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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) Ltd
No.1, Zhongzhu Road South, Science & Technology Innovation
Coast, High Tech District, Zhuhai City, Guangdong Prov., China

For products:

LED Downlight

Models No.:

538281##(##=00-99)

(The product is a color tunable luminaire, tunable to 2200K, 2700K to 5000K and ## can be 00-99 and represent different client and sales districts.)

Test Date: Apr. 22, 2020 to Apr. 25, 2020

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Test Note:

Complied by:

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May. 7, 2020

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1. General

1.1 Product Information

Brand Name	Commercial Electric
Product Type	LED Downlight
Model Number	538281##(##=00-99)
Rated Inputs	120VAC, 60Hz
Rated Power	15W
Rated Light output	900lm
Declared CCT	2700K, 3000K, 3500K, 4000K, 5000K
Power Supply	ETI-AD01600380036DDA
LED Package, Array or Module	SPMWH6229AQ7SGW*SM +SPMWH1228FD7WAL*SE, SAMSUNG ELECTRONICS CO., LTD.
Receipt Samples	1 unit
Sample Code of lab.	200406103023
Date of Receipt Samples	Apr. 6, 2020
Note	2700K 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	2020-01-06	2021-01-05
AC Power supply	LC-I-989	APW-120N	2020-01-06	2021-01-05
Power analyzer	LC-I-928	WT210	2019-12-29	2020-12-28
Power analyzer	LC-I-954	WT210	2019-12-26	2020-12-25
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	2020-04-24	2021-04-23
Wireless temperature transmitter	LC-I-PL-009	DWLR-DLR	2020-01-03	2021-01-02
Wireless temperature transmitter	LC-I-PL-008	DWLR-DLR	2020-01-03	2021-01-02

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 $25\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$; 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	120.00 V~60Hz	119.98V~60Hz
Input Current(A)	0.124	0.123
Total Power(W)	14.71	14.55
Power Factor	0.985	0.985
Off-state Power(W)	-	-

3.2 Photometric data

Criteria Item	Result(Sphere)	Result(Goniophotometer)
Total Lumens(lm)	-	955.02
Luminaire Efficacy(lm/W)	-	65.64
Correlated Color Temperature (CCT)(K)	2792	-
Color Rendering Index (CRI)	92.2	-
R9	60	-
Chromaticity Coordinate (x,y)	x = 0.4507 y = 0.4055	-
Chromaticity Coordinate (u,v)	u = 0.2589 v = 0.3493	-
Chromaticity Coordinate (u',v')	u' = 0.2589 v' = 0.5240	-
Duv	-0.0011	-
Zone Lumens between 0-60 °	-	79.30 %
Beam Angle(50%Imax)	-	C0/180= 112.0° C90/270= 112.2°

