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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) 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.:

565784##(##=01-10)

(Where ## denotes CCT and could be 01-10 which refers 2700K .)

Test Date:	Dec. 26, 2019 to Dec. 30, 2019
Test Lab.:	**LCTECH Guangdong Testing Services Co., Ltd.** 2/F., Technology and Enterprise Development Center, Guangyuan Road, Xiaolan, Zhongshan, Guangdong, China Tel:+86-760-22833366 Fax:+86-760-22833399 E-mail:Service@lccert.com http://www.lccert.com
Test Sites:	1/F., Building I, Technology and Enterprise Development Center, Guangyuan Road, Xiaolan, Zhongshan, Guangdong, China
Template No.:	LC-RT-PL-001 Rev.1.3
Test Note:	

Complied by:		**Reviewed by:**	
Fish Tan	Fish Tan	**Lin Qiu**	Lin
Project Engineer		**Technical Manager**	
Dec. 31, 2019		**Dec. 31, 2019**	

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1. General

1.1 Product Information

Brand Name	ETI
Product Type	LED Downlights
Model Number	565784##(##=01-10)
Rated Inputs	120VAC, 60Hz
Rated Power	20W
Rated Light output	1500lm
Declared CCT	2700K
Power Supply	Integrated in luminaire
LED Package, Array or Module	SPMWH6229AQ5SGW*SM, SAMSUNG
Receipt Samples	1 unit
Sample Code of lab.	191223101007
Date of Receipt Samples	Dec. 23, 2019
Note	-

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.

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

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 °C ± 1°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)	0.178	0.177
Total Power(W)	19.73	19.70
Power Factor	0.922	0.925
Off-state Power(W)	-	-

3.2 Photometric data

Criteria Item	Result(Sphere)	Result(Goniophotometer)
Total Lumens(lm)	-	1535.77
Luminaire Efficacy(lm/W)	-	77.96
Correlated Color Temperature (CCT)(K)	2718	-
Color Rendering Index (CRI)	84.2	-
R9	15	-
Chromaticity Coordinate (x,y)	x = 0.4550 y = 0.4042	-
Chromaticity Coordinate (u,v)	u = 0.2623 v = 0.3494	-
Chromaticity Coordinate (u',v')	u' = 0.2623 v' = 0.5241	-
Duv	-0.0020	-
Zone Lumens between 0-60 °	-	75.88%
Beam Angle(50%Imax)	-	C0/180=110.6° C90/270=111.0°

