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Test report of

IES LM-79-08

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

Rendered to:

ETI Solid State Lighting (Zhuhai) Ltd
No.1, Zhongzhu Road South, Science & Technology Innovation
Coast, High Tech District, Zhuhai City, Guangdong Prov., China

For products:

LED Ceiling Light

Models No.:

546521##(##=41-50)

Test Date: Sep. 8, 2017 to Sep. 12, 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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Test Note:

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1. General

1.1 Product Information

Brand Name	ETI, I-Brite, Commercial Electric
Product Type	LED Ceiling Light
Model Number	546521##(##=41-50)
Rated Inputs	120VAC, 60Hz
Rated Power	22 W
Rated Light output	1600 lm
Declared CCT	4000K
Power Supply	LED Driver
LED Package, Array or Module	Model: SPMWHX228FXXXXXXXX, Samsung Electronics Co., LTD
Receipt Samples	1 unit
Sample Code of lab.	170906104003
Date of Receipt Samples	Sep. 6, 2017
Note	-



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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	2017-08-10	2018-08-09
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 $25\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$; 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.



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3. Test Result Summary

3.1 Electrical data

Criteria Item	Result(Sphere)	Result(Goniophotometer)
Input Voltage & Frequency	120.00 V~60Hz	120.03 V~60Hz
Input Current(A)	0.169	0.170
Total Power(W)	20.02	20.02
Power Factor	0.986	0.984
I-THD	-	-
Off-state Power(W)	-	-

3.2 Photometric data

Criteria Item	Result(Sphere)	Result(Goniophotometer)
Total Lumens(lm)	1816.20	1820.52
Luminaire Efficacy(Lm/W)	90.72	90.93
Correlated Color Temperature (CCT)(K)	4109	-
Color Rendering Index (CRI)	85.6	-
R9	19	-
Chromaticity Coordinate (x,y)	x = 0.3746 y = 0.3692	-
Chromaticity Coordinate (u,v)	u = 0.2243 v = 0.3315	-
Chromaticity Coordinate (u',v')	u' = 0.2243 v' = 0.4973	-
Duv	-0.0018	-
Zone Lumens between 0-60 °	-	64.67%

