IESNA LM79-2008 Test Report

TÜV SÜD America

Photometric Testing and Evaluation in Accordance with LM79-2008

Report Prepared for:

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Sample Tested:	**RKT2014U4050DV**
Sample Description:	**2x2 LED Retrofit Luminaire**
Manufacturer:	**Maxlite, Inc.**
Technical Report Number:	**JI1402123-07-LM79**
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Total Number of Pages:	**10** (including this page)

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IESNA LM79-2008
TEST REPORT

March 14, 2014

Summary of Key Test Results

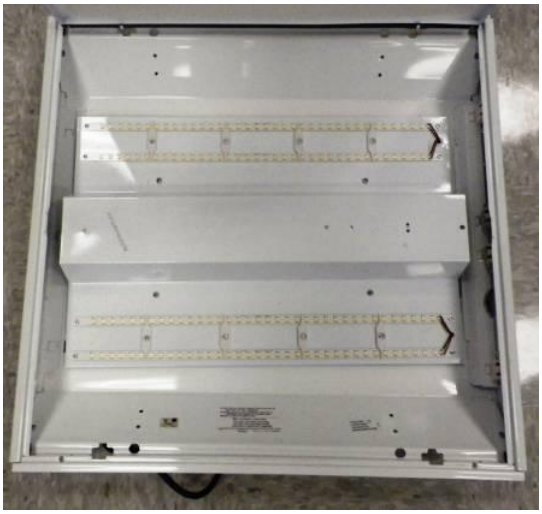
Model# **RKT2014U4050DV**

Manufacturer **Maxlite, Inc.**

TÜV Sample# 1244-7

Date of Test March 13th , 2014

Notes: Tested in intended orientation
(Aperture Downward) with door installed



Parameter	Measured Result
Luminous Flux	**3,935 Lumens**
Input Power	**38.55 Watts**
Efficacy	**102.08 Lumens/Watt**
C.C.T.	**5300 K**
C.R.I. (R_a)	**85.9**
Beam Angle	**91.1° (V) / 89.5° (H)**
Stabilization Time	**46 minutes**
In-Situ Temp Test (ISTMT)**	**49.8°C (LED)**

The above results are recorded / derived from measurements in accordance with LM79-08

**ISTMT in accordance with "Energy Star Program Requirements for Luminaires – Version 1.2".

IESNA LM79-2008
TEST REPORT

March 14, 2014

TABLE OF CONTENTS

IESNA LM79-2008
TEST REPORT

March 14, 2014

Test Results –

The following results were obtained after stabilization of the sample in accordance with the requirements set forth in section 5.0 of IES LM79-2008. Stability is achieved when the variation of 3 readings of light output and electrical power over a period of 30 minutes, taken 15 minutes apart, is less than 0.5%.

Photometric Results	Maxlite - RKT2014U4050DV	
	Integrating Sphere	Goniophotometer
Total Luminous Flux (Lumens)	3995.0	3975.5
Luminous Efficacy (Lumens/Watt)	102.08	103.1
Total Radiant Flux (Watts)	13.1	-
Correlated Color Temperature (CCT)	5300	-
Color Rendering Index (CRI – R_a)	85.9	-
R_9 Value	33.1	-
Chromaticity (Chroma x / Chroma y)	0.3371 / 0.3450	-
Chromaticity (Chroma u / Chroma v)	0.2085 / 0.3201	-
Chromaticity (Chroma u' / Chroma v')	0.2085 / 0.4802	-
D_{uv} Value	0.00040	-

Electrical Results (120V unless stated otherwise)	Maxlite - RKT2014U4050DV	
	Integrating Sphere	Goniophotometer
Input Power (Watts)	38.55	38.55
Input Voltage (Volts AC)	120.02	120.04
Input Current (Amps)	0.324	0.320
Power Factor @120VAC	0.991	0.991
Power Factor @277VAC	0.919	N/A
Input Frequency (Hertz)	60.0	60.0
A-THD @120VAC (Current %)	12.17%	12.11%
A-THD @277VAC (Current %)	16.34%	N/A

