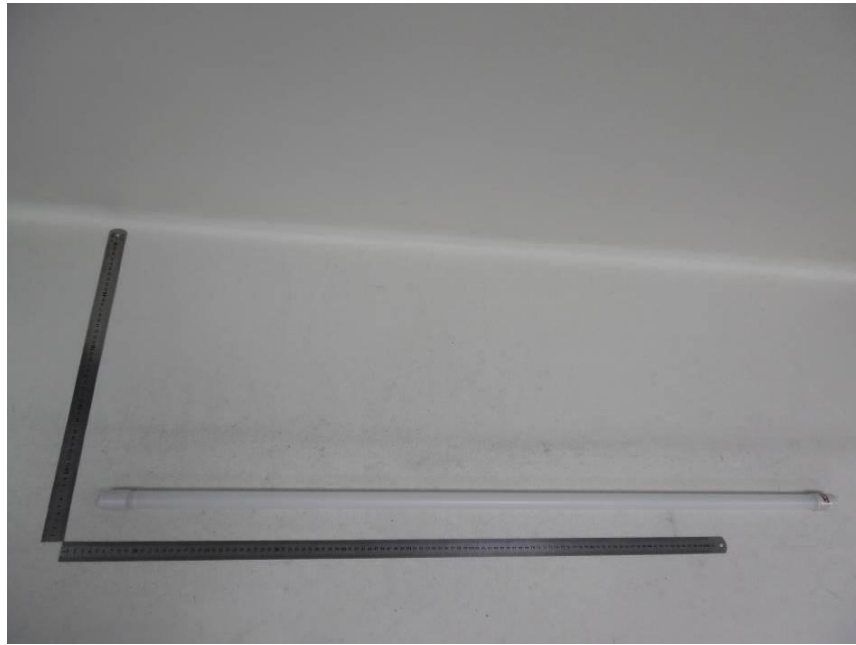
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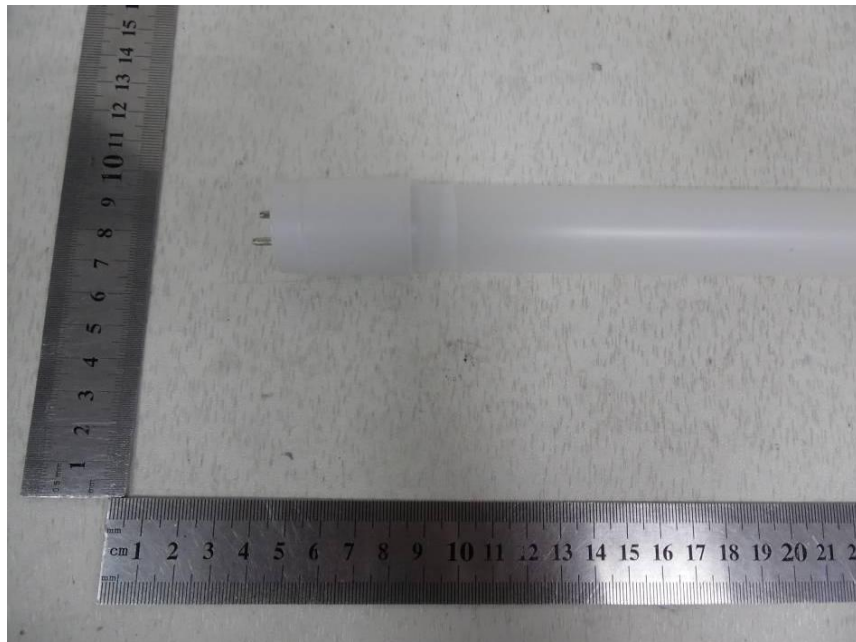
4.6 Candela Tabulation

