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Test report of

IES LM-79-08

Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products

Rendered to:

Light Efficient Design, LLC

188 S. Northwest Highway , Cary, IL 60013, USA

For products:

LED Lamps

Models No.:

LED-8090M50C-G4

Test Date: Nov. 14, 2018 to Nov. 16, 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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1. General

1.1 Product Information

Brand Name	Light Efficient Design
Product Type	LED Lamp
Model Number	LED-8090M50C-G4
Rated Inputs	220-347VAC, 50/60Hz
Rated Power	110W
Rated Light output	14000 lm
Declared CCT	5000K
Power Supply	Integrated in lamp
LED Package, Array or Module	Model: SPMWHT541MXXXXXXX, manufactured by SAMSUNG ELECTRONICS CO.,LTD.
Receipt Samples	1 unit
Sample Code of lab.	1811140102007
Date of Receipt Samples	Nov. 14, 2018
Note	-

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-987	APW-120N	2018-01-10	2019-01-09
AC Power supply	LC-I-989	APW-120N	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	2018-08-01	2019-07-31
Photometric colorimetric electric system [*] (2 meter sphere)	LC-I-956	HAAS-2000	Before use	Before use
Standard lamp ^{**}	LC-PL-I-011	D204C	2018-08-09	2019-08-08
Luminous Flux Standard Lamp ^{***}	LC-PL-I-003	24V100W	2018-08-09	2019-08-08
Goniophotometer(with mirror)	LC-I-902	GMS2000	2018-05-06	2019-05-05
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:

* 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 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.

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	347.00 V~60Hz	347.00 V~60Hz
Input Current(A)	0.330	0.331
Total Power(W)	107.00	107.15
Power Factor	0.936	0.935
Off-state Power(W)	-	-

3.2 Photometric data

Criteria Item	Result(Sphere)	Result(Goniophotometer)
Total Lumens(lm)	- ⁴	14392.54
Luminaire Efficacy(Lm/W)	-	134.32
Correlated Color Temperature (CCT)(K)	5211	-
Color Rendering Index (CRI)	85.3	-
R9	17	-
Chromaticity Coordinate (x,y)	x = 0.3390 y = 0.3401	-
Chromaticity Coordinate (u,v)	u = 0.2118 v = 0.3187	-
Chromaticity Coordinate (u',v')	u' = 0.2118 v' = 0.4780	-
Duv	-0.0034	-
Zone Lumens between 0-60 °	-	78.87%

3.3 Color Rendering Details

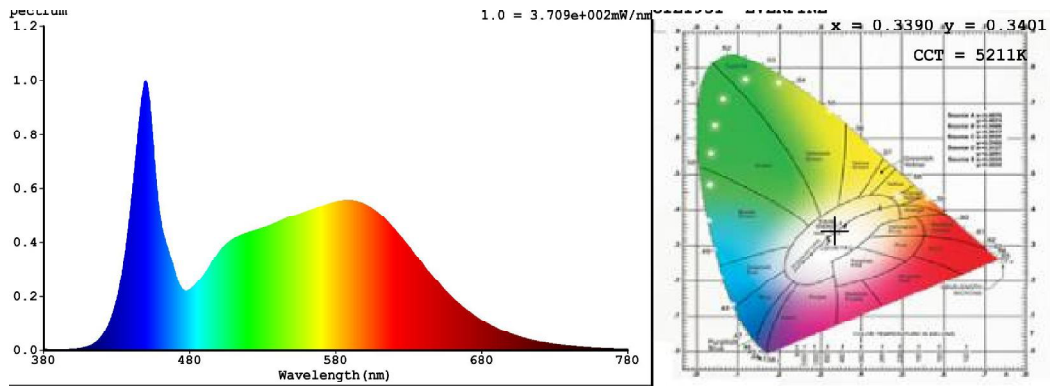
R1	R2	R3	R4	R5	R6	R7	R8
85	90	92	86	86	85	87	71
R9	R10	R11	R12	R13	R14	R15	-
17	76	87	70	86	96	81	-