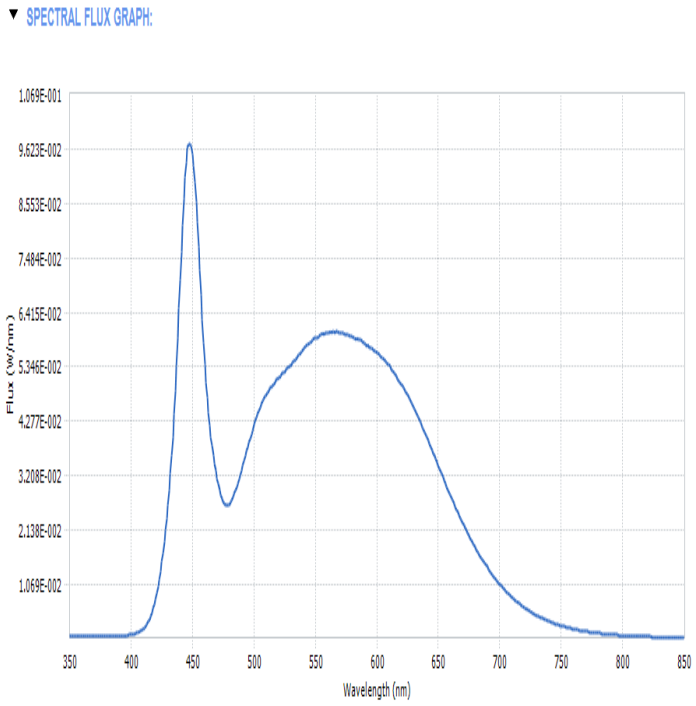
Additional Parameters	Maxlite - RKT2014U4050DV	
	Integrating Sphere	Goniophotometer
Stabilization Time (Light and Power)	46 minutes	50 minutes
Test Geometry Configuration	4π	Type C
Ambient Temperature	25.2°C	25.3°C
ISTMT (In-Situ Temperature Measurement)	49.8°C (LED)	
Spacing Criteria	1.24 (0° – 180°) / 1.20 (90° – 270°)	

IESNA LM79-2008
TEST REPORT

March 14, 2014

Spectral Flux and Chromaticity Diagram

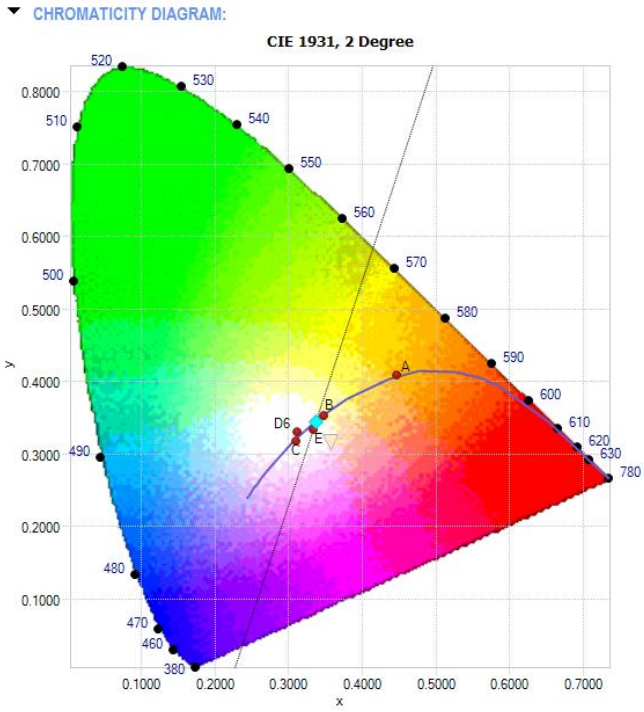
Spectral Flux



Spectral response of the Radiant Flux

(350nm to 850nm)

Chromaticity Diagram



Tristimulus values (from page 4):

x / y = 0.3371 / 0.3450

The locations on the diagram of the tristimulus coordinates are indicated by the blue diamond.

