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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,
ZhuhaiCity, Guangdong Province, P.R. China 519085**

For products:

SSL Downlight retrofit kits

Models No.:

531863##(##=01-11)

(The product is a color tunable luminaire, tunable to 3000K, 4000K, 5000K and ## can be 01-11 and represent different client and sales districts.)

Test Date: Jun. 27, 2017
Test Item: Total luminous flux, Luminous Efficacy, Electrical values, Luminous Intensity Distribution, Chromaticity coordinates, CCT and CRI, Spectral Power Distribution.
Test Lab.: **LCTECH (Zhongshan) Testing Service Co., Ltd**
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Template No.: LC-RT-PL/LM79-08/01
Test Note: *This product is a color tunable luminaire, all the tests were tested at 3000K setting.*

Complied by:

Fish Tan

Project Engineer

Jun. 29, 2017

Reviewed by:

Richard Li

Technical Manager

Jun. 29, 2017

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1. General

1.1 Product Information

Brand Name	ETI
Product Type	SSL Downlight retrofit kits
Model Number	531863##(##=01-11)
Rated Inputs	120VAC, 50/60Hz
Rated Power	11W
Rated Light output	800lm
Declared CCT	3000K
Power Supply	LED Driver
LED Package, Array or Module	Model: SPMWHX221FXXXXXXXXX, manufactured by SAMSUNG ELECTRONICS CO
Receipt Samples	1 unit
Sample Code of lab.	1706121106
Date of Receipt Samples	Jun. 12, 2017
Note	All the tests are tested in a Can. Auxiliary test can mode: HALO H71CAT

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	2017-02-04	2018-02-03
AC Power supply	LC-I-987	APW-110N	2017-02-04	2018-02-03
Power analyzer	LC-I-928	WT210	2017-01-19	2018-01-19
Power analyzer	LC-I-954	WT210	2017-02-04	2018-02-03
Multimeter	LC-I-972	Fluke 17B	2016-08-10	2017-08-09
Photometric colorimetric electric system (2 meter sphere)	LC-I-900	SPR3000	Before use	Before use
Standard lamp	LC-PL-I-002	24V100W	2016-10-08	2017-10-07
Luminous Flux Standard Lamp	LC-PL-I-001	110V/200W	2016-09-24	2017-09-23
Goniophotometer(with mirror)	LC-I-902	GMS2000	2017-05-07	2018-05-07
Wireless temperature transmitter	LC-I-978	DWRF-B	2017-02-10	2018-02-10
Wireless temperature transmitter	LC-I-979	DWRF-B	2017-02-10	2018-02-10

2. Test conducted and method

The 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 $25\text{ }^{\circ}\text{C} \pm 1^{\circ}\text{C}$; 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 type C goniophotometer system and a sphere (2 meter)-spectroradiometer 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.

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.

2.7 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	120.06 V~60Hz
Input Current(A)	0.090	0.090
Total Power(W)	10.25	10.24
Power Factor	0.951	0.950
I-THD	-	-
Off-state Power(W)	-	-

3.2 Photometric data

Criteria Item	Result(Sphere)	Result(Goniophotometer)
Total Lumens(lm)	850.35	859.65
Luminaire Efficacy(Lm/W)	82.96	83.95
Correlated Color Temperature (CCT)(K)	2971	-
Color Rendering Index (CRI)	91.8	-
R9	54	-
Chromaticity Coordinate (x,y)	x = 0.4365 y = 0.3996	-
Chromaticity Coordinate (u,v)	u = 0.2522 v = 0.3464	-
Chromaticity Coordinate (u',v')	u' = 0.2522 v' = 0.5196	-
Duv	-0.0017	-
Zone Lumens between 0-60 °	-	86.79%

