



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) Limited
Factory 2#-2 No.1 South Zhongzhu Rd., Science & Technology
Innovation Coast, High Tech District, Zhuhai City, Guangdong
Prov., China

For products:

LED Downlights

Models No.:

565782##(##=11-60)

(The product is a color tunable luminaire, tunable to 3000K, 4000K, 5000K and ## can be 11-60 and represent different client and sales districts.)

Test Date: Dec. 26, 2019 to Dec. 30, 2019

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Test Note:

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Lin

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1. General

1.1 Product Information

Brand Name	ETI
Product Type	LED Downlights
Model Number	565782##(##=11-60)
Rated Inputs	120VAC, 60Hz
Rated Power	14W
Rated Light output	1000lm
Declared CCT	3000K
Power Supply	Integrated in luminaire
LED Package, Array or Module	SPMWH6229AQ5SGW*SM, SAMSUNG
Receipt Samples	1 unit
Sample Code of lab.	191223101002
Date of Receipt Samples	Dec. 23, 2019
Note	3000K was selected for the test.

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 or 2015 or 2017	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-987	APW-120N	2019-01-08	2020-01-07
AC Power supply	LC-I-989	APW-120N	2019-01-08	2020-01-07
Power analyzer	LC-I-928	WT210	2019-01-02	2020-01-01
Power analyzer	LC-I-954	WT210	2019-03-12	2020-03-11
Multimeter	LC-I-972	Fluke 17B	2019-07-29	2020-07-28
Photometric colorimetric electric system* (2 meter sphere)	LC-I-956	HAAS-2000	Before use	Before use
Standard lamp**	LC-PL-I-011	D204C	2019-08-01	2020-07-31
Luminous Flux Standard Lamp***	LC-PL-I-003	24V100W	2019-08-01	2020-07-31
Goniophotometer(with mirror)	LC-I-902	GMS2000	2019-05-06	2020-05-05
Wireless temperature transmitter	LC-I-978	DWRF-B	2019-01-07	2020-01-06
Wireless temperature transmitter	LC-I-979	DWRF-B	2019-01-07	2020-01-06

Note:

* Bandwidth of spectroradiometer is 1 nm.

** halogen lamp, 100W, omni-directional type, and its traceability to NIM.

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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 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.

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	120.03 V~60Hz	120.00 V~60Hz
Input Current(A)	0.123	0.122
Total Power(W)	13.76	13.70
Power Factor	0.929	0.925
Off-state Power(W)	-	-

3.2 Photometric data

Criteria Item	Result(Sphere)	Result(Goniophotometer)
Total Lumens(lm)	-	1047.03
Luminaire Efficacy(lm/W)	-	76.43
Correlated Color Temperature (CCT)(K)	2981	-
Color Rendering Index (CRI)	83.9	-
R9	11	-
Chromaticity Coordinate (x,y)	x = 0.4390 y = 0.4059	-
Chromaticity Coordinate (u,v)	u = 0.2511 v = 0.3483	-
Chromaticity Coordinate (u',v')	u' = 0.2511 v' = 0.5224	-
Duv	0.0004	-
Zone Lumens between 0-60 °	-	76.45%
Beam Angle(50%Imax)	-	C0/180=111.4° C90/270=111.8°