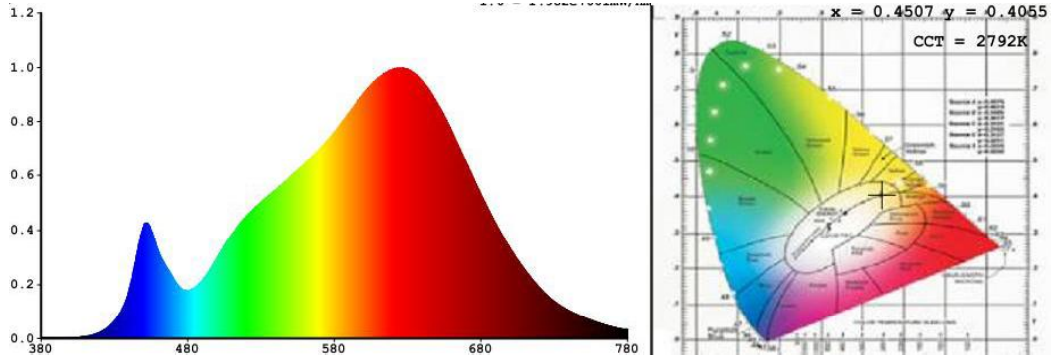
3.3 Color Rendering Details

R1	R2	R3	R4	R5	R6	R7	R8
93	96	97	92	92	95	92	82
R9	R10	R11	R12	R13	R14	R15	-
60	89	93	81	93	97	89	-

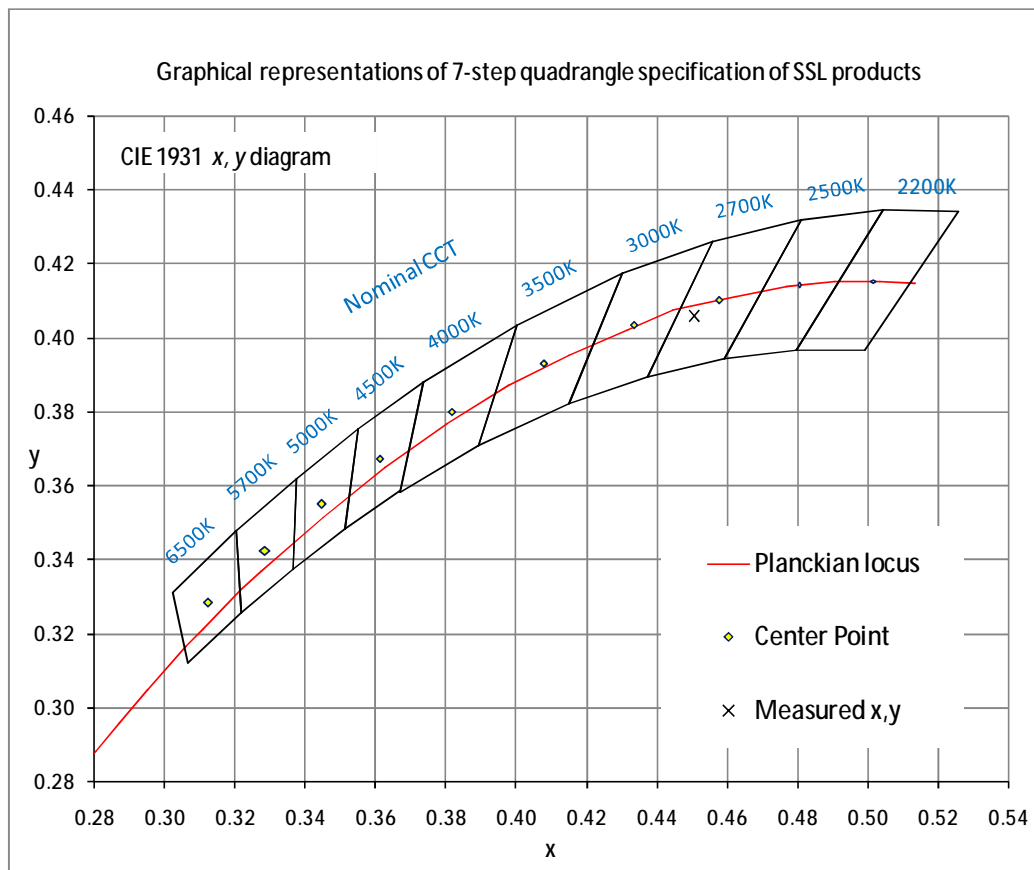
Note: N/A

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)	1.26	Luminous Length	0.12 m (Diameter)
Spacing Criteria (90-270)	1.26	Luminous Width	0.12 m (Diameter)
Spacing Criteria (Diagonal)	1.38	Luminous Height	0.00 m
Test Distance	29.63 m		

4.4 Zonal Lumen Summary

Zone	Lumens	%Lamp	%Fixt
0-20	123.08	12.90	12.90
0-30	261.60	27.40	27.40
0-40	428.57	44.90	44.90
0-60	756.99	79.30	79.30
0-80	939.20	98.30	98.30
0-90	953.79	99.90	99.90
10-90	921.97	96.50	96.50
20-40	305.48	32.00	32.00
20-50	478.31	50.10	50.10
40-70	445.78	46.70	46.70
60-80	182.21	19.10	19.10
70-80	64.86	6.80	6.80
80-90	14.58	1.50	1.50
90-110	0.18	0.00	0.00
90-120	0.30	0.00	0.00
90-130	0.42	0.00	0.00
90-150	0.71	0.10	0.10
90-180	1.23	0.10	0.10
110-180	1.05	0.10	0.10
0-180	955.02	100.00	100.00

