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Ref. No.: LCZP18040312
Version: 1.0
Date of Issue: May. 10, 2018
Total pages: 11

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,Zhuhai City, Guangdong Province,China,519085

For products:

2x2 Luminaires for Ambient Lighting of Interior Commercial Spaces

Models No.:

FPE-22-40-835-MV-D

Test Date:	Apr. 27, 2018 to Apr. 28, 2018
Test Item:	Total luminous flux, Luminous Efficacy, Electrical values, Luminous Intensity Distribution, Chromaticity coordinates, CCT and CRI, Spectral Power Distribution.
Test Lab.:	**LCTECH (Zhongshan) Testing Service Co., Ltd**
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Template No.:	LC-RT-PL-001 Rev.1.1
Test Note:	

Complied by:	**Reviewed by:**
Fish Tan	**Richard Li**
Project Engineer	**Technical Manager**
May. 10, 2018	**May. 10, 2018**

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1. General

1.1 Product Information

Brand Name	ETI
Product Type	2x2 Luminaires for Ambient Lighting of Interior Commercial Spaces
Model Number	FPE-22-40-835-MV-D
Rated Inputs	100-277VAC, 50/60Hz
Rated Power	40W
Rated Light output	4000lm
Declared CCT	3500K
LED Package, Array or Module	2835 White SMD LED, ShenZhen JuFei Optoelectronics Co., Ltd.
Dimming Information	Dimmable
Receipt Samples	1 unit
Sample Code of lab.	180425104001
Date of Receipt Samples	Apr. 25, 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-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	2017-08-08	2018-08-07
Photometric colorimetric electric system[1] (2 meter sphere)	LC-I-900	SPR3000	Before use	Before use
Standard lamp[2]	LC-PL-I-011	D204C	2017-09-07	2018-09-06
Luminous Flux Standard Lamp[3]	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:

1, Bandwidth of spectroradiometer is 1 nm.

2, halogen lamp, 100W, omni-directional type, and its traceability to NIM.

3, 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 °C ± 1°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	120.03 V~60Hz
Input Current(A)	0.329	0.327
Total Power(W)	39.12	38.87
Power Factor	0.992	0.990
I-THD	5.73%	-
Off-state Power(W)	-	-

3.2 Photometric data

Criteria Item	Result(Sphere)	Result(Goniophotometer)
Total Lumens(lm)	-[4]	4175.11
Luminaire Efficacy(Lm/W)	-	107.41
Correlated Color Temperature (CCT)(K)	3389	-
Color Rendering Index (CRI)	81.9	-
R9	3	-
Chromaticity Coordinate (x,y)	x = 0.4136 y = 0.3984	-
Chromaticity Coordinate (u,v)	u = 0.2379 v = 0.3438	-
Chromaticity Coordinate (u',v')	u' = 0.2379 v' = 0.5157	-
Duv	0.0017	-
Zone Lumens between 0-60 °	-	77.47%

3.3 Color Rendering Details

R1	R2	R3	R4	R5	R6	R7	R8
80	90	96	79	80	87	84	59
R9	R10	R11	R12	R13	R14	R15	-
3	76	78	65	82	99	72	-

3.4 Electrical data on 277V

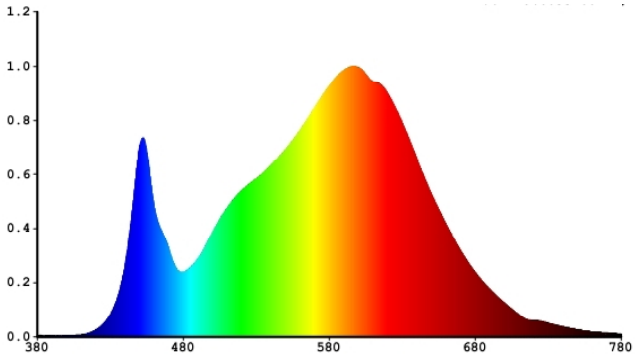
Criteria Item	Result(Sphere)	Result(Goniophotometer)
Input Voltage & Frequency	277.00 V~60Hz	-
Power Factor	0.927	-
I-THD	10.93%	-

