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Test report of

## IES LM-79-08

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

Rendered to:

Zhejiang Starco Lighting Co., Ltd

8-3 Geshan Road, 322110, Dongyang, Zhejiang, China

For products:

LED Tube

Models No.:

SLT836P850

**Test Date:** Nov. 29, 2016 to Nov. 30, 2016

**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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**Dec. 8, 2016**

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## 1. General

### 1.1 Product Information

Brand Name	-
Product Type	LED Tube
Model Number	SLT836P850
Rated Inputs	100-277V, 50/60Hz
Rated Power	36W
Rated Light output	N/A
Declared CCT	5000K
Power Supply	Internal LED Driver
LED Package, Array or Module	Model: 2835 White SMD LED, manufactured by ShenZhen JuFei Optoelectronics Co., Ltd.
Receipt Samples	1 unit
Date of Receipt Samples	Nov. 26, 2016
Note	-

## 1.2 Standards or methods

The following standards are partly or totally used or referenced for test:

No.	Name
ANSI/NEMA/ ANSLG C78.377-2011	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	2016-02-04	2017-02-03
AC Power supply	LC-I-987	APW-110N	2016-02-04	2017-02-03
Power analyzer	LC-I-928	WT210	2016-01-24	2017-01-24
Power analyzer	LC-I-954	WT210	2016-02-04	2017-02-03
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	2016-02-03	2017-02-02
Wireless temperature transmitter	LC-I-979	DWRF-B	2016-02-03	2017-02-02

## 2. Test conducted and method

The Tube 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 both sphere-spectroradiometer system and 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.

Spectral radiant flux was measured by a sphere (2 meter)-spectroradiometer system, and the total luminous flux was 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	120.00V~60Hz	120.02V~60Hz
Input Current(A)	0.283	0.145
Total Power(W)	33.75	34.54
Power Factor	0.993	0.994
I-THD	5.03%	-
Off-state Power(W)	-	-

#### 3.2 Photometric data

Criteria Item	Result(Sphere)	Result(Goniophotometer)
Total Lumens(lm)	4244.23	4357.82
Luminaire Efficacy(Lm/W)	125.75	126.17
Correlated Color Temperature (CCT)(K)	4956	-
Color Rendering Index (CRI)	82.4	-
R9	2	-
Chromaticity Coordinate (x,y)	x = 0.3473 y = 0.3621	-
Chromaticity Coordinate (u,v)	u = 0.2089 v = 0.3267	-
Chromaticity Coordinate (u',v')	u' = 0.2089 v' = 0.4900	-
Duv	0.00431	-
Zone Lumens between 0-60 °	-	48.80%

Note:

\*:The Total Lumens is based on the test data of half of model SLT836P850 multiplied by 2, the luminaire efficacy is equal to total lumens divided by total power.

