



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
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Innovation Coast, High Tech District, Zhuhai City, Guangdong
Prov., China

For products:
LED Downlights

Models No.:
565783##(##=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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Template No.: LC-RT-PL-001 Rev.1.3
Test Note:

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Dec. 31, 2019

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Dec. 31, 2019

Lin

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1. General

1.1 Product Information

Brand Name	ETI
Product Type	LED Downlights
Model Number	565783##(##=11-60)
Rated Inputs	120VAC, 60Hz
Rated Power	20W
Rated Light output	1500lm
Declared CCT	3000K
Power Supply	Integrated in luminaire
LED Package, Array or Module	SPMWH6229AQ5SGW*SM, SAMSUNG
Receipt Samples	1 unit
Sample Code of lab.	191219101002
Date of Receipt Samples	Dec. 19, 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	120.02 V~60Hz	120.00 V~60Hz
Input Current(A)	0.175	0.174
Total Power(W)	19.41	19.30
Power Factor	0.923	0.927
Off-state Power(W)	-	-

3.2 Photometric data

Criteria Item	Result(Sphere)	Result(Goniophotometer)
Total Lumens(lm)	-	1592.00
Luminaire Efficacy(lm/W)	-	82.49
Correlated Color Temperature (CCT)(K)	2970	-
Color Rendering Index (CRI)	83.8	-
R9	11	-
Chromaticity Coordinate (x,y)	x = 0.4396 y = 0.4058	-
Chromaticity Coordinate (u,v)	u = 0.2515 v = 0.3483	-
Chromaticity Coordinate (u',v')	u' = 0.2515 v' = 0.5225	-
Duv	0.0003	-
Zone Lumens between 0-60 °	-	76.85%
Beam Angle(50%Imax)	-	C0/180=109.2° C90/270=111.0°