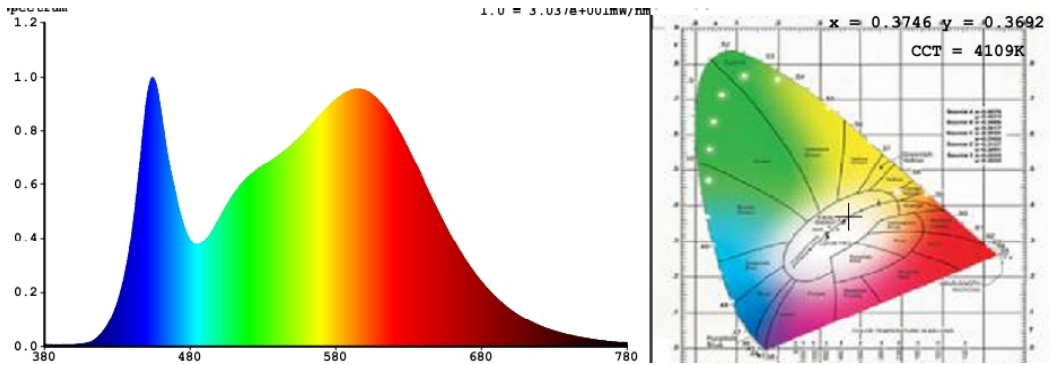
3.3 Color Rendering Details

R1	R2	R3	R4	R5	R6	R7	R8
85	93	96	83	85	89	86	67
R9	R10	R11	R12	R13	R14	R15	-
19	83	82	68	87	98	80	-

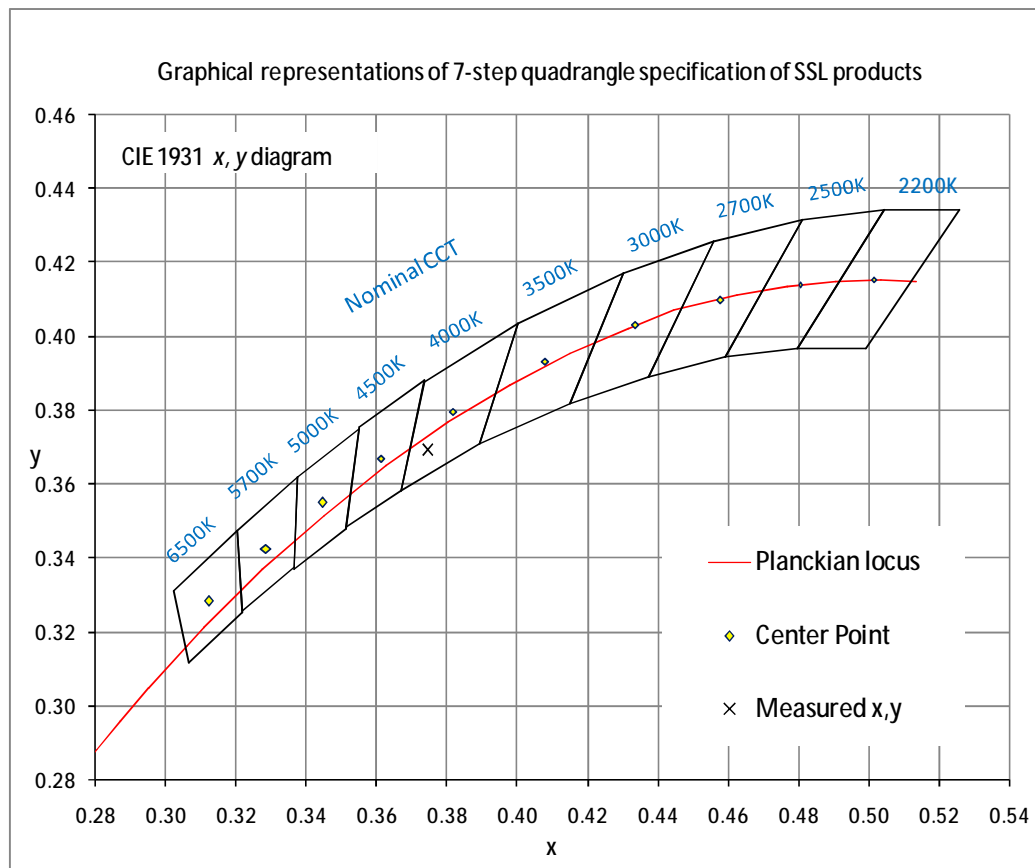
Note: N.A.

4. Test Data

4.1 Spectral Distribution



4.2 ANSI Chromaticity Quadrangles Diagram





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4.3 Goniometry Test Data

CIE Type	Direct	Basic Luminous Shape	Circular
Spacing Criteria (0-180)	1.28	Luminous Length	0.20 m (Diameter)
Spacing Criteria (90-270)	1.28	Luminous Width	0.20 m (Diameter)
Spacing Criteria (Diagonal)	1.40	Luminous Height	0.00 m
Test Distance	29.79 m		

4.4 Zonal Lumen Summary

Zone	Lumens	%Lamp	%Fixt
0-20	186.74	10.30	10.30
0-30	397.89	21.90	21.90
0-40	654.87	36.00	36.00
0-60	1177.35	64.70	64.70
0-80	1543.62	84.80	84.80
0-90	1649.2	90.60	90.60
10-90	1600.97	87.90	87.90
20-40	468.13	25.70	25.70
20-50	738.74	40.60	40.60
40-70	731.93	40.20	40.20
60-80	366.27	20.10	20.10
70-80	156.82	8.60	8.60
80-90	105.57	5.80	5.80
90-110	99.76	5.50	5.50
90-120	121.94	6.70	6.70
90-130	138.35	7.60	7.60
90-150	160.08	8.80	8.80
90-180	171.32	9.40	9.40
110-180	71.56	3.90	3.90
0-180	1820.52	100.00	100.00