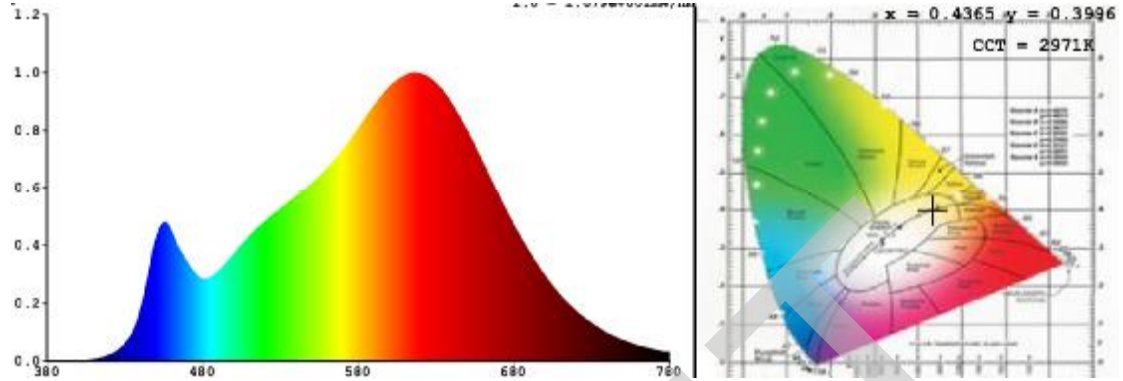
3.3 Color Rendering Details

R1	R2	R3	R4	R5	R6	R7	R8
93	98	97	91	93	96	89	78
R9	R10	R11	R12	R13	R14	R15	-
54	95	92	83	94	99	88	-

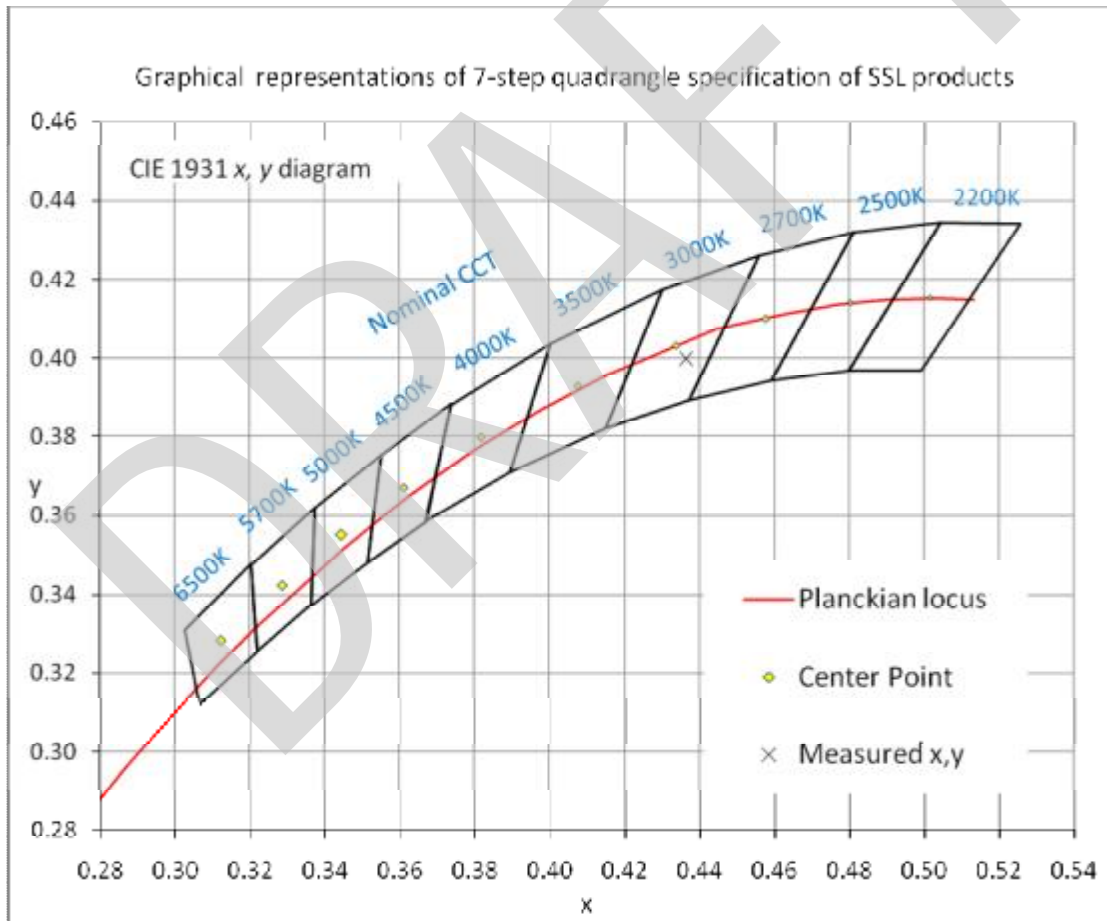
Note: N.A.