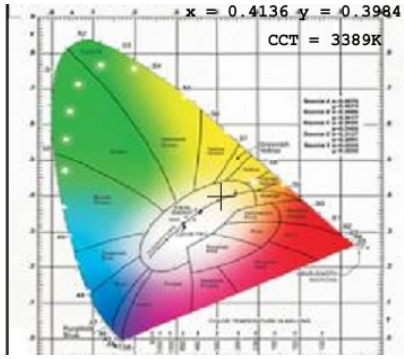
Note:

4, Self-absorption is 1.

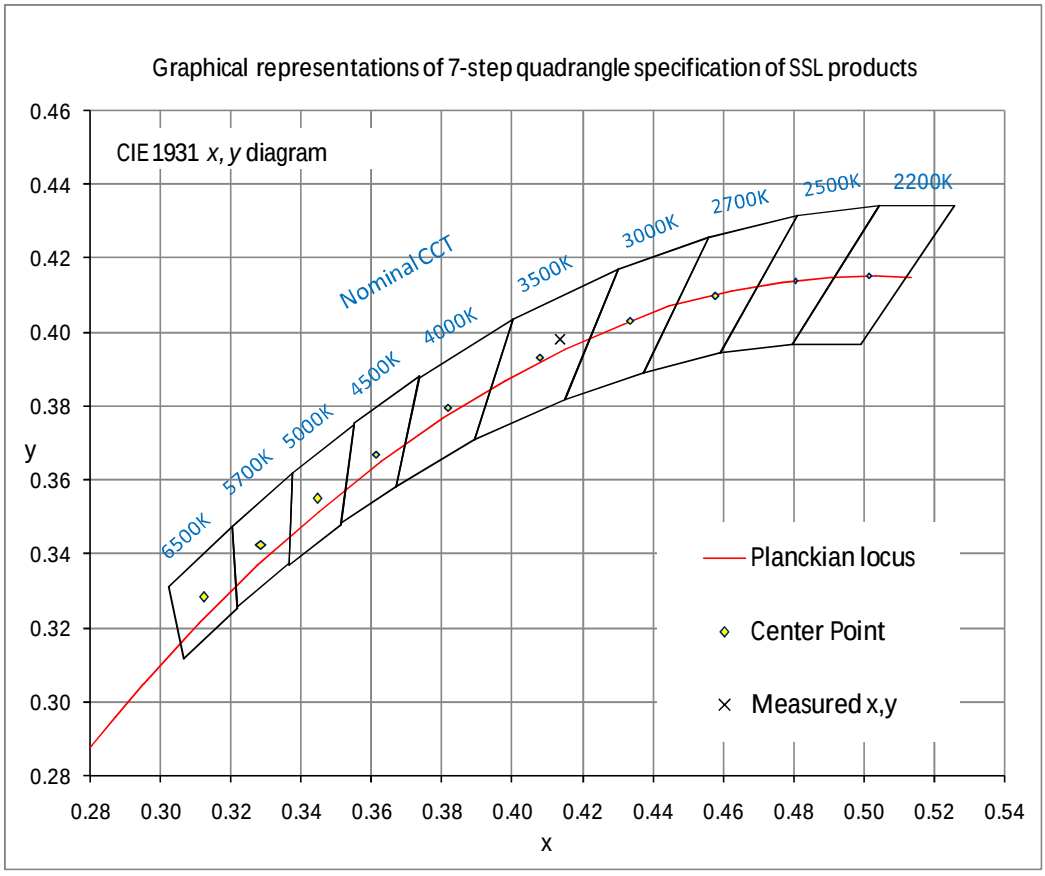
4. Test Data

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)	1.28	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