Total Luminaire Efficiency = 100.00%

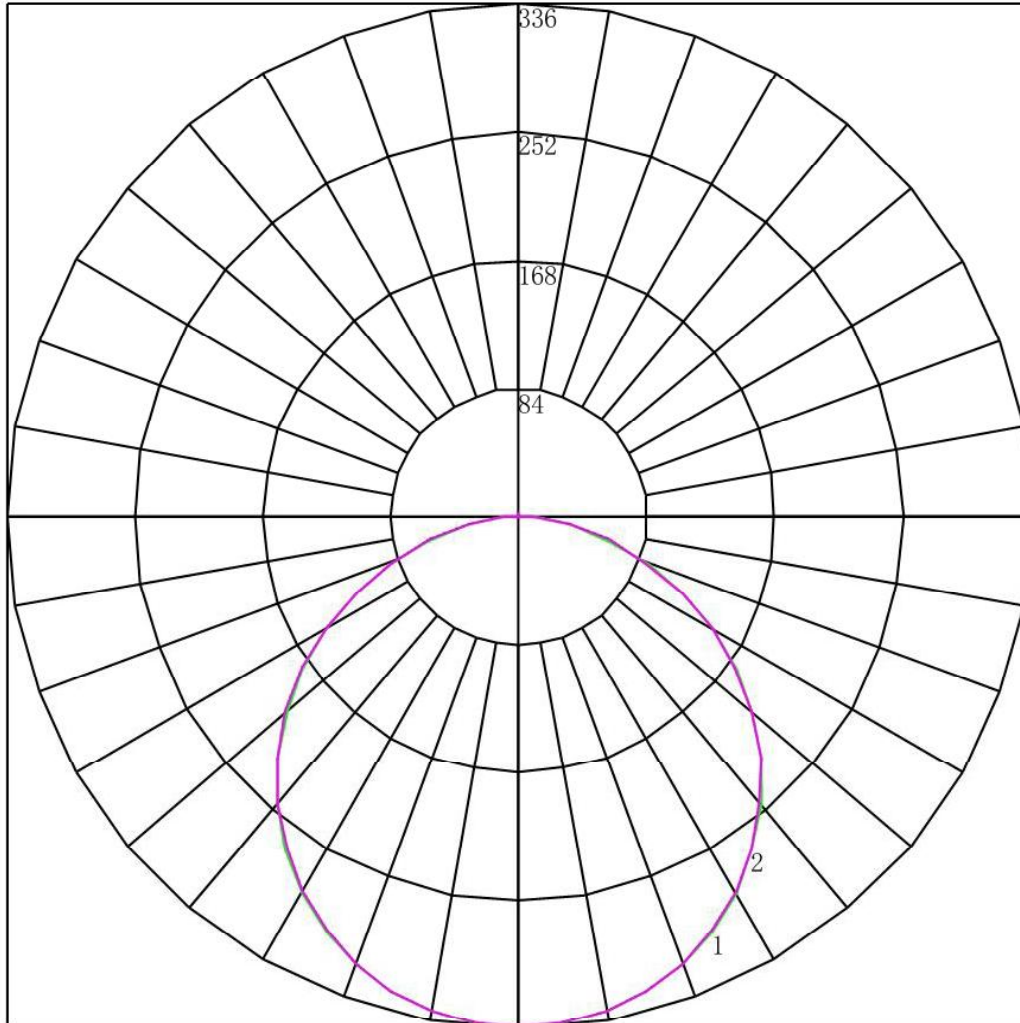
ZONAL LUMEN SUMMARY

Zone	Lumens
0-10	31.82
10-20	91.26
20-30	138.51
30-40	166.97
40-50	172.83
50-60	155.59
60-70	117.35
70-80	64.86
80-90	14.58
90-100	0.07
100-110	0.11
110-120	0.12
120-130	0.12
130-140	0.13
140-150	0.15
150-160	0.21
160-170	0.22
170-180	0.09