4. Test Data

4.1 Spectral Distribution



4.2 ANSI Chromaticity Quadrangles Diagram



4.3 Goniometry Test Data

CIE Type	Direct	Basic Luminous Shape	Circular
Spacing Criteria (0-180)	1.22	Luminous Length	0.12 m (Diameter)
Spacing Criteria (90-270)	1.22	Luminous Width	0.12 m (Diameter)
Spacing Criteria (Diagonal)	1.32	Luminous Height	0.00 m
Test Distance	29.65 m		

4.4 Zonal Lumen Summary

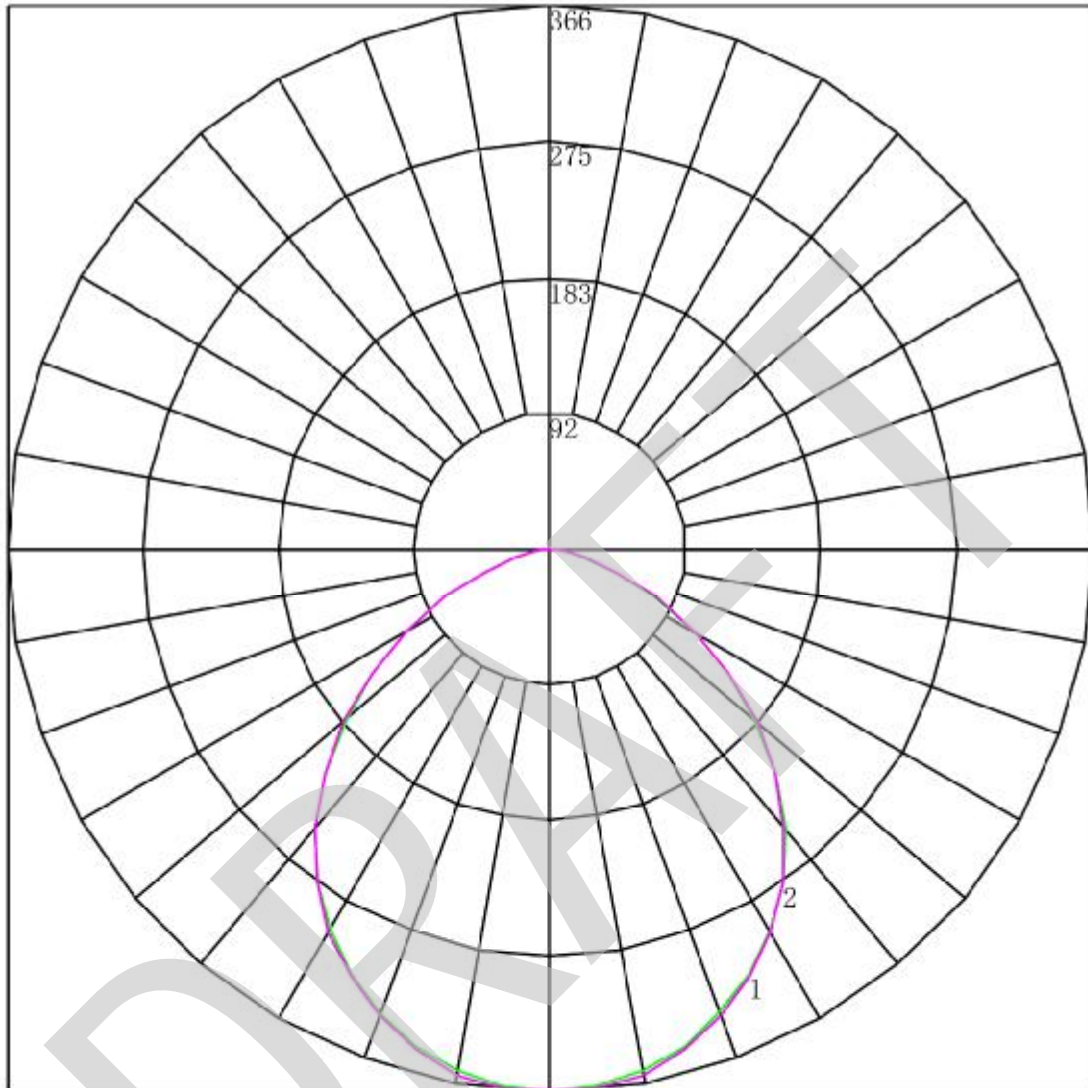
Zone	Lumens	%Lamp	%Fixt
0-20	132.64	15.40	15.40
0-30	278.80	32.40	32.40
0-40	449.69	52.30	52.30
0-60	746.07	86.80	86.80
0-80	852.12	99.20	99.20
0-90	859.00	99.90	99.90
10-90	824.43	95.90	95.90
20-40	317.05	36.90	36.90
20-50	482.21	56.10	56.10
40-70	374.31	43.50	43.50
60-80	106.35	12.40	12.40
70-80	28.42	3.30	3.30
80-90	6.58	0.80	0.80
90-110	0.08	0.00	0.00
90-120	0.15	0.00	0.00
90-130	0.23	0.00	0.00
90-150	0.42	0.00	0.00
90-180	0.65	0.10	0.10
110-180	0.57	0.10	0.10
0-180	859.65	100.00	100.00

