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**INDEPENDENT TEST LABORATORY REPORT No. 31904**

**Description:**

OPTOLUM INC. - LED DOWN LIGHT, CAT# DL LO 25  
 WITH WHITE INTERIOR AND FROSTED PLASTIC FOCUSING LENSES  
 THREE LEDS. LUMINAIRE OUTPUT = 254 LMS.  
 ONE HIGH PERFECTION LP1013-24 DRIVER OPERATING AT 120 VAC AND 4.96 WATTS


**The sample(s) was(were) tested in accordance with the following applied standards/regulations:**

IES LM-41-98: Approved Method for Photometric Testing of Indoor Fluorescent Luminaire (withdrawn)  
 IES LM-79-08: Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products

**Prepared for:**

OPTOLUM  
 TEMPE, AZ

**Approved by:**

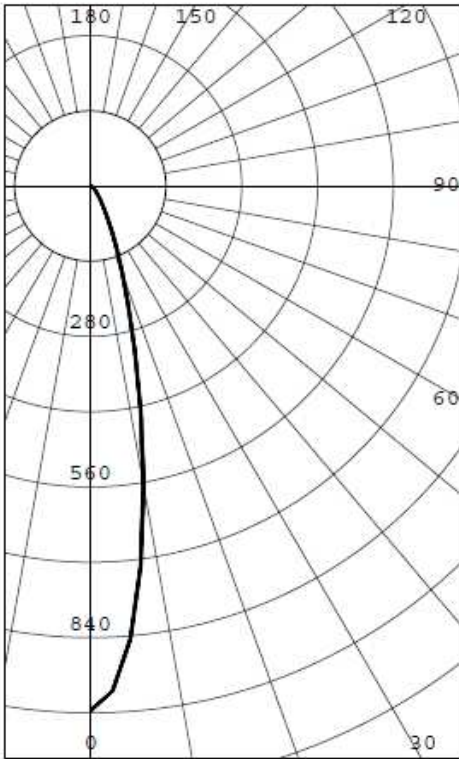
RYDER TUNNEY  
  
 STAFF ENGINEER  
 JUL 11, 2013

*This report shall not be reproduced except in full without the written approval of the laboratory. The results in this report apply to the test sample(s) mentioned above at the time of the testing period only and are not to be used to indicate applicability to other similar products.*

LIGHTING SCIENCES, INC.  
 7826 E. EVANS RD.  
 SCOTTSDALE, AZ, USA 85260

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INTENSITY (CANDLEPOWER) SUMMARY

ANGLE	MEAN CP	LUMENS
0	976	
5	846	72
10	565	
15	316	88
20	172	
25	95	45
30	54	
35	33	21
40	22	
45	15	12
50	12	
55	9	8
60	7	
65	5	5
70	3	
75	2	2
80	1	
85	0	0
90	0	

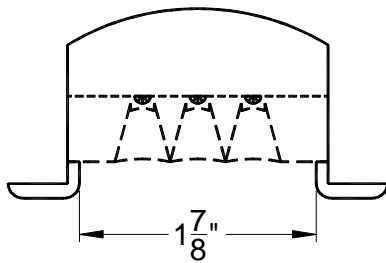
ZONAL LUMENS AND PERCENTAGES

ZONE	LUMENS	% LUMINAIRE
0-30	205	80.74
0-40	227	89.13
0-60	247	97.11
0-90	254	100.00
40-90	28	10.87
60-90	7	2.89
90-180	0	0.00
0-180	254	100.00

EFFICACY (LUMENS PER WATT): 51.2

\*\*\* THIS IS AN ABSOLUTE TEST \*\*\*

LUMINOUS DIAMETER: 1.875 INS



LUMINANCE SUMMARY CD./SQ.M.

S/MH: 0.4  
 SC: 0.4

ANGLE	MEAN CD/SQ M
45	12307
55	8835
65	6633
75	4204
85	1616

TESTED IN ACCORDANCE WITH IES PROCEDURES.

