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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.

No.1 Jinfeng Road, Tangjiawan Town, Xiangzhou District,
Zhuhai City, Guangdong Province, P.R. China 519085

For products:

LED Downlight

Models No.:

538082##(##=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.

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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

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May. 25, 2018

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Table of Contents

1. General	3
1.1 Product Information	3
1.2 Standards or methods	4
1.3 Equipment list	4
2. Test conducted and method	5
2.1 Ambient Condition	5
2.2 Power Supply Characteristics	5
2.3 Seasoning and Stabilization	5
2.4 Electrical Instrumentation	5
2.5 Color Measurement Method	5
2.6 Total Luminous Flux Measurement Method	5
2.7 Luminous Intensity Distribution Measurement Method	5
2.8 Spatial Non-uniformity of Chromaticity	5
3. Test Result Summary	6
3.1 Electrical data	6
3.2 Photometric data	6
3.3 Color Rendering Details	6
4. Test Data	7
4.1 Spectral Distribution	7
4.2 ANSI Chromaticity Quadrangles Diagram	7
4.3 Goniometry Test Data	8
4.4 Zonal Lumen Summary	8
4.5 Polar Curves	9
4.6 Candela Tabulation	10
Appendix A Product Photo	11



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1. General

1.1 Product Information

Brand Name	-
Product Type	LED Downlight
Model Number	538082##(##=00-99)
Rated Inputs	120VAC, 60Hz
Rated Power	11W
Rated Light output	650lm
Declared CCT	2700K
Power Supply	LED Driver
LED Package, Array or Module	SPMWHX229AXXXXXXX, SAMSUNG ELECTRONICS., LTD
Receipt Samples	1 unit
Sample Code of lab.	180515108012
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	119.97 V~60Hz
Input Current(A)	0.093	0.093
Total Power(W)	10.90	10.93
Power Factor	0.981	0.981
Off-state Power(W)	-	-

3.2 Photometric data

Criteria Item	Result(Sphere)	Result(Goniophotometer)
Total Lumens(lm)	675.48 ⁴	677.65
Luminaire Efficacy(Lm/W)	61.97	62.00
Correlated Color Temperature (CCT)(K)	2663	-
Color Rendering Index (CRI)	91.0	-
R9	55	-
Chromaticity Coordinate (x,y)	x = 0.4574 y = 0.4015	-
Chromaticity Coordinate (u,v)	u = 0.2650 v = 0.3489	-
Chromaticity Coordinate (u',v')	u' = 0.2650 v' = 0.5234	-
Duv	-0.0032	-
Zone Lumens between 0-60 °	-	80.49%

3.3 Color Rendering Details

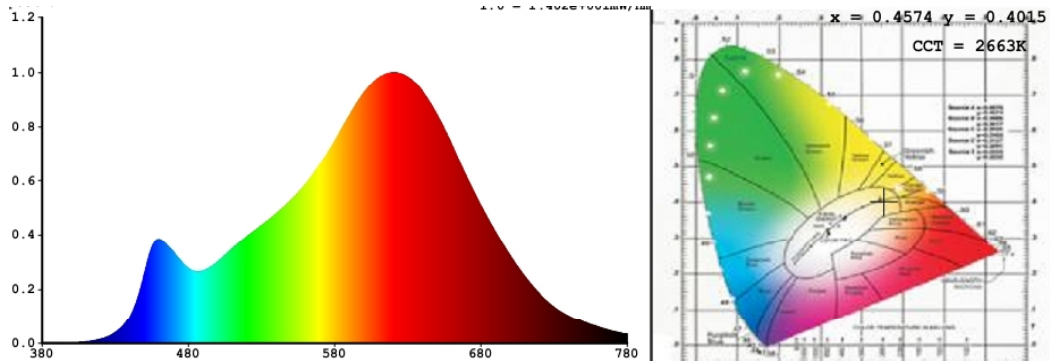
R1	R2	R3	R4	R5	R6	R7	R8
94	99	93	90	94	95	87	77
R9	R10	R11	R12	R13	R14	R15	-
55	99	92	85	96	97	89	-

Note:

