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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,
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For products:

SSL Downlight Retrofit Kit

Models No.:

531822##(##=01-11)

(Where "##" denotes color temperature, 01 ~ 11 identifies 2700K)

Test Date: Jul. 8, 2017 and Jul. 11, 2017

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. 14, 2017

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Jul. 14, 2017

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1. General

1.1 Product Information

Brand Name	ETI
Product Type	SSL Downlight retrofit kits
Model Number	531822##(##=01-11)
Rated Inputs	120VAC, 60Hz
Rated Power	10W
Rated Light output	625lm
Declared CCT	2700K
Power Supply	LED Driver
LED Package, Array or Module	Model: SPMWHX221FXXXXXXX, manufactured by SAMSUNG ELECTRONICS CO
Receipt Samples	1 unit
Sample Code of lab.	170701171
Date of Receipt Samples	Jul. 1, 2017
Note	All the tests are tested in a Can. Auxiliary test can mode: EPL405/WL-416-AT

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	2018-05-06
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 $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$; 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	120.10 V~60Hz	120.00 V~60Hz
Input Current(A)	0.077	0.077
Total Power(W)	9.23	9.16
Power Factor	0.992	0.991
I-THD	-	-
Off-state Power(W)	-	-

3.2 Photometric data

Criteria Item	Result(Sphere)	Result(Goniophotometer)
Total Lumens(lm)	730.70	739.71
Luminaire Efficacy(Lm/W)	79.17	80.75
Correlated Color Temperature (CCT)(K)	2737	-
Color Rendering Index (CRI)	83.0	-
R9	10	-
Chromaticity Coordinate (x,y)	x = 0.4555 y = 0.4075	-
Chromaticity Coordinate (u,v)	u = 0.2611 v = 0.3503	-
Chromaticity Coordinate (u',v')	u' = 0.2611 v' = 0.5255	-
Duv	-0.0008	-
Zone Lumens between 0-60 °	-	83.19%