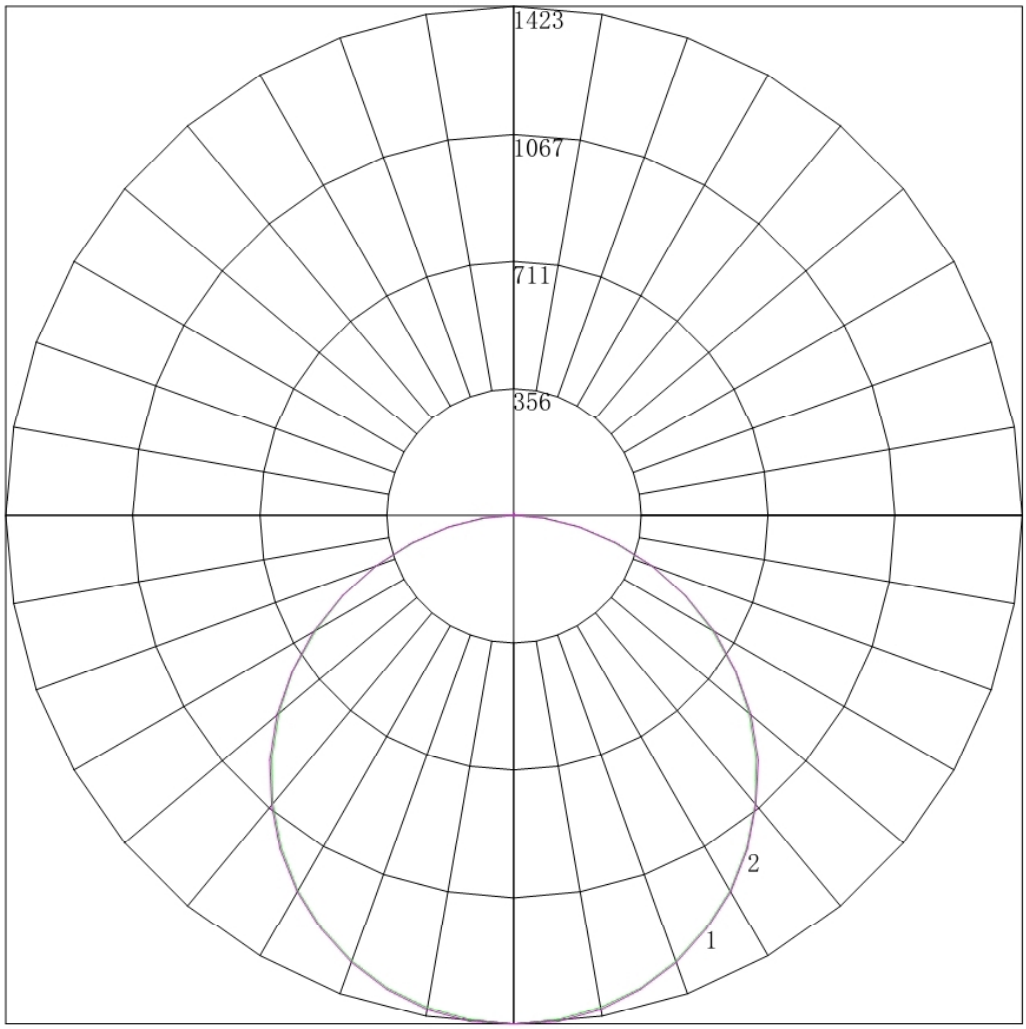
Zone	Lumens	%Lamp	%Fixt
0-20	520.88	12.50	12.50
0-30	1108.08	26.50	26.50
0-40	1818.84	43.60	43.60
0-60	3234.48	77.50	77.50
0-80	4068.01	97.40	97.40
0-90	4164.61	99.70	99.70
10-90	4029.95	96.50	96.50
20-40	1297.96	31.10	31.10
20-50	2039.19	48.80	48.80
40-70	1936.89	46.40	46.40
60-80	833.53	20.00	20.00
70-80	312.28	7.50	7.50
80-90	96.59	2.30	2.30
90-110	4.14	0.10	0.10
90-120	5.23	0.10	0.10
90-130	6.32	0.20	0.20
90-150	8.22	0.20	0.20
90-180	10.50	0.30	0.30
110-180	6.36	0.20	0.20
0-180	4175.11	100.00	100.00