	<u>0</u>	<u>15</u>	<u>30</u>	<u>45</u>	<u>60</u>	<u>75</u>	<u>90</u>
0	326.610	326.610	326.610	326.610	326.610	326.610	326.610
5	324.859	324.854	325.084	325.303	325.958	326.174	326.178
10	319.167	319.586	321.160	322.687	323.780	325.085	325.314
15	310.411	311.904	313.964	317.454	320.730	322.908	323.586
20	298.152	300.709	304.589	310.694	315.504	319.205	320.562
25	283.266	286.881	293.034	301.535	309.188	314.415	317.105
30	266.191	271.077	279.733	291.504	301.130	308.970	311.921
35	247.365	252.640	264.035	279.292	292.637	302.438	306.737
40	225.912	233.105	247.683	266.863	283.273	295.252	300.256
45	203.584	212.253	230.023	253.562	272.821	287.413	292.912
50	179.066	190.303	212.143	239.172	262.585	278.703	284.704
55	154.986	167.695	193.828	225.654	251.484	269.994	275.631
60	129.155	145.087	175.947	211.045	240.161	260.413	266.991
65	103.762	122.259	158.288	197.311	228.622	250.181	257.054
70	77.931	100.529	141.496	183.576	217.518	239.946	246.685
75	53.413	80.774	126.453	170.930	206.195	229.060	236.317
80	29.771	62.776	112.063	158.503	194.439	218.175	225.084
85	10.508	48.728	100.289	146.950	183.121	207.290	213.420
90	2.189	39.729	90.697	137.358	173.324	196.403	202.187
95	1.751	34.900	83.501	128.854	163.740	186.821	192.251
100	2.627	32.266	77.177	120.569	154.376	176.369	182.314
105	3.503	30.949	71.510	112.066	144.581	165.482	171.945
110	4.378	29.632	66.711	104.000	134.348	154.378	159.849
115	5.254	28.534	62.353	96.368	124.551	142.838	148.184
120	6.567	27.217	58.428	89.392	114.970	131.734	136.519
125	7.881	26.340	54.286	82.196	105.170	120.629	125.287
130	8.756	25.023	49.924	75.219	95.589	109.525	113.622
135	9.632	23.925	45.784	68.242	86.444	98.419	101.958
140	10.508	21.950	41.642	61.048	76.863	87.314	91.157
145	11.383	19.535	37.717	53.854	67.718	76.644	79.924
150	12.697	17.340	32.707	46.876	58.356	65.322	68.260
155	13.134	16.462	26.383	39.032	49.211	55.089	56.595
160	15.324	16.682	20.275	29.654	39.637	44.639	45.794
165	18.388	17.121	18.754	22.239	28.095	35.057	36.290
170	21.015	18.438	19.415	19.632	19.604	24.613	25.921
175	23.204	21.072	20.289	20.294	18.966	17.217	15.553
180	20.508	20.508	20.508	20.508	20.508	20.508	20.508

Appendix 1 Product Photo



Picture 1



Picture 2

****End of test report****



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Attachment 1

**U.S. Department of Energy
Lighting Facts^{CM} Uniform LM-79 Reporting Template**

Laboratory Information

Name of test lab	LCTECH (Zhongshan) Testing Service Co.,Ltd
Date of test report	Jul. 20, 2016
Test report number	LCZP16070285
Laboratory contact name	Richard Li

Product Information

Manufacturer	Elec-Tech International Co., Ltd	
Brand name	ETI	
Model number	542222XX(XX=61-70)	
SKU(if available)	N/A	
Type of luminaire (for integral lamps, list base type and lamp type)	Four-Foot Linear Replacement Lamps	
Luminaire aperture	-	in.
Luminaire height	0.8	in.
Luminaire length	44.1	in.
Luminaire width	0.8	in.
Number of units(modular products)	N/A	

Electrical Measurements	Integrating sphere output	Goniophotometer Output	
Input wattage	12.03	12.01	W
Input current	0.102	0.102	A
Input voltage(AC)	120.00	120.00	V
Power factor	0.986	0.986	
Off-state power	0.0	0.0	W

Photometric Characteristics

Total initial lumen output	1821.10	1825.72	lm
Initial luminaire efficacy	151.38	152.02	lm/W
Correlated color temperature / CCT	4981	K	
Color rendering index/CRI	82.6		
Rgvalue	8		
Duv	0.0040		

Luminous Intensity Distribution		Goniophotometer Output	
Center beam candle power(if applicable)		326.610	cd
Beam angle(if applicable)		106.5	°
Zonallumensinthe0°-60°zone	--	45.20	%
Zonal lumens in the60°-90° zone		27.55	%
Zonallumensinthe90°-120°zone		17.67	%
Zonallumensinthe120°-180°zone		9.59	%