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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.

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Zhuhai City, Guangdong Province, P.R. China 519085

For products:

LED Downlight

Models No.:

538071##(##=00-99)

(The product is a color tunable luminaire, tunable to 3000K, 4000K, 5000K and ## can be 00-99 and represent different client and sales districts.)

Test Date: May. 17, 2018 to May. 19, 2018

Test Item: Total luminous flux, Luminous Efficacy, Electrical values, Luminous Intensity Distribution, Chromaticity coordinates, CCT and CRI, Spectral Power Distribution.

Test Lab.: **LCTECH (Zhongshan) Testing Service Co., Ltd**

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Template No.: LC-RT-PL-001 Rev.1.1

Test Note: *This product is a tunable luminaire, this test was set on 2700K.*

Complied by:

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May. 25, 2018

Reviewed by:

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May. 25, 2018

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1. General

1.1 Product Information

Brand Name	-
Product Type	LED Downlight
Model Number	538071##(##=00-99)
Rated Inputs	120VAC, 60Hz
Rated Power	15W
Rated Light output	900lm
Declared CCT	2700K
Power Supply	LED Driver
LED Package, Array or Module	SPMWHX229AXXXXXXXXX, SAMSUNG ELECTRONICS., LTD
Receipt Samples	1 unit
Sample Code of lab.	180515108016
Date of Receipt Samples	May. 15, 2018
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 C78.377-2015	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	2018-01-10	2019-01-09
AC Power supply	LC-I-987	APW-110N	2018-01-10	2019-01-09
Power analyzer	LC-I-928	WT210	2018-01-05	2019-01-05
Power analyzer	LC-I-954	WT210	2018-01-10	2019-01-09
Multimeter	LC-I-972	Fluke 17B	2017-08-08	2018-08-07
Photometric colorimetric electric system ¹ (2 meter sphere)	LC-I-900	SPR3000	Before use	Before use
Standard lamp ²	LC-PL-I-011	D204C	2017-09-07	2018-09-06
Luminous Flux Standard Lamp ³	LC-PL-I-003	24V100W	2017-09-22	2018-09-21
Goniophotometer(with mirror)	LC-I-902	GMS2000	2018-05-07	2019-05-06
Wireless temperature transmitter	LC-I-978	DWRF-B	2018-02-11	2019-02-10
Wireless temperature transmitter	LC-I-979	DWRF-B	2018-02-11	2019-02-10

Note:

- 1, Bandwidth of spectroradiometer is 1 nm.
- 2, halogen lamp, 100W, omni-directional type, and its traceability to NIM.
- 3, halogen lamp, 100W, omni-directional type, and its traceability to NIM.

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	119.96 V~60Hz
Input Current(A)	0.126	0.126
Total Power(W)	14.91	14.90
Power Factor	0.987	0.987
Off-state Power(W)	-	-

3.2 Photometric data

Criteria Item	Result(Sphere)	Result(Goniophotometer)
Total Lumens(lm)	1006.00 ⁴	1006.92
Luminaire Efficacy(Lm/W)	67.47	67.58
Correlated Color Temperature (CCT)(K)	2712	-
Color Rendering Index (CRI)	91.6	-
R9	58	-
Chromaticity Coordinate (x,y)	x = 0.4543 y = 0.4021	-
Chromaticity Coordinate (u,v)	u = 0.2627 v = 0.3488	-
Chromaticity Coordinate (u',v')	u' = 0.2627 v' = 0.5232	-
Duv	-0.0027	-
Zone Lumens between 0-60 °	-	80.42%

