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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:

Inseparable SSL Luminaire

Models No.:

504021##(##=11-30)

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

Test Date: Aug. 15, 2018 to Aug. 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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Test Note:

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1. General

1.1 Product Information

Brand Name	ETI
Product Type	Inseparable SSL Luminaire
Model Number	504021##(##=11-30)
Rated Inputs	120-277VAC, 50/60Hz
Rated Power	12.5W
Rated Light output	1100lm
Declared CCT	3000K, 4000K, 5000K
Power Supply	Integrated in luminaire
LED Package, Array or Module	SPMWHX228FD5WAW0XX, Samsung Electronics Co., LTD.
Receipt Samples	1 unit
Sample Code of lab.	180816104002
Date of Receipt Samples	Aug. 16, 2018
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 C78.377-2015	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	2018-08-08	2019-08-07
Photometric colorimetric electric system [*] (2 meter sphere)	LC-I-900	SPR3000	Before use	Before use
Standard lamp ^{**}	LC-PL-I-011	D204C	2017-09-07	2018-09-06
Luminous Flux Standard Lamp ^{***}	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:

* 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 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.

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	120.01 V~60Hz
Input Current(A)	0.105	0.104
Total Power(W)	12.40	12.32
Power Factor	0.984	0.983
Off-state Power(W)	-	-

3.2 Photometric data

Criteria Item	Result(Sphere)	Result(Goniophotometer)
Total Lumens(lm)	- ****	1169.38
Luminaire Efficacy(Lm/W)	-	94.92
Correlated Color Temperature (CCT)(K)	3029	-
Color Rendering Index (CRI)	85.9	-
R9	24	-
Chromaticity Coordinate (x,y)	x = 0.4311 y = 0.3955	-
Chromaticity Coordinate (u,v)	u = 0.2505 v = 0.3447	-
Chromaticity Coordinate (u',v')	u' = 0.2505 v' = 0.5171	-
Duv	-0.0027	-
Zone Lumens between 0-60 °	-	61.40 %

3.3 Color Rendering Details

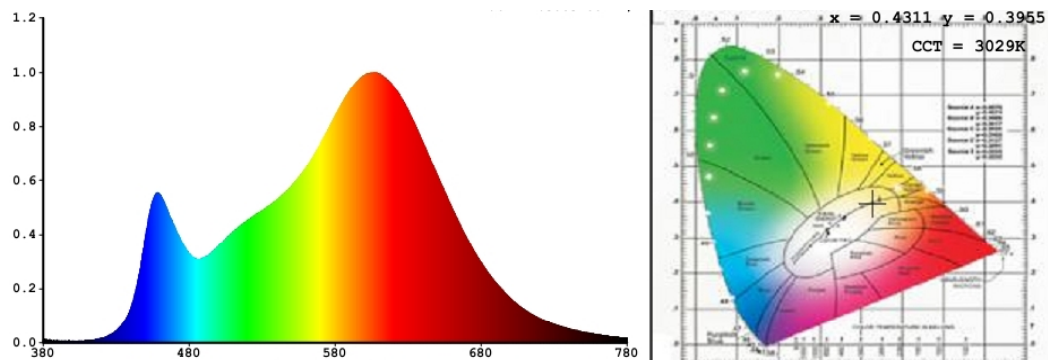
R1	R2	R3	R4	R5	R6	R7	R8
87	98	91	83	88	95	81	64
R9	R10	R11	R12	R13	R14	R15	-
24	95	84	79	91	96	80	-

Note:

