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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:

2x2 Luminaires for Ambient Lighting of Interior Commercial Spaces

Models No.:

FPE-22-40-840-MV-D

**Test Date:** Aug. 21, 2017 to Aug. 22, 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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**Test Note:**

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## 1. General

### 1.1 Product Information

Brand Name	ETI
Product Type	2x2Luminaires for Ambient Lighting of Interior Commercial Spaces
Model Number	FPE-22-40-840-MV-D
Rated Inputs	100-277VAC, 50/60Hz
Rated Power	40W
Rated Light output	4000lm
Declared CCT	4000K
Power Supply	MPU45D-40E
LED Package, Array or Module	67-21S Series, EVERLIGHT ELECTRONICS CO., LTD
Dimming Information	Dimmable
Receipt Samples	1 unit
Sample Code of lab.	170819105001
Date of Receipt Samples	Aug. 19, 2017
Note	-



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## 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	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	2017-08-10	2018-08-09
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	2017-05-07	2018-05-07
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



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## 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  $\pm 0.2$  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.



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### 3. Test Result Summary

#### 3.1 Electrical data

Criteria Item	Result(Sphere)	Result(Goniophotometer)
Input Voltage & Frequency	119.90 V~60Hz	120.01 V~60Hz
Input Current(A)	0.336	0.336
Total Power(W)	40.01	39.92
Power Factor	0.994	0.991
I-THD	3.14 %	-
Off-state Power(W)	-	-

#### 3.2 Photometric data

Criteria Item	Result(Sphere)	Result(Goniophotometer)
Total Lumens(lm)	-	4238.83
Luminaire Efficacy(lm/W)	-	106.18
Correlated Color Temperature (CCT)(K)	3731	-
Color Rendering Index (CRI)	82.3	-
R9	4	-
Chromaticity Coordinate (x,y)	x = 0.3959 y = 0.3929	-
Chromaticity Coordinate (u,v)	u = 0.2287 v = 0.3405	-
Chromaticity Coordinate (u',v')	u' = 0.2287 v' = 0.5108	-
Duv	0.0032	-
Zone Lumens between 0-60 °	-	77.36%

#### 3.3 Color Rendering Details

R1	R2	R3	R4	R5	R6	R7	R8
80	90	97	79	80	86	85	62
R9	R10	R11	R12	R13	R14	R15	-
4	76	78	62	83	98	73	-

#### 3.4 Electrical data on 277V

Criteria Item	Result(Sphere)	Result(Goniophotometer)
Input Voltage & Frequency	277.00 V~60Hz	-
Power Factor	0.901	-
I-THD	8.47 %	-
Off-state Power(W)	-	-

Note: N.A.

