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Test report of

IES LM-79-08

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

Rendered to:

Revolution Lighting Technologies, Inc.
2280 Ward Ave Simi Valley, CA 93065, USA

For products:

2x4 Luminaires for Ambient Lighting of Interior Commercial Spaces

Models No.:

154036-111

Test Date: Nov. 1, 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: *This report was based on the LCZP17060530 except the applicant, brand name and model number.*

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1. General

1.1 Product Information

Brand Name	Revolution Lighting Technologies
Category	Indoor
General Application	Troffer
Primary Use	2x4 Luminaires for Ambient Lighting of Interior Commercial Spaces
Model Number	154036-111
Rated Inputs	100-277V, 50/60Hz
Rated Power	50W
Rated Light output	6250lm
Declared CCT	3000K
Power Supply	N/A
LED Package, Array or Module	Model: 67-21S Series, manufactured by EVERLIGHT ELECTRONICS CO., LTD
Receipt Samples	1 unit
Sample Code of lab.	171028105003
Date of Receipt Samples	Oct. 28, 2017
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	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-011	D204C	2017-09-07	2018-09-06
Luminous Flux Standard Lamp	LC-PL-I-003	24V100W	2017-10-08	2018-10-07
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

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 $25\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$; 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	120.00V~60Hz	120.08V~60Hz
Input Current(A)	0.430	0.429
Total Power(W)	51.25	51.21
Power Factor	0.994	0.994
I-THD	3.29%	-
Off-state Power(W)	-	-

3.2 Photometric data

Criteria Item	Result(Sphere)	Result(Goniophotometer)
Total Lumens(lm)	-	6392.53
Luminaire Efficacy(Lm/W)	-	124.83
Correlated Color Temperature (CCT)(K)	3185	-
Color Rendering Index (CRI)	84.8	-
R9	17	-
Chromaticity Coordinate (x,y)	x = 0.4181 y = 0.3851	-
Chromaticity Coordinate (u,v)	u = 0.2464 v = 0.3405	-
Chromaticity Coordinate (u',v')	u' = 0.2464 v' = 0.5108	-
Duv	-0.00496	-
Spacing Criteria(0-180°)	-	1.24
Spacing Criteria(90-270°)	-	1.32
Zone Lumens between 0-60 °	-	73.50%

3.3 Color Rendering Details

R1	R2	R3	R4	R5	R6	R7	R8
85	95	94	82	86	93	82	62
R9	R10	R11	R12	R13	R14	R15	-
17	88	83	75	89	97	79	-

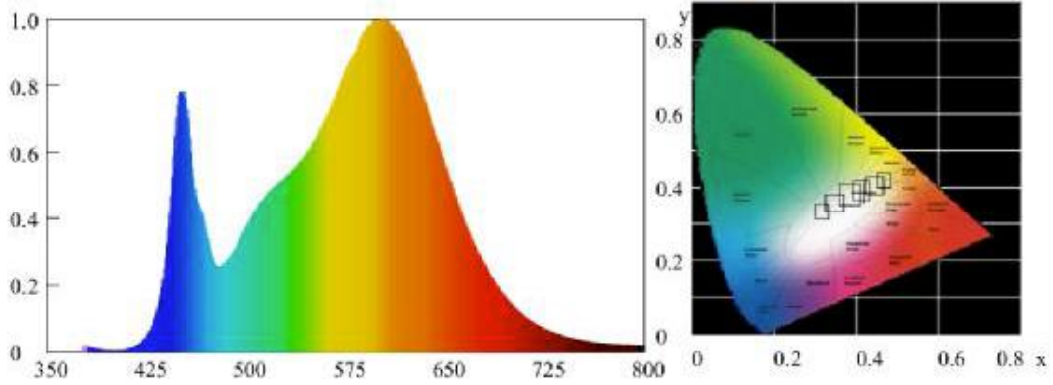
3.4 Additional test at 277V

Criteria Item	Result(Sphere)	Result(Goniophotometer)
Input Voltage & Frequency	276.97V~60Hz	-
Power Factor	0.911	-
I-THD	9.19%	-