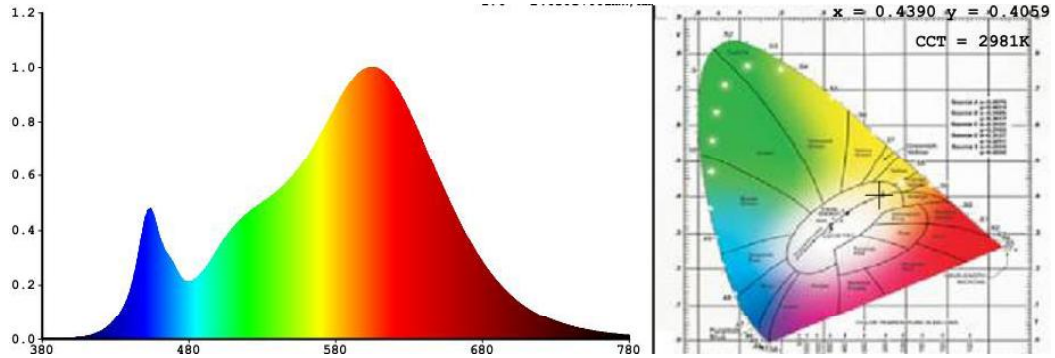
3.3 Color Rendering Details

R1	R2	R3	R4	R5	R6	R7	R8
83	93	96	82	83	92	83	60
R9	R10	R11	R12	R13	R14	R15	-
11	83	82	75	85	98	75	-

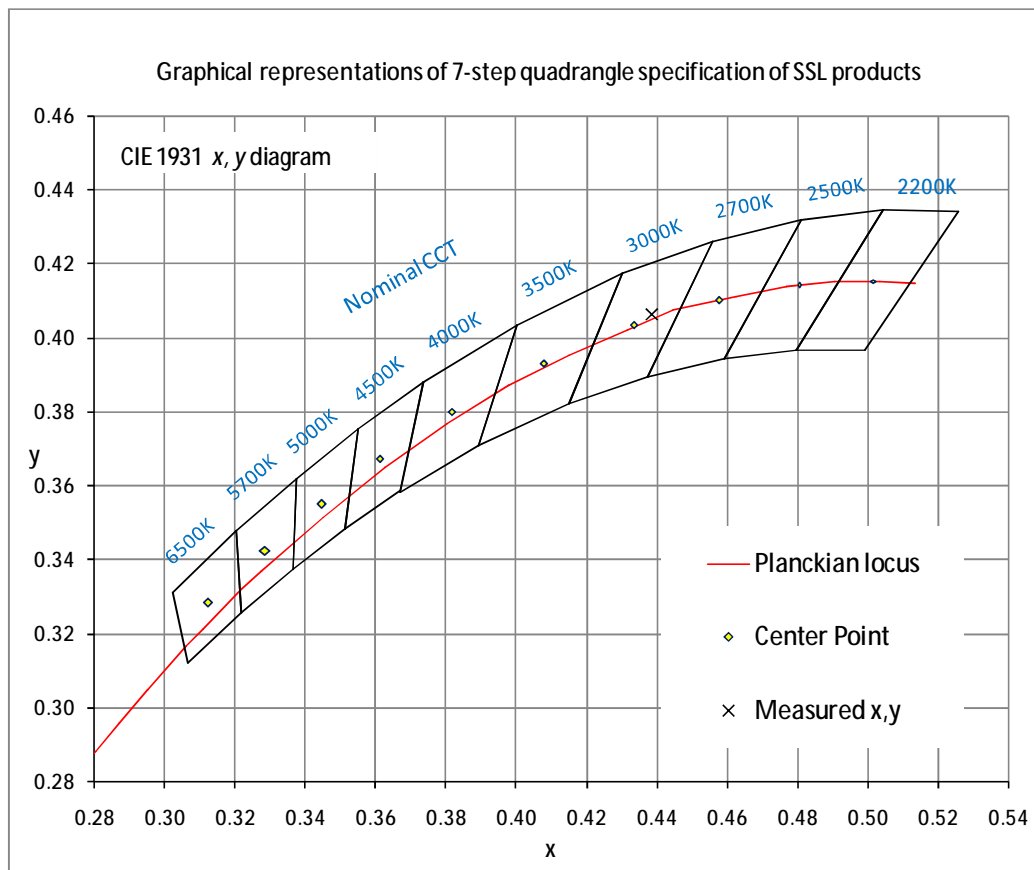
Note: N/A

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 w/ Sides
Spacing Criteria (0-180)	1.24	Luminous Length	0.10 m (Diameter)
Spacing Criteria (90-270)	1.24	Luminous Width	0.10 m (Diameter)
Spacing Criteria (Diagonal)	1.36	Luminous Height	0.01 m
Test Distance	30.00 m		