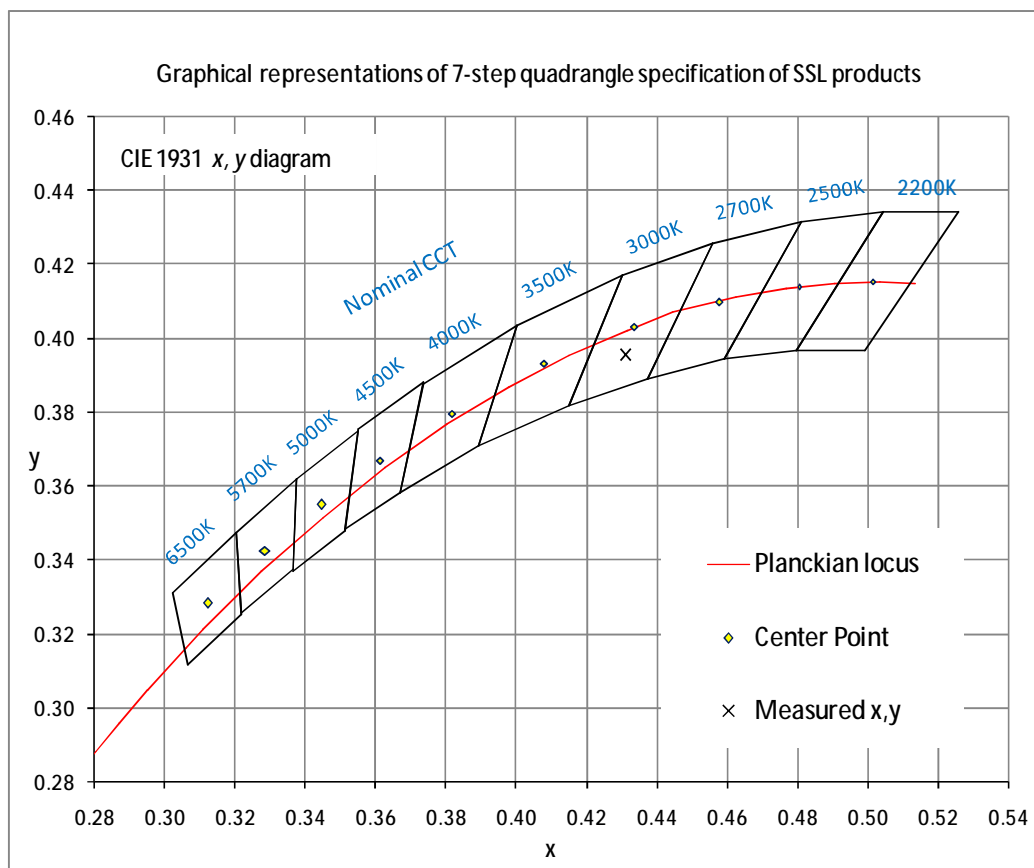
**** Self-absorption is 1.

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 w/Sides
Spacing Criteria (0-180)	1.28	Luminous Length	0.22 m
Spacing Criteria (90-270)	1.34	Luminous Width	0.12 m
Spacing Criteria (Diagonal)	1.44	Luminous Height	0.00 m
Test Distance	29.79 m		

4.4 Zonal Lumen Summary

Zone	Lumens	%Lamp	%Fixt
0-20	109.57	9.40	9.40
0-30	234.54	20.10	20.10
0-40	388.91	33.30	33.30
0-60	717.88	61.40	61.40
0-80	973.58	83.30	83.30
0-90	1055.15	90.20	90.20
10-90	1026.92	87.80	87.80
20-40	279.33	23.90	23.90
20-50	446.10	38.10	38.10
40-70	471.48	40.30	40.30
60-80	255.70	21.90	21.90
70-80	113.19	9.70	9.70
80-90	81.57	7.00	7.00
90-110	88.94	7.60	7.60
90-120	106.56	9.10	9.10
90-130	112.77	9.60	9.60
90-150	113.73	9.70	9.70
90-180	114.23	9.80	9.80
110-180	25.29	2.20	2.20
0-180	1169.38	100.00	100.00

Total Luminaire Efficiency = 100.00%

ZONAL LUMEN SUMMARY

Zone	Lumens
0-10	28.23
10-20	81.34
20-30	124.97
30-40	154.36
40-50	166.76
50-60	162.21
60-70	142.51
70-80	113.19
80-90	81.57
90-100	54.95
100-110	33.98
110-120	17.62
120-130	6.21
130-140	0.74
140-150	0.22
150-160	0.24
160-170	0.19
170-180	0.07