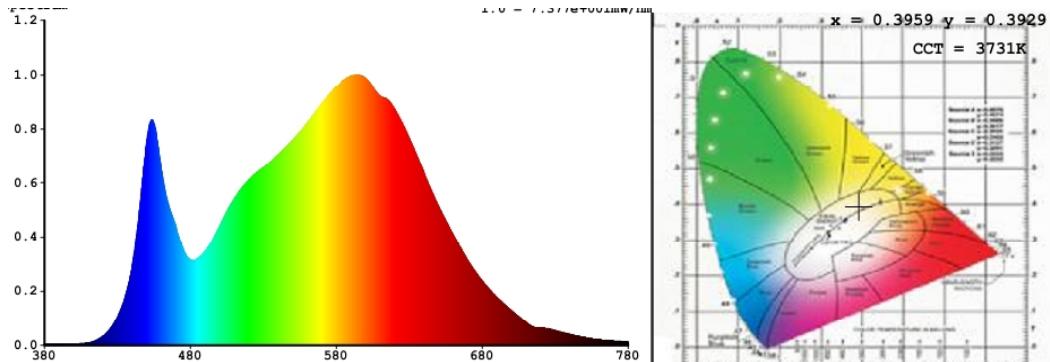


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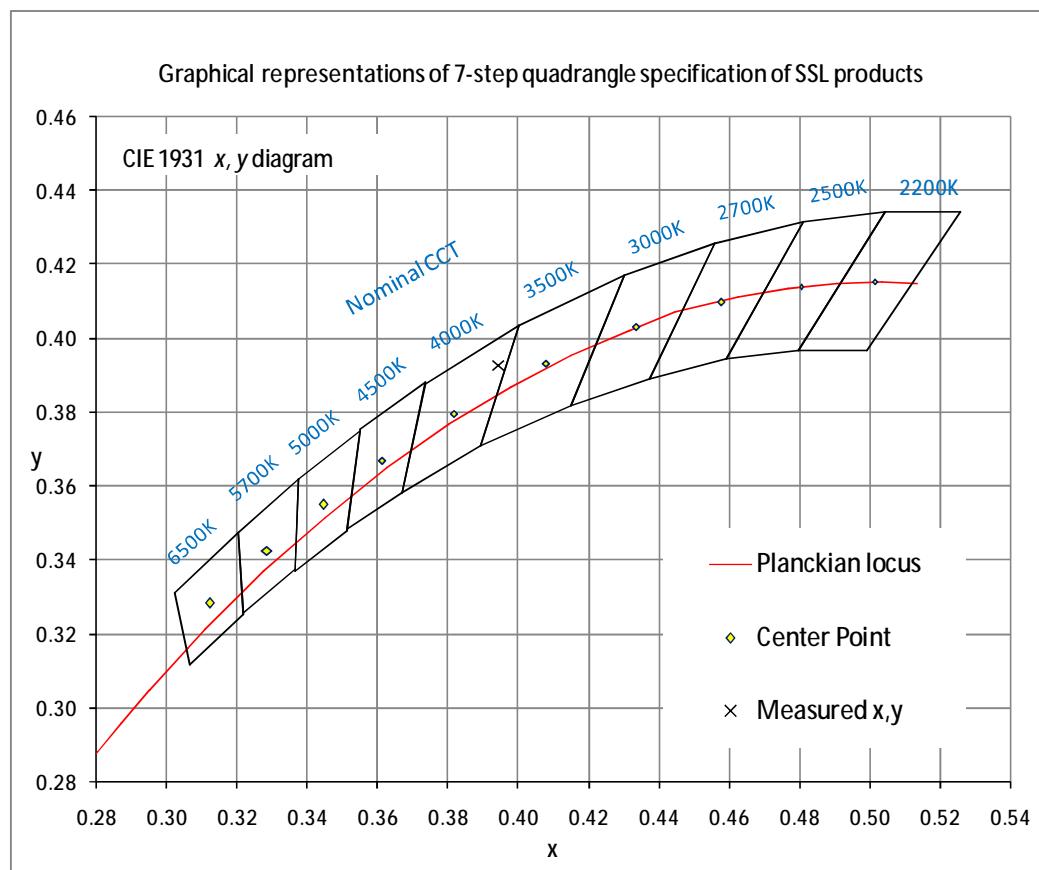


## 4. Test Data

### 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	Rectangular
Spacing Criteria (0-180)	1.28	Luminous Length	0.56 m
Spacing Criteria (90-270)	1.28	Luminous Width	0.56 m
Spacing Criteria (Diagonal)	1.40	Luminous Height	0.00 m
Test Distance	29.79 m		

#### 4.4 Zonal Lumen Summary

Zone	Lumens	%Lamp	%Fixt
0-20	527.95	12.50	12.50
0-30	1122.96	26.50	26.50
0-40	1843.35	43.50	43.50
0-60	3279.08	77.40	77.40
0-80	4131.21	97.50	97.50
0-90	4231.14	99.80	99.80
10-90	4094.65	96.60	96.60
20-40	1315.4	31.00	31.00
20-50	2066.53	48.80	48.80
40-70	1966.79	46.40	46.40
60-80	852.14	20.10	20.10
70-80	321.08	7.60	7.60
80-90	99.92	2.40	2.40
90-110	2.68	0.10	0.10
90-120	3.67	0.10	0.10
90-130	4.61	0.10	0.10
90-150	6.11	0.10	0.10
90-180	7.69	0.20	0.20
110-180	5.00	0.10	0.10
0-180	4238.82	100.00	100.00