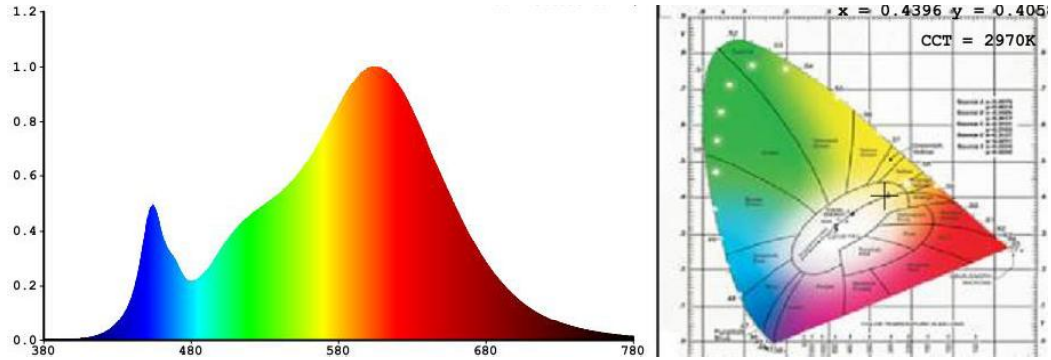
3.3 Color Rendering Details

R1	R2	R3	R4	R5	R6	R7	R8
83	93	95	82	83	92	83	60
R9	R10	R11	R12	R13	R14	R15	-
11	84	82	75	85	98	75	-

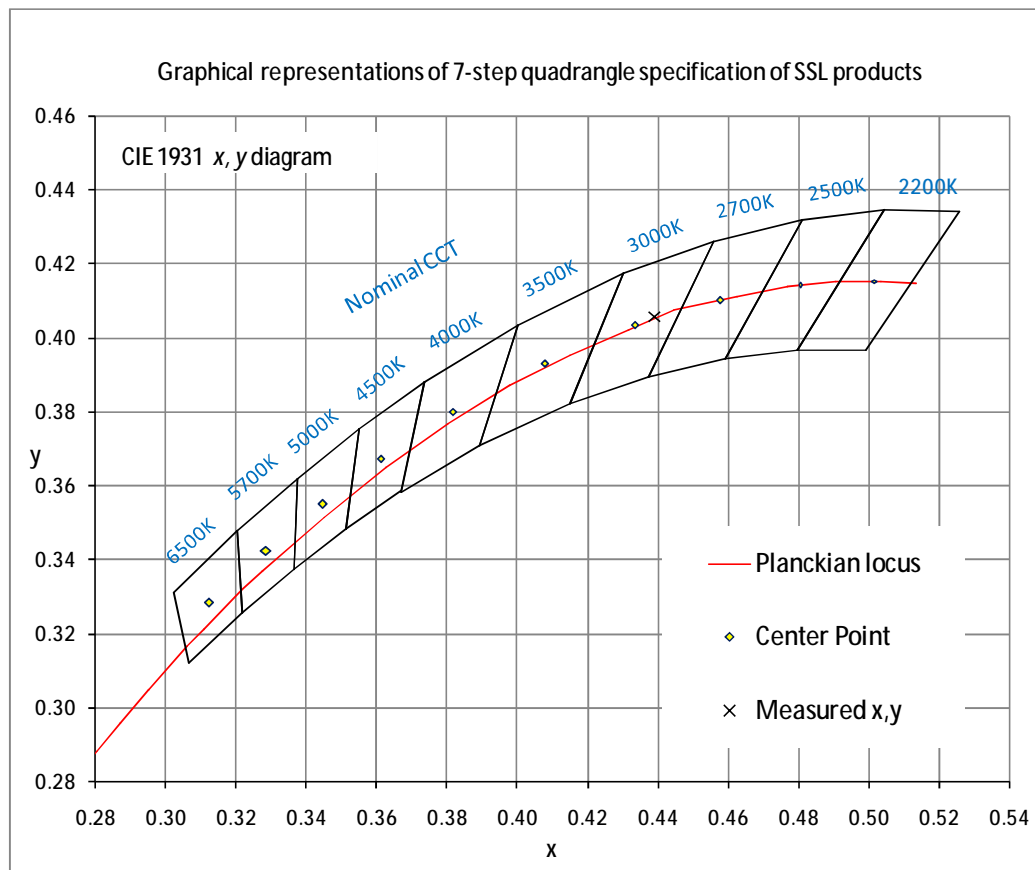
Note: N/A

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	203.71	12.80	12.80
0-30	430.10	27.00	27.00
0-40	699.31	43.90	43.90
0-60	1223.46	76.90	76.90
0-80	1535.3	96.40	96.40
0-90	1583.53	99.50	99.50
10-90	1530.63	96.10	96.10
20-40	495.60	31.10	31.10
20-50	771.17	48.40	48.40
40-70	715.81	45.00	45.00
60-80	311.84	19.60	19.60
70-80	120.18	7.50	7.50
80-90	48.23	3.00	3.00
90-110	5.58	0.40	0.40
90-120	5.94	0.40	0.40
90-130	6.37	0.40	0.40
90-150	7.24	0.50	0.50
90-180	8.48	0.50	0.50
110-180	2.90	0.20	0.20
0-180	1592.00	100.00	100.00