Total Luminaire Efficiency = 100.00%

ZONAL LUMEN SUMMARY

Zone	Lumens
0-10	134.65
10-20	386.23
20-30	587.20
30-40	710.76
40-50	741.22
50-60	674.41
60-70	521.25
70-80	312.28
80-90	96.59
90-100	2.86
100-110	1.28
110-120	1.09
120-130	1.09
130-140	0.90
140-150	1.01
150-160	1.06
160-170	0.88
170-180	0.34

4.5 Polar Curves

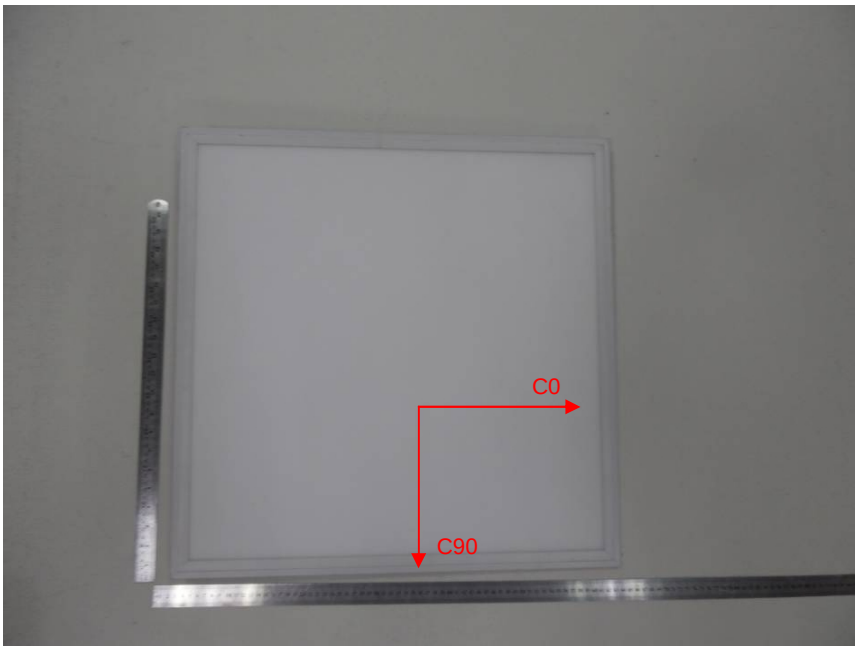


Maximum Candela = 1422.564 Located At Horizontal Angle = 0, Vertical Angle = 0
1 - Vertical Plane Through Horizontal Angles (0 - 180)
2 - Vertical Plane Through Horizontal Angles (90 - 270)