Total Luminaire Efficiency = 100.00%

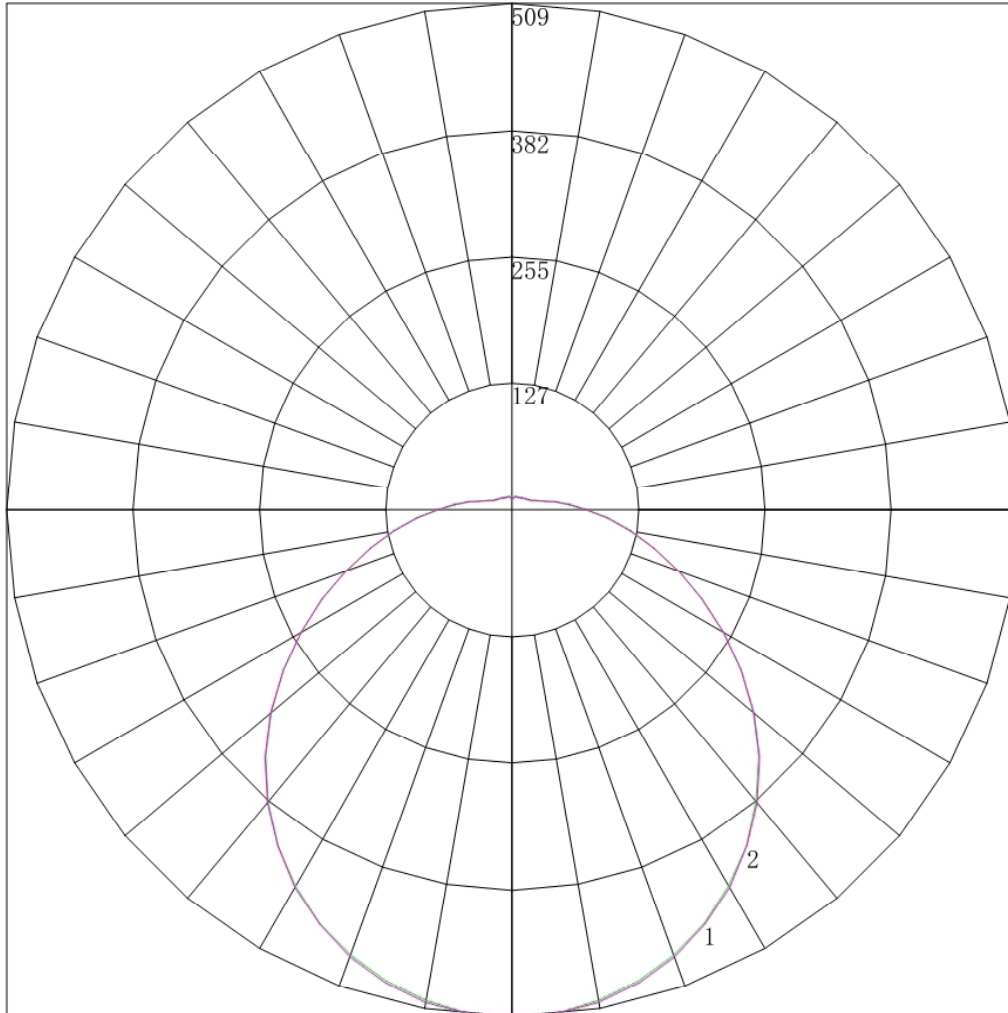
ZONAL LUMEN SUMMARY

Zone	Lumens
0-10	48.23
10-20	138.51
20-30	211.15
30-40	256.99
40-50	270.61
50-60	251.87
60-70	209.45
70-80	156.82
80-90	105.57
90-100	63.69
100-110	36.07
110-120	22.17
120-130	16.41
130-140	12.52
140-150	9.21
150-160	6.33
160-170	3.80
170-180	1.12



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4.5 Polar Curves



Maximum Candela = 509.25 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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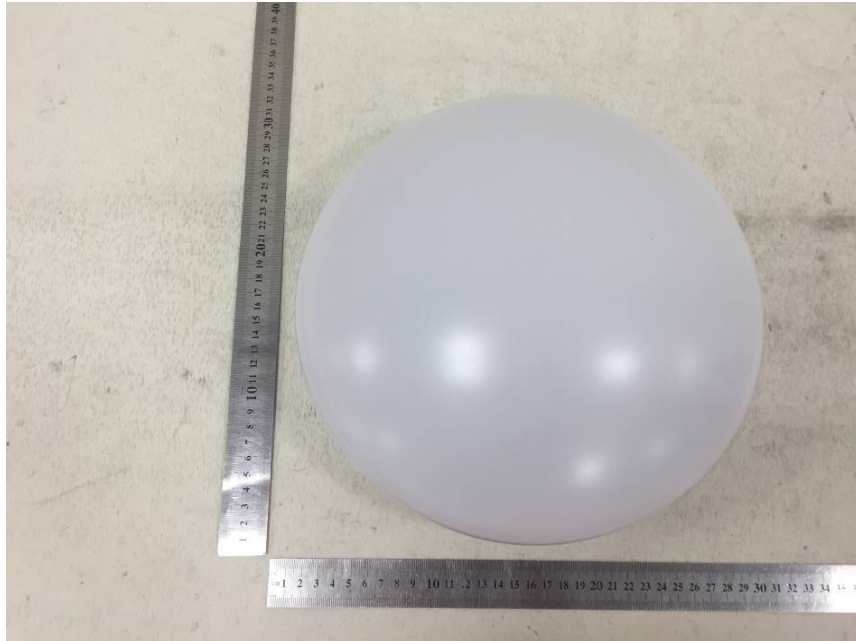
4.6 Candela Tabulation

