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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 Ceiling Light

Models No.:

544512##(##=11-30)

(Where ## denotes CCT and could be 11-30 which refers 3000K, 4000K and 5000K.)

Test Date: Apr. 25, 2017

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/LM79-08/01

Test Note:

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Apr. 28, 2017

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Apr. 28, 2017

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1. General

1.1 Product Information

Brand Name	Hampton Bay
Product Type	LED Ceiling Light
Model Number	544512##(##=11-30)
Rated Inputs	120VAC, 60Hz
Rated Power	22W
Rated Light output	1450lm
Declared CCT	3000K
Power Supply	LED Driver
LED Package, Array or Module	Model: SPMWHx229xxxxxxx, manufactured by SAMSUNG ELECTRONICS CO., LTD
Receipt Samples	1 unit
Sample Code of lab.	1704201137 + 12 Lens
Date of Receipt Samples	Apr. 20, 2017
Note	This product is a color tunable luminaire, all the tests were tested at 3000K setting.

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	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	2017-02-04	2018-02-03
AC Power supply	LC-I-987	APW-110N	2017-02-04	2018-02-03
Power analyzer	LC-I-928	WT210	2017-01-19	2018-01-19
Power analyzer	LC-I-954	WT210	2017-02-04	2018-02-03
Multimeter	LC-I-972	Fluke 17B	2016-08-10	2017-08-09
Photometric colorimetric electric system (2 meter sphere)	LC-I-900	SPR3000	Before use	Before use
Standard lamp	LC-PL-I-002	24V100W	2016-10-08	2017-10-07
Luminous Flux Standard Lamp	LC-PL-I-001	110V/200W	2016-09-24	2017-09-23
Goniophotometer(with mirror)	LC-I-902	GMS2000	2016-05-07	2017-05-07
Wireless temperature transmitter	LC-I-978	DWRF-B	2017-02-10	2018-02-10
Wireless temperature transmitter	LC-I-979	DWRF-B	2017-02-10	2018-02-10

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 $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$; 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 and a sphere (2 meter)-spectroradiometer 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 color characteristics (Color rendering index, correlated color temperature, chromaticity coordinate) were 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.

3. Test Result Summary

3.1 Electrical data

Criteria Item	Result(Sphere)	Result(Goniophotometer)
Input Voltage & Frequency	120.00 V~60Hz	120.06 V~60Hz
Input Current(A)	0.205	0.206
Total Power(W)	21.96	21.96
Power Factor	0.893	0.890
I-THD	-	-
Off-state Power(W)	-	-

3.2 Photometric data

Criteria Item	Result(Sphere)	Result(Goniophotometer)
Total Lumens(lm)	1655.60	1660.24
Luminaire Efficacy(Lm/W)	75.39	75.60
Correlated Color Temperature (CCT)(K)	3068	-
Color Rendering Index (CRI)	84.5	-
R9	14	-
Chromaticity Coordinate (x,y)	x = 0.4308 y = 0.3995	-
Chromaticity Coordinate (u,v)	u = 0.2486 v = 0.3457	-
Chromaticity Coordinate (u',v')	u' = 0.2486 v' = 0.5186	-
Duv	-0.0010	-
Zone Lumens between 0-60 °	-	48.33 %

