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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.:

538291##(##=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. 13, 2020 to May. 7, 2020

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

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Test Note:

Complied by:

Fish Tan
May. 8, 2020

Fish Tan

Reviewed by:

Lin Qiu
May. 8, 2020

Lin Qiu

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1. General

1.1 Product Information

Brand Name	Commercial Electric
Product Type	LED Downlight
Model Number	538291##(##=00-99)
Rated Inputs	120VAC, 60Hz
Rated Power	25W
Rated Light output	1800lm
Declared CCT	2700K, 3000K, 3500K, 4000K, 5000K
Power Supply	ETI-AD02800500042DDA
LED Package, Array or Module	SPMWH6229AQ7SGW*SM +SPMWH1228FD7WAL*SE, SAMSUNG ELECTRONICS CO., LTD.
Receipt Samples	1 unit
Sample Code of lab.	200406103018
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	120.01 V~60Hz	119.96V~60Hz
Input Current(A)	0.195	0.188
Total Power(W)	22.96	22.06
Power Factor	0.982	0.981
Off-state Power(W)	-	-

3.2 Photometric data

Criteria Item	Result(Sphere)	Result(Goniophotometer)
Total Lumens(lm)	-	1908.89
Luminaire Efficacy(lm/W)	-	86.53
Correlated Color Temperature (CCT)(K)	2588	-
Color Rendering Index (CRI)	92.3	-
R9	57	-
Chromaticity Coordinate (x,y)	x = 0.4669 y = 0.4084	-
Chromaticity Coordinate (u,v)	u = 0.2681 v = 0.3517	-
Chromaticity Coordinate (u',v')	u' = 0.2681 v' = 0.5276	-
Duv	-0.0013	-
Zone Lumens between 0-60 °	-	78.74 %
Beam Angle(50%Imax)	-	C0/180= 111.2° C90/270= 110.8°