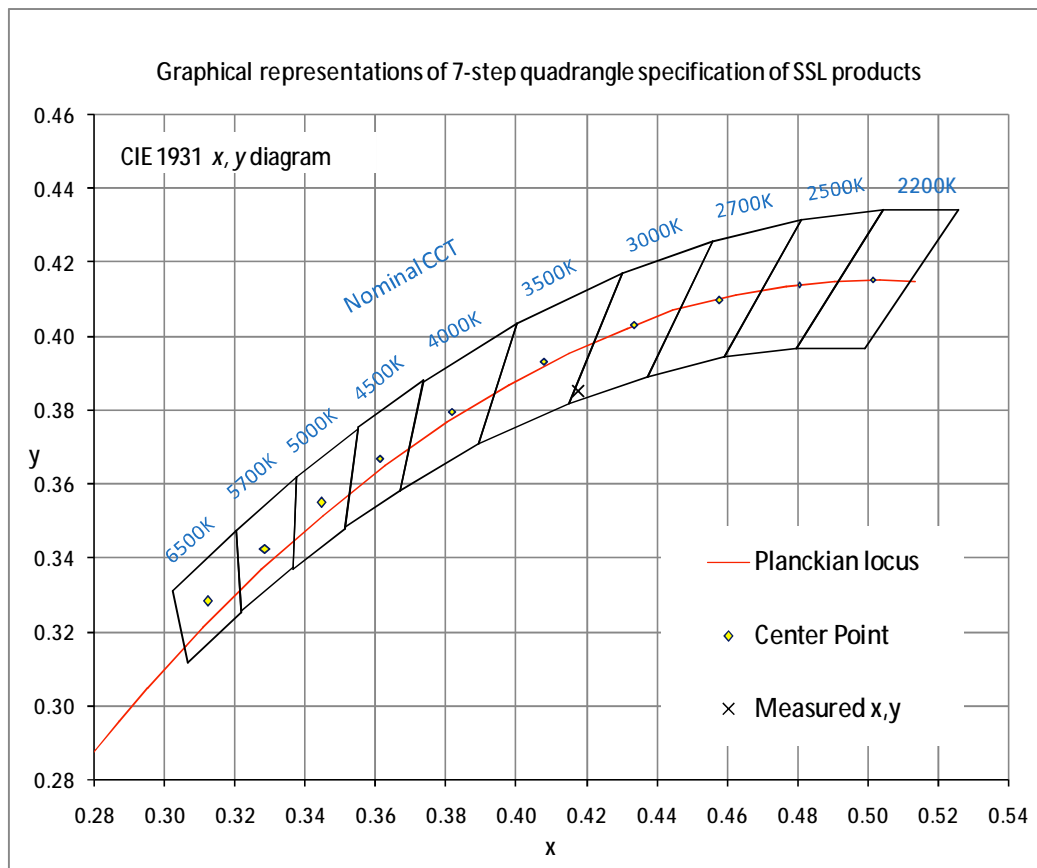
Note: N.A.

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	1.16 m
Spacing Criteria (90-270)	1.32	Luminous Width	0.56 m
Spacing Criteria (Diagonal)	1.40	Luminous Height	0.00 m
Test Distance	29.79 m	Luminous Diameter	N/A

4.4 Zonal Lumen Summary

Zone	Lumens	%Lamp	%Fixt
0-20	740.35	11.60	11.60
0-30	1575.8	24.70	24.70
0-40	2593.96	40.60	40.60
0-60	4698.97	73.50	73.50
0-80	6171.24	96.50	96.50
0-90	6366.69	99.60	99.60
10-90	6175.3	96.60	96.60
20-40	1853.61	29.00	29.00
20-50	2934.71	45.90	45.90
40-70	2968.21	46.40	46.40
60-80	1472.27	23.00	23.00
70-80	609.06	9.50	9.50
80-90	195.45	3.10	3.10
90-110	8.96	0.10	0.10
90-120	12.37	0.20	0.20
90-130	15.48	0.20	0.20
90-150	20.87	0.30	0.30
90-180	25.84	0.40	0.40
110-180	16.88	0.30	0.30
0-180	6392.53	100.00	100.00