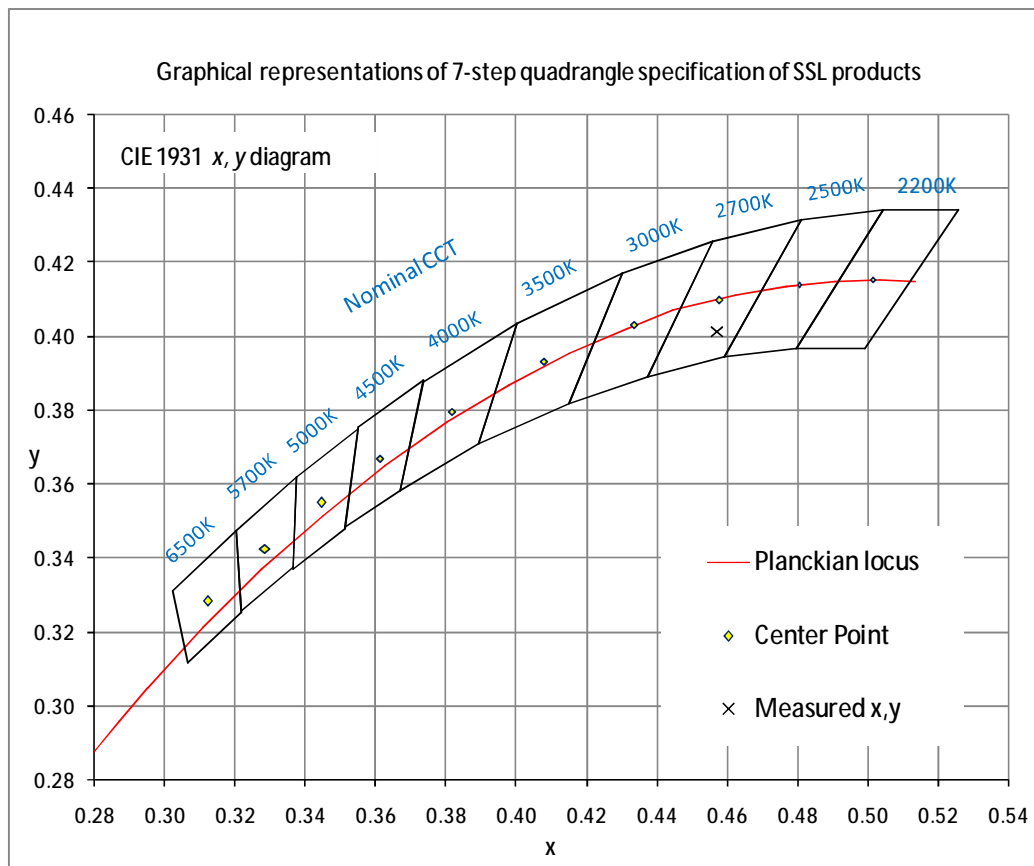
4, Self-absorption is 1.035.

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	0.08 m (Diameter)
Spacing Criteria (90-270)	1.24	Luminous Width	0.08 m (Diameter)
Spacing Criteria (Diagonal)	1.34	Luminous Height	0.0 m
Test Distance	29.79 m		

4.4 Zonal Lumen Summary

Zone	Lumens	%Lamp	%Fixt
0-20	91.64	13.50	13.50
0-30	193.60	28.60	28.60
0-40	314.47	46.40	46.40
0-60	545.47	80.50	80.50
0-80	668.79	98.70	98.70
0-90	676.95	99.90	99.90
10-90	653.17	96.40	96.40
20-40	222.83	32.90	32.90
20-50	345.44	51.00	51.00
40-70	311.50	46.00	46.00
60-80	123.32	18.20	18.20
70-80	42.82	6.30	6.30
80-90	8.16	1.20	1.20
90-110	0.07	0.00	0.00
90-120	0.13	0.00	0.00
90-130	0.21	0.00	0.00
90-150	0.39	0.10	0.10
90-180	0.70	0.10	0.10
110-180	0.63	0.10	0.10
0-180	677.65	100.00	100.00