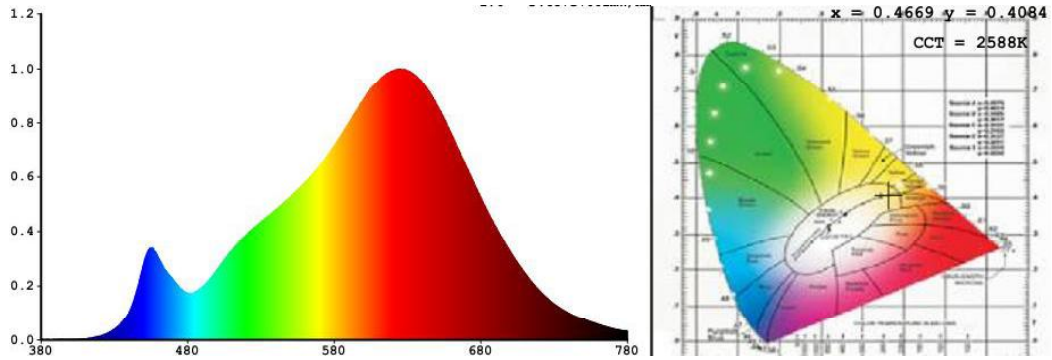
3.3 Color Rendering Details

R1	R2	R3	R4	R5	R6	R7	R8
93	97	98	92	93	97	90	79
R9	R10	R11	R12	R13	R14	R15	-
57	92	93	85	94	99	88	-

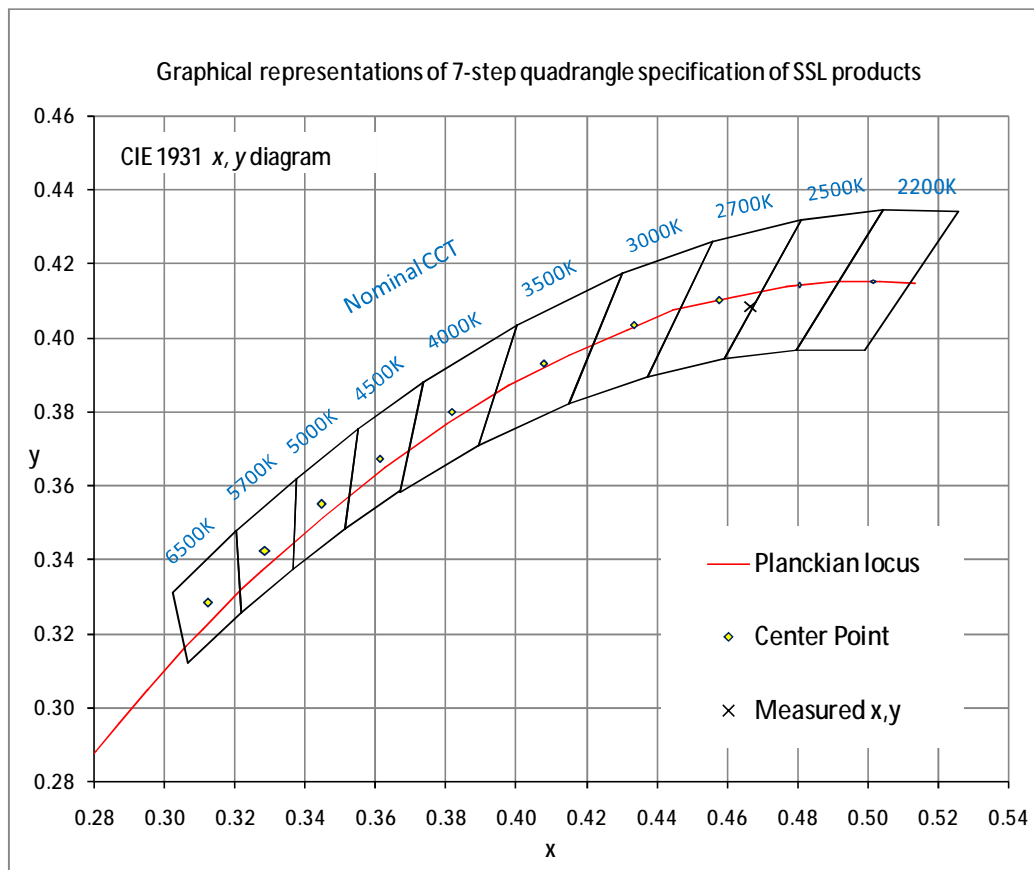
Note: N/A

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
Spacing Criteria (0-180)	1.26	Luminous Length	0.17 m (Diameter)
Spacing Criteria (90-270)	1.26	Luminous Width	0.17 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	246.85	12.90	12.90
0-30	522.98	27.40	27.40
0-40	853.67	44.70	44.70
0-60	1502.98	78.70	78.70
0-80	1871.57	98.00	98.00
0-90	1904.95	99.80	99.80
10-90	1840.95	96.40	96.40
20-40	606.82	31.80	31.80
20-50	948.33	49.70	49.70
40-70	883.85	46.30	46.30
60-80	368.60	19.30	19.30
70-80	134.05	7.00	7.00
80-90	33.37	1.70	1.70
90-110	0.76	0.00	0.00
90-120	1.18	0.10	0.10
90-130	1.64	0.10	0.10
90-150	2.58	0.10	0.10
90-180	3.94	0.20	0.20
110-180	3.18	0.20	0.20
0-180	1908.89	100.00	100.00