Zonal Lumen Summary

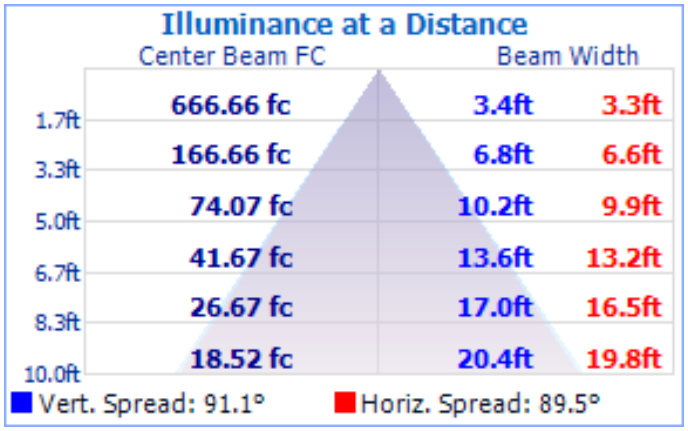
Zone	Lumens	% Lamp / Luminaire
0 - 60	3452.1	86.8 %
60 - 90	523.4	13.2 %
0 - 90	3975.6	100 %
90 - 180	0.0	0.0 %
0 - 180	3975.6	100.0 %

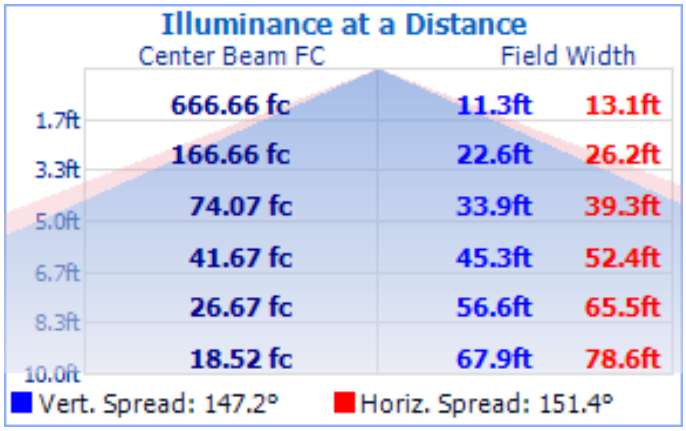
IESNA LM79-2008
TEST REPORT

March 14, 2014

Test Results – Illuminance Plots

The following images depict the illuminance characteristics of the luminaire.



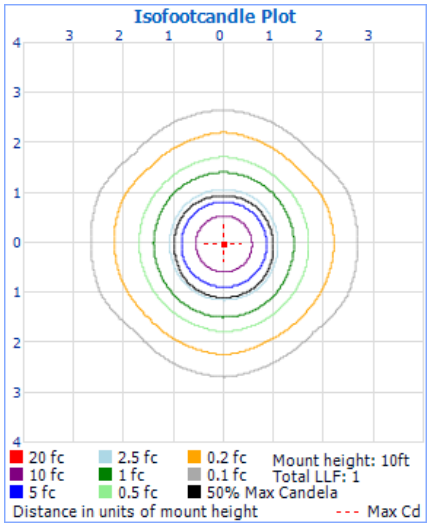


Beam Angle = 91.1° (V) / 89.5° (H)

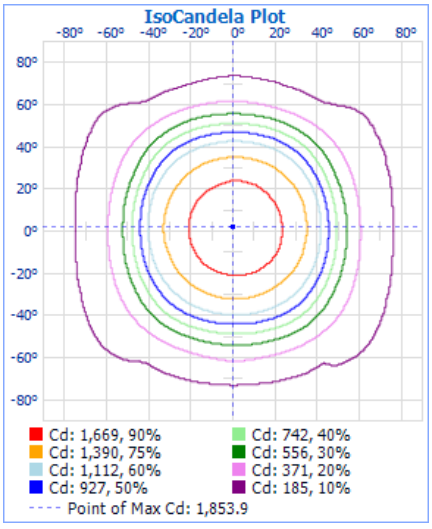
Field Angle = 147.2° (V) / 151.4° (H)

