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:	**RKT2014U4035DV** Tested in Lithonia 2GT8 lensed 2X2
Sample Description:	**2x2 LED Retrofit Luminaire**
Manufacturer:	**Maxlite, Inc.**
Technical Report Number:	**JI1405263-01-LM79**
Report Issue Date:	**June 3rd, 2014**
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Summary of Key Test Results

Model# **RKT2014U4035DV**

Manufacturer **Maxlite Inc.**

TÜV Sample# 1345-2

Date of Test May 30th, 2014

Notes: Tested in intended orientation
(Horizontal)

Parameter	Measured Result
Luminous Flux	**3,630 Lumens**
Input Power	**38.40 Watts**
Efficacy	**94.54 Lumens/Watt**
C.C.T.	**3576 K**
C.R.I. (R_a)	**82.7**
Beam Angle	**90.6°**
Stabilization Time	**60 minutes**
In-Situ Temp Test (ISTMT)**	**Not tested**

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".

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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	RKT2014U4035DV
	Integrating Sphere
Total Luminous Flux (Lumens)	3,630.0
Luminous Efficacy (Lumens/Watt)	94.54
Total Radiant Flux (Watts)	11.6
Correlated Color Temperature (CCT)	3576
Color Rendering Index (CRI – R_a)	82.7
R_9 Value	22.1
Chromaticity (Chroma x / Chroma y)	0.4000 / 0.3857
Chromaticity (Chroma u / Chroma v)	0.2343 / 0.3389
Chromaticity (Chroma u' / Chroma v')	0.2343 / 0.5083
D_{uv} Value	-0.00105

Electrical Results (120V unless stated otherwise)	RKT2014U4035DV
	Integrating Sphere
Input Power (Watts)	38.40
Input Voltage (Volts AC)	120.06
Input Current (Amps)	0.323
Power Factor @120VAC	0.992
Power Factor @277VAC	0.920
Input Frequency (Hertz)	60.0
A-THD @120VAC (Current %)	12.07 %
A-THD @277VAC (Current %)	15.91 %

Additional Parameters	RKT2014U4035DV	
	Integrating Sphere	Goniophotometer
Stabilization Time (Light and Power)	60 minutes	61 minutes
Test Geometry Configuration	4π	Type C
Ambient Temperature	24.1°C	25.4°C
ISTMT (In-Situ Temperature Measurement)	48.2°C	
Spacing Criteria	1.16 (0° – 180°) / 1.20 (90° – 270°)	

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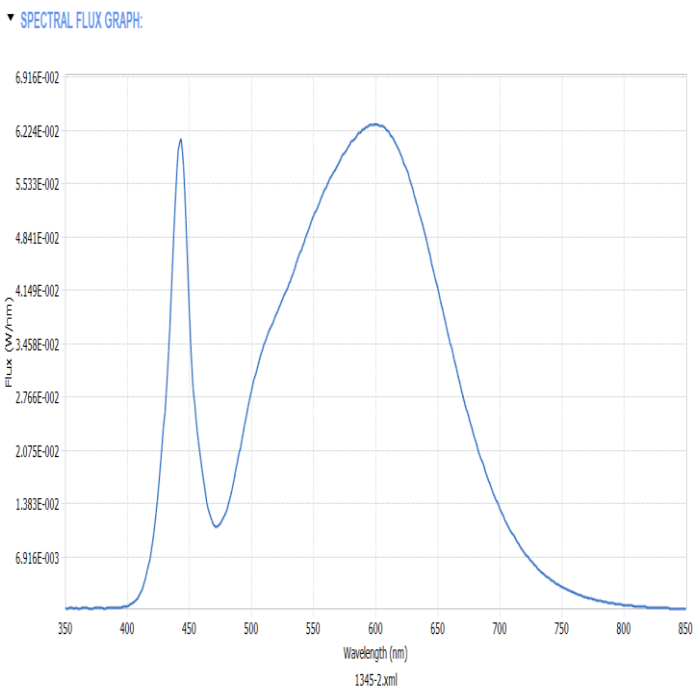
Spectral Flux and Chromaticity Diagram

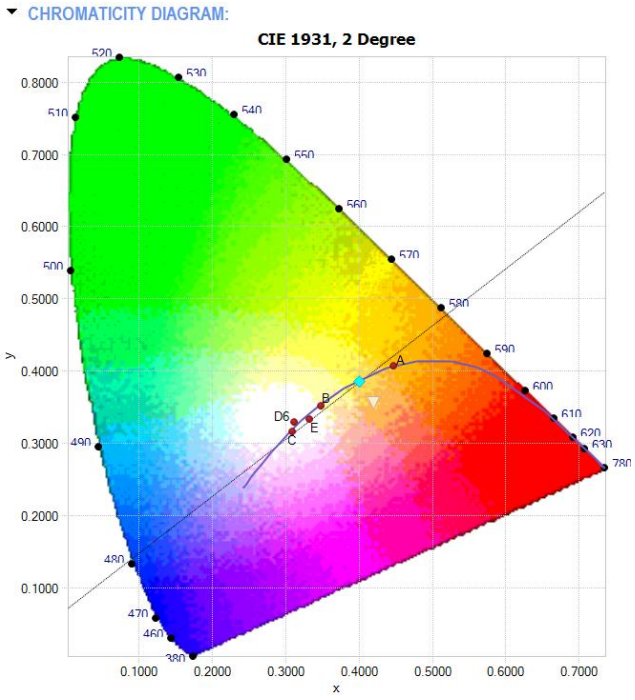
Spectral Flux



Spectral response of the Radiant Flux

(350nm to 850nm)