Total Luminaire Efficiency = 100.00%

#### ZONAL LUMEN SUMMARY

Zone	Lumens
0-10	136.48
10-20	391.47
20-30	595.01
30-40	720.38
40-50	751.14
50-60	684.59
60-70	531.06
70-80	321.08
80-90	99.92
90-100	1.56
100-110	1.12
110-120	0.98
120-130	0.94
130-140	0.74
140-150	0.76
150-160	0.74
160-170	0.60
170-180	0.24



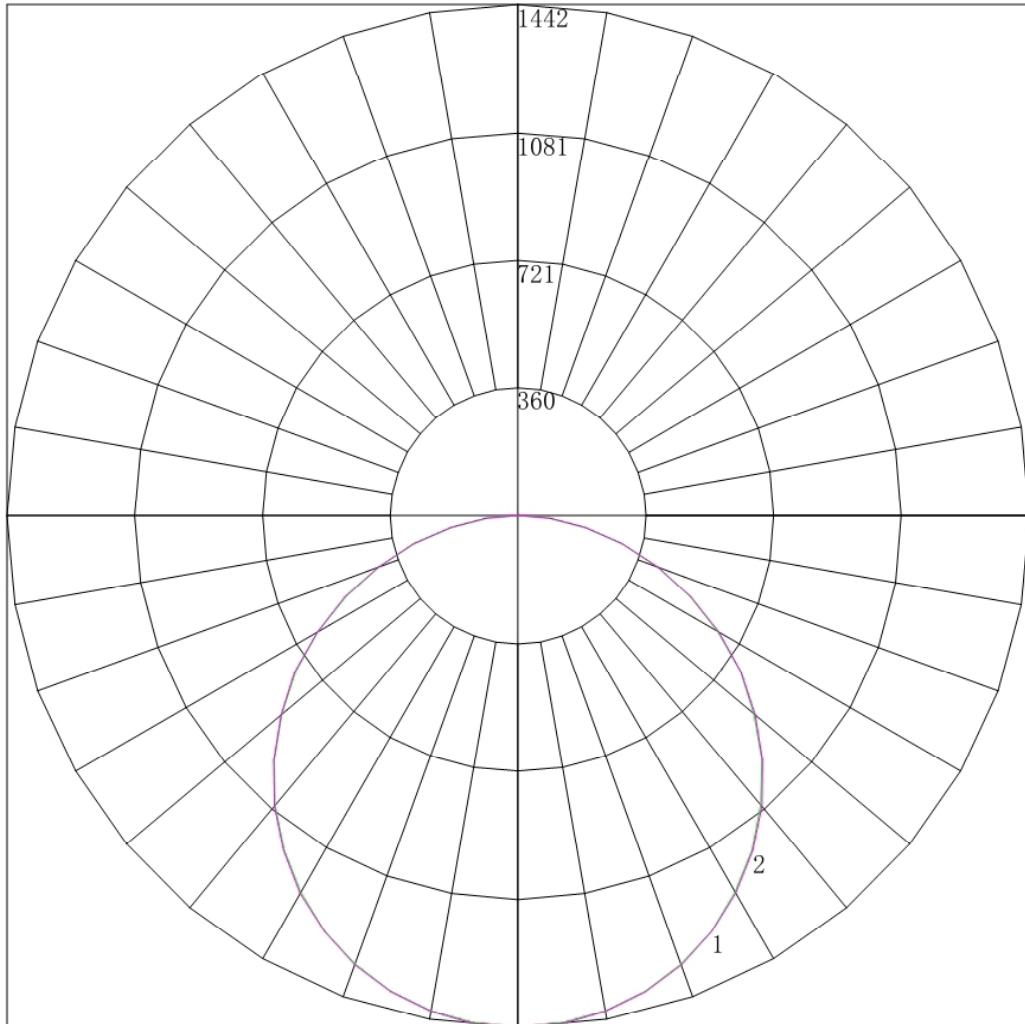
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#### 4.5 Polar Curves