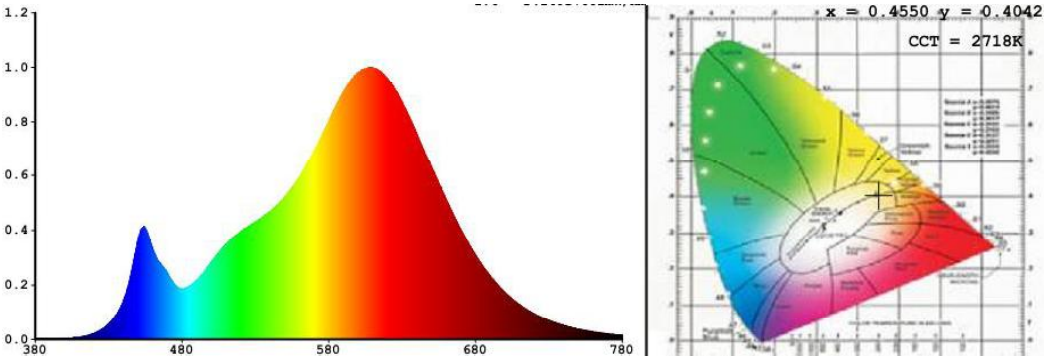
3.3 Color Rendering Details

R1	R2	R3	R4	R5	R6	R7	R8
84	94	93	82	85	94	81	60
R9	R10	R11	R12	R13	R14	R15	-
15	88	83	81	87	97	76	-

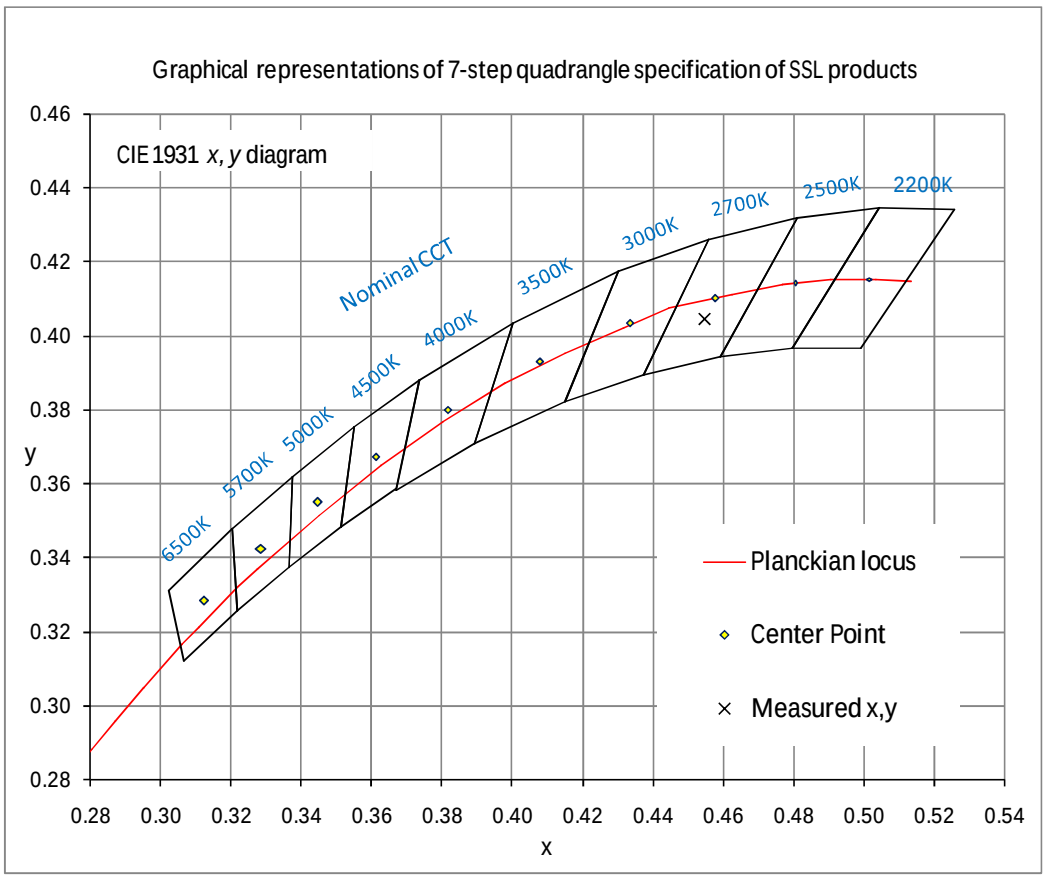
Note: N/A

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

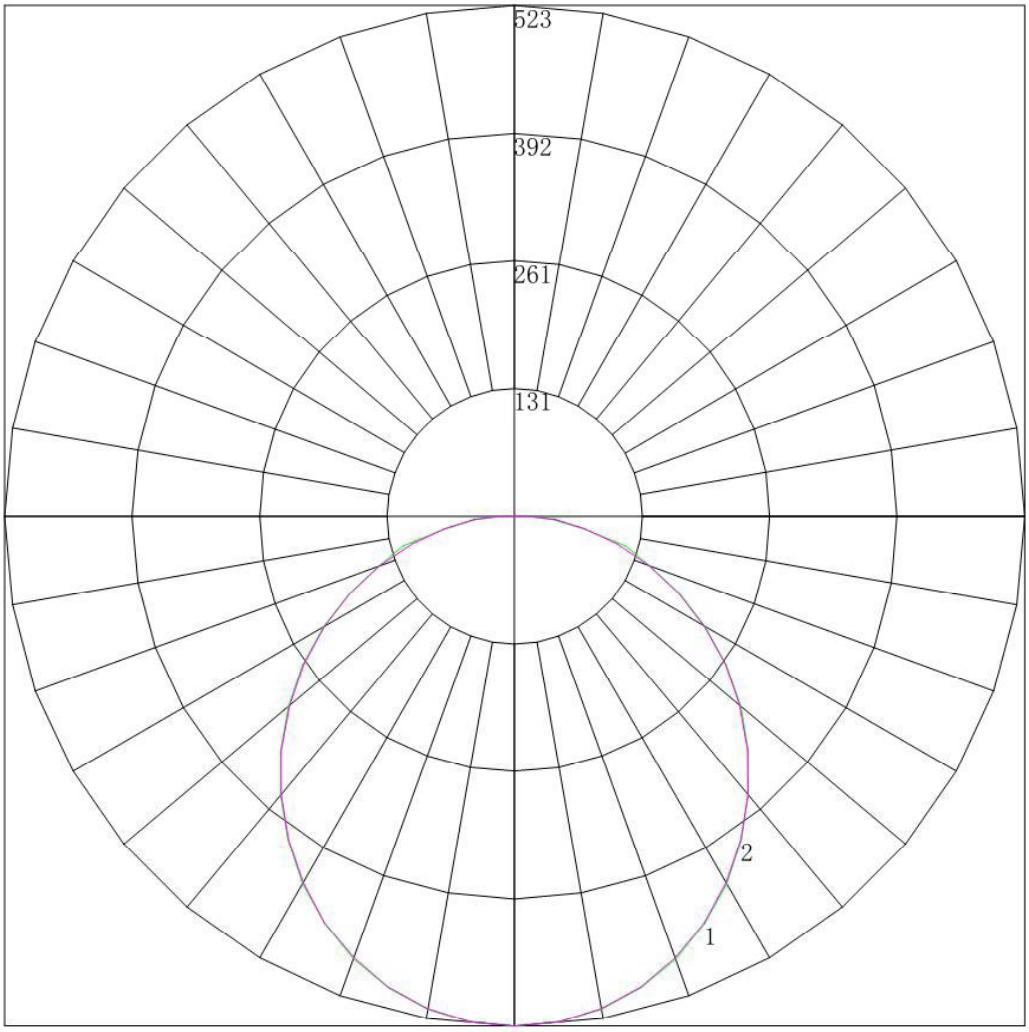
Zone	Lumens	%Lamp	%Fixt
0-20	191.08	12.40	12.40
0-30	404.54	26.30	26.30
0-40	660.21	43.00	43.00
0-60	1165.33	75.90	75.90
0-80	1476.24	96.10	96.10
0-90	1526.06	99.40	99.40
10-90	1476.55	96.10	96.10
20-40	469.13	30.50	30.50
20-50	733.53	47.80	47.80
40-70	694.53	45.20	45.20
60-80	310.91	20.20	20.20
70-80	121.50	7.90	7.90
80-90	49.82	3.20	3.20
90-110	7.17	0.50	0.50
90-120	7.53	0.50	0.50
90-130	7.91	0.50	0.50
90-150	8.65	0.60	0.60
90-180	9.71	0.60	0.60
110-180	2.54	0.20	0.20
0-180	1535.77	100.00	100.00