Total Luminaire Efficiency = 100.00%

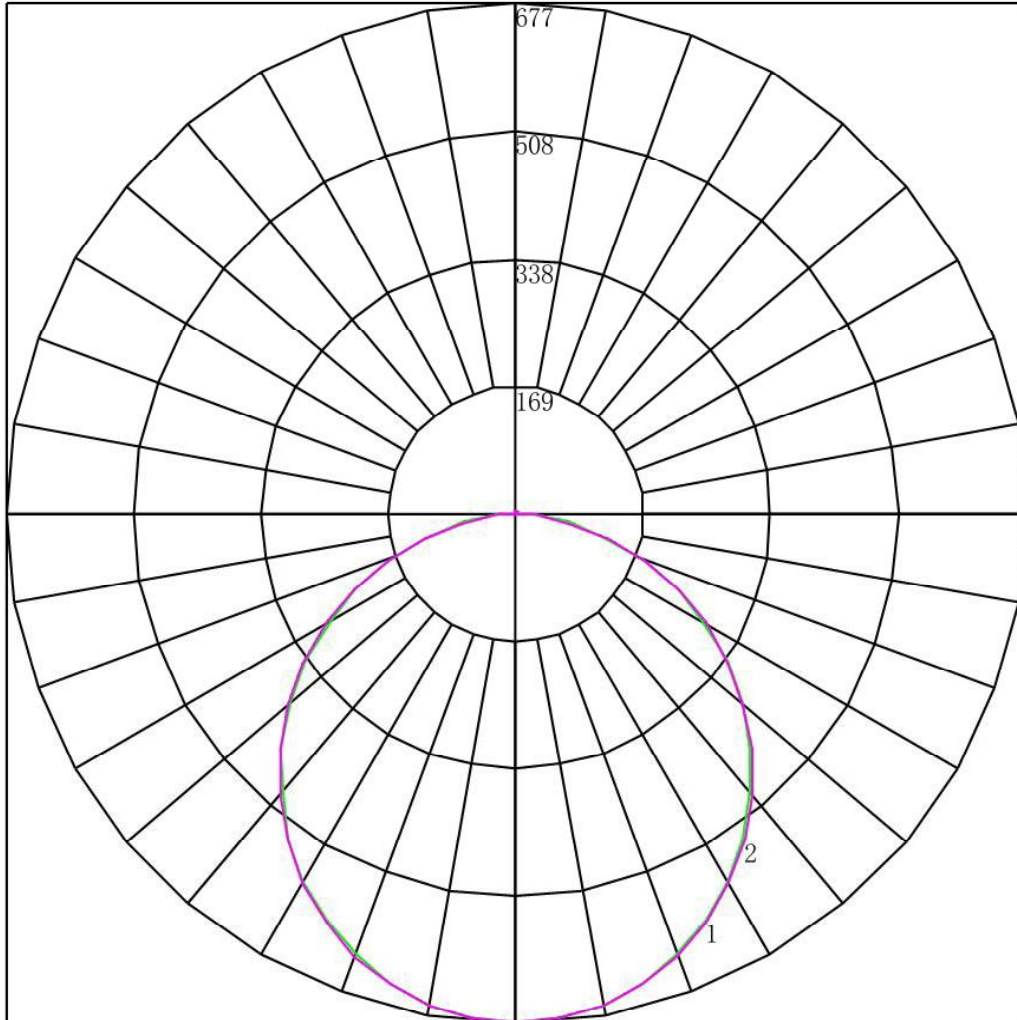
ZONAL LUMEN SUMMARY

Zone	Lumens
0-10	64.00
10-20	182.86
20-30	276.13
30-40	330.69
40-50	341.51
50-60	307.79
60-70	234.55
70-80	134.05
80-90	33.37
90-100	0.35
100-110	0.41
110-120	0.41
120-130	0.46
130-140	0.46
140-150	0.48
150-160	0.58
160-170	0.56
170-180	0.22



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4.5 Polar Curves



Maximum Candela = 676.816 Located At Horizontal Angle = 0, Vertical Angle = 0

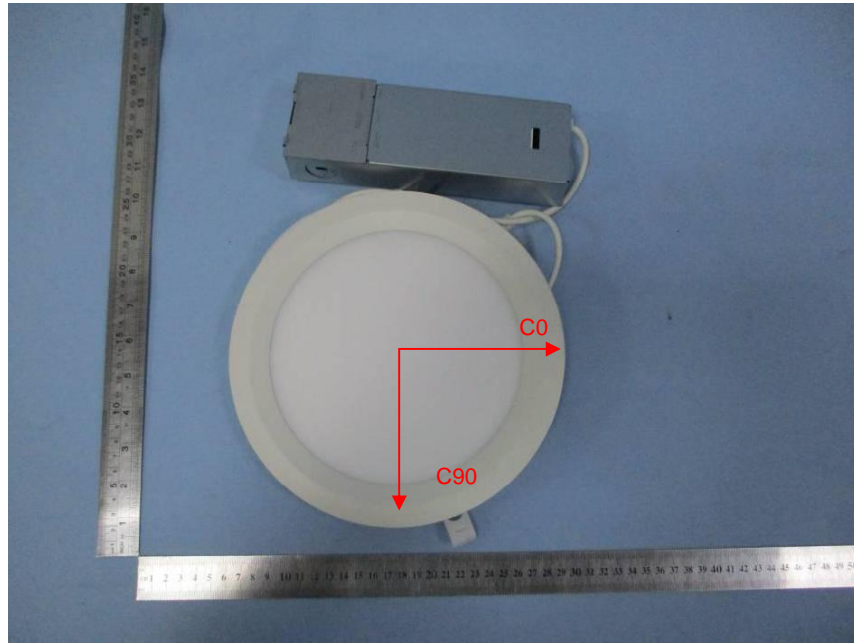
1 - Vertical Plane Through Horizontal Angles (0 - 180)