Total Luminaire Efficiency = 100.00%

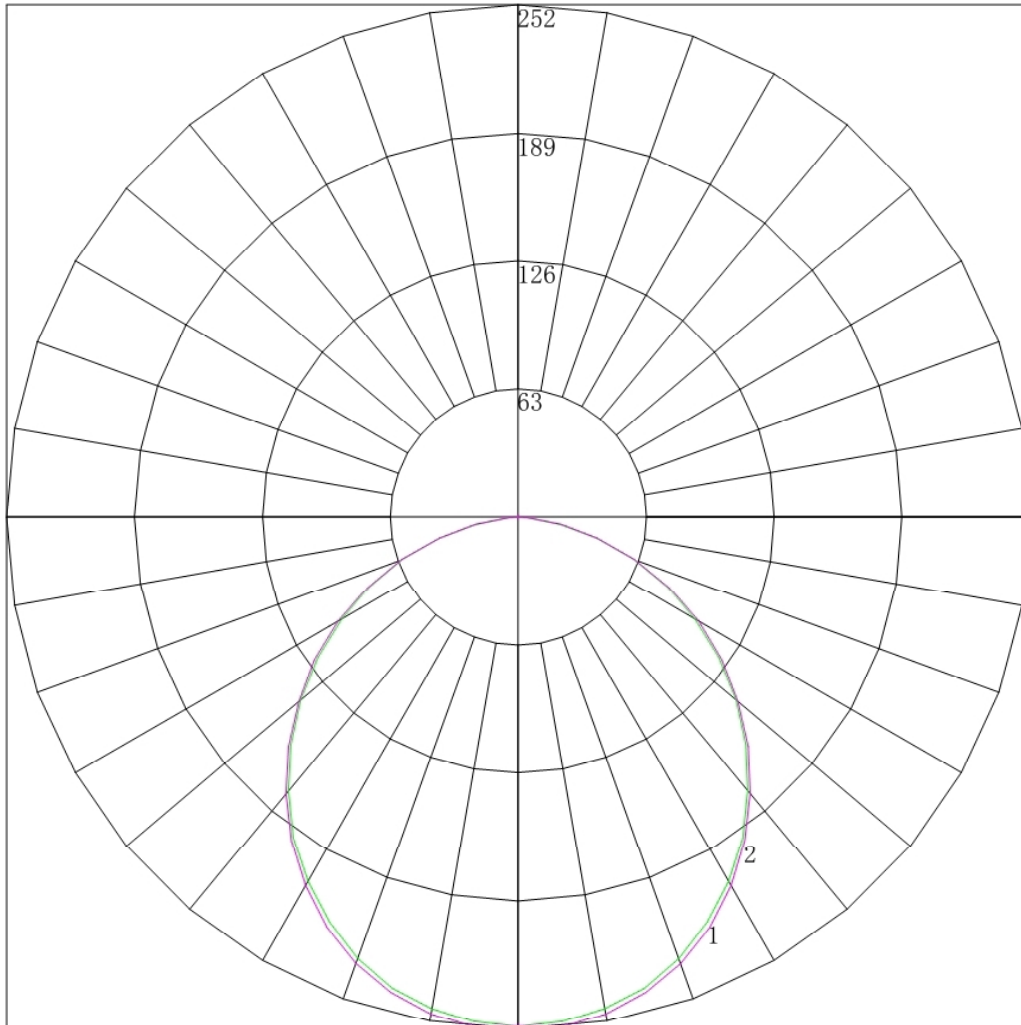
ZONAL LUMEN SUMMARY

Zone	Lumens
0-10	23.78
10-20	67.86
20-30	101.96
30-40	120.87
40-50	122.61
50-60	108.39
60-70	80.50
70-80	42.82
80-90	8.16
90-100	0.02
100-110	0.05
110-120	0.06
120-130	0.08
130-140	0.09
140-150	0.09
150-160	0.13
160-170	0.13
170-180	0.05



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4.5 Polar Curves



Maximum Candela = 252.492 Located At Horizontal Angle = 90, Vertical Angle = 5

- # 1 - Vertical Plane Through Horizontal Angles (0 - 180)
- # 2 - Vertical Plane Through Horizontal Angles (90 - 270)