Note:

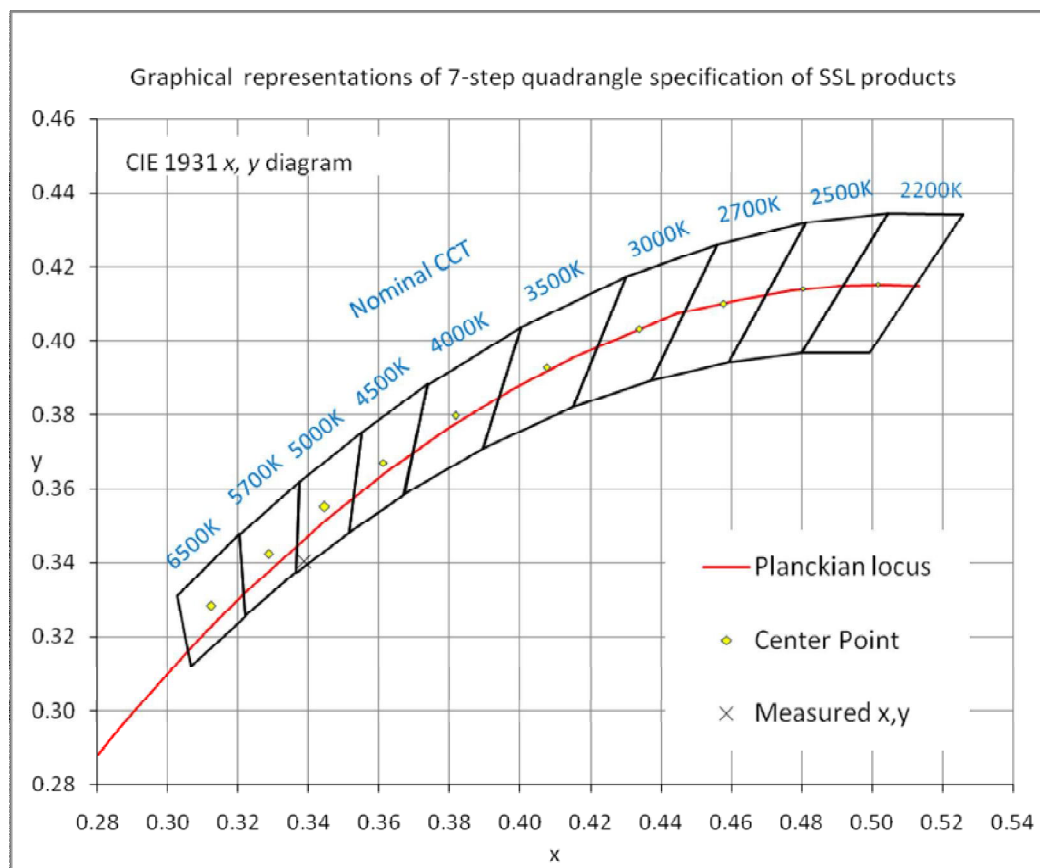
4, Self-absorption is 1.

4. Test Data

4.1 Spectral Distribution



4.2 ANSI Chromaticity Quadrangles Diagram



4.3 Goniometry Test Data

CIE Type	Direct	Basic Luminous Shape	Rectangular
Spacing Criteria (0-180)	1.24	Luminous Length	0.14 m
Spacing Criteria (90-270)	1.30	Luminous Width	0.09 m
Spacing Criteria (Diagonal)	1.38	Luminous Height	0.00 m
Test Distance	30.00 m		