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

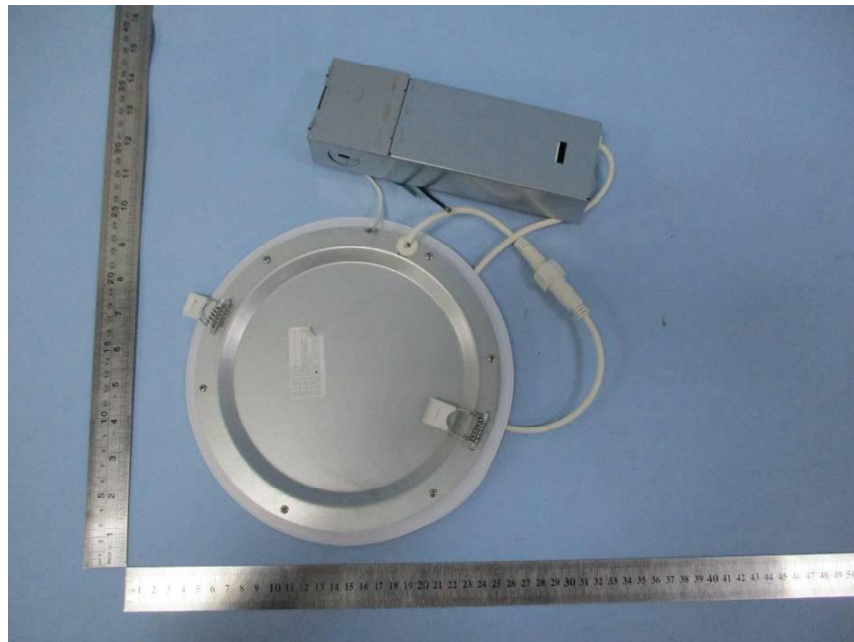
4.6 Candela Tabulation

	0	15	30	45	60	75	90
0	676.816	676.816	676.816	676.816	676.816	676.816	676.816
5	672.690	673.522	674.134	673.961	673.414	673.768	672.877
10	663.339	663.835	664.133	664.208	663.713	664.979	663.336
15	647.361	648.217	648.196	647.735	647.121	649.505	647.448
20	624.841	625.791	626.105	625.946	625.524	629.056	626.309
25	596.659	600.993	601.308	598.292	598.178	601.749	598.254
30	564.701	565.408	565.413	566.026	565.586	569.554	565.997
35	527.520	528.199	527.034	527.126	527.901	533.238	528.664
40	482.393	485.061	486.785	487.216	486.574	492.233	487.960
45	441.217	441.985	441.613	442.562	442.087	447.700	443.099
50	392.007	393.464	393.341	393.866	394.088	400.100	395.087
55	342.929	343.669	343.113	345.237	345.168	350.110	344.623
60	282.877	286.891	290.049	291.050	290.539	296.833	290.964
65	235.336	236.501	236.326	236.425	235.825	243.074	237.568
70	180.508	181.038	180.778	181.338	180.737	187.519	182.159
75	124.626	125.620	125.252	125.767	125.561	132.555	126.050
80	71.202	72.090	71.177	71.712	71.417	77.766	72.128
85	22.739	24.074	23.806	24.269	24.318	29.095	24.291
90	0.307	0.285	0.286	0.308	0.307	0.285	0.394
95	0.263	0.308	0.330	0.330	0.351	0.219	0.350
100	0.439	0.395	0.374	0.395	0.395	0.241	0.350
105	0.395	0.417	0.440	0.439	0.417	0.285	0.438
110	0.395	0.417	0.418	0.417	0.417	0.285	0.438
115	0.395	0.417	0.440	0.439	0.439	0.307	0.438
120	0.439	0.439	0.462	0.505	0.461	0.329	0.481
125	0.527	0.527	0.528	0.527	0.505	0.460	0.525
130	0.615	0.615	0.615	0.615	0.593	0.592	0.569
135	0.571	0.571	0.572	0.593	0.593	0.592	0.525
140	0.658	0.637	0.615	0.637	0.636	0.657	0.569
145	0.702	0.747	0.791	0.747	0.702	0.789	0.744
150	0.966	0.967	0.967	0.944	0.922	0.986	0.919
155	1.229	1.252	1.253	1.230	1.229	1.271	1.269
160	1.668	1.647	1.627	1.669	1.690	1.709	1.619
165	2.019	1.977	1.978	2.021	2.019	2.060	2.013
170	2.239	2.262	2.286	2.306	2.304	2.367	2.320
175	2.546	2.526	2.484	2.482	2.502	2.520	2.495
180	1.376	1.376	1.376	1.376	1.376	1.376	1.376

Appendix A Product Photo



Picture 1



Picture 2

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