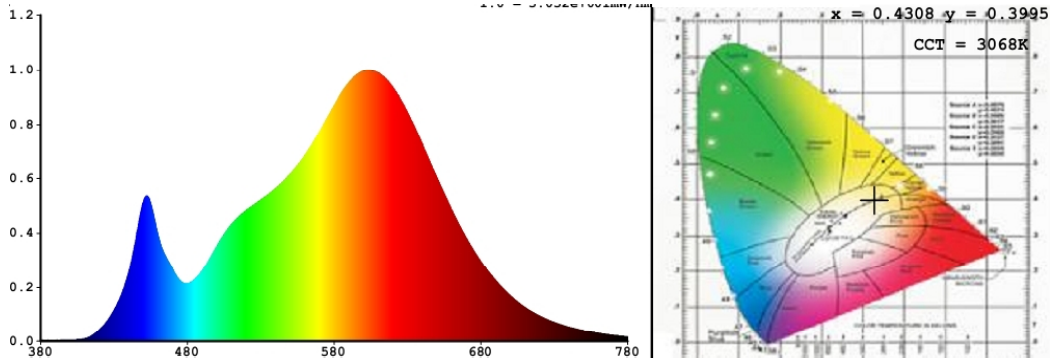
3.3 Color Rendering Details

R1	R2	R3	R4	R5	R6	R7	R8
83	92	96	83	84	91	84	62
R9	R10	R11	R12	R13	R14	R15	-
14	83	83	76	86	99	76	-

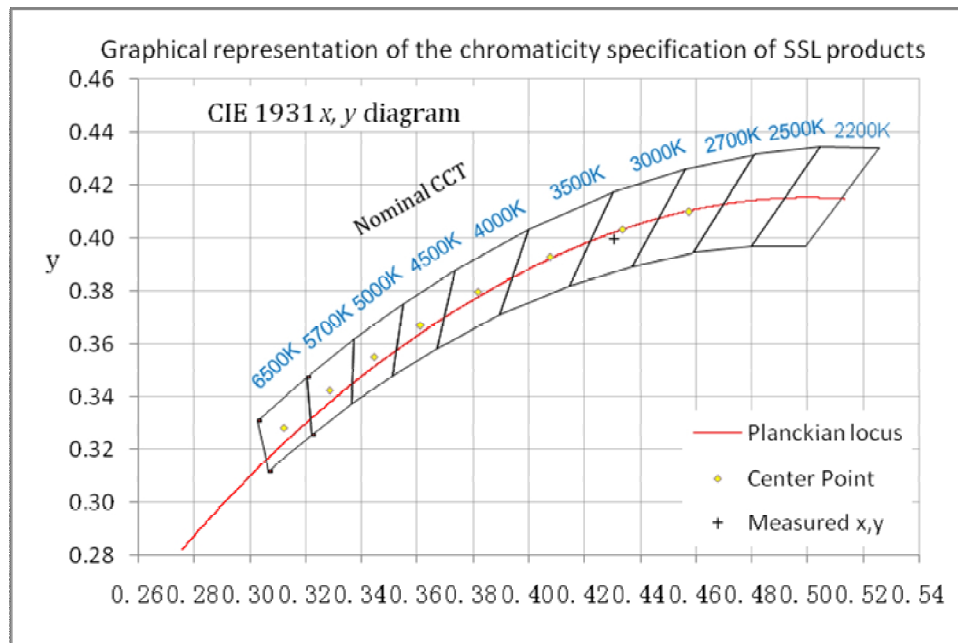
Note: N.A.

4. Test Data

4.1 Spectral Distribution



4.2 ANSI Chromaticity Quadrangles Diagram



4.3 Goniometry Test Data

CIE Type	Semi-Direct	Basic Luminous Shape	Circular w/Sides
Spacing Criteria (0-180)	1.44	Luminous Length	0.38 m (Diameter)
Spacing Criteria (90-270)	1.42	Luminous Width	0.38 m (Diameter)
Spacing Criteria (Diagonal)	1.56	Luminous Height	0.07 m
Test Distance	29.65 m		

4.4 Zonal Lumen Summary

Zone	Lumens	%Lamp	%Fixt
0-20	111.67	6.70	6.70
0-30	244.69	14.70	14.70
0-40	415.50	25.00	25.00
0-60	802.40	48.30	48.30
0-80	1125.49	67.80	67.80
0-90	1236.48	74.50	74.50
10-90	1208.3	72.80	72.80
20-40	303.83	18.30	18.30
20-50	496.09	29.90	29.90
40-70	564.62	34.00	34.00
60-80	323.09	19.50	19.50
70-80	145.37	8.80	8.80
80-90	111.00	6.70	6.70
90-110	181.45	10.90	10.90
90-120	256.56	15.50	15.50
90-130	317.73	19.10	19.10
90-150	395.24	23.80	23.80
90-180	423.76	25.50	25.50
110-180	242.31	14.60	14.60
0-180	1660.24	100.00	100.00