4.4 Zonal Lumen Summary

Zone	Lumens	%Lamp	%Fixt
0-20	131.66	12.60	12.60
0-30	278.43	26.60	26.60
0-40	454.03	43.40	43.40
0-60	800.43	76.40	76.40
0-80	1010.69	96.50	96.50
0-90	1042.8	99.60	99.60
10-90	1008.66	96.30	96.30
20-40	322.37	30.80	30.80
20-50	503.69	48.10	48.10
40-70	475.74	45.40	45.40
60-80	210.26	20.10	20.10
70-80	80.92	7.70	7.70
80-90	32.12	3.10	3.10
90-110	3.02	0.30	0.30
90-120	3.14	0.30	0.30
90-130	3.30	0.30	0.30
90-150	3.64	0.30	0.30
90-180	4.23	0.40	0.40
110-180	1.21	0.10	0.10
0-180	1047.03	100.00	100.00

Total Luminaire Efficiency = 100.00%

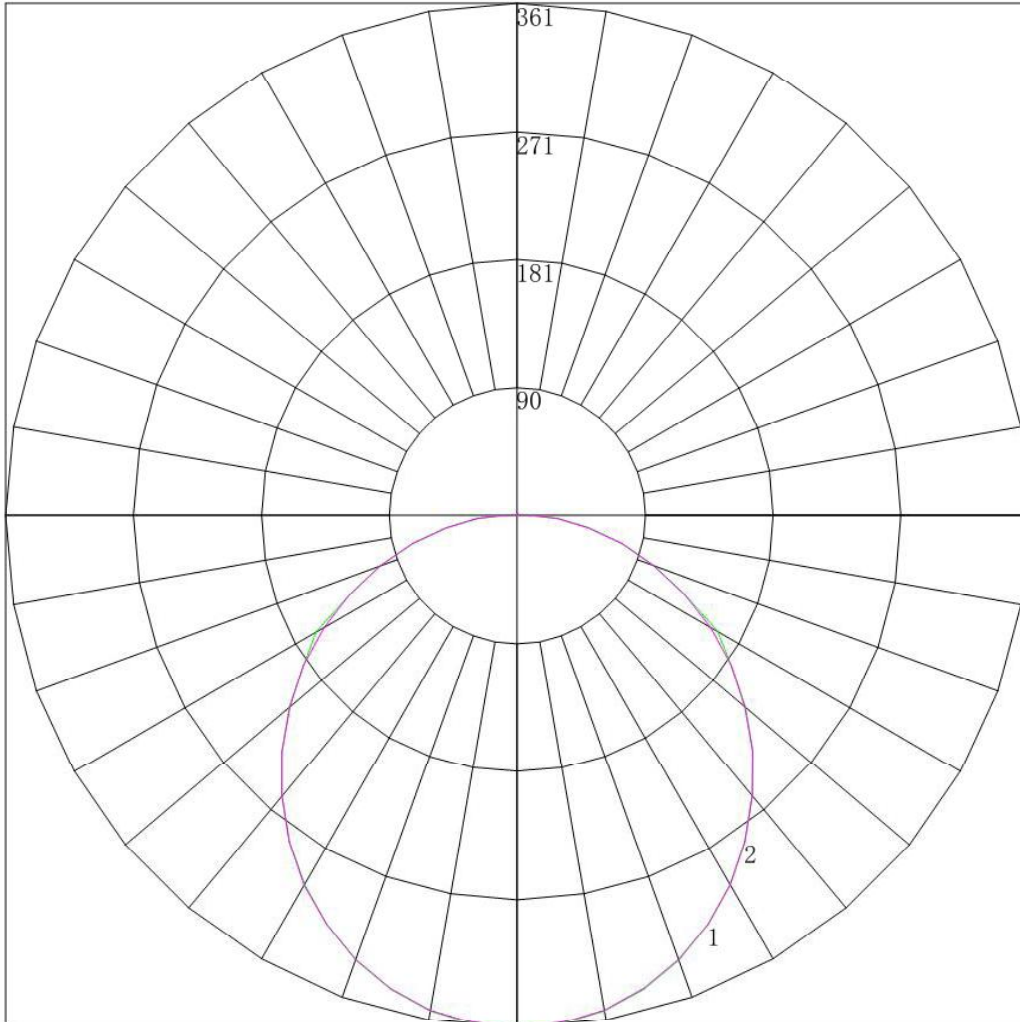