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INTENSITY(CANDLEPOWER) DATA  
IN 2.5 DEGREE STEPS

ANGLE	INTENSITY (CANDLEPOWER)	LUMENS
0.0	976	
2.5	941	
5.0	846	72
7.5	712	
10.0	565	
12.5	428	
15.0	316	88
17.5	232	
20.0	172	
22.5	127	
25.0	95	45
27.5	71	
30.0	54	
32.5	42	
35.0	33	21
37.5	26	
40.0	22	
42.5	18	
45.0	15	12
47.5	13	
50.0	12	
52.5	10	
55.0	9	8
57.5	8	
60.0	7	
62.5	6	
65.0	5	5
67.5	4	
70.0	3	
72.5	3	
75.0	2	2
77.5	1	
80.0	1	
82.5	0	
85.0	0	0
87.5	0	
90.0	0	

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AVERAGE LUMINANCE DATA

CD./SQ.M (FOOTLAMBERTS)

ANGLE	LUMINANCE
0	547853 ( 159899)
30	35152 ( 10259)
40	15851 ( 4626)
45	12307 ( 3592)
50	10255 ( 2993)
55	8835 ( 2578)
60	7634 ( 2228)
65	6633 ( 1936)
70	5549 ( 1619)
75	4204 ( 1227)
80	2646 ( 772)
85	1616 ( 471)

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COEFFICIENTS OF UTILIZATION

ZONAL CAVITY METHOD

EFFECTIVE FLOOR CAVITY REFLECTANCE = .20

CC WALL	90				80				70				50				30				10				0	
	70	50	30	10	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	50	30	10	0	
RCR																										
0	1.221	.221	.221	.22	1.191	.191	.191	.19	1.161	.161	.161	.16	1.111	.111	.111	.11	1.061	.061	.06	1.021	.021	.02	1.00			
1	1.171	.141	.121	.10	1.141	.121	.101	.08	1.121	.101	.081	.06	1.061	.041	.03	1.021	.011	.00	0.990	.980	.97	0.95				
2	1.121	.081	.051	.01	1.101	.061	.031	.00	1.081	.051	.020	.99	1.010	.990	.97	0.990	.970	.95	0.960	.950	.93	0.92				
3	1.081	.030	.990	.95	1.061	.010	.980	.95	1.051	.000	.970	.94	0.980	.950	.92	0.960	.930	.91	0.930	.920	.90	0.88				
4	1.050	.980	.940	.91	1.030	.970	.930	.90	1.020	.960	.930	.89	0.940	.910	.88	0.920	.900	.87	0.910	.880	.87	0.85				
5	1.010	.940	.890	.86	1.000	.930	.890	.86	0.980	.920	.880	.85	0.910	.870	.85	0.890	.860	.84	0.880	.850	.83	0.82				
6	0.980	.910	.860	.83	0.970	.900	.860	.83	0.950	.890	.850	.82	0.880	.850	.82	0.870	.840	.81	0.860	.830	.81	0.80				
7	0.940	.870	.830	.80	0.940	.870	.820	.79	0.930	.860	.820	.79	0.850	.810	.79	0.840	.810	.78	0.830	.800	.78	0.77				
8	0.920	.850	.800	.77	0.910	.840	.800	.77	0.900	.830	.790	.76	0.820	.790	.76	0.820	.780	.76	0.810	.780	.75	0.74				
9	0.890	.820	.770	.74	0.880	.810	.770	.74	0.870	.810	.770	.74	0.800	.760	.74	0.790	.760	.73	0.780	.750	.73	0.72				
10	0.870	.790	.750	.72	0.860	.790	.750	.72	0.850	.780	.750	.72	0.780	.740	.71	0.770	.740	.71	0.770	.730	.71	0.70				

THE ABOVE COEFFICIENTS HAVE BEEN CALCULATED BASED ON LUMINAIRE LUMENS  
 BECAUSE IN AN ABSOLUTE TEST THE BARE LAMP LUMENS ARE UNKNOWN.  
 LIGHTING DESIGN CALCULATIONS MADE USING THESE COEFFICIENTS SHOULD  
 THEREFORE USE THE LUMINAIRE LUMENS IN THE CALCULATION FORMULA

LUMINAIRE INPUT WATTS 5.0

LABORATORY RESULTS MAY NOT BE REPRESENTATIVE OF FIELD PERFORMANCE.  
 BALLAST AND FIELD FACTORS HAVE NOT BEEN APPLIED.