Total Luminaire Efficiency = 100.00%

ZONAL LUMEN SUMMARY

Zone	Lumens
0-10	34.57
10-20	98.07
20-30	146.16
30-40	170.89
40-50	165.16
50-60	131.21
60-70	77.93
70-80	28.42
80-90	6.58
90-100	0.03
100-110	0.05
110-120	0.07
120-130	0.08
130-140	0.10
140-150	0.10
150-160	0.10
160-170	0.09
170-180	0.04

4.5 Polar Curves

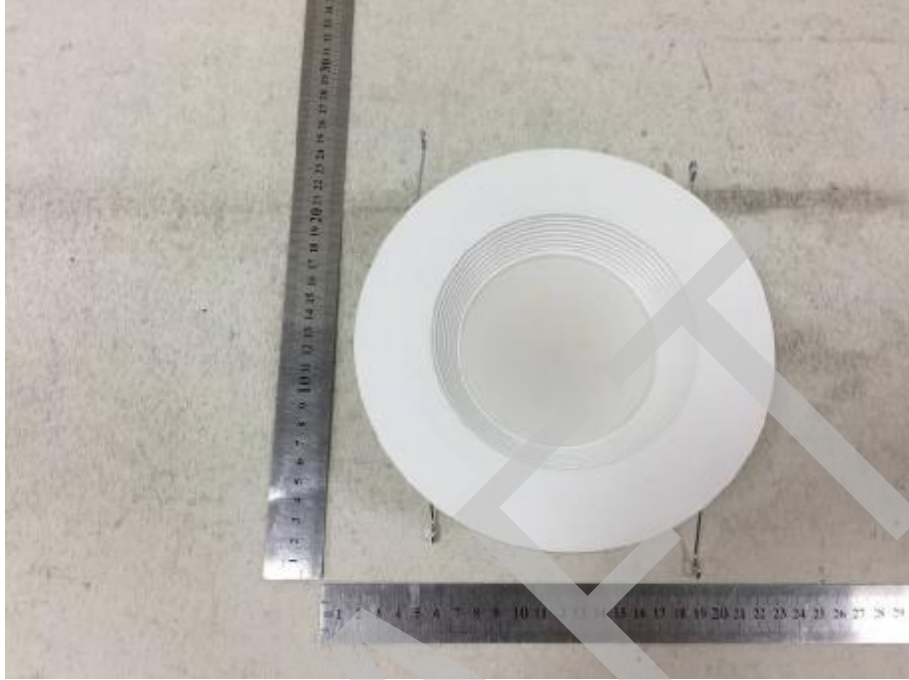


Maximum Candela = 366.075 Located At Horizontal Angle = 0, Vertical Angle = 0
1 - Vertical Plane Through Horizontal Angles (0 - 180)
2 - Vertical Plane Through Horizontal Angles (90 - 270)