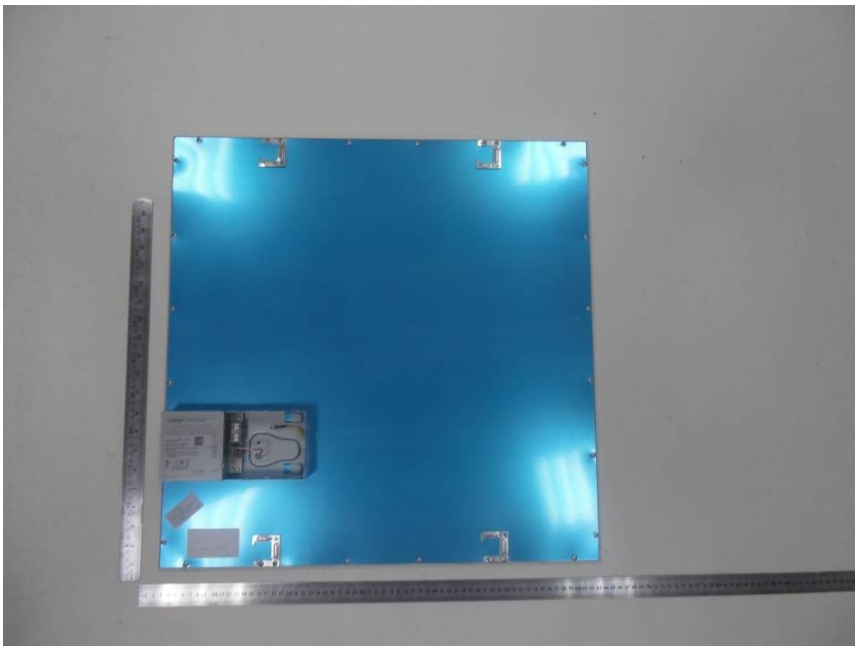
4.6 Candela Tabulation

	0	15	30	45	60	75	90
0	1422.564	1422.564	1422.564	1422.564	1422.564	1422.564	1422.564
5	1416.264	1416.171	1416.659	1416.554	1416.375	1416.665	1420.448
10	1397.587	1397.614	1398.127	1398.035	1398.076	1398.438	1402.328
15	1368.307	1367.715	1367.698	1367.851	1368.420	1367.593	1371.715
20	1326.028	1326.339	1326.615	1326.579	1326.963	1326.505	1331.046
25	1272.881	1273.510	1273.236	1272.842	1274.217	1273.111	1276.422
30	1209.618	1215.003	1210.625	1210.213	1209.537	1210.491	1213.435
35	1135.088	1134.180	1135.693	1135.785	1136.516	1136.251	1139.409
40	1049.998	1051.273	1052.618	1053.217	1053.890	1051.590	1054.580
45	960.428	961.487	961.132	962.043	960.665	961.785	966.473
50	858.835	860.536	861.255	860.448	859.806	860.646	865.121
55	755.512	754.566	754.584	755.505	755.000	756.542	757.125
60	641.631	638.807	641.302	642.576	642.233	642.385	647.180
65	525.842	524.582	525.422	526.722	528.488	526.105	529.971
70	408.278	408.559	409.920	410.444	410.550	412.128	411.080
75	290.892	292.912	292.464	294.231	294.143	297.692	297.284
80	181.625	183.125	182.687	185.208	185.967	186.906	186.286
85	79.677	79.909	81.012	82.547	82.958	82.797	84.176
90	7.187	7.147	7.703	7.187	5.635	5.590	3.718
95	1.287	1.243	1.354	1.397	1.442	1.464	1.508
100	1.198	1.243	1.243	1.308	1.264	1.242	1.286
105	1.287	1.199	1.221	1.220	1.176	1.220	1.242
110	1.109	1.154	1.132	1.175	1.131	1.175	1.153
115	1.065	1.043	1.065	1.065	1.042	1.064	1.064
120	1.153	1.132	1.132	1.109	1.109	1.131	1.153
125	1.242	1.243	1.265	1.264	1.264	1.242	1.241
130	1.242	1.221	1.198	1.242	1.198	1.220	1.196
135	1.020	1.088	1.065	1.042	1.043	1.042	1.019
140	1.331	1.310	1.310	1.309	1.353	1.308	1.284
145	1.597	1.643	1.642	1.641	1.619	1.641	1.638
150	1.863	1.842	1.842	1.863	1.863	1.863	1.815
155	2.307	2.286	2.308	2.351	2.285	2.350	2.346
160	2.795	2.797	2.774	2.794	2.773	2.772	2.789
165	3.105	3.152	3.129	3.171	3.128	3.127	3.188
170	3.372	3.396	3.374	3.327	3.372	3.393	3.410
175	3.682	3.707	3.729	3.681	3.749	3.725	3.720
180	3.865	3.865	3.865	3.865	3.865	3.865	3.865

Appendix A Product Photo



Picture 1



Picture 2

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