Test Results – Candela Plots

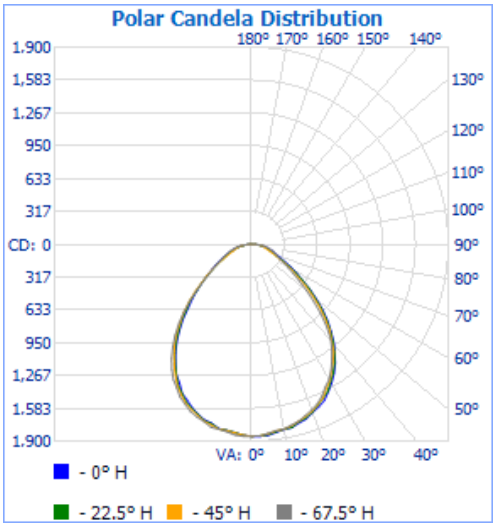
The following images depict the luminous intensity distribution characteristics of the luminaire:



Isofootcandle Plot



Isocandela Plot



Polar Candela

IESNA LM79-2008
TEST REPORT

March 14, 2014

Test Results – Candela Tabulation

The table below displays the tabulated Candela measurements from the IES file:
Horizontal (lateral) angles are shown in **red** across the top of the table, in increments of 22.5°.
Vertical (longitudinal) angles are shown in **blue** down the side of the table, in increments of 2.5°.

	0.0	22.5	45.0	67.5	90.0	112.5	135.0	157.5	180.0	202.5	225.0	247.5	270.0	292.5	315.0	337.5	360.0
0.0	1852	1852	1852	1852	1852	1852	1852	1852	1852	1852	1852	1852	1852	1852	1852	1852	1852
2.5	**1854**	1850	1850	1851	1828	1840	1836	1833	1844	1845	1843	1853	1853	**1854**	**1854**	1853	1853
5.0	1850	1843	1835	1831	1814	1817	1816	1815	1824	1824	1827	1848	1851	1851	1852	1853	1852
7.5	1830	1823	1815	1813	1810	1810	1810	1810	1812	1812	1813	1824	1832	1842	1843	1839	1834
10.0	1814	1810	1810	1809	1805	1809	1800	1803	1806	1809	1810	1810	1812	1815	1816	1816	1818
12.5	1810	1808	1794	1786	1768	1771	1767	1767	1769	1774	1787	1808	1808	1810	1810	1810	1810
15.0	1783	1772	1767	1766	1764	1756	1756	1738	1753	1762	1766	1770	1773	1789	1788	1794	1789
17.5	1766	1755	1742	1731	1725	1721	1720	1711	1717	1722	1731	1748	1762	1765	1766	1767	1765
20.0	1727	1721	1712	1699	1689	1679	1679	1672	1676	1685	1697	1717	1722	1725	1731	1733	1730
22.5	1698	1680	1674	1663	1649	1639	1633	1632	1625	1647	1660	1672	1680	1688	1694	1701	1704
25.0	1664	1638	1635	1613	1589	1590	1573	1565	1585	1589	1602	1629	1628	1645	1647	1661	1666
27.5	1605	1597	1567	1548	1539	1523	1507	1513	1507	1533	1545	1562	1583	1589	1605	1618	1602
30.0	1545	1529	1517	1502	1470	1450	1449	1436	1451	1452	1466	1507	1516	1534	1539	1545	1556
32.5	1481	1470	1442	1432	1415	1378	1368	1356	1367	1372	1389	1431	1462	1467	1486	1487	1480
35.0	1408	1397	1373	1353	1338	1289	1284	1275	1278	1290	1304	1346	1384	1410	1409	1415	1400
37.5	1322	1318	1306	1273	1246	1203	1179	1184	1184	1201	1221	1249	1288	1310	1327	1331	1318
40.0	1237	1222	1202	1189	1136	1105	1088	1073	1080	1096	1126	1148	1182	1211	1235	1229	1235
42.5	1134	1124	1113	1071	1021	995	991	982	976	1000	1014	1037	1062	1091	1128	1140	1144
45.0	1036	1022	1000	946	896	880	884	868	862	884	924	922	932	959	1022	1029	1031
47.5	929	914	888	812	773	759	785	778	772	799	813	808	811	832	898	926	925
50.0	812	798	768	694	660	660	676	662	681	686	711	694	693	712	782	812	814
52.5	706	699	657	579	562	555	575	577	595	597	606	591	602	602	660	700	701
55.0	595	593	547	493	481	475	480	495	520	516	522	501	513	509	551	594	604
57.5	514	500	463	418	426	423	407	416	452	436	443	439	446	429	462	485	511
60.0	438	410	384	374	365	355	350	360	400	375	369	376	376	375	382	400	438
62.5	364	338	305	314	323	312	283	307	346	317	305	335	330	313	302	323	374
65.0	310	267	261	276	285	279	240	265	301	273	259	299	292	277	259	279	310
67.5	266	229	213	265	261	262	207	226	263	237	220	266	263	261	207	237	265
70.0	227	199	177	227	224	224	177	207	223	214	180	234	225	225	177	210	226
72.5	208	177	158	219	220	209	166	177	188	177	176	218	220	218	145	177	207
75.0	177	159	135	187	188	177	135	154	172	161	151	181	192	178	134	169	177
77.5	152	134	132	173	175	147	132	132	136	134	134	162	177	175	132	135	155
80.0	134	124	125	134	137	130	103	93	119	100	116	132	142	137	125	124	132
82.5	96	90	92	117	112	91	76	81	85	80	88	94	121	113	91	90	95
85.0	74	66	71	78	64	54	45	46	46	45	48	67	80	80	64	67	72
87.5	41	40	37	33	21	10	3	11	10	10	15	24	28	37	33	42	43
90.0	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1