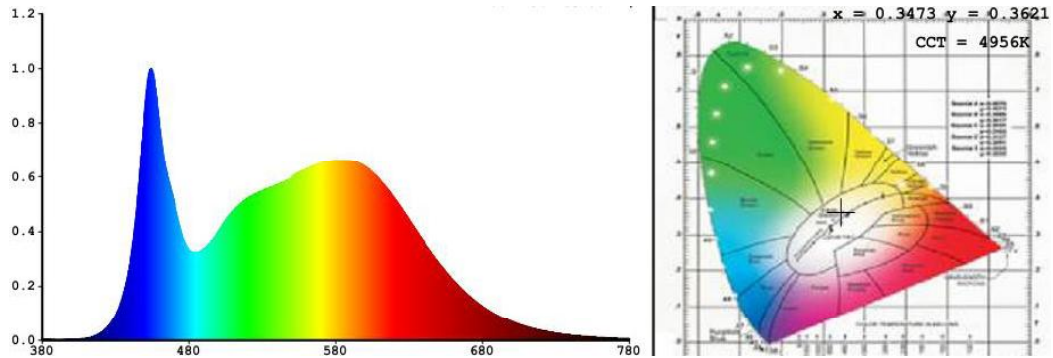
#### 3.3 Color Rendering Details

R1	R2	R3	R4	R5	R6	R7	R8
80	91	95	78	80	86	86	64
R9	R10	R11	R12	R13	R14	R15	-
2	77	77	56	83	98	74	-

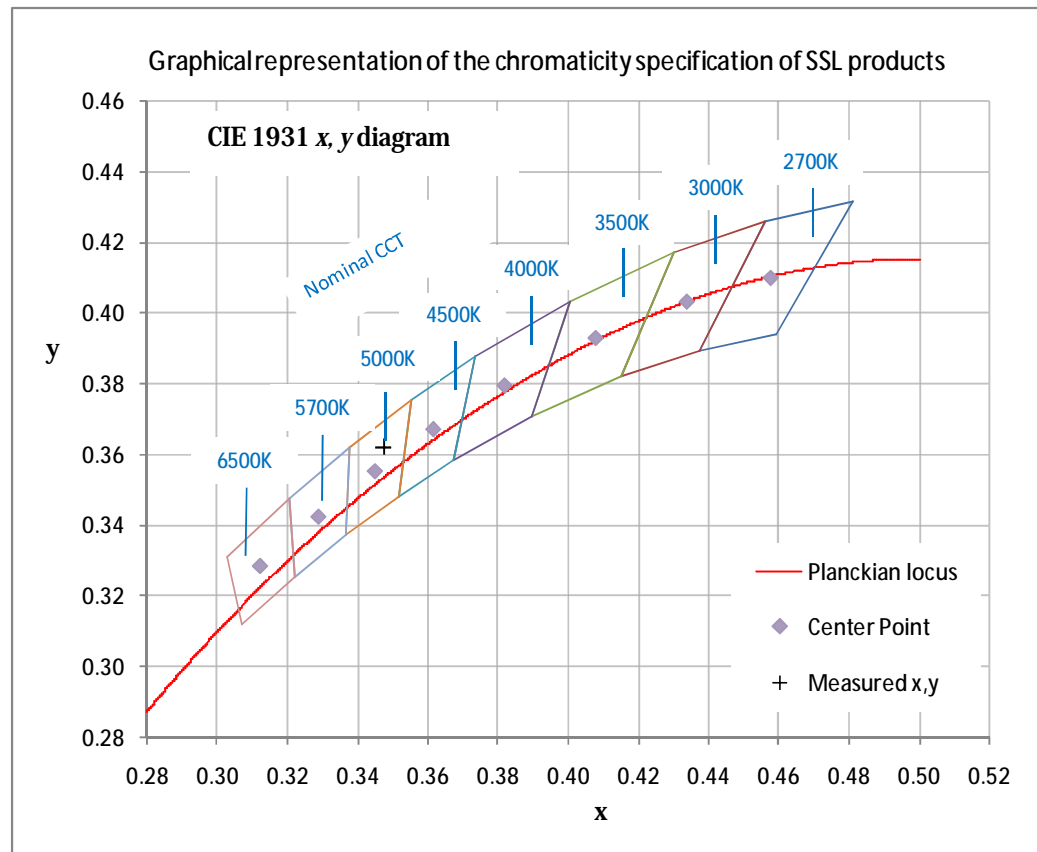
Note: N.A.

## 4. Test Data

### 4.1 Spectral Distribution



### 4.2 ANSI Chromaticity Quadrangles Diagram



#### 4.3 Goniometry Test Data (half of SLT836P850)

CIE Type	Semi-Direct	Basic Luminous Shape	Rectangular w/Sides
Spacing Criteria (0-180)	1.26	Luminous Length	1.11 m
Spacing Criteria (90-270)	1.42	Luminous Width	0.03 m
Spacing Criteria (Diagonal)	1.50	Luminous Height	0.02m
Test Distance	29.65 m		

#### 4.4 Zonal Lumen Summary (half of SLT836P850)

Zone	Lumens	%Lamp	%Fixt
0-20	173.38	7.10	7.10
0-30	373.38	15.40	15.40
0-40	624.62	25.70	25.70
0-60	1185.3	48.80	48.80
0-80	1677.23	69.10	69.10
0-90	1866.65	76.90	76.90
10-90	1822.14	75.00	75.00
20-40	451.25	18.60	18.60
20-50	730.08	30.10	30.10
40-70	823.71	33.90	33.90
60-80	491.93	20.30	20.30
70-80	228.90	9.40	9.40
80-90	189.41	7.80	7.80
90-110	276.65	11.40	11.40
90-120	371.53	15.30	15.30
90-130	441.98	18.20	18.20
90-150	526.10	21.70	21.70
90-180	562.27	23.10	23.10
110-180	285.61	11.80	11.80
0-180	2178.91	100.00	100.00