Maximum Candela = 1441.925 Located At Horizontal Angle = 0, Vertical Angle = 0

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

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



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## 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>
<b>0</b>	1441.925	1441.925	1441.925	1441.925	1441.925	1441.925	1441.925
<b>5</b>	1435.536	1436.684	1435.357	1435.915	1435.846	1435.717	1438.249
<b>10</b>	1416.813	1417.943	1416.829	1417.155	1417.233	1417.469	1419.248
<b>15</b>	1386.510	1387.166	1385.720	1386.797	1386.751	1387.160	1388.955
<b>20</b>	1344.184	1344.820	1344.227	1344.442	1344.644	1343.969	1347.010
<b>25</b>	1290.811	1291.084	1290.951	1290.623	1290.735	1291.179	1292.488
<b>30</b>	1224.704	1226.888	1225.893	1226.514	1225.778	1226.481	1228.891
<b>35</b>	1151.233	1150.724	1150.562	1152.937	1151.925	1151.562	1152.980
<b>40</b>	1065.604	1066.655	1067.243	1067.340	1068.798	1065.535	1069.979
<b>45</b>	972.212	973.126	974.360	974.359	974.646	974.054	975.468
<b>50</b>	869.636	872.136	873.844	872.042	873.261	874.059	872.762
<b>55</b>	765.063	766.506	764.275	767.265	766.597	766.902	768.642
<b>60</b>	651.084	651.859	652.133	655.390	654.807	653.493	654.423
<b>65</b>	533.290	534.837	536.728	537.019	537.516	535.495	538.075
<b>70</b>	417.537	417.837	419.393	417.538	419.049	420.977	420.621
<b>75</b>	303.337	303.436	301.459	303.491	302.579	303.001	304.324
<b>80</b>	190.955	190.344	190.803	191.883	193.451	192.562	191.925
<b>85</b>	86.560	85.757	85.560	84.599	86.276	88.177	89.352
<b>90</b>	2.130	2.398	2.396	2.439	2.418	2.461	4.115
<b>95</b>	1.109	1.044	1.043	1.109	1.021	1.086	1.064
<b>100</b>	1.065	1.088	1.065	1.042	1.043	1.064	1.064
<b>105</b>	1.065	1.066	1.021	1.087	1.065	1.109	1.019
<b>110</b>	1.065	1.088	1.043	1.042	0.998	1.042	1.019
<b>115</b>	1.020	0.977	0.954	0.998	0.932	0.931	1.019
<b>120</b>	0.976	0.999	0.999	0.954	0.932	0.998	1.019
<b>125</b>	1.020	1.066	1.043	1.109	1.087	1.109	1.107
<b>130</b>	1.065	1.044	1.043	1.064	1.043	1.042	1.019
<b>135</b>	0.932	0.866	0.888	0.909	0.843	0.865	0.886
<b>140</b>	1.020	1.044	1.043	1.020	1.043	1.042	1.063
<b>145</b>	1.242	1.288	1.243	1.242	1.242	1.286	1.240
<b>150</b>	1.287	1.332	1.309	1.331	1.331	1.352	1.328
<b>155</b>	1.553	1.599	1.620	1.597	1.575	1.596	1.594
<b>160</b>	1.908	1.865	1.886	1.907	1.908	1.907	1.948
<b>165</b>	2.174	2.154	2.174	2.151	2.174	2.173	2.214
<b>170</b>	2.396	2.332	2.330	2.328	2.329	2.306	2.303
<b>175</b>	2.529	2.509	2.530	2.595	2.551	2.528	2.524
<b>180</b>	2.598	2.598	2.598	2.598	2.598	2.598	2.598