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	366.075	366.075	366.075	366.075	366.075	366.075	366.075
5	364.229	364.294	363.941	363.592	364.121	364.098	365.420
10	358.163	358.203	358.025	357.702	357.207	358.477	360.286
15	348.141	347.804	347.732	347.703	347.220	347.805	349.226
20	333.898	333.909	333.722	333.990	333.612	334.432	335.143
25	317.458	317.199	317.489	317.135	316.754	317.587	318.385
30	297.546	298.137	297.651	297.268	297.395	297.581	299.078
35	274.293	274.501	273.588	273.908	273.602	273.734	274.596
40	246.600	246.512	245.568	245.801	245.243	245.054	245.860
45	214.467	215.160	214.996	214.332	213.679	214.199	214.709
50	180.620	181.652	181.080	180.906	180.908	181.083	182.072
55	147.608	147.772	146.769	146.887	146.382	146.605	147.322
60	112.223	112.572	111.775	111.989	111.658	111.666	112.617
65	77.804	78.382	77.949	78.476	77.833	77.695	78.221
70	47.342	47.117	47.332	47.116	47.499	46.863	47.777
75	23.825	23.526	23.468	23.514	23.881	24.156	24.173
80	13.011	12.994	13.087	13.164	13.038	13.154	13.162
85	5.407	5.519	5.587	5.604	5.509	5.468	5.616
90	0.000	0.000	0.000	0.044	0.022	0.088	0.000
95	0.000	0.066	0.000	0.000	0.066	0.000	0.044
100	0.044	0.088	0.022	0.022	0.044	0.044	0.000
105	0.044	0.044	0.066	0.088	0.000	0.022	0.044
110	0.044	0.088	0.000	0.066	0.044	0.066	0.044
115	0.088	0.088	0.088	0.088	0.044	0.066	0.066
120	0.088	0.088	0.066	0.066	0.066	0.044	0.044
125	0.088	0.088	0.132	0.066	0.088	0.110	0.088
130	0.088	0.088	0.110	0.088	0.110	0.088	0.132
135	0.132	0.132	0.154	0.154	0.110	0.132	0.132
140	0.132	0.132	0.110	0.154	0.176	0.132	0.131
145	0.176	0.176	0.132	0.154	0.132	0.154	0.175
150	0.176	0.176	0.154	0.154	0.198	0.198	0.175
155	0.220	0.242	0.220	0.220	0.198	0.176	0.219
160	0.264	0.286	0.308	0.308	0.241	0.220	0.263
165	0.308	0.374	0.330	0.286	0.329	0.351	0.307
170	0.396	0.418	0.374	0.374	0.373	0.351	0.395
175	0.352	0.440	0.396	0.418	0.373	0.373	0.351
180	0.408	0.408	0.408	0.408	0.408	0.408	0.408

Appendix 1 Product Photo



Picture 1



Picture 2

Appendix 2 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	Jun. 29, 2017
Test report number	LCZP17060294
Laboratory contact name	Richard Li

Product Information

Applicant	ELEC-TECH INTERNATIONAL CO LTD	
Brand name	ETI	
Model number	531863##(##=01-11)	
SKU(if available)	N/A	
Type of luminaire (for integral lamps, list base type and lamp type)	SSL Downlight retrofit kits	
Luminaire aperture	-	in.
Luminaire height	0	in.
Luminaire length	4.7	in.
Luminaire width	4.7	in.
Number of units(modular products)	N/A	

Electrical Measurements	Integrating sphere output	Goniophotometer Output	
Input wattage	10.25	10.24	W
Input current	0.090	0.090	A
Input voltage(AC)	120.00	120.06	V
Power factor	0.951	0.950	
Off-state power	0.0	0.0	W

Photometric Characteristics	Integrating sphere output	Goniophotometer Output	
Total initial lumen output	850.35	859.65	lm
Initial luminaire efficacy	82.96	83.95	lm/W
Correlated color temperature / CCT	2971	K	
Color rendering index/CRI	91.8		
R9value	54		
Duv	-0.0017		

Luminous Intensity Distribution	Integrating sphere output	Goniophotometer Output	
Center beam candle power(if applicable)		366.075	cd
Beam angle(if applicable)		99.3	°
Zonallumensinthe0°-60°zone	--	86.79	%
Zonal lumens in the60°-90° zone		13.13	%
Zonallumensinthe90°-120°zone		0.02	%
Zonallumensinthe120°-180°zone		0.06	%

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