ZONAL LUMEN SUMMARY

Zone	Lumens
0-10	34.15
10-20	97.51
20-30	146.77
30-40	175.60
40-50	181.32
50-60	165.08
60-70	129.33
70-80	80.92
80-90	32.12
90-100	2.86
100-110	0.16
110-120	0.12
120-130	0.16
130-140	0.17
140-150	0.18
150-160	0.24
160-170	0.25
170-180	0.10



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4.5 Polar Curves

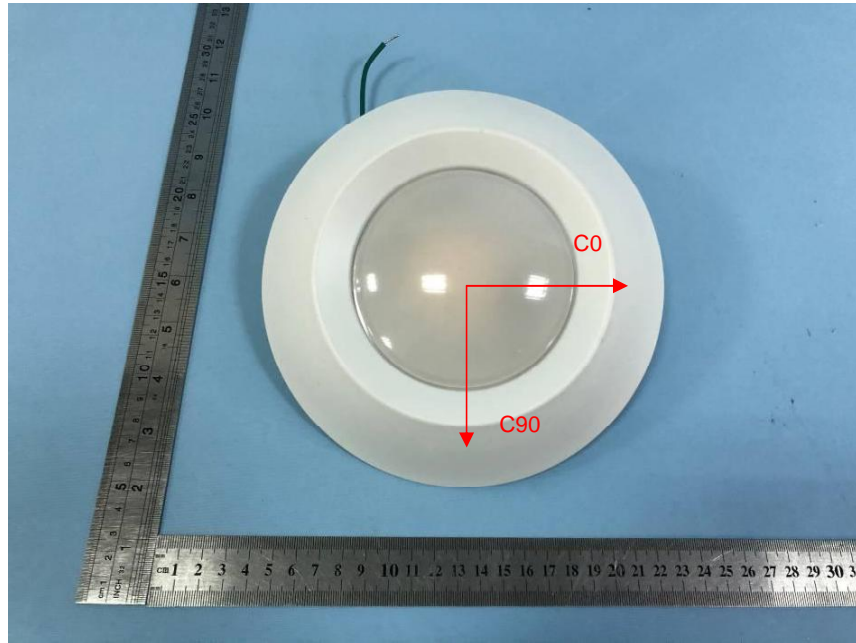


Maximum Candela = 361.308 Located At Horizontal Angle = 0, Vertical Angle = 0
1 - Vertical Plane Through Horizontal Angles (0 - 180)
2 - Vertical Plane Through Horizontal Angles (90 - 270)