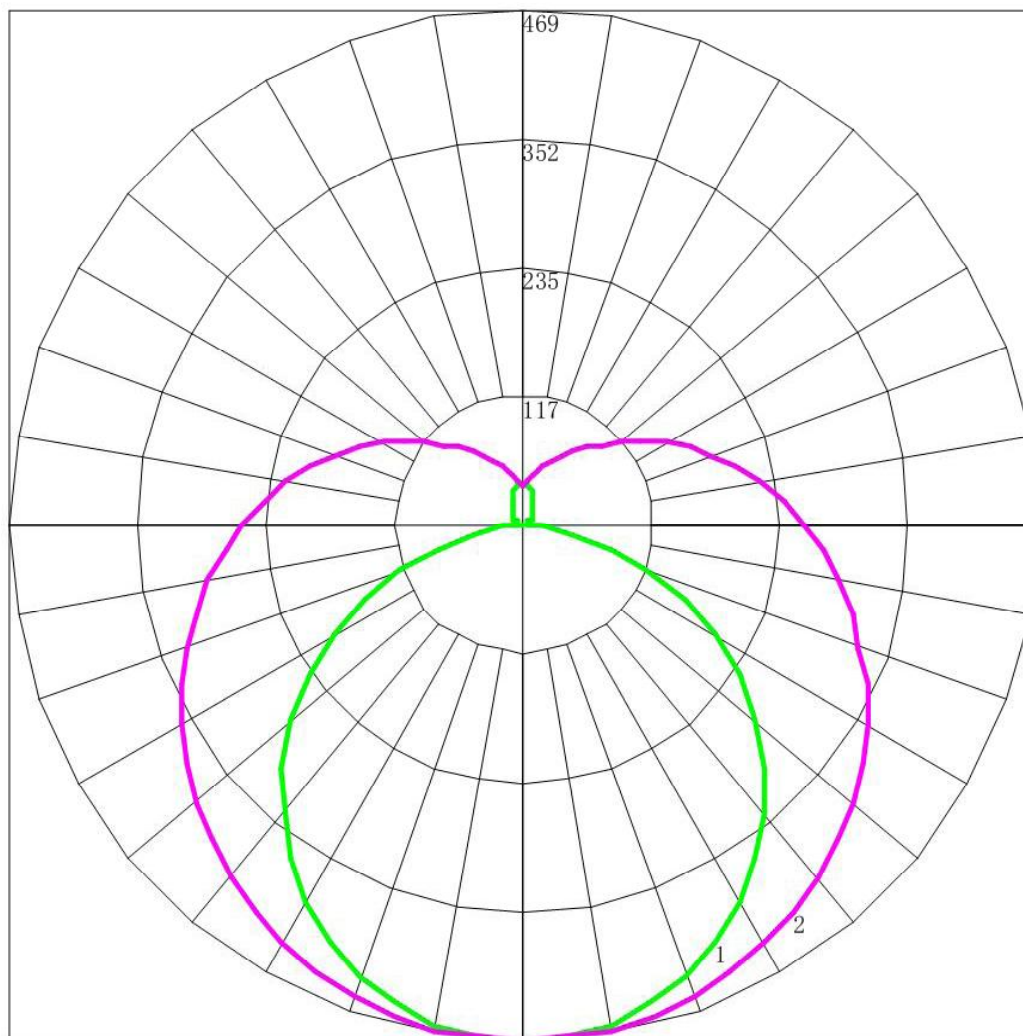
Total Luminaire Efficiency = 100.00%

#### ZONAL LUMEN SUMMARY

Zone	Lumens
0-10	44.50
10-20	128.87
20-30	200.01
30-40	251.24
40-50	278.83
50-60	281.85
60-70	263.03
70-80	228.90
80-90	189.41
90-100	153.85
100-110	122.81
110-120	94.88
120-130	70.45
130-140	50.08
140-150	34.03
150-160	21.23
160-170	11.39
170-180	3.54