3.3 Color Rendering Details

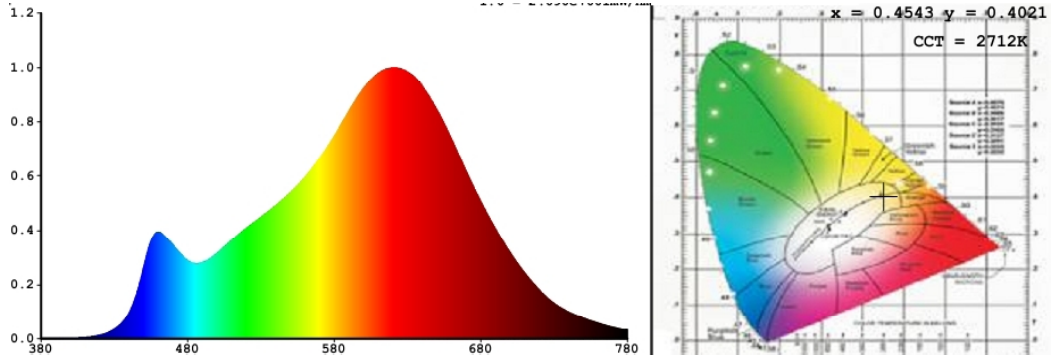
R1	R2	R3	R4	R5	R6	R7	R8
94	99	94	91	95	94	87	78
R9	R10	R11	R12	R13	R14	R15	-
58	99	93	85	97	97	89	-

Note:

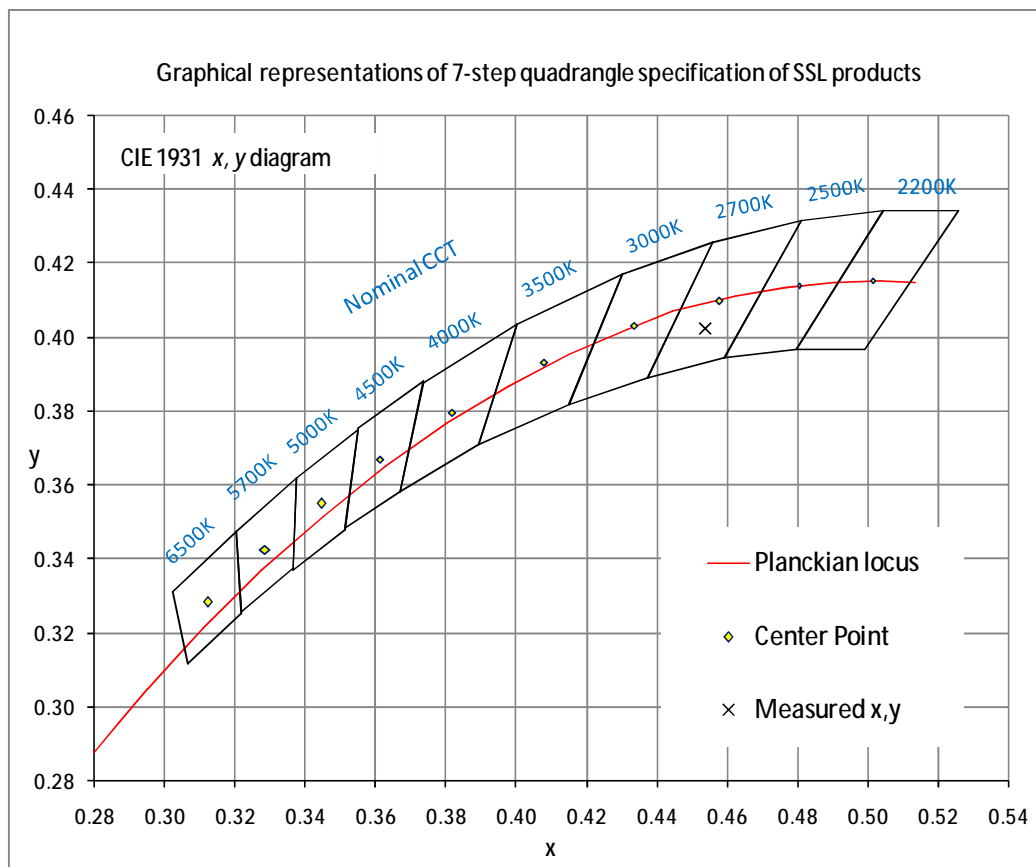
4, Self-absorption is 1.0535.