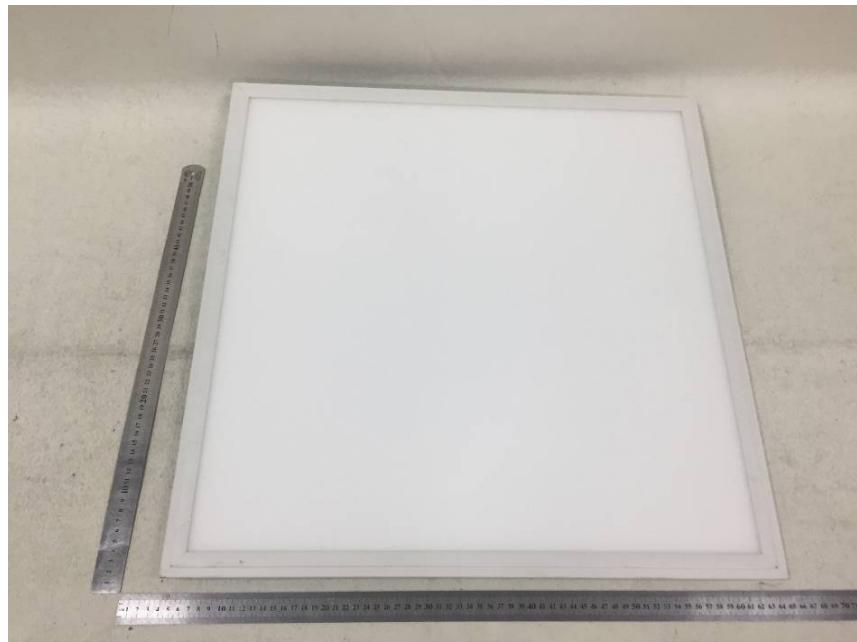
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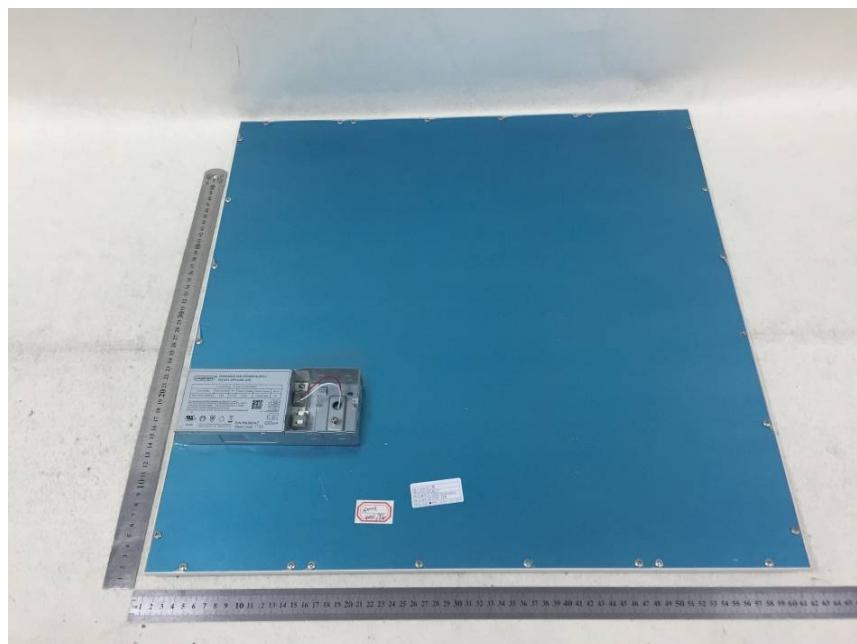
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## Appendix 1 Product Photo



Picture 1



Picture 2

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