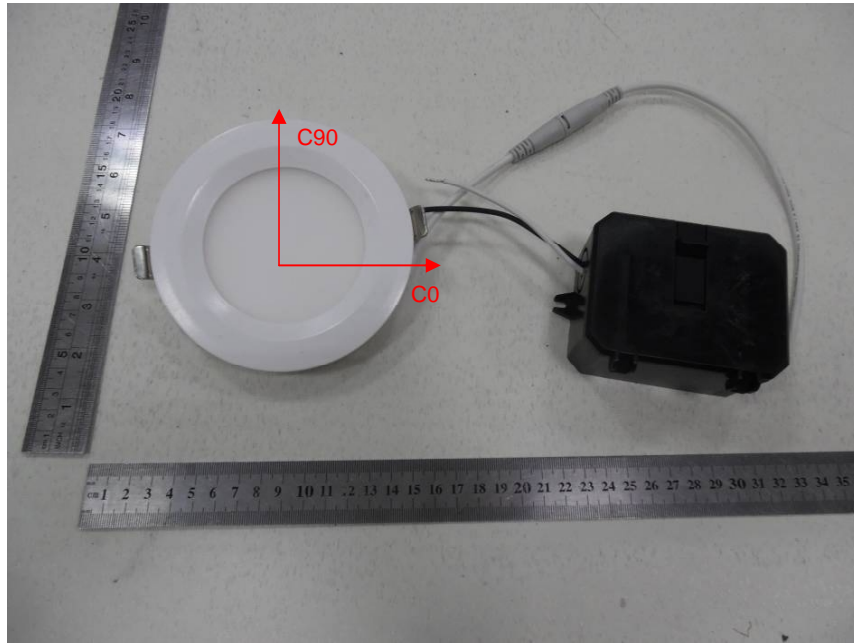
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4.6 Candela Tabulation



	<u>0</u>	<u>15</u>	<u>30</u>	<u>45</u>	<u>60</u>	<u>75</u>	<u>90</u>
0	251.407	251.407	251.407	251.407	251.407	251.407	251.407
5	249.897	249.894	250.339	250.207	249.922	250.323	252.492
10	245.943	246.734	246.670	246.565	246.200	246.674	248.833
15	240.258	240.659	240.355	240.325	240.128	240.369	242.625
20	231.552	232.092	232.016	231.863	231.929	232.161	234.347
25	220.581	221.277	221.388	221.313	221.139	221.341	223.336
30	207.610	207.970	208.157	208.366	208.333	208.666	210.168
35	193.308	192.750	193.058	193.486	193.021	193.267	194.891
40	176.296	176.283	176.492	176.473	176.402	176.987	178.202
45	158.662	158.526	158.747	158.595	158.896	159.112	160.451
50	140.139	139.878	140.335	140.406	140.438	140.462	141.517
55	120.684	121.030	121.056	121.328	121.094	121.279	122.802
60	100.696	101.537	101.310	101.407	101.707	101.657	102.635
65	80.974	81.288	81.252	81.397	81.365	81.656	82.158
70	60.631	60.660	60.483	61.008	60.957	61.037	60.972
75	40.198	39.965	40.048	40.198	40.526	40.397	40.408
80	20.921	20.850	20.947	21.187	21.071	21.149	21.609
85	4.264	4.606	4.336	4.509	4.411	4.338	4.741
90	0.000	0.000	0.000	0.000	0.022	0.000	0.000
95	0.000	0.045	0.022	0.022	0.022	0.022	0.000
100	0.044	0.000	0.044	0.022	0.022	0.044	0.044
105	0.089	0.022	0.067	0.044	0.067	0.022	0.044
110	0.044	0.089	0.111	0.089	0.044	0.044	0.089
115	0.089	0.045	0.044	0.022	0.044	0.067	0.000
120	0.089	0.067	0.089	0.067	0.089	0.067	0.000
125	0.089	0.067	0.111	0.089	0.111	0.044	0.044
130	0.089	0.134	0.111	0.111	0.111	0.088	0.066
135	0.178	0.134	0.133	0.089	0.133	0.088	0.132
140	0.044	0.089	0.133	0.111	0.089	0.155	0.132
145	0.178	0.111	0.133	0.156	0.133	0.155	0.176
150	0.178	0.200	0.245	0.222	0.177	0.133	0.220
155	0.311	0.289	0.311	0.311	0.332	0.265	0.264
160	0.355	0.401	0.400	0.355	0.355	0.354	0.396
165	0.489	0.490	0.467	0.422	0.443	0.464	0.528
170	0.577	0.534	0.534	0.511	0.532	0.553	0.528
175	0.533	0.579	0.578	0.533	0.554	0.575	0.572
180	0.602	0.602	0.602	0.602	0.602	0.602	0.602

Appendix A Product Photo



Picture 1



Picture 2

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