4.4 Zonal Lumen Summary

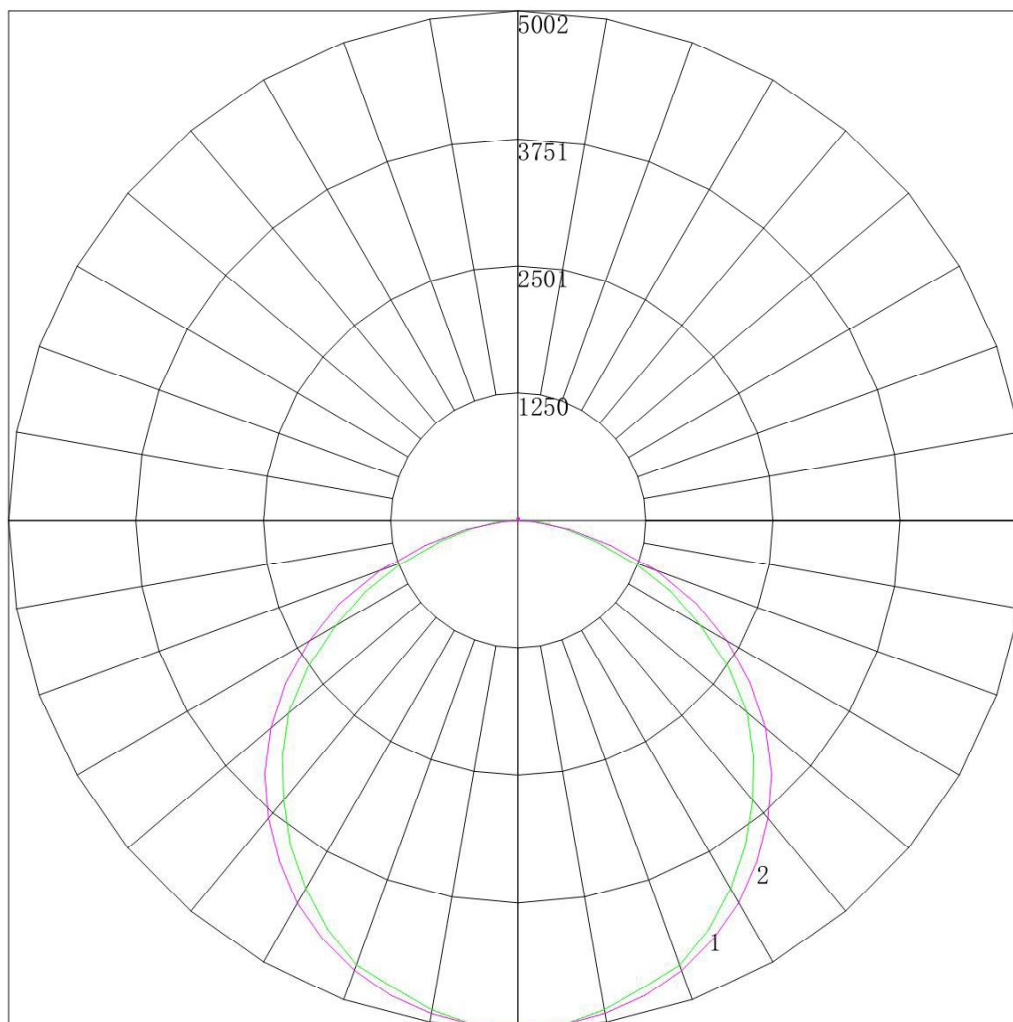
0-20	1828.84	12.70	12.70
0-30	3897.07	27.10	27.10
0-40	6397.68	44.50	44.50
0-60	11351.81	78.90	78.90
0-80	14047.41	97.60	97.60
0-90	14301.34	99.40	99.40
10-90	13827.86	96.10	96.10
20-40	4568.84	31.70	31.70
20-50	7172.06	49.80	49.80
40-70	6709.03	46.60	46.60
60-80	2695.61	18.70	18.70
70-80	940.70	6.50	6.50
80-90	253.92	1.80	1.80
90-110	41.01	0.30	0.30
90-120	49.46	0.30	0.30
90-130	56.78	0.40	0.40
90-150	72.35	0.50	0.50
90-180	91.19	0.60	0.60
110-180	50.18	0.30	0.30
0-180	14392.53	100.00	100.00