Total Luminaire Efficiency = 100.00%

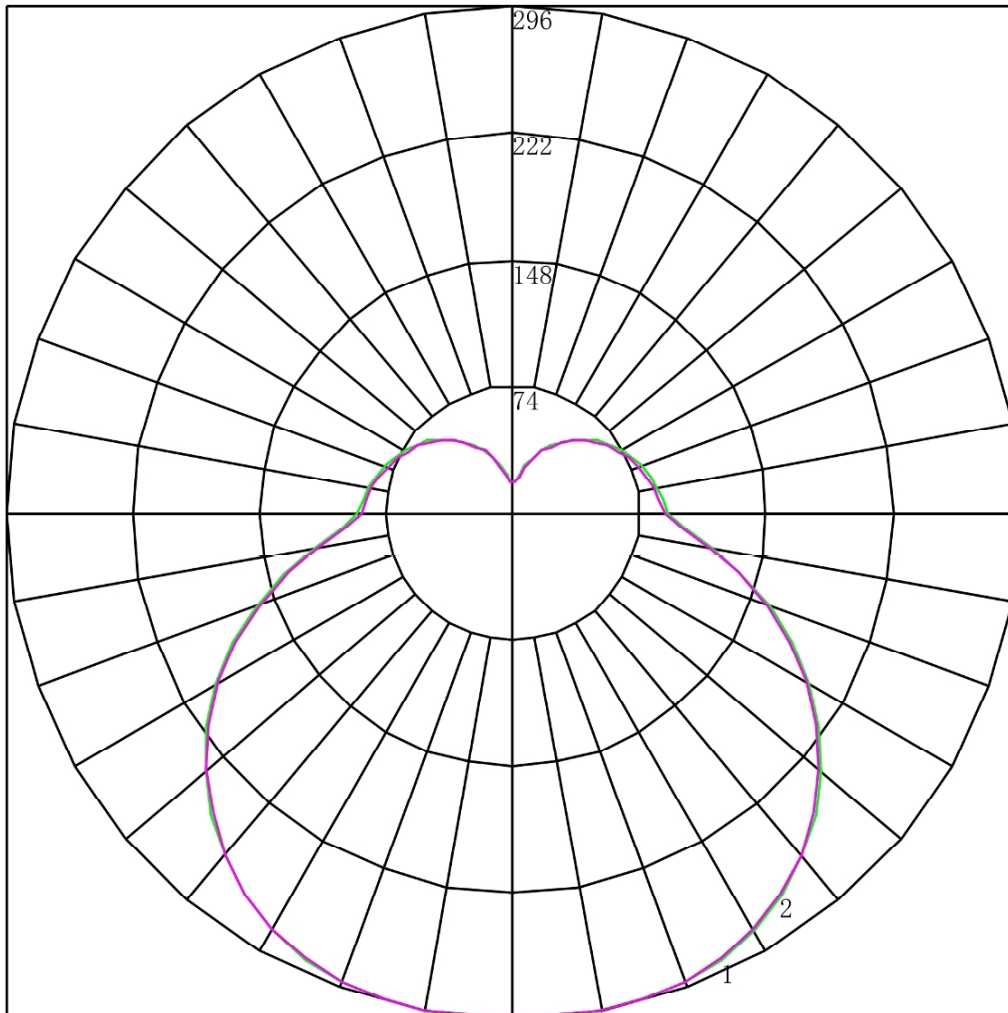
ZONAL LUMEN SUMMARY

Zone	Lumens
0-10	28.18
10-20	83.49
20-30	133.02
30-40	170.82
40-50	192.26
50-60	194.64
60-70	177.72
70-80	145.37
80-90	111.00
90-100	94.83
100-110	86.62
110-120	75.11
120-130	61.17
130-140	46.12
140-150	31.39
150-160	18.51
160-170	8.13
170-180	1.87