Total Luminaire Efficiency = 100.00%

ZONAL LUMEN SUMMARY

Zone	Lumens
0-10	49.51
10-20	141.57
20-30	213.46
30-40	255.67
40-50	264.40
50-60	240.72
60-70	189.41
70-80	121.50
80-90	49.82
90-100	6.79
100-110	0.38
110-120	0.36
120-130	0.38
130-140	0.37
140-150	0.38
150-160	0.45
160-170	0.44
170-180	0.17

4.5 Polar Curves

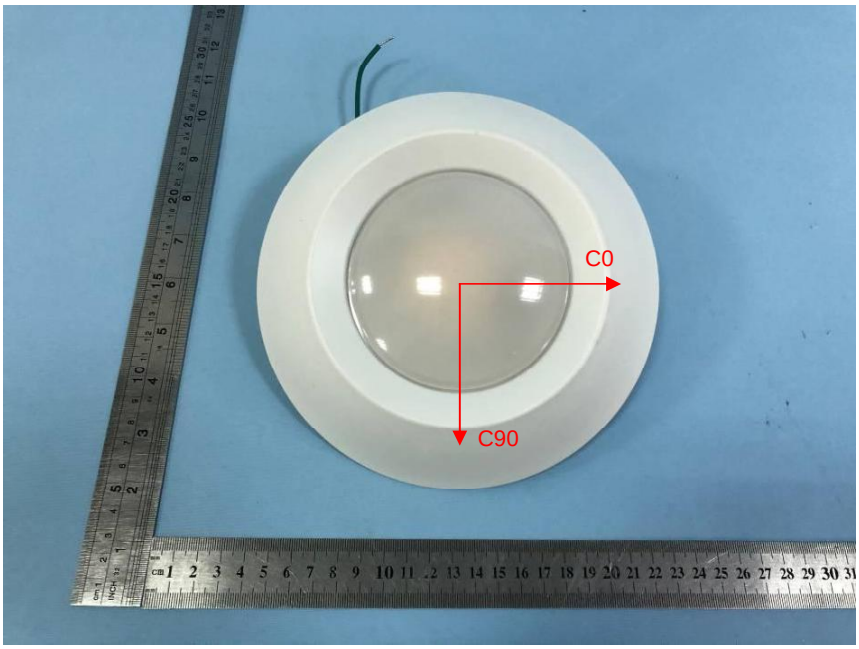


Maximum Candela = 522.992 Located At Horizontal Angle = 0, Vertical Angle = 0
1 - Vertical Plane Through Horizontal Angles (0 - 180)
2 - Vertical Plane Through Horizontal Angles (90 - 270)