Total Luminaire Efficiency = 100.00%

ZONAL LUMEN SUMMARY

Zone	Lumens
0-10	473.48
10-20	1355.36
20-30	2068.23
30-40	2500.61
40-50	2603.22
50-60	2350.91
60-70	1754.9
70-80	940.70
80-90	253.92
90-100	29.80
100-110	11.21
110-120	8.46
120-130	7.31
130-140	6.93
140-150	8.64
150-160	9.08
160-170	7.06
170-180	2.70

4.5 Polar Curves

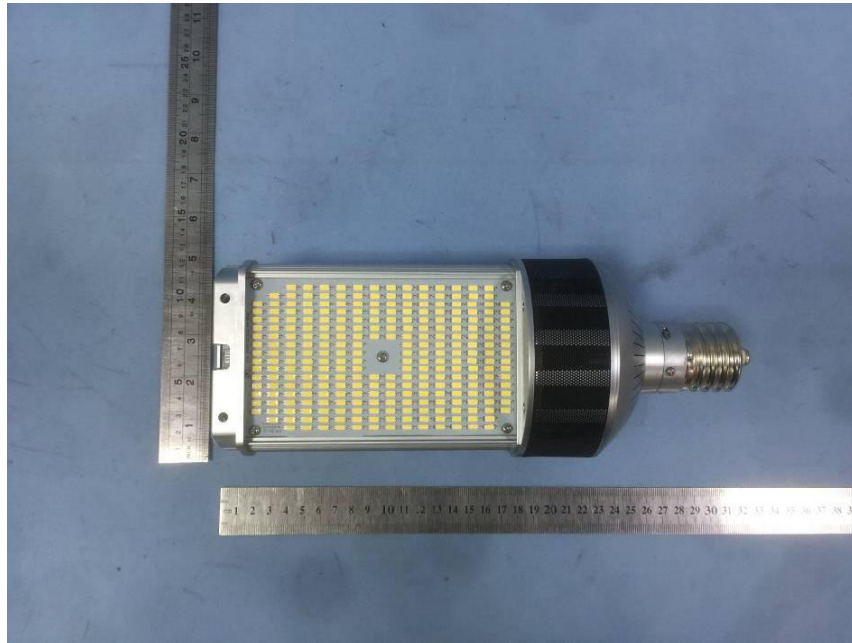


Maximum Candela = 5001.516 Located At Horizontal Angle = 0, Vertical Angle = 0
 # 1 - Vertical Plane Through Horizontal Angles (0 - 180)
 # 2 - Vertical Plane Through Horizontal Angles (90 - 270)