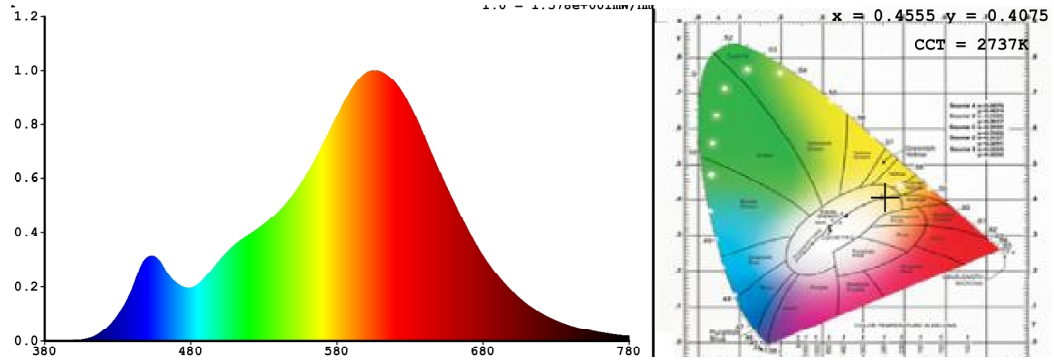
3.3 Color Rendering Details

R1	R2	R3	R4	R5	R6	R7	R8
82	93	94	81	83	93	81	58
R9	R10	R11	R12	R13	R14	R15	-
10	85	80	82	85	97	74	-

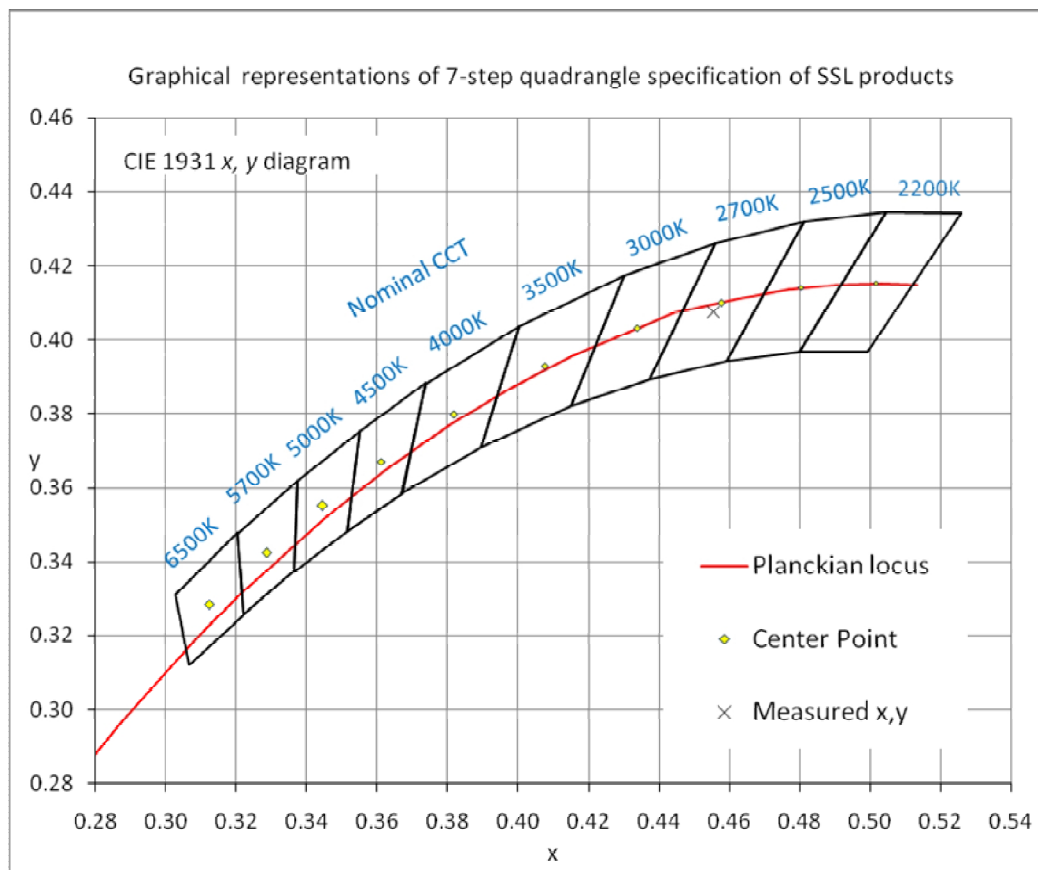
Note: N.A.

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	0.10 m (Diameter)
Spacing Criteria (90-270)	1.24	Luminous Width	0.10 m (Diameter)
Spacing Criteria (Diagonal)	1.34	Luminous Height	0.00 m
Test Distance	29.65 m		

4.4 Zonal Lumen Summary

Zone	Lumens	%Lamp	%Fixt
0-20	105.03	14.20	14.20
0-30	220.92	29.90	29.90
0-40	357.89	48.40	48.40
0-60	615.39	83.20	83.20
0-80	728.89	98.50	98.50
0-90	733.94	99.20	99.20
10-90	706.58	95.50	95.50
20-40	252.86	34.20	34.20
20-50	391.43	52.90	52.90
40-70	338.31	45.70	45.70
60-80	113.50	15.30	15.30
70-80	32.69	4.40	4.40
80-90	5.05	0.70	0.70
90-110	1.71	0.20	0.20
90-120	2.64	0.40	0.40
90-130	3.54	0.50	0.50
90-150	4.99	0.70	0.70
90-180	5.77	0.80	0.80
110-180	4.06	0.50	0.50
0-180	739.71	100.00	100.00