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4.5 Polar Curves



Maximum Candela = 295.806 Located At Horizontal Angle = 30, Vertical Angle = 10

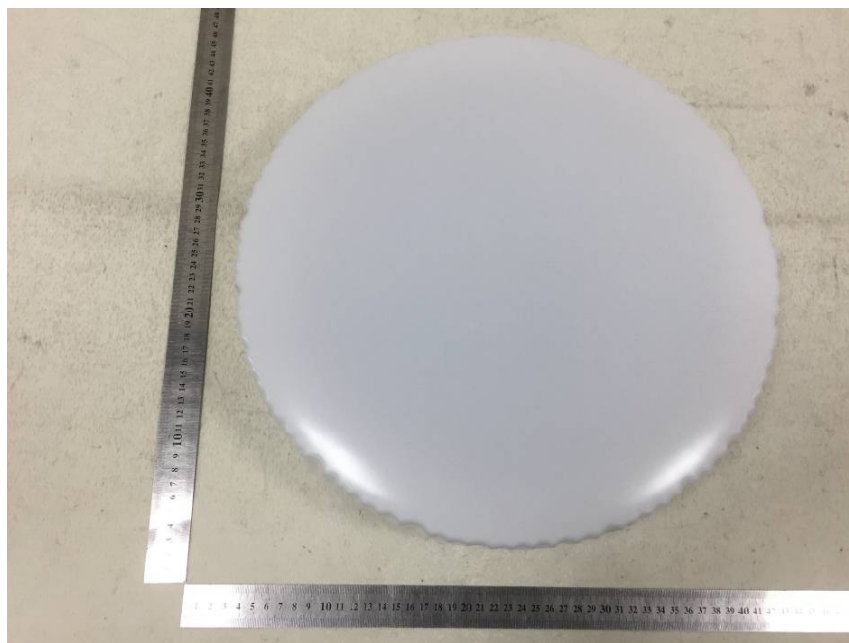
1 - Vertical Plane Through Horizontal Angles (0 - 180)