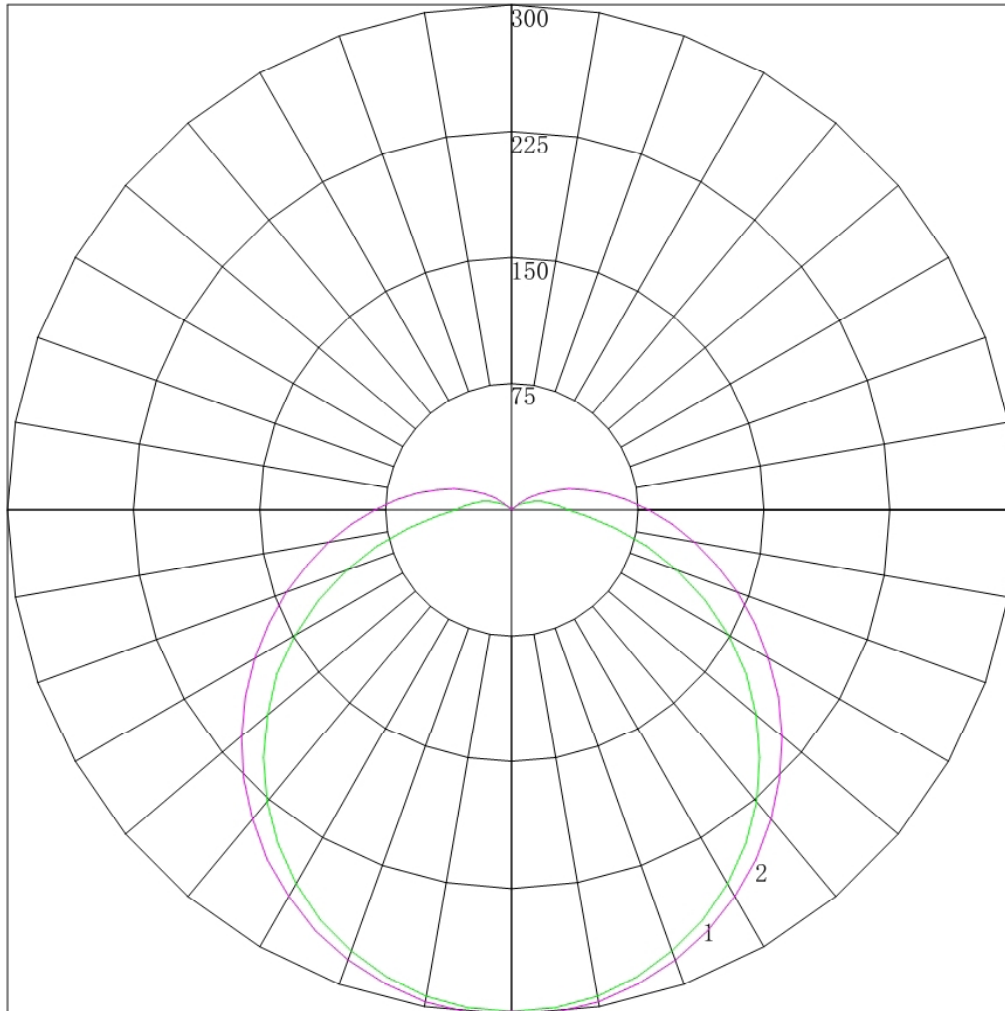


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4.5 Polar Curves

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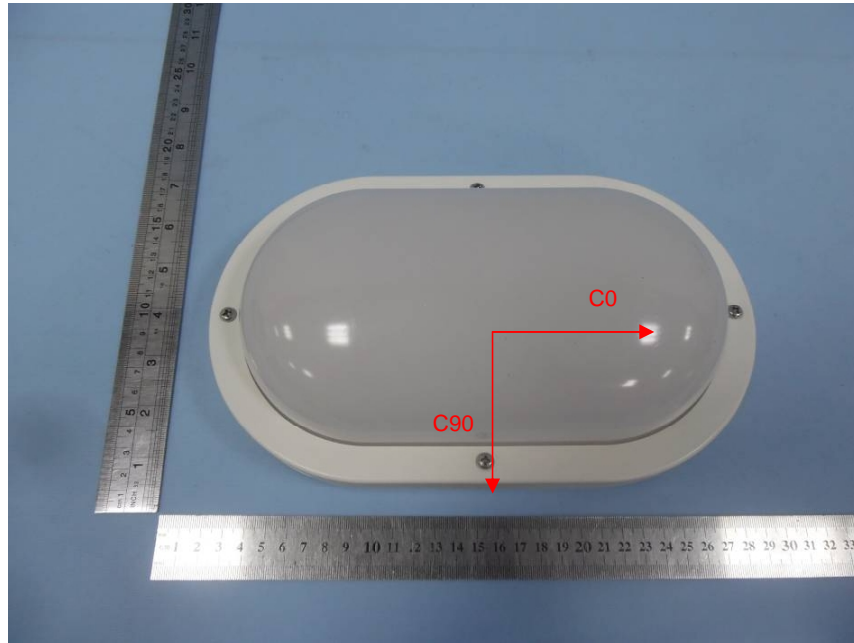


Maximum Candela = 299.606 Located At Horizontal Angle = 90, Vertical Angle = 5
1 - Vertical Plane Through Horizontal Angles (0 - 180)
2 - Vertical Plane Through Horizontal Angles (90 - 270)