TEST DISTANCE EXCEEDS FIVE TIMES THE GREATEST  
 LUMINOUS OPENING OF LUMINAIRE.

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**ELECTRICAL MEASUREMENTS**

INPUT VOLTAGE:	120.0	VOLTS AC
INPUT CURRENT:	0.043	AMPS
INPUT POWER:	5.0	WATTS
POWER FACTOR:	96.1	PERCENT
TOTAL HARMONIC DISTORTION:	22.28	PERCENT
OFF STATE POWER:	0.00	WATTS

INPUT VOLTAGE:	277.0	VOLTS AC
INPUT CURRENT:	0.030	AMPS
INPUT POWER:	6.5	WATTS
POWER FACTOR:	77.83	PERCENT
TOTAL HARMONIC DISTORTION:	28.16	PERCENT

**LIGHT OUTPUT**

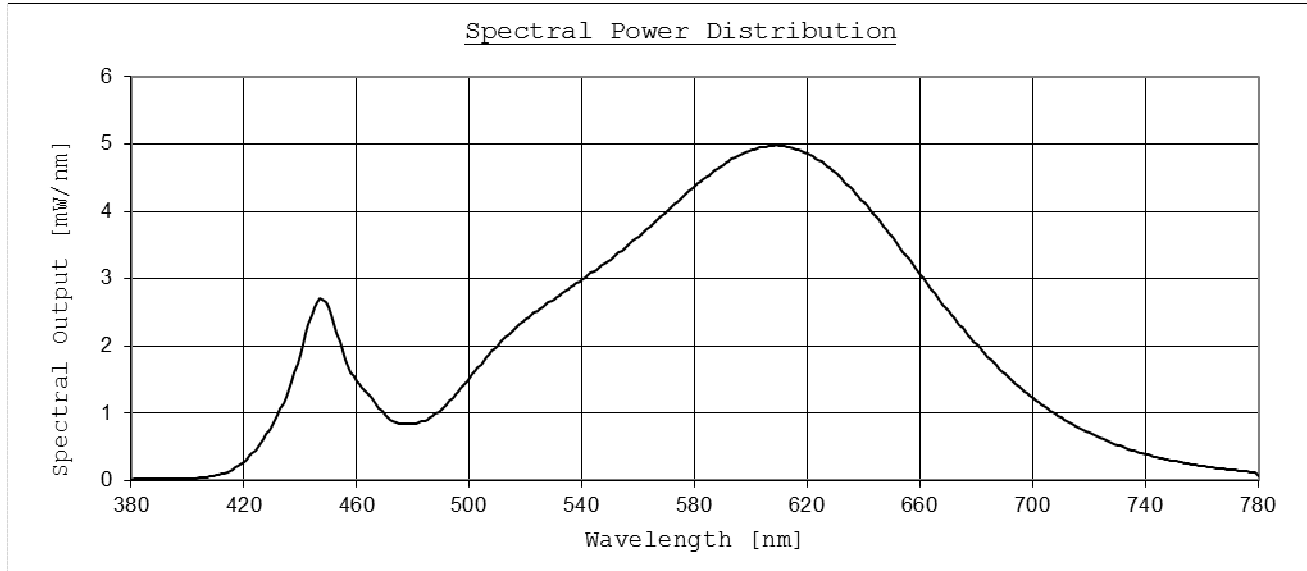
LUMENS:	254	lm
EFFICACY:	51.2	lm/W

**SPECTRAL MEASUREMENTS**

X:	0.4358	
Y:	0.3999	
u/u':	0.2516	
v:	0.3464	
v':	0.5196	
Duv:	0.0017	
CRI (R <sub>a</sub> ):	84.6	
CRI (R <sub>g</sub> ):	26.8	
CCT:	2983	K
RADIANT FLUX:	824	mW