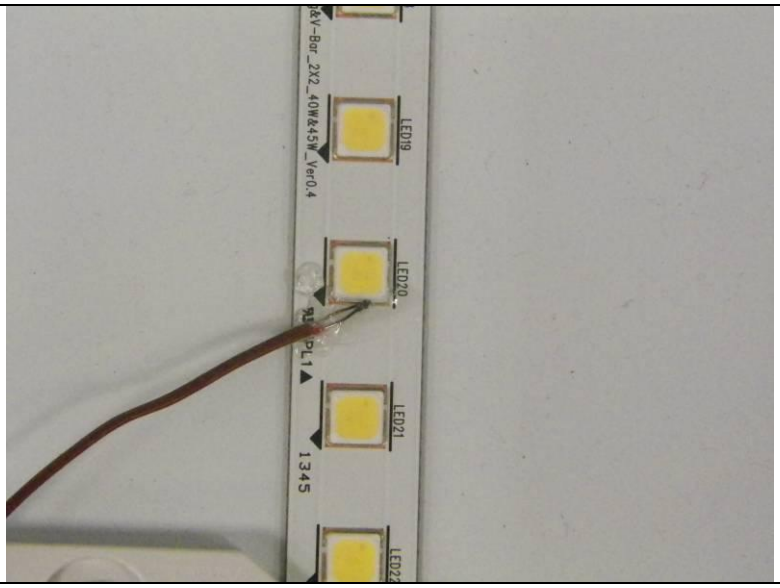
Maximum Candela = **1854** at Horizontal: 0.0°, Vertical: 2.5°

IESNA LM79-2008
TEST REPORT

March 14, 2014

ISTMT Temperature Measurement

ISTMT temperature measurement at thermal stabilization (8 hours continuous operation).
Thermocouple locations (shown below) are in accordance with manufacturers recommended / stated guidelines for TMP - Temperature Measurement Point.