Total Luminaire Efficiency = 100.00%

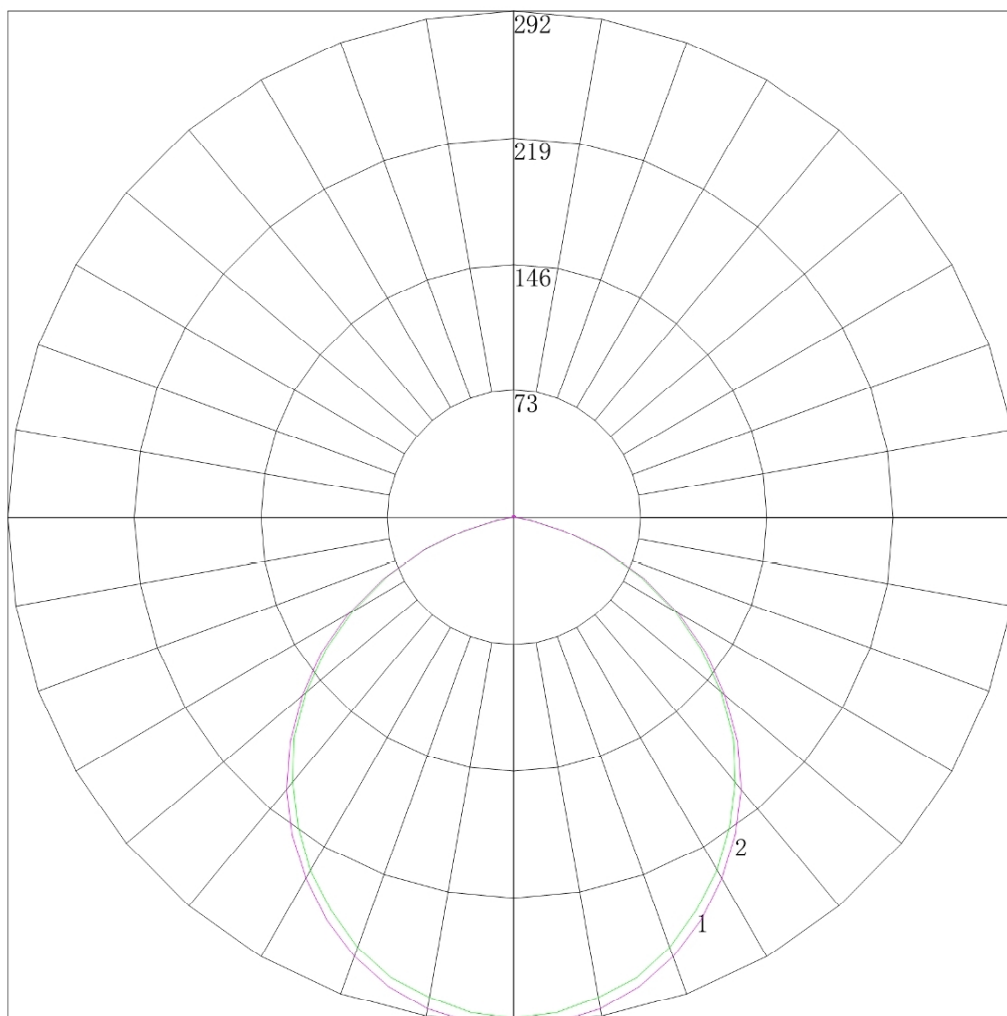
ZONAL LUMEN SUMMARY

Zone	Lumens
0-10	27.35
10-20	77.67
20-30	115.90
30-40	136.97
40-50	138.57
50-60	118.93
60-70	80.81
70-80	32.69
80-90	5.05
90-100	0.82
100-110	0.89
110-120	0.92
120-130	0.90
130-140	0.81
140-150	0.64
150-160	0.48
160-170	0.26
170-180	0.05



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4.5 Polar Curves



Maximum Candela = 292.482 Located At Horizontal Angle = 90, Vertical Angle = 5

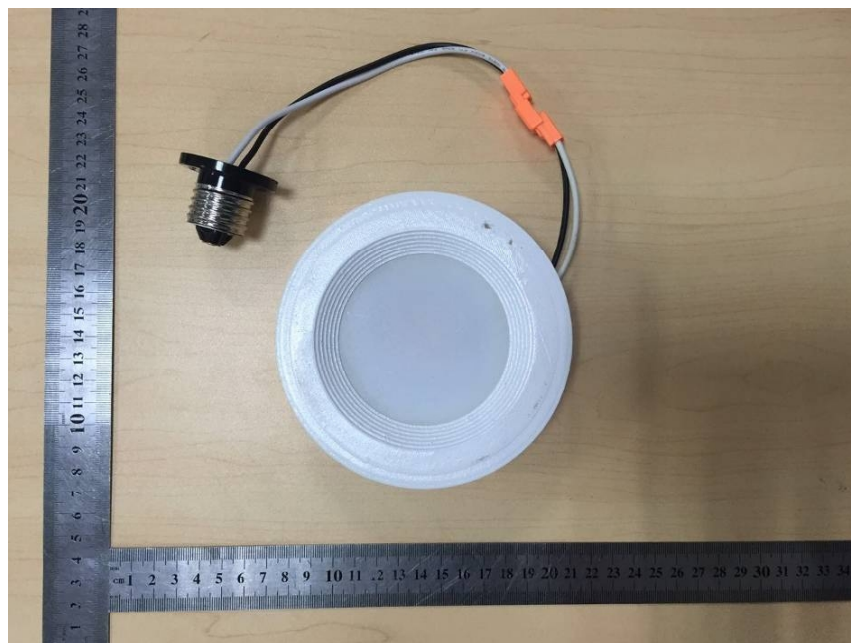
1 - Vertical Plane Through Horizontal Angles (0 - 180)