Total Luminaire Efficiency = 100.00%

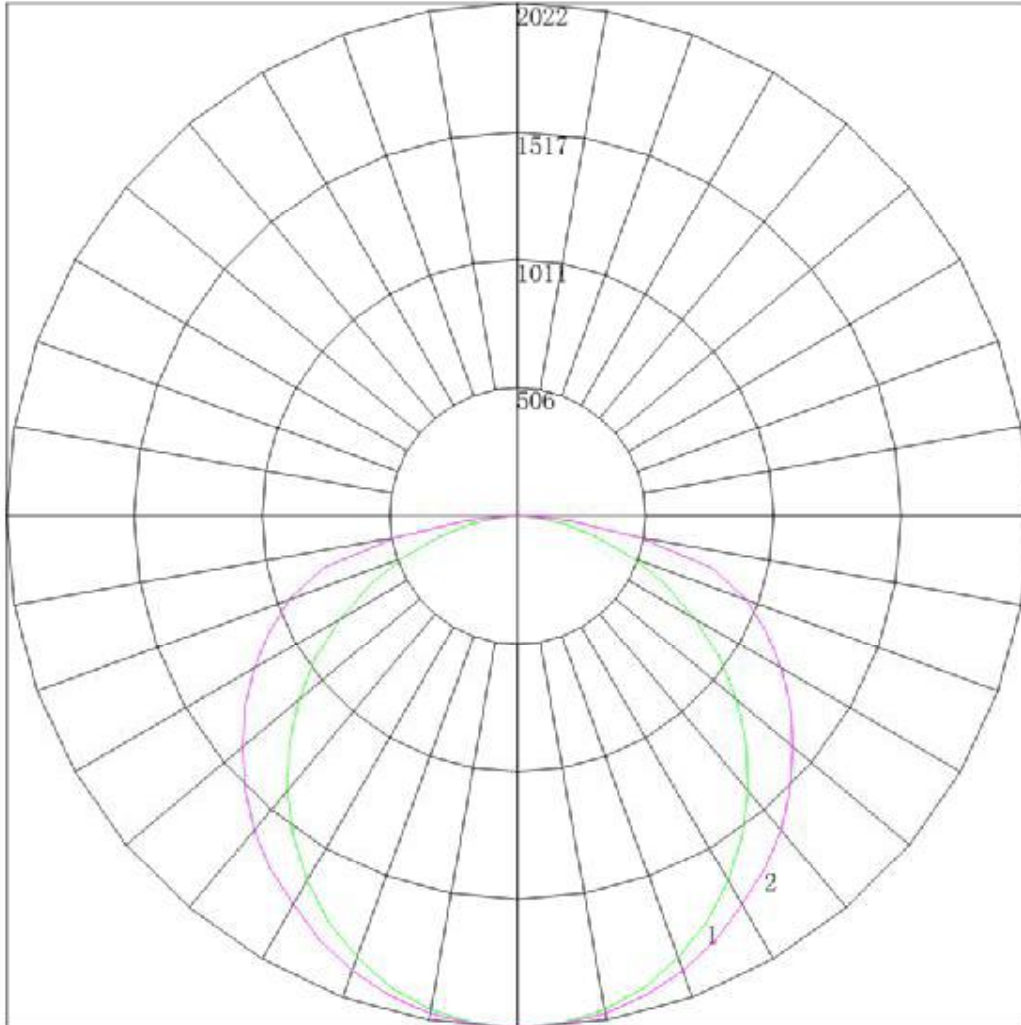
ZONAL LUMEN SUMMARY

Zone	Lumens
0-10	191.39
10-20	548.97
20-30	835.45
30-40	1018.16
40-50	1081.1
50-60	1023.91
60-70	863.21
70-80	609.06
80-90	195.45
90-100	5.07
100-110	3.90
110-120	3.40
120-130	3.12
130-140	2.68
140-150	2.71
150-160	2.50
160-170	1.80
170-180	0.68



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4.5 Polar Curves



Maximum Candela = 2022.448 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	2022.448	2022.448	2022.448	2022.448	2022.448	2022.448	2022.448
5	2011.742	2011.754	2012.471	2014.023	2014.699	2014.924	2016.268
10	1980.518	1980.341	1984.094	1988.078	1991.448	1993.677	1994.639
15	1929.667	1929.770	1937.540	1945.060	1953.362	1958.265	1959.768
20	1857.851	1863.156	1871.475	1886.959	1900.210	1908.690	1912.539
25	1769.887	1776.538	1787.132	1815.339	1833.107	1848.493	1852.068
30	1666.177	1674.235	1693.510	1729.482	1756.646	1775.820	1774.999
35	1545.161	1557.208	1582.416	1629.229	1667.067	1698.286	1704.644
40	1416.605	1429.060	1462.702	1518.272	1569.642	1609.073	1620.604
45	1278.906	1292.319	1332.345	1400.749	1464.729	1511.959	1524.292
50	1129.832	1144.190	1198.147	1274.972	1351.685	1407.492	1420.963
55	974.513	992.960	1055.331	1144.015	1234.266	1297.104	1316.441
60	811.522	836.477	908.100	1009.447	1109.387	1178.853	1202.960
65	647.148	676.340	764.151	877.968	981.764	1057.676	1085.418
70	484.736	526.232	622.280	744.571	854.509	935.512	962.270
75	323.039	378.593	485.608	610.800	719.741	788.480	795.099
80	185.428	243.476	357.824	448.620	483.174	479.988	488.672
85	69.140	120.052	168.897	177.730	184.560	182.510	184.694
90	3.792	4.055	4.966	5.518	6.417	7.851	11.827
95	3.479	3.654	3.925	4.325	4.651	4.803	4.812
100	3.345	3.520	3.725	3.992	4.231	4.404	4.415
105	3.301	3.364	3.459	3.682	3.876	3.984	4.061
110	3.033	3.097	3.215	3.460	3.632	3.718	3.885
115	3.033	3.097	3.193	3.416	3.522	3.696	3.752
120	3.167	3.275	3.415	3.504	3.588	3.740	3.840
125	3.256	3.297	3.459	3.571	3.654	3.740	3.929
130	3.078	3.052	3.170	3.304	3.411	3.452	3.487
135	3.390	3.319	3.348	3.371	3.388	3.364	3.487
140	3.792	3.787	3.769	3.814	3.876	3.895	4.017
145	4.238	4.233	4.235	4.302	4.363	4.382	4.458
150	4.817	4.790	4.789	4.879	4.828	4.891	4.987
155	5.308	5.414	5.410	5.411	5.470	5.511	5.473
160	5.888	5.882	5.854	5.988	6.046	6.086	6.135
165	6.289	6.260	6.274	6.365	6.400	6.485	6.532
170	6.736	6.773	6.740	6.764	6.821	6.905	6.841
175	7.137	7.107	7.117	7.185	7.309	7.304	7.239
180	7.390	7.390	7.390	7.390	7.390	7.390	7.390

Appendix 1 Product Photo



Picture 1



Picture 2

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