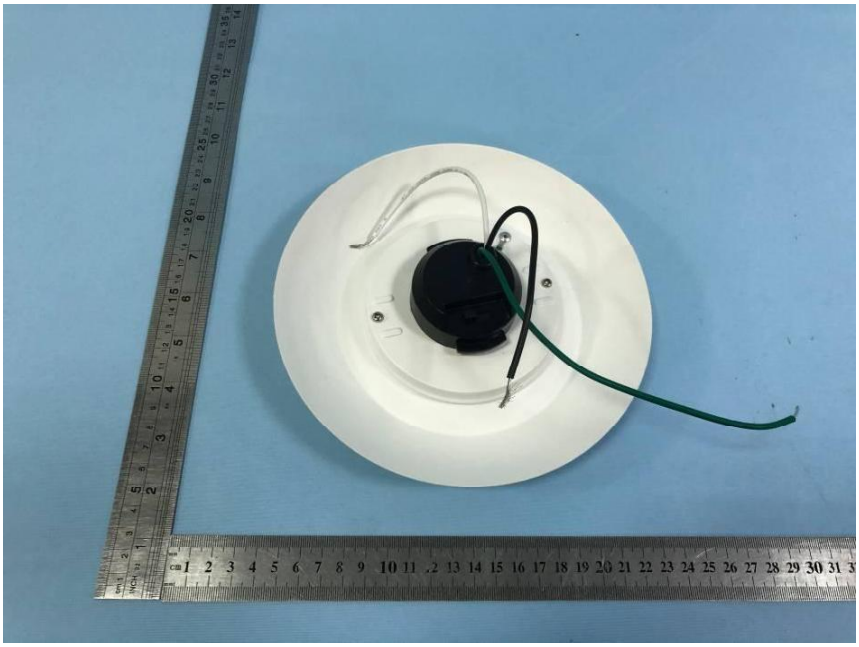
4.6 Candela Tabulation

	0	15	30	45	60	75	90
0	522.992	522.992	522.992	522.992	522.992	522.992	522.992
5	520.781	521.504	521.504	520.267	521.143	521.143	520.393
10	513.063	514.694	514.694	512.565	514.465	514.465	512.642
15	500.246	503.015	503.015	499.885	502.440	502.440	499.558
20	483.366	486.603	486.603	482.341	485.744	485.744	481.994
25	460.755	465.207	465.207	460.135	464.174	464.174	460.217
30	434.759	439.957	439.957	434.191	438.831	438.831	433.960
35	405.107	410.898	410.898	404.868	410.255	410.255	404.432
40	372.928	379.426	379.426	372.752	378.197	378.197	372.171
45	338.988	345.633	345.633	338.227	344.230	344.230	338.117
50	302.702	309.833	309.833	301.832	307.659	307.659	301.016
55	265.152	272.432	272.432	264.334	270.908	270.908	264.005
60	226.158	233.724	233.724	225.867	232.385	232.385	224.709
65	186.532	194.340	194.340	186.072	193.163	193.163	185.503
70	147.582	155.362	155.362	146.930	153.495	153.495	146.341
75	118.246	120.898	120.898	108.283	115.243	115.243	108.255
80	71.986	79.323	79.323	72.564	79.284	79.284	73.081
85	39.716	45.779	45.779	39.953	46.204	46.204	41.850
90	13.856	18.210	18.210	14.706	19.510	19.510	16.982
95	2.031	3.222	3.222	2.454	4.280	4.280	4.391
100	0.361	0.361	0.361	0.405	0.270	0.270	0.448
105	0.406	0.383	0.383	0.405	0.270	0.270	0.448
110	0.406	0.406	0.406	0.450	0.293	0.293	0.493
115	0.406	0.383	0.383	0.405	0.270	0.270	0.493
120	0.361	0.361	0.361	0.360	0.270	0.270	0.538
125	0.406	0.451	0.451	0.473	0.360	0.360	0.627
130	0.451	0.451	0.451	0.450	0.449	0.449	0.672
135	0.451	0.451	0.451	0.473	0.472	0.472	0.538
140	0.496	0.473	0.473	0.450	0.494	0.494	0.493
145	0.542	0.564	0.564	0.608	0.674	0.674	0.582
150	0.722	0.676	0.676	0.698	0.786	0.786	0.717
155	0.948	0.969	0.969	0.968	1.011	1.011	0.986
160	1.264	1.285	1.285	1.284	1.303	1.303	1.255
165	1.580	1.578	1.578	1.599	1.617	1.617	1.568
170	1.760	1.758	1.758	1.779	1.842	1.842	1.792
175	1.941	1.939	1.939	1.937	1.954	1.954	1.927
180	1.189	1.189	1.189	1.189	1.189	1.189	1.189

Appendix A Product Photo



Picture 1



Picture 2

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