Chromaticity Diagram



Tristimulus values (from page 4):

x / y = 0.4000 / 0.3857

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

Zonal Lumen Summary

Zone	Lumens	% Lamp / Luminaire
0 - 60	3,030.6	86.1 %
60 - 90	489.9	13.9 %
0 - 90	3,520.5	100 %
90 - 180	0.0	0.0 %
0 - 180	3,520.5	100 %

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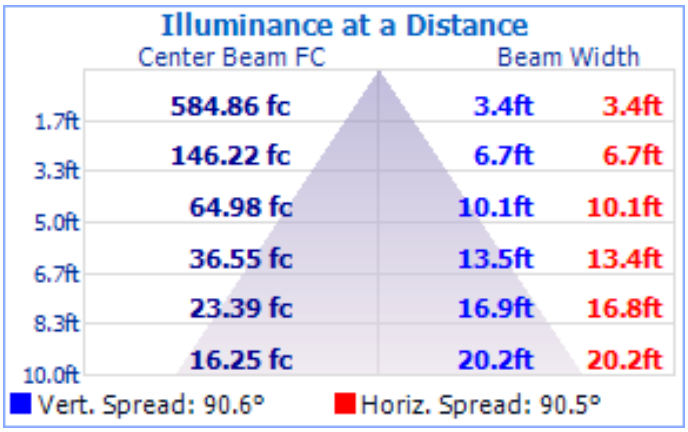
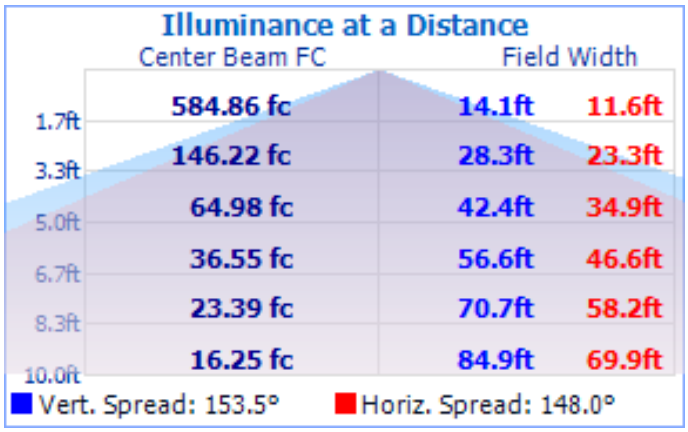
Test Results – Illuminance Plots

The following images depict the illuminance characteristics of the luminaire.



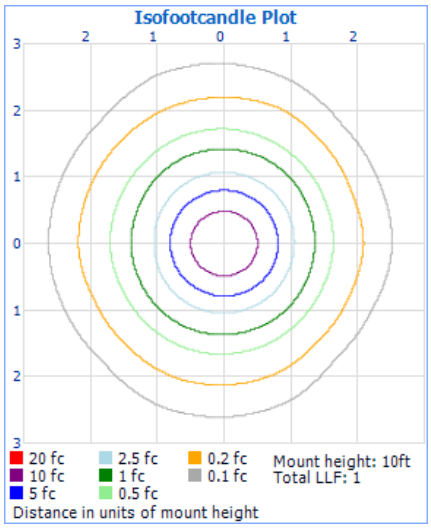


Beam Angle = 90.6°

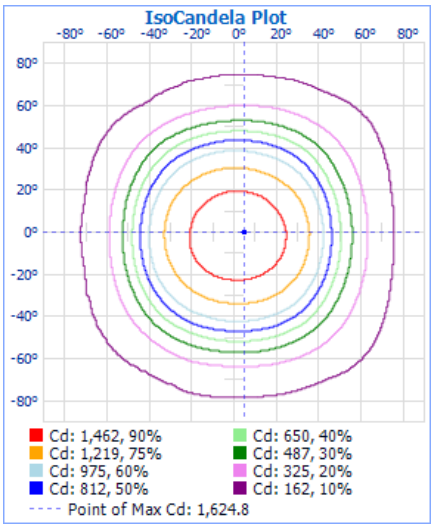
Field Angle = 153.5°

Test Results – Candela Plots

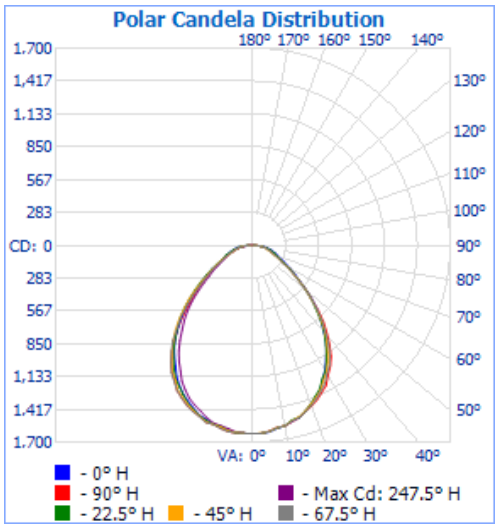
The following images depict the luminous intensity distribution characteristics of the luminaire:



Isofootcandle Plot



Isocandela Plot



Polar Candela

Maximum Candela = **1,040.7** at Horizontal: 0.0°, Vertical: 2.5°

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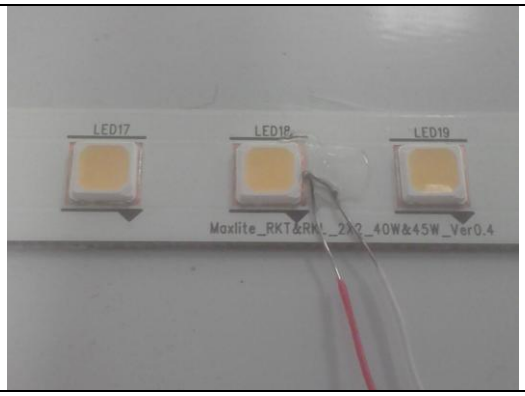
ISTMT Temperature Measurement

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- RKT2014U4035DV

LED TMP Temperature	48.2°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

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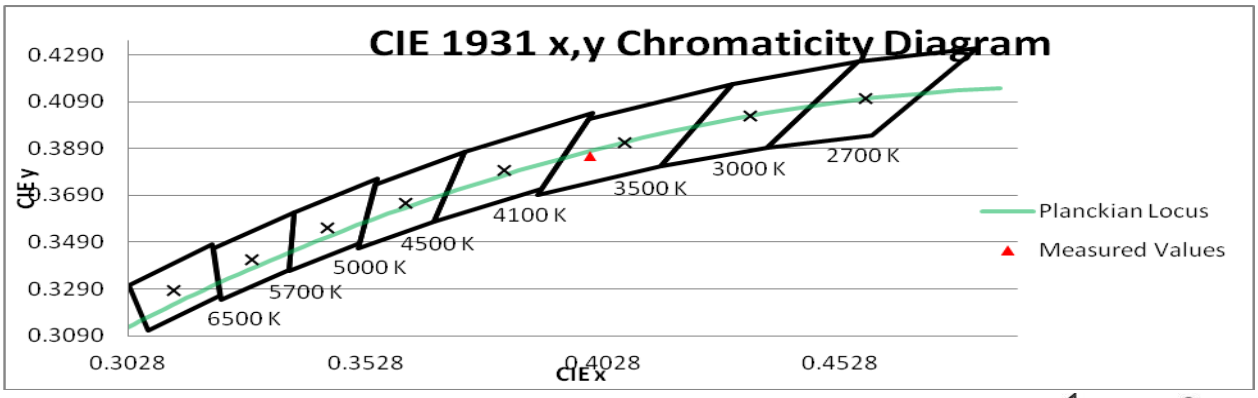
Addendum A (DLC Program Results) –

DesignLights Consortium Product Qualification Criteria, Technical Requirements Table, v2.1

31	Retrofit Kits for 2x2 Luminaires for Ambient Lighting of Interior Commercial Spaces	Nominal Requirements	Tolerance	Actual Requirement	*Measured Results*
	Minimum Light Output	2000 lm	-10%	**2700 lm**	***3,630 lm***
	Spacing Criteria	0-180°: 1.0-2.0 90-270°: 1.0-2.0	±0.1	**0.9-2.1**	***0-180°: 1.16*** ***90-270°: 1.20***
	Zonal Lumen Requirements	≥75%: 0-60°	-3%	**≥72%**	***86.1%***
	Minimum Luminaire Efficacy	85 lm/W	-3%	**77.45 lm/W**	***94.54 lm/W***
	Allowable CCTs (ANSI C78.377-2008)	≤5000K	Defined by ANSI C78.377	**≤5000K**	***3576K***
	Minimum CRI	80	-2 points	**78**	***82.7***
	L70 Lumen Maintenance	50,000 hrs	None	**50,000 hrs**	
	Minimum Luminaire Warranty	5 years	None	**5 Years**	
	Power Factor 120 / 277VAC	≥ 0.9	-3%	**0.873**	***0.992 / 0.920***
	Total Harmonic Distortion (THD-A%)	≤20%	+5%	**25%**	***12.07 / 15.91***



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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…..

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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	SPH004	weekly
Spectroradiometer	Labsphere CDS1100	ATLE0094	9/7/2014
Power Analyzer	Yokogawa WT210	ATLE0059	4/17/2015
Power Source	Chroma 61602	AC003	N/A
Thermometer	Fluke 52-II	ATLE0118	1/16/2015
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	11/21/2014
Power Source	Chroma 61603	AC007	N/A