Total Luminaire Efficiency = 100.00%

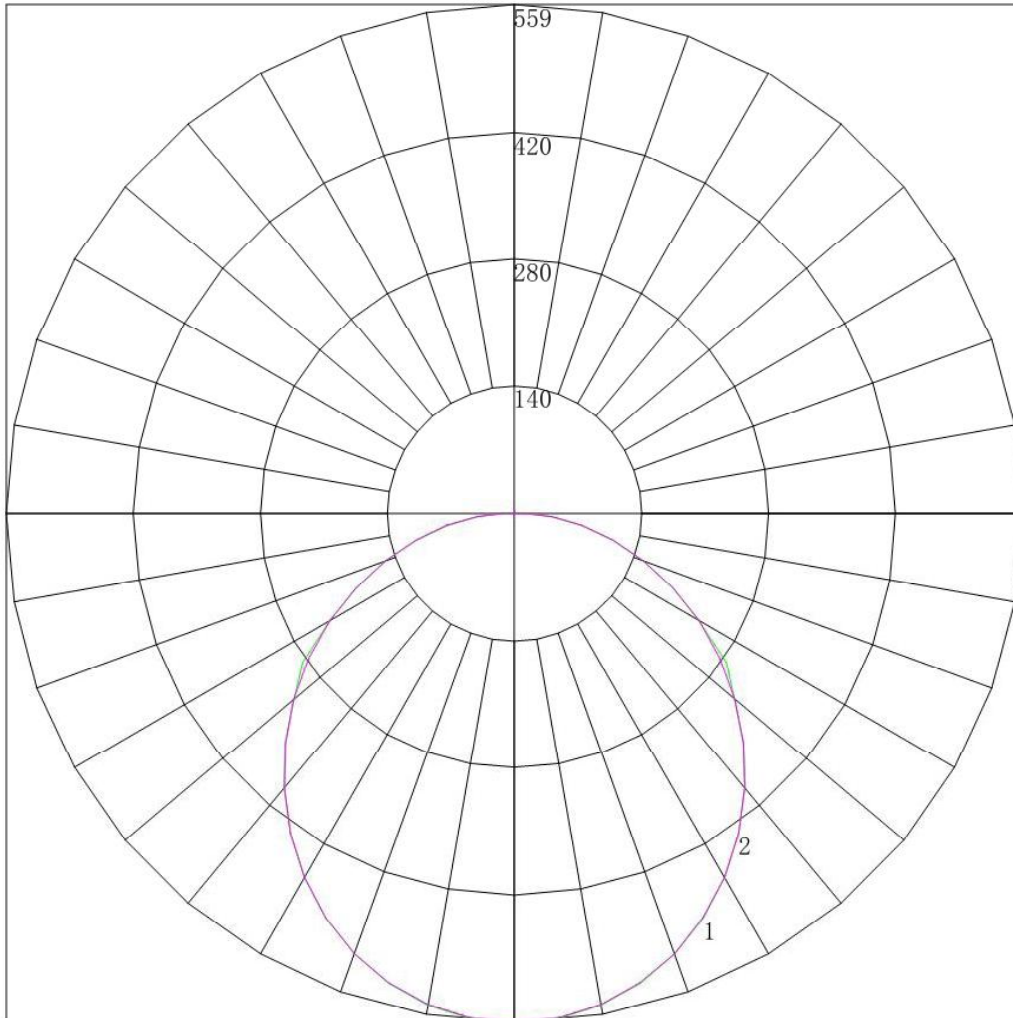
ZONAL LUMEN SUMMARY

Zone	Lumens
0-10	52.89
10-20	150.81
20-30	226.40
30-40	269.21
40-50	275.57
50-60	248.58
60-70	191.66
70-80	120.18
80-90	48.23
90-100	5.14
100-110	0.44
110-120	0.36
120-130	0.42
130-140	0.42
140-150	0.46
150-160	0.53
160-170	0.50
170-180	0.19



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4.5 Polar Curves



Maximum Candela = 559.38 Located At Horizontal Angle = 0, Vertical Angle = 0

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

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



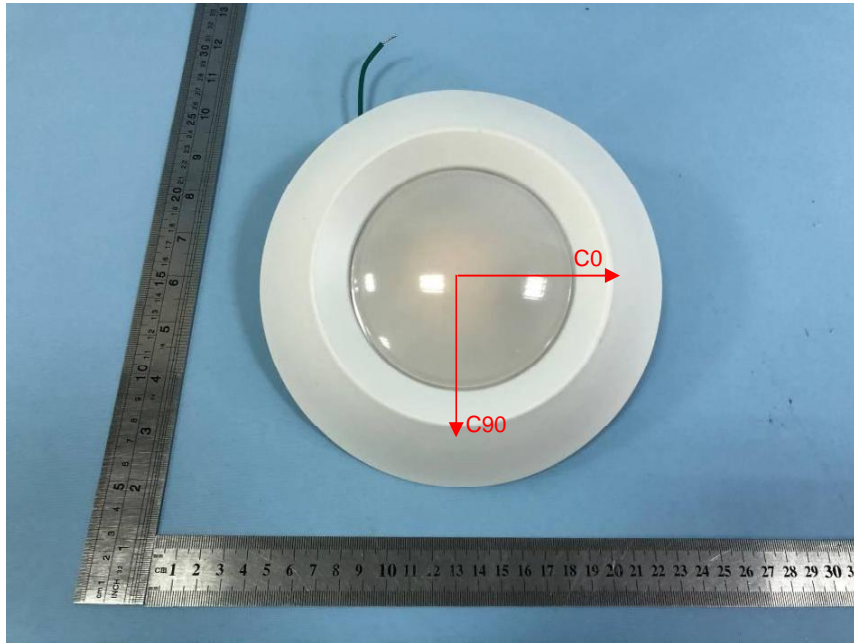
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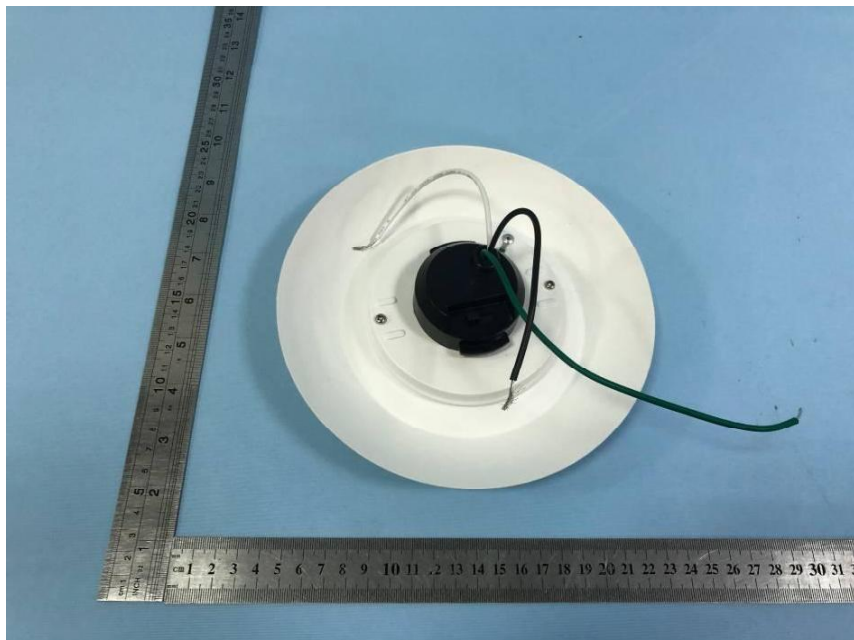
4.6 Candela Tabulation