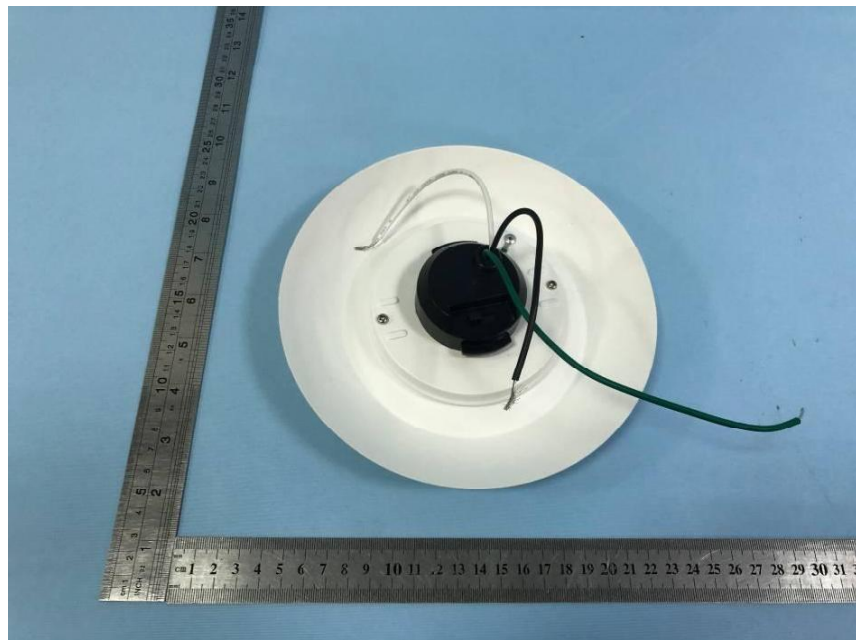
4.6 Candela Tabulation

	<u>0</u>	<u>15</u>	<u>30</u>	<u>45</u>	<u>60</u>	<u>75</u>	<u>90</u>
0	361.308	361.308	361.308	361.308	361.308	361.308	361.308
5	359.685	359.304	359.304	359.440	359.645	359.645	359.153
10	354.454	353.762	353.762	354.150	354.857	354.857	354.260
15	345.705	345.043	345.043	345.642	346.339	346.339	345.281
20	333.935	332.721	332.721	333.510	334.808	334.808	333.429
25	318.512	317.447	317.447	318.429	319.568	319.568	318.210
30	300.654	299.244	299.244	300.602	302.395	302.395	300.836
35	280.541	279.194	279.194	280.502	282.457	282.457	280.499
40	258.444	256.914	256.914	258.399	260.317	260.317	258.366
45	235.175	233.124	233.124	234.720	237.165	237.165	235.156
50	210.327	208.096	208.096	209.600	211.855	211.855	209.835
55	184.487	182.166	182.166	183.963	186.433	186.433	184.291
60	163.698	158.603	158.603	157.560	159.729	159.729	157.444
65	129.831	127.760	127.760	130.167	132.689	132.689	130.193
70	102.909	100.591	100.591	102.797	105.064	105.064	102.897
75	76.302	74.030	74.030	76.237	78.608	78.608	76.410
80	51.274	49.181	49.181	51.275	53.006	53.006	50.910
85	28.456	26.742	26.742	28.496	30.123	30.123	28.598
90	9.741	8.742	8.742	9.949	11.016	11.016	9.787
95	0.135	0.203	0.203	0.315	0.225	0.225	0.224
100	0.090	0.135	0.135	0.180	0.135	0.135	0.180
105	0.180	0.203	0.203	0.180	0.068	0.068	0.135
110	0.225	0.180	0.180	0.135	0.112	0.112	0.180
115	0.135	0.113	0.113	0.113	0.067	0.067	0.135
120	0.135	0.135	0.135	0.158	0.090	0.090	0.135
125	0.225	0.203	0.203	0.203	0.157	0.157	0.135
130	0.225	0.203	0.203	0.180	0.225	0.225	0.224
135	0.225	0.225	0.225	0.203	0.225	0.225	0.180
140	0.271	0.225	0.225	0.180	0.225	0.225	0.180
145	0.271	0.270	0.270	0.270	0.315	0.315	0.269
150	0.316	0.338	0.338	0.360	0.405	0.405	0.359
155	0.541	0.541	0.541	0.540	0.539	0.539	0.494
160	0.676	0.698	0.698	0.698	0.742	0.742	0.718
165	0.902	0.879	0.879	0.878	0.899	0.899	0.853
170	1.037	1.036	1.036	1.013	1.034	1.034	1.033
175	1.037	1.081	1.081	1.103	1.079	1.079	1.077
180	0.649	0.649	0.649	0.649	0.649	0.649	0.649

Appendix A Product Photo



Picture 1



Picture 2

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