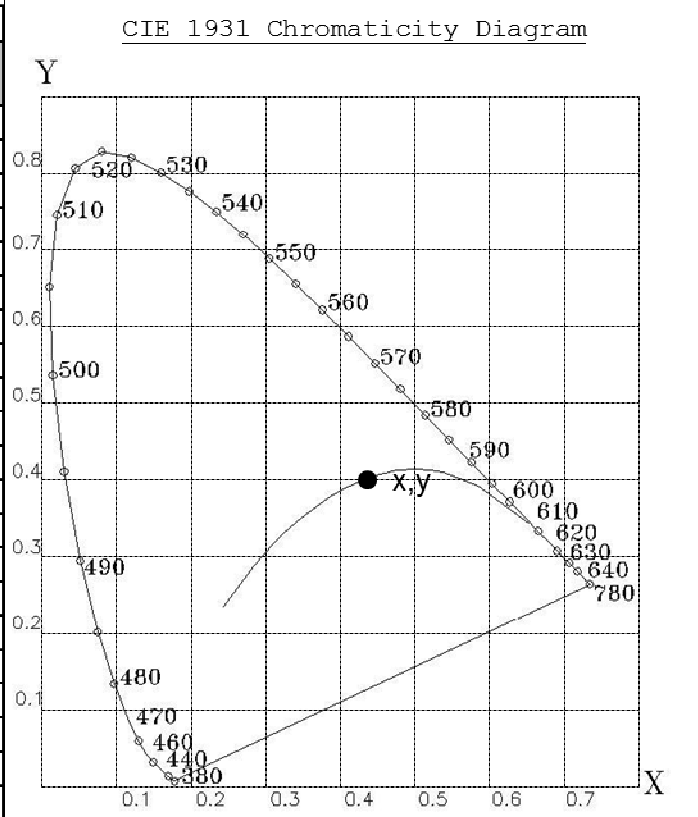
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Tabulated Spectral Power Distribution

Wavelength [nm]	[mW/nm]	Wavelength [nm]	[mW/nm]
380	0.01093	590	4.69117
390	0.02152	600	4.90973
400	0.02842	610	4.97482
410	0.07544	620	4.84821
420	0.28154	630	4.56564
430	0.82423	640	4.13383
440	1.87559	650	3.61898
450	2.57453	660	3.05892
460	1.48063	670	2.51961
470	0.98334	680	2.01959
480	0.84433	690	1.59079
490	1.05709	700	1.22783
500	1.52662	710	0.93503
510	2.01102	720	0.70590
520	2.39885	730	0.52846
530	2.69790	740	0.39354
540	2.98873	750	0.29280
550	3.28144	760	0.21903
560	3.62701	770	0.16166
570	4.00276	780	0.06049
580	4.37733		



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LUMINOUS OPENING



SIDE VIEW



**All testing was conducted in accordance with LM-79-08,**

Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products as published by the Illuminating Engineering Society of North America (IESNA).

The condition of the item tested was new. Stabilization time before testing meets the stabilization requirements of LM-79-08.

The test results (luminous distribution and flux) were obtained by using a Lighting Sciences series 6000 Type C Moving Mirror Goniophotometer

- The photometric reference standard used is a set of three incandescent luminous intensity standard lamps calibrated and traceable to the U.S. National Institute of Standards and Technology.

The test results (colorimetric and luminous flux) were obtained by using a Labsphere Model LMS-760 Integrating Sphere.  $4\pi$  geometry was used. Correction factors were applied for self-absorption.

- The colorimetric & photometric reference standard used is an incandescent spectral flux standard lamp calibrated and traceable to the U.S. National Institute of Standards and Technology.

Power measurements were obtained with a Yokogawa WT210 power analyzer.

Ambient temperature during testing was  $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$ , measured using an Omega model DP460.

Calibration certificates are on file at the laboratories of Lighting Sciences Inc.

The results in this report apply to the test sample(s) mentioned in this report at the time of the testing period only and are not to be used to indicate applicability to other similar products.