	<u>0</u>	<u>15</u>	<u>30</u>	<u>45</u>	<u>60</u>	<u>75</u>	<u>90</u>
0	559.380	559.380	559.380	559.380	559.380	559.380	559.380
5	557.301	556.692	556.692	556.516	557.182	557.182	556.701
10	548.673	548.295	548.295	548.399	549.397	549.397	548.083
15	534.939	533.893	533.893	533.943	535.779	535.779	534.286
20	515.197	514.346	514.346	515.002	517.137	517.137	515.310
25	491.163	490.195	490.195	491.121	493.245	493.245	490.618
30	462.520	460.990	460.990	462.235	465.446	465.446	462.131
35	429.948	428.217	428.217	429.626	432.982	432.982	429.715
40	394.213	392.490	392.490	394.111	397.957	397.957	394.129
45	356.897	354.731	354.731	356.137	360.510	360.510	356.756
50	316.328	314.760	314.760	316.516	320.662	320.662	317.330
55	284.975	278.765	278.765	275.701	280.251	280.251	276.252
60	234.152	232.923	232.923	234.389	238.695	238.695	234.370
65	192.002	191.101	191.101	192.196	196.399	196.399	192.443
70	150.665	150.093	150.093	151.111	155.604	155.604	151.231
75	111.406	111.478	111.478	112.190	116.514	116.514	112.385
80	74.632	74.780	74.780	74.867	79.285	79.285	75.593
85	41.246	41.448	41.448	41.425	44.980	44.980	41.257
90	14.547	14.842	14.842	14.590	17.202	17.202	14.333
95	1.626	1.601	1.601	1.375	1.301	1.301	1.072
100	0.497	0.474	0.474	0.428	0.337	0.337	0.447
105	0.497	0.474	0.474	0.428	0.337	0.337	0.447
110	0.452	0.452	0.452	0.451	0.314	0.314	0.402
115	0.361	0.384	0.384	0.406	0.247	0.247	0.402
120	0.452	0.429	0.429	0.406	0.292	0.292	0.402
125	0.497	0.519	0.519	0.519	0.471	0.471	0.491
130	0.542	0.519	0.519	0.496	0.516	0.516	0.491
135	0.497	0.519	0.519	0.519	0.561	0.561	0.580
140	0.587	0.587	0.587	0.564	0.583	0.583	0.580
145	0.723	0.722	0.722	0.744	0.785	0.785	0.714
150	0.858	0.857	0.857	0.857	0.920	0.920	0.848
155	1.129	1.151	1.151	1.128	1.211	1.211	1.161
160	1.491	1.467	1.467	1.443	1.481	1.481	1.429
165	1.807	1.805	1.805	1.804	1.840	1.840	1.786
170	2.033	2.054	2.054	2.052	2.087	2.087	2.054
175	2.214	2.212	2.212	2.210	2.221	2.221	2.188
180	1.300	1.300	1.300	1.300	1.300	1.300	1.300

Appendix A Product Photo



Picture 1



Picture 2

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