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	289.372	289.372	289.372	289.372	289.372	289.372	289.372
5	287.080	287.852	288.468	287.720	287.415	288.110	292.482
10	281.351	282.780	283.772	283.009	282.563	283.540	288.173
15	274.916	275.087	274.821	275.215	275.033	275.292	280.380
20	263.899	263.601	264.724	264.428	264.298	264.227	269.488
25	249.840	251.168	251.431	251.241	251.056	251.762	256.043
30	235.208	236.109	236.219	235.830	236.151	235.857	240.498
35	217.536	218.231	219.266	218.217	218.478	218.698	223.347
40	198.894	199.338	199.932	200.296	199.859	200.433	204.417
45	179.634	179.232	179.826	179.712	180.208	179.786	183.033
50	156.629	157.252	157.405	156.882	156.825	157.417	159.478
55	132.390	133.068	133.310	133.172	133.093	132.878	135.856
60	107.622	107.605	107.891	107.700	107.736	107.680	110.210
65	81.356	81.702	81.591	82.029	81.540	82.164	82.963
70	55.309	55.402	54.761	54.884	55.039	55.109	55.192
75	29.660	29.431	29.717	29.082	28.869	28.971	29.819
80	10.445	10.384	10.427	10.413	10.384	10.430	10.669
85	3.570	3.638	3.615	3.699	3.710	3.805	3.776
90	0.749	0.683	0.661	0.704	0.768	0.764	0.866
95	0.705	0.727	0.728	0.704	0.768	0.765	0.739
100	0.837	0.794	0.772	0.793	0.834	0.809	0.826
105	0.793	0.860	0.794	0.837	0.856	0.897	0.870
110	0.837	0.860	0.882	0.859	0.878	0.940	0.913
115	0.837	0.904	0.926	0.947	0.922	0.984	0.957
120	1.014	0.970	0.970	0.947	1.010	0.984	1.000
125	1.014	1.058	0.970	0.947	1.032	0.984	1.087
130	1.058	0.992	1.036	1.035	1.054	1.028	1.086
135	1.058	1.036	1.014	1.057	1.054	1.071	1.042
140	1.058	0.992	1.014	1.057	1.054	1.028	1.042
145	1.058	1.014	0.970	0.991	1.032	1.050	0.997
150	1.058	1.036	1.014	0.969	1.010	1.028	1.084
155	0.970	1.036	1.058	1.035	1.054	1.071	1.042
160	0.970	1.014	1.058	1.035	1.010	1.071	1.086
165	0.970	0.882	0.926	0.881	0.878	0.853	0.909
170	0.749	0.728	0.728	0.748	0.747	0.678	0.779
175	0.441	0.419	0.375	0.352	0.395	0.373	0.391
180	0.320	0.320	0.320	0.320	0.320	0.320	0.320

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	Jul. 14, 2017
Test report number	LCZP17060300
Laboratory contact name	Richard Li

Product Information

Applicant	ELEC-TECH INTERNATIONAL CO LTD		
Brand name	ETI		
Model number	531822##(##=01-11)		
SKU(if available)	N/A		
Type of luminaire (for integral lamps, list base type and lamp type)	SSL Downlight Retrofit <u>Kit</u>		
Luminaire aperture	-	in.	
Luminaire height	0	in.	
Luminaire length	3.7	in.	
Luminaire width	3.7	in.	
Number of units(modular products)	N/A		

Electrical Measurements

Integrating sphere output

Goniophotometer Output

Input wattage	9.23	9.16	W
Input current	0.077	0.077	A
Input voltage(AC)	120.10	120.00	V
Power factor	0.992	0.991	
Off-state power	0.0	0.0	W

Photometric Characteristics

Total initial lumen output	730.70	739.71	lm
Initial luminaire efficacy	79.17	80.75	lm/W
Correlated color temperature / CCT	2737	K	
Color rendering index/CRI	83.0		
Rgvalue	10		
Duv	-0.0008		

Luminous Intensity Distribution

Goniophotometer Output

Center beam candle power(if applicable)	--	289.372	cd
Beam angle(if applicable)		104.9	°
Zonallumensinthe0°-60°zone		83.19	%
Zonal lumens in the60°-90° zone		16.03	%
Zonallumensinthe90°-120°zone		0.36	%
Zonallumensinthe120°-180°zone		0.42	%

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