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)	1.24	Luminous Length	0.10 m (Diameter)
Spacing Criteria (90-270)	1.26	Luminous Width	0.10 m (Diameter)
Spacing Criteria (Diagonal)	1.36	Luminous Height	0.0 m
Test Distance	29.79 m		

4.4 Zonal Lumen Summary

Zone	Lumens	%Lamp	%Fixt
0-20	136.10	13.50	13.50
0-30	287.58	28.60	28.60
0-40	467.24	46.40	46.40
0-60	809.77	80.40	80.40
0-80	992.61	98.60	98.60
0-90	1005.74	99.90	99.90
10-90	970.44	96.40	96.40
20-40	331.15	32.90	32.90
20-50	513.21	51.00	51.00
40-70	461.51	45.80	45.80
60-80	182.85	18.20	18.20
70-80	63.86	6.30	6.30
80-90	13.13	1.30	1.30
90-110	0.15	0.00	0.00
90-120	0.27	0.00	0.00
90-130	0.40	0.00	0.00
90-150	0.69	0.10	0.10
90-180	1.18	0.10	0.10
110-180	1.03	0.10	0.10
0-180	1006.92	100.00	100.00

Total Luminaire Efficiency = 100.00%

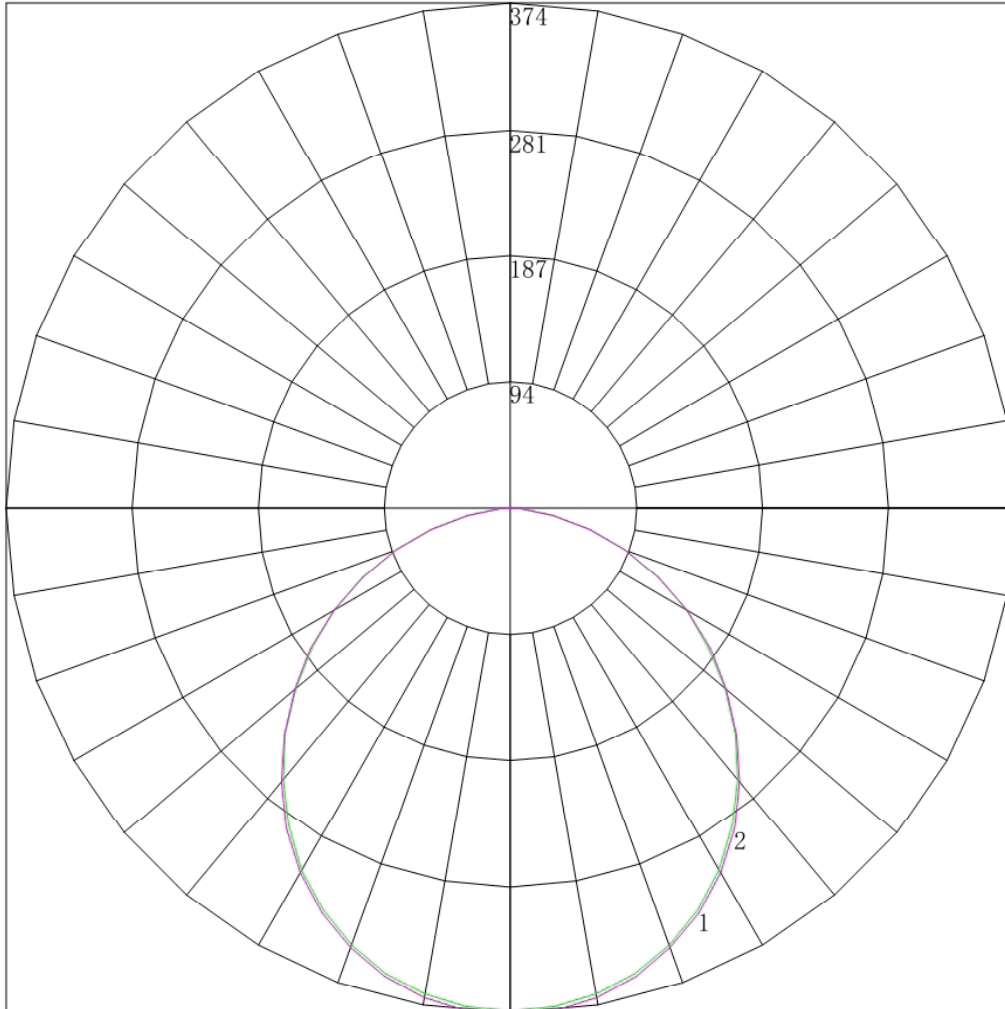
ZONAL LUMEN SUMMARY

Zone	Lumens
0-10	35.30
10-20	100.80
20-30	151.49
30-40	179.66
40-50	182.07
50-60	160.46
60-70	118.98
70-80	63.86
80-90	13.13
90-100	0.05
100-110	0.10
110-120	0.12
120-130	0.13
130-140	0.13
140-150	0.16
150-160	0.21
160-170	0.20
170-180	0.08



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4.5 Polar Curves



Maximum Candela = 374.342 Located At Horizontal Angle = 90, Vertical Angle = 5
1 - Vertical Plane Through Horizontal Angles (0 - 180)
2 - Vertical Plane Through Horizontal Angles (90 - 270)



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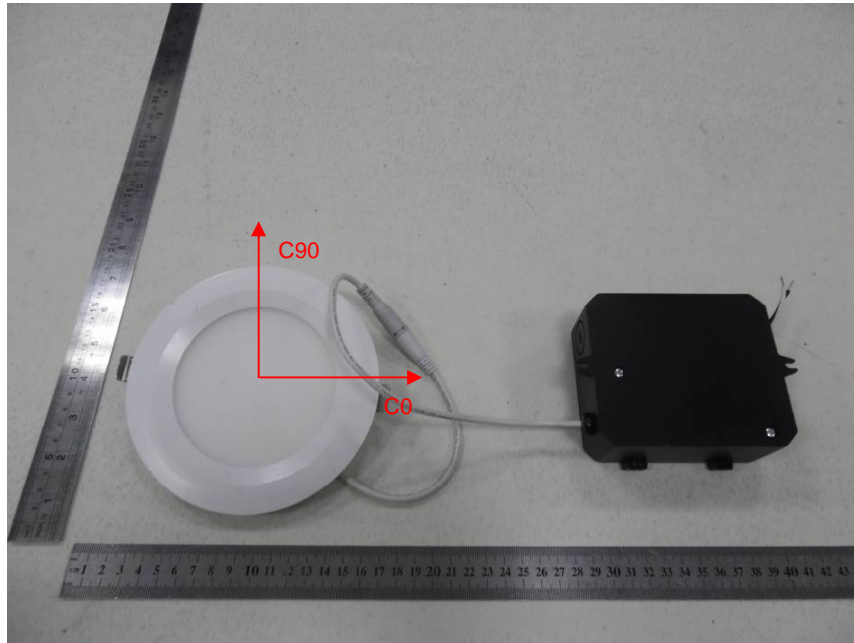
4.6 Candela Tabulation