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4.5 Polar Curves

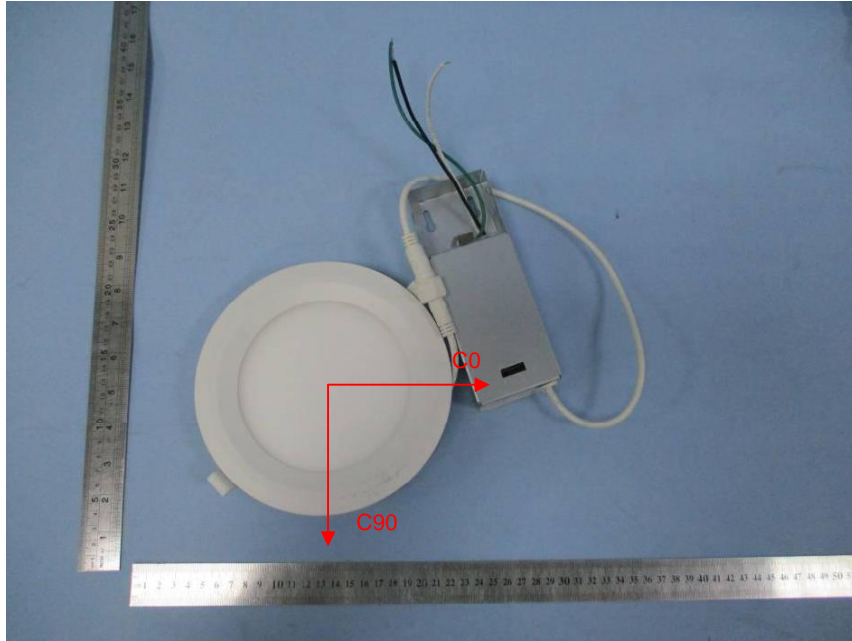


Maximum Candela = 336.221 Located At Horizontal Angle = 0, Vertical Angle = 0
1 - Vertical Plane Through Horizontal Angles (0 - 180)
2 - Vertical Plane Through Horizontal Angles (90 - 270)

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	336.221	336.221	336.221	336.221	336.221	336.221	336.221
5	334.989	334.813	334.726	334.793	334.859	334.842	334.692
10	330.545	330.459	330.528	330.378	330.469	330.618	330.326
15	323.550	323.247	323.364	323.174	323.269	323.679	323.208
20	313.606	313.285	313.342	313.224	313.412	313.849	313.122
25	300.759	300.334	300.550	300.287	300.395	300.999	300.372
30	285.317	284.942	285.254	285.131	285.204	285.479	284.783
35	267.102	266.845	267.012	266.504	266.830	267.528	266.357
40	246.952	246.484	246.573	246.011	246.392	247.387	246.314
45	224.602	223.901	223.979	223.672	224.089	225.145	224.307
50	199.612	199.143	199.825	199.336	199.568	200.714	200.029
55	174.182	173.438	173.979	173.593	173.818	174.751	173.612
60	146.376	149.431	150.293	146.158	146.399	147.779	146.365
65	118.174	117.631	118.155	117.494	118.257	119.627	118.332
70	90.061	89.245	89.978	89.554	89.938	90.774	89.295
75	61.727	60.594	61.231	60.824	61.115	62.227	60.825
80	33.745	32.780	33.406	33.323	33.807	34.751	33.535
85	10.295	9.649	10.066	9.666	9.857	10.515	9.606
90	0.088	0.088	0.088	0.088	0.066	0.022	0.087
95	0.044	0.066	0.066	0.066	0.044	0.000	0.044
100	0.132	0.110	0.088	0.088	0.088	0.044	0.087
105	0.088	0.110	0.110	0.110	0.132	0.066	0.087
110	0.176	0.154	0.132	0.132	0.132	0.066	0.131
115	0.088	0.110	0.132	0.154	0.154	0.066	0.087
120	0.176	0.154	0.132	0.154	0.132	0.044	0.131
125	0.132	0.110	0.088	0.132	0.154	0.109	0.087
130	0.132	0.154	0.176	0.176	0.176	0.175	0.175
135	0.176	0.176	0.154	0.132	0.132	0.197	0.218
140	0.176	0.198	0.176	0.154	0.176	0.263	0.218
145	0.264	0.242	0.220	0.242	0.219	0.219	0.218
150	0.352	0.308	0.286	0.308	0.307	0.328	0.306
155	0.440	0.440	0.440	0.461	0.483	0.504	0.480
160	0.616	0.638	0.637	0.615	0.637	0.679	0.655
165	0.792	0.792	0.813	0.835	0.790	0.810	0.830
170	0.924	0.924	0.923	0.945	0.966	0.963	0.917
175	1.056	1.033	0.989	0.966	0.988	1.029	1.048
180	0.564	0.564	0.564	0.564	0.564	0.564	0.564

Appendix A Product Photo



Picture 1



Picture 2

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