"LED" Thermocouple location at TMP

Test Results for Maxlite- RKT2014U4050DV

LED TMP Temperature	49.8°C

All temperatures are normalized to 25°C ambient.

Test Equipment

Description	Manufacturer / Model#	TÜV SÜD Ref#	Calibration Due Date
Thermometer	Fluke 52-II	ATLE0118	1/16/2015

IESNA LM79-2008
TEST REPORT

March 14, 2014

TÜV SÜD Photometric Testing Information

Testing is performed in accordance with the procedures outlined in IESNA LM79-2008. The sample is evaluated for photometric and electrical characteristics using an integrating sphere and a goniophotometer, located in an accredited, temperature and humidity-controlled, draft free photometric laboratory.

Sphere Geometry

The integrating spheres used for measurement utilize a "4π geometry" configuration in accordance with section 9 of IES LM-79-2008 and is applicable for all types of SSL products (directional and non-directional light projections). The spectroradiometer is an array-type detector manufactured and calibrated by Labsphere (Model# CDS1100).

Self-Absorption Correction

The integrating sphere uses self-absorption correction to eliminate errors due to mismatches between the standard reference lamp and the test samples being measured. This auxiliary correction lamp is a halogen type lamp powered by a calibrated Lamp Power Supply manufactured and calibrated by Labsphere (model LPS150). Ambient temperature is measured using a thermocouple located inside the integrating sphere at the same height as the sample under test (UUT) and not more than 1 meter in horizontal distance away from the sample (section 2.2 of LM79-2008). The thermocouple is located behind a baffle in order to eliminate any direct optical radiation from the sample under test.

Sample Stabilization

The sample (UUT) is placed inside the integrating sphere and powered by a regulated and conditioned alternating or direct current supply. The stabilization times shown on the results pages of this report denote the time of the 3rd measurement (of the 3 consecutive readings) since this is the minimum time that the sample is assumed to have taken to reach stabilization in accordance with section 5.0 of LM79-2008.

Sphere Calibration

The integrating sphere is calibrated using a quartzline halogen lamp with the following specifications:

Manufacturer: EYE Lighting International
Model# J94/JD28V75W
Voltage = 28.0 Volts DC
Wattage = 75.0 Watts
Calibration Current = 2.679 Amperes
Luminous Flux = 1685 Lumens
Calibration Date = 2-17-2011 (calibrated by Labsphere – NIST traceable).

Continued…..

IESNA LM79-2008
TEST REPORT

March 14, 2014

TÜV SÜD Photometric Testing Information (continued)

Goniophotometer

The Goniophotometer is a Mirror based Type C optical measurement system in accordance with section 9.3.1 of IESNA LM79-2008.

Goniophotometer Calibration

The Goniophotometer is calibrated using a frosted tungsten filament FDS/DZE lamp with the following specifications:

Manufacturer: General Electric
Part Number: CSB-110
Lamp Number: 112-A
Voltage: 16.52 Volts DC
Wattage: 150.0 Watts
Calibration Current: 4.816 Amperes
Luminous Intensity: 151.5 Candelas
Calibration Date: 02-13-2011 (NIST traceable)

TÜV SÜD Test Equipment List:

TÜV SÜD Sphere System – contains the following:			
Description	**Manufacturer / Model#**	**TÜV SÜD Ref#**	**Calibration Due Date**
Integrating Sphere	Labsphere LM760	SPH003	weekly
Spectroradiometer	Labsphere CDS1100	ATLE0048	9/7/2016
Power Analyzer	Yokogawa WT210	ATLE0058	3/7/2015
Power Source	Chroma 61602	AC003	N/A
Thermometer	Fluke 52-II	ATLE0008	11/17/2014
TÜV SÜD Mirror Goniophotometer System – contains the following:			
Goniophotometer	M.E. GONC02	GON002	Weekly
Spectroradiometer	Gigahertz Optik P9801	GIG002	Weekly
Power Analyzer	Yokogawa WT210	ATLE0031	11/16/2014
Power Source	Chroma 61603	AC007	N/A