	<u>0</u>	<u>15</u>	<u>30</u>	<u>45</u>	<u>60</u>	<u>75</u>	<u>90</u>
0	509.250	509.250	509.250	509.250	509.250	509.250	509.250
5	508.228	507.076	507.740	506.899	507.343	507.322	508.941
10	501.251	500.643	500.904	500.889	500.737	500.715	502.737
15	490.364	490.305	490.826	490.465	490.319	490.337	492.496
20	476.411	476.063	476.287	475.717	476.131	476.192	478.356
25	458.502	457.894	457.885	457.509	457.753	457.900	459.430
30	436.239	435.800	436.221	435.885	436.028	436.105	437.888
35	411.532	410.621	410.294	410.447	410.512	410.342	412.135
40	382.293	382.027	381.726	382.414	381.960	381.892	383.634
45	351.409	350.747	350.917	350.633	350.216	350.963	351.897
50	317.281	316.584	316.822	316.391	316.298	316.352	318.122
55	281.776	281.467	281.817	281.283	281.072	281.167	281.775
60	246.049	245.441	245.724	245.842	244.871	245.625	246.047
65	211.743	210.990	210.674	210.535	211.309	210.813	211.074
70	178.415	177.825	177.867	178.289	177.524	177.399	178.586
75	148.065	147.788	147.301	147.727	147.752	147.800	147.558
80	120.425	119.903	120.398	120.138	119.909	120.705	121.450
85	95.806	95.723	96.136	95.919	95.722	96.427	96.717
90	74.832	74.626	74.871	74.695	74.684	75.053	75.219
95	57.057	57.189	57.358	57.685	57.505	57.580	57.578
100	43.593	43.547	43.440	43.668	43.782	43.835	43.970
105	33.150	33.120	33.207	33.223	33.208	33.214	33.110
110	25.996	26.110	26.304	26.214	26.070	26.097	26.151
115	21.819	21.762	21.887	21.801	21.770	21.685	21.764
120	19.463	19.566	19.556	19.650	19.442	19.401	19.326
125	18.175	18.235	18.424	18.275	18.267	18.093	18.041
130	17.108	17.170	17.314	17.033	17.159	17.095	16.888
135	15.997	16.327	16.204	15.946	16.139	15.987	15.913
140	15.420	15.462	15.383	15.170	15.275	15.211	14.982
145	14.709	14.753	14.739	14.571	14.632	14.568	14.273
150	14.175	14.065	14.051	13.884	14.034	13.970	14.008
155	13.464	13.577	13.740	13.729	13.590	13.349	13.166
160	13.509	13.554	13.674	13.684	13.590	13.326	12.811
165	13.864	14.020	13.762	13.706	13.811	13.614	13.653
170	12.220	12.378	12.430	12.486	12.480	12.638	12.500
175	10.665	10.715	10.766	10.801	10.951	10.953	10.993
180	12.758	12.758	12.758	12.758	12.758	12.758	12.758



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Appendix 1 Product Photo



Picture 1



Picture 2



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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	Sep. 12, 2017
Test report number	LCZP17090344
Laboratory contact name	Richard Li

Product Information

Applicant	ETI Solid State Lighting (Zhuhai) Ltd	
Brand name	ETI, I-Brite, Commercial Electric	
Model number	546521##(##=41-50)	
SKU(if available)	N/A	
Type of luminaire (for integral lamps, list base type and lamp type)	LED Ceiling Light	
Luminaire aperture	-	in.
Luminaire height	3.86	in.
Luminaire length	11.02	in.
Luminaire width	11.02	in.
Number of units(modular products)	N/A	

Electrical Measurements	Integrating sphere output	Goniophotometer Output	
Input wattage	20.02	20.02	W
Input current	0.169	0.170	A
Input voltage(AC)	120.00	120.03	V
Power factor	0.986	0.984	
Off-state power	0.0	0.0	W

Photometric Characteristics			
Total initial lumen output	1816.20	1820.52	lm
Initial luminaire efficacy	90.72	90.93	lm/W
Correlated color temperature / CCT	4109	K	
Color rendering index/CRI	85.6		
Rgvalue	19		
Duv	-0.0018		

Luminous Intensity Distribution		Goniophotometer Output	
Center beam candle power(if applicable)	--	509.250	cd
Beam angle(if applicable)		117.6	°
Zonallumensinthe0°-60°zone		64.67	%
Zonal lumens in the60°-90° zone		32.61	%
Zonallumensinthe90°-120°zone		9.27	%
Zonallumensinthe120°-180°zone		2.71	%

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