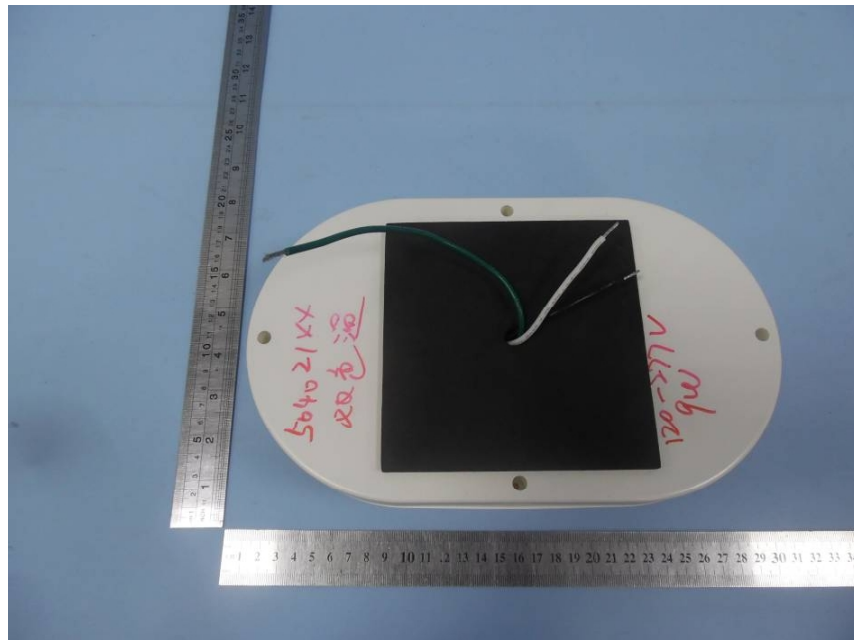
4.6 Candela Tabulation

	<u>0</u>	<u>15</u>	<u>30</u>	<u>45</u>	<u>60</u>	<u>75</u>	<u>90</u>
0	297.866	297.866	297.866	297.866	297.866	297.866	297.866
5	296.840	296.174	296.753	296.778	296.714	296.827	299.606
10	293.403	292.635	292.861	293.427	293.262	293.538	296.519
15	287.199	286.870	287.479	287.900	288.151	288.613	291.222
20	278.720	278.768	279.716	280.197	280.938	281.480	284.423
25	268.722	268.151	269.574	271.160	271.622	272.784	275.690
30	256.226	256.153	257.675	259.617	261.155	262.449	265.188
35	242.078	242.331	244.040	246.432	248.520	250.215	253.279
40	226.234	226.394	228.893	232.380	234.622	236.392	239.559
45	208.381	209.387	212.367	216.152	219.420	221.601	225.179
50	189.503	190.735	194.552	199.302	203.267	206.188	209.654
55	170.311	171.637	175.980	181.810	186.629	190.289	193.465
60	148.888	151.048	156.651	163.207	169.102	173.399	176.002
65	126.707	129.902	137.167	144.850	151.465	155.890	159.192
70	104.302	108.689	117.661	126.801	134.339	139.150	142.440
75	83.147	88.545	98.777	109.175	117.345	122.922	125.679
80	62.305	69.469	81.362	92.636	101.213	107.003	110.204
85	44.452	53.154	66.059	77.630	86.610	92.098	95.558
90	33.696	40.644	52.625	63.800	72.757	78.584	81.401
95	28.028	31.808	41.793	52.168	60.321	65.822	68.525
100	22.940	24.551	32.518	41.668	49.390	54.075	56.705
105	18.343	18.519	24.555	32.432	39.454	43.962	45.769
110	14.014	14.112	17.415	24.419	30.271	34.468	36.377
115	10.087	10.105	11.188	16.894	22.062	25.746	27.337
120	6.650	6.678	6.895	10.101	14.671	17.906	19.221
125	3.928	3.873	3.959	4.639	8.187	10.841	12.032
130	1.651	1.692	1.691	1.754	2.700	4.814	5.639
135	0.223	0.289	0.289	0.311	0.310	0.442	0.834
140	0.268	0.245	0.267	0.266	0.244	0.243	0.265
145	0.357	0.356	0.356	0.355	0.354	0.397	0.354
150	0.446	0.467	0.489	0.422	0.487	0.464	0.443
155	0.580	0.512	0.445	0.533	0.487	0.486	0.486
160	0.625	0.579	0.600	0.577	0.620	0.574	0.574
165	0.669	0.668	0.667	0.688	0.686	0.684	0.706
170	0.714	0.712	0.734	0.733	0.775	0.751	0.793
175	0.759	0.779	0.756	0.733	0.730	0.773	0.749
180	0.805	0.805	0.805	0.805	0.805	0.805	0.805

Appendix A Product Photo



Picture 1



Picture 2

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