#### 4.5 Polar Curves (half of SLT836P850)



Maximum Candela = 469.396 Located At Horizontal Angle = 0, Vertical Angle = 0

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

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

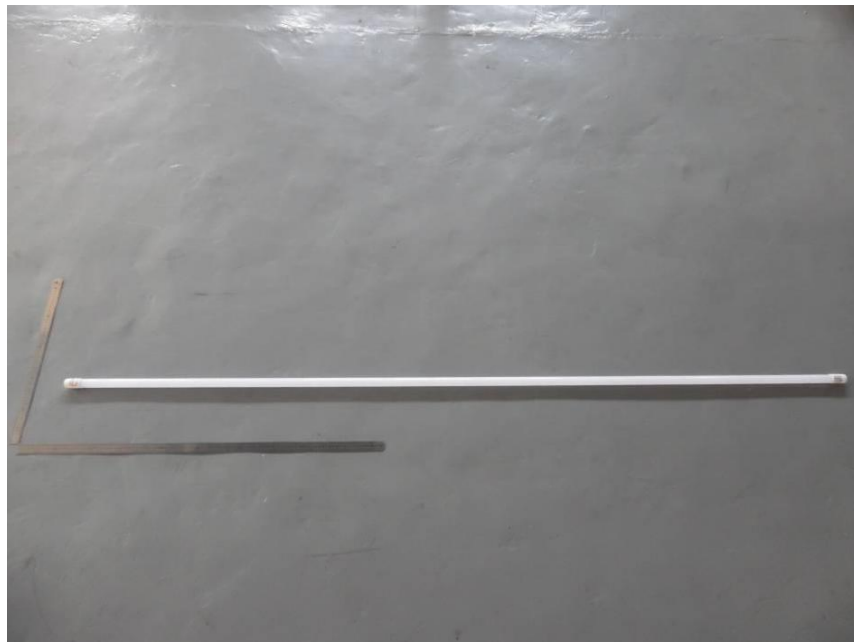
4.6 Candela Tabulation (half of SLT836P850)

	<u>0</u>	<u>15</u>	<u>30</u>	<u>45</u>	<u>60</u>	<u>75</u>	<u>90</u>
0	469.396	469.396	469.396	469.396	469.396	469.396	469.396
5	466.343	467.096	467.524	467.047	468.257	468.652	468.787
10	460.769	460.571	461.629	463.426	464.985	465.408	465.354
15	449.709	451.213	453.668	455.922	459.280	460.699	461.094
20	435.507	436.833	440.759	446.447	451.689	454.871	456.096
25	416.970	419.599	425.758	433.720	441.750	446.657	448.490
30	394.761	398.671	407.152	419.154	430.255	437.059	439.667
35	369.809	374.513	386.500	401.952	416.937	426.545	429.323
40	340.876	347.368	363.781	383.194	401.710	414.913	418.153
45	310.173	318.675	338.424	363.428	386.200	401.329	405.723
50	275.488	286.220	311.809	342.059	368.760	387.331	392.032
55	239.963	253.014	283.767	319.880	351.404	371.906	377.342
60	200.898	218.614	255.590	297.591	332.912	355.477	361.522
65	161.037	182.641	227.414	274.951	314.177	338.913	344.919
70	121.353	148.351	200.514	253.033	294.741	321.104	327.621
75	81.270	115.498	174.738	231.842	275.633	303.401	310.018
80	45.435	86.672	152.061	211.155	256.526	285.087	292.242
85	17.475	63.886	131.563	192.155	237.989	266.356	273.814
90	4.026	47.581	113.659	173.553	219.341	247.954	255.516
95	2.212	37.361	98.990	156.726	201.111	229.333	237.045
100	3.053	31.366	86.563	141.237	184.283	211.017	218.791
105	4.336	28.270	76.424	126.539	167.434	193.096	200.710
110	5.751	26.722	68.419	113.946	151.311	175.679	183.021
115	7.300	26.213	61.712	102.078	136.063	158.919	165.810
120	8.981	26.280	56.500	91.460	122.068	142.839	149.120
125	10.795	26.546	52.322	82.269	109.057	127.153	133.082
130	12.343	27.165	49.133	74.218	96.860	112.563	117.871
135	14.113	28.248	46.515	67.066	86.066	99.112	103.484
140	15.838	29.113	44.405	61.253	76.633	87.392	90.967
145	17.519	30.264	42.998	56.228	68.603	76.986	79.710
150	19.378	30.399	40.734	52.126	61.407	67.872	69.757
155	20.837	30.929	37.812	47.631	55.572	60.138	61.500
160	24.642	31.766	36.050	42.409	50.004	53.566	54.459
165	29.597	32.185	36.665	38.942	43.313	48.702	49.634
170	34.154	34.111	36.683	38.041	37.782	42.071	44.419
175	37.826	37.343	37.542	37.599	36.849	33.870	38.899
180	35.288	35.288	35.288	35.288	35.288	35.288	35.288

## Appendix 1 Product Photo



Picture 1



Picture 2

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