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

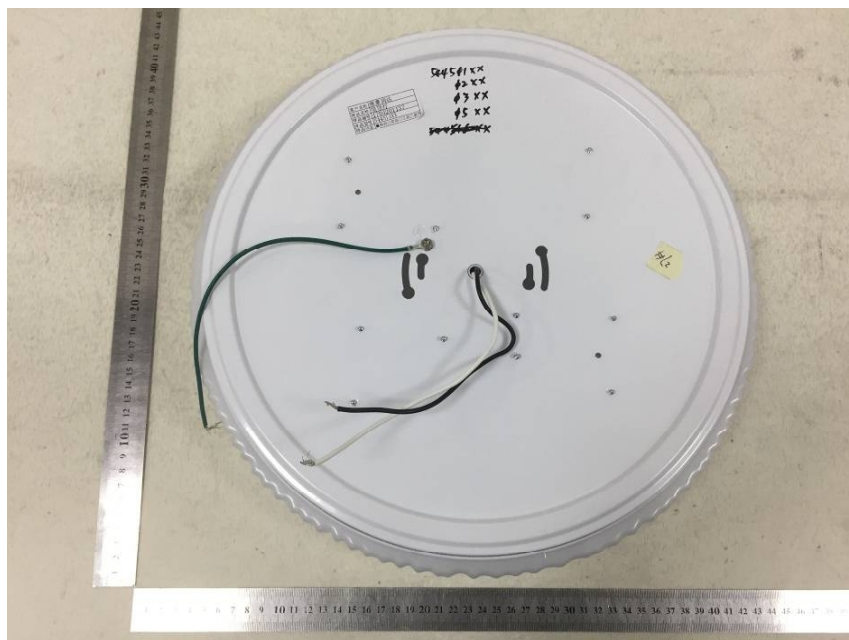
4.6 Candela Tabulation

	<u>0</u>	<u>15</u>	<u>30</u>	<u>45</u>	<u>60</u>	<u>75</u>	<u>90</u>
0	294.487	294.487	294.487	294.487	294.487	294.487	294.487
5	294.839	295.059	295.125	295.146	295.081	294.971	295.146
10	295.498	295.674	295.806	295.784	295.718	295.564	295.674
15	295.015	295.169	295.278	295.147	295.103	294.993	295.103
20	292.730	292.773	292.883	292.642	292.664	292.445	292.512
25	288.160	288.378	288.466	288.204	287.984	287.855	287.943
30	281.701	281.983	281.807	281.569	281.393	281.178	281.179
35	273.220	273.148	272.972	272.803	272.385	272.195	272.262
40	262.323	262.380	262.248	261.994	261.598	261.345	261.368
45	249.712	249.501	249.633	249.009	248.680	248.496	248.366
50	234.773	234.667	234.623	234.487	233.872	233.539	233.255
55	218.603	218.470	217.877	217.724	217.306	217.001	216.871
60	199.840	200.208	199.768	199.291	198.939	198.485	198.159
65	180.023	180.363	180.319	179.672	179.100	178.631	178.611
70	159.723	159.375	159.023	158.514	158.317	157.612	157.702
75	138.148	137.904	137.882	137.379	136.742	136.592	135.958
80	117.760	117.993	117.707	116.991	116.595	115.858	116.147
85	100.887	100.807	100.587	100.140	99.569	99.078	99.102
90	90.868	90.764	90.522	90.034	89.484	89.063	88.954
95	87.485	87.402	87.116	86.716	86.211	85.769	85.615
100	85.156	85.072	84.852	84.585	84.036	83.616	83.418
105	82.695	82.589	82.412	82.234	81.619	81.244	81.046
110	79.752	79.688	79.424	79.114	78.697	78.411	78.235
115	76.368	76.413	76.061	75.841	75.292	75.006	74.896
120	72.853	72.743	72.413	72.062	71.776	71.382	71.250
125	69.030	68.875	68.435	68.217	67.844	67.626	67.429
130	64.900	64.612	64.414	64.065	63.713	63.322	63.124
135	60.066	60.062	59.952	59.649	59.056	58.775	58.863
140	55.321	55.206	55.117	54.859	54.442	54.206	54.470
145	50.355	50.261	50.019	49.806	49.652	49.440	49.506
150	45.127	45.096	45.030	44.797	44.533	44.345	44.455
155	40.073	40.151	39.910	39.722	39.722	39.535	39.491
160	34.932	34.811	34.745	34.647	34.581	34.439	34.351
165	28.254	28.372	28.262	28.188	28.100	28.069	27.850
170	21.882	21.757	21.779	21.706	21.597	21.525	21.437
175	18.323	18.351	18.394	18.521	18.499	18.581	18.626
180	17.664	17.664	17.664	17.664	17.664	17.664	17.664

Appendix 1 Product Photo



Picture 1



Picture 2

Appendix 2 U.S. Department of Energy Lighting Facts CM Uniform LM-79 Reporting Template

Laboratory Information

Name of test lab	LCTECH (Zhongshan) Testing Service Co.,Ltd
Date of test report	Apr. 28, 2017
Test report number	LCZP17040296
Laboratory contact name	Richard Li

Product Information

Applicant	ELEC-TECH INTERNATIONAL CO LTD		
Brand name	Hampton Bay		
Model number	544512##(##=11-30)		
SKU(if available)	N/A		
Type of luminaire (for integral lamps, list base type and lamp type)	LED Ceiling Light		
Luminaire aperture	-	in.	
Luminaire height	2.76	in.	
Luminaire length	14.96	in.	
Luminaire width	14.96	in.	
Number of units(modular products)	N/A		

Electrical Measurements

Integrating sphere output

Goniophotometer Output

Input wattage	21.96	21.96	W
Input current	0.205	0.206	A
Input voltage(AC)	120.00	120.09	V
Power factor	0.893	0.890	
Off-state power	0.0	0.0	W

Photometric Characteristics

Total initial lumen output	1655.60	1660.24	lm
Initial luminaire efficacy	75.39	75.60	lm/W
Correlated color temperature / CCT	3068	K	
Color rendering index/CRI	84.5		
Rgvalue	14		
Duv	-0.0010		

Luminous Intensity Distribution

Goniophotometer Output

Center beam candle power(if applicable)	--	294.487	cd
Beam angle(if applicable)		144.5	°
Zonallumensinthe0°-60°zone		48.33	%
Zonal lumens in the60°-90° zone		31.95	%
Zonallumensinthe90°-120°zone		18.59	%
Zonallumensinthe120°-180°zone		10.07	%

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