	<u>0</u>	<u>15</u>	<u>30</u>	<u>45</u>	<u>60</u>	<u>75</u>	<u>90</u>
0	373.051	373.051	373.051	373.051	373.051	373.051	373.051
5	371.449	371.339	371.563	371.541	371.455	371.196	374.342
10	366.019	366.048	366.074	365.922	365.911	365.732	368.568
15	357.251	357.068	357.274	356.972	357.107	357.173	359.841
20	345.012	344.664	344.853	344.825	344.932	344.411	346.928
25	328.901	328.326	328.542	328.502	328.808	328.643	331.245
30	309.852	309.453	309.877	309.758	309.715	309.224	312.121
35	286.798	286.868	287.211	287.039	287.251	286.710	289.958
40	262.230	262.372	262.190	262.233	262.502	262.959	264.316
45	236.283	235.830	235.791	236.160	236.223	235.756	237.398
50	207.799	207.554	207.926	207.956	208.213	207.802	209.025
55	179.404	179.390	179.459	179.330	179.383	179.557	181.090
60	150.698	150.003	149.949	149.971	149.712	149.746	151.353
65	120.078	119.882	120.417	120.345	120.352	119.713	121.129
70	90.036	90.028	89.885	90.653	90.258	90.190	90.200
75	59.727	59.685	59.886	60.117	59.921	60.331	61.079
80	31.955	31.899	31.599	31.491	32.089	31.936	32.181
85	8.278	8.269	8.222	8.239	8.161	8.049	8.000
90	0.045	0.044	0.022	0.022	0.044	0.022	0.044
95	0.045	0.044	0.044	0.067	0.044	0.044	0.044
100	0.045	0.067	0.044	0.067	0.089	0.088	0.089
105	0.134	0.067	0.089	0.111	0.111	0.088	0.044
110	0.134	0.111	0.111	0.089	0.155	0.088	0.132
115	0.134	0.111	0.156	0.155	0.133	0.133	0.089
120	0.089	0.111	0.111	0.133	0.133	0.110	0.044
125	0.178	0.111	0.111	0.155	0.155	0.155	0.089
130	0.178	0.156	0.156	0.178	0.200	0.177	0.220
135	0.178	0.133	0.178	0.155	0.177	0.155	0.176
140	0.178	0.156	0.222	0.178	0.222	0.199	0.132
145	0.223	0.222	0.222	0.266	0.244	0.243	0.264
150	0.356	0.333	0.355	0.289	0.377	0.332	0.396
155	0.445	0.445	0.444	0.444	0.444	0.398	0.484
160	0.579	0.600	0.556	0.577	0.577	0.597	0.616
165	0.757	0.711	0.711	0.688	0.732	0.730	0.704
170	0.801	0.845	0.822	0.866	0.820	0.818	0.836
175	0.846	0.867	0.822	0.866	0.865	0.818	0.837
180	0.925	0.925	0.925	0.925	0.925	0.925	0.925

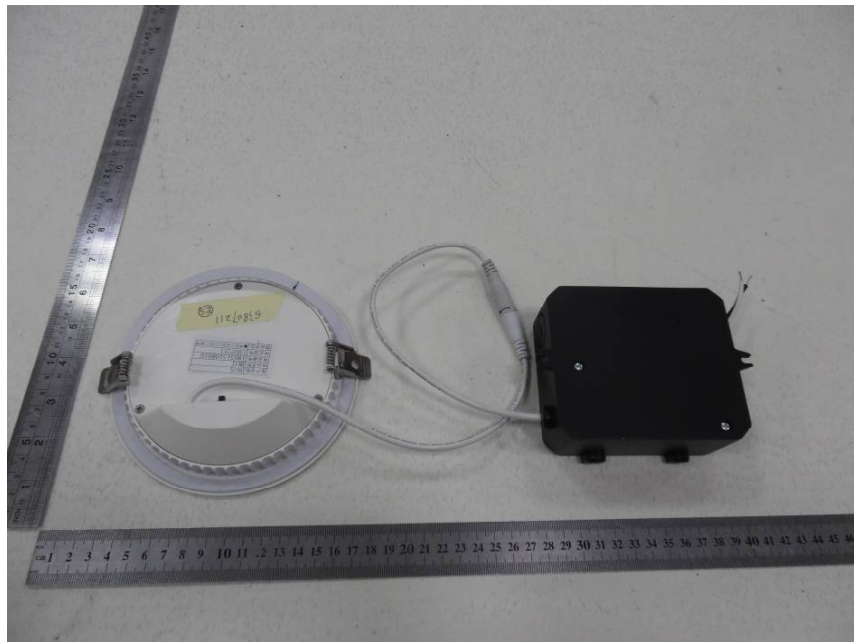


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Appendix A Product Photo



Picture 1



Picture 2

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