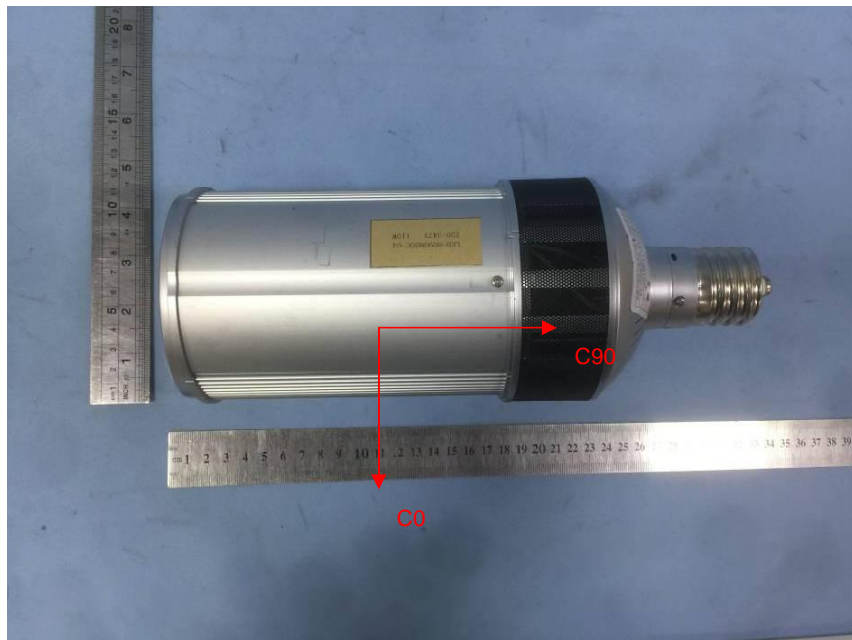
4.6 Candela Tabulation

	<u>0</u>	<u>15</u>	<u>30</u>	<u>45</u>	<u>60</u>	<u>75</u>	<u>90</u>
0	5001.516	5001.516	5001.516	5001.516	5001.516	5001.516	5001.516
5	4970.392	4983.473	4987.989	4983.086	4983.754	4986.688	4969.727
10	4874.764	4896.849	4918.351	4928.461	4930.689	4931.190	4912.825
15	4745.757	4750.218	4757.886	4787.084	4838.501	4839.948	4825.408
20	4637.499	4645.334	4638.205	4631.323	4685.381	4716.567	4694.021
25	4427.298	4455.413	4487.891	4477.583	4488.188	4554.763	4529.027
30	4170.186	4194.619	4234.115	4282.263	4286.500	4348.012	4331.735
35	3893.226	3908.594	3941.801	3994.783	4061.652	4087.548	4086.467
40	3581.533	3592.107	3626.963	3686.402	3776.996	3803.265	3812.036
45	3266.683	3285.342	3311.660	3345.890	3436.576	3493.151	3517.873
50	2937.398	2935.235	2955.343	2980.863	3061.304	3151.794	3168.991
55	2522.365	2536.616	2579.650	2604.598	2667.822	2772.240	2785.128
60	2060.239	2092.311	2166.362	2199.694	2239.353	2360.084	2366.282
65	1651.836	1664.710	1698.376	1784.659	1829.475	1882.591	1933.465
70	1208.609	1246.235	1292.929	1317.873	1380.275	1403.631	1435.537
75	782.885	831.435	865.716	884.082	892.598	924.588	944.027
80	464.787	481.424	486.952	487.792	482.543	486.579	511.236
85	236.408	246.845	219.168	199.482	165.484	154.032	161.596
90	88.185	85.631	71.398	50.451	33.635	21.231	15.312
95	28.373	31.935	32.019	24.093	16.661	10.204	5.465
100	8.931	13.511	18.478	16.250	12.546	8.675	5.689
105	8.345	10.060	13.138	12.676	10.298	7.889	6.002
110	9.112	9.429	10.840	10.699	8.971	7.304	6.047
115	8.976	9.091	9.668	9.125	7.847	6.945	6.137
120	9.021	9.203	8.879	8.294	7.757	7.079	6.677
125	8.931	8.662	8.451	8.271	8.027	7.686	7.443
130	8.164	8.256	8.226	8.159	7.825	7.663	7.535
135	8.570	8.708	8.812	8.609	8.387	8.292	8.207
140	10.871	11.167	11.134	10.811	10.703	10.697	10.672
145	14.074	14.167	14.109	13.801	13.716	13.641	13.631
150	17.006	16.986	16.881	16.678	16.549	16.472	16.455
155	20.073	20.054	19.923	19.712	19.629	19.484	19.551
160	23.050	22.987	22.898	22.814	22.710	22.630	22.559
165	25.486	25.491	25.355	25.241	25.183	25.035	25.073
170	27.200	27.205	27.158	26.972	26.914	26.810	26.733
175	28.869	28.897	28.871	28.770	28.803	28.675	28.525
180	29.894	29.894	29.894	29.894	29.894	29.894	29.894

Appendix A Product Photo



Picture 1



Picture 2

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