



FOR THE SCOPE OF  
ACCREDITATION UNDER NVLAP LAB  
CODE 100402-0.

# REPORT

3933 US ROUTE 11 CORTLAND, NEW YORK 13045

Project No. G100874520

Date: September 13, 2012

REPORT NO. 100874520CRT-001

TEST OF ONE LED DOWNLIGHT

FIXTURE MODEL NO. ZMS-DL-015

RENDERED TO

ZEMOS LED INC.  
3F,628-7, DEUNGCHON-DONG  
KANGSEO-GU 157-030  
KOREA, SOUTH

TEST: Electrical and Photometric tests as required to the IESNA test standard.

LABORATORY NOTE: The laboratory that conducted the testing detailed in this report has been Qualified, Verified, and Recognized for LM-79 Testing for ENERGY STAR for SSL by US DOE's CALiPER program.

STATEMENT OF LIMITATION: This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government.

AUTHORIZATION: The testing performed was authorized by signed quote number 500401916.

STANDARDS USED: The following American National Standards or Illuminating Engineering Society of North America Test Guides were used in part or totally to test each specimen:

IESNA LM-79: 2008 Approved Method for Electrical and Photometric Measurements of Solid-State Lighting Products

ANSI ANSLG C38.377: 2012 Specifications of the Chromaticity of Solid State Lighting Products

DESCRIPTION OF SAMPLE: The client submitted one sample of model number ZMS-DL-015. The sample was received by Intertek on August 24, 2012, in undamaged condition, and one sample was tested as received. The sample designation was 254168-1.

DATES OF TESTS: September 7, 2012 through September 11, 2012.

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SUMMARY

Model No.: ZMS-DL-015
Description: LED Downlight

Criteria	Result
Total Lumen Output	1189 Lumens
Total Power	14.55 W
Luminaire Efficacy	81.72
Power Factor	0.983
Current ATHD	15.61%
Correlated Color Temperature (CCT)	5959 K
Color Rendering Index (CRI) - Ra	86.80
Color Rendering Index (CRI) - R9	31.1
Duv	0.001
Chromaticity Coordinate (x)	0.323
Chromaticity Coordinate (y)	0.336
Chromaticity Coordinate (u')	0.202
Chromaticity Coordinate (v')	0.473

EQUIPMENT LIST

Equipment Used	Model Number	Control Number	Last Calibration Date	Calibration Due Date
Leeds & Northup Standard Resistor	Manganin	Y089	02/24/12	02/24/13
Data Precision Digital Voltmeter	3600	V124	02/24/12	02/24/13
Fluke Multimeter	45	M133	02/24/12	02/24/13
Kikusui DC Power Supply	35-10L	E160	---	---
NIST Spectral Flux Standard Source	RF1024	---	09/18/10	100 hours of use
Sorenson DC Power Supply	DLM150-20E	---	---	---
LSI High Speed Mirror Goniometer	6440	---	09/10/12	10/10/12
Yokogawa Power Analyzer	WT210	E464	04/19/12	04/19/13
Extech Hygro-Thermometer	445703	T1359	10/26/11	10/26/12
Xitron Power Analyzer	2503AH	E246	05/02/12	05/02/13
ITS 2 Meter Sphere	W/ CDS 600	N308	w/use	w/use
Fluke Temperature Meter	53 II	D587	04/13/12	04/13/13
Elgar Power Supply	CW1251	---	---	---
Extech Hygro-Thermometer	445703	T1366	10/26/11	10/26/12



## TEST METHODS

### Seasoning in Sample Orientation – LED Products

No seasoning was performed in accordance with IESNA LM-79.

### Photometric and Electrical measurements – Distribution Method

A LSI Type C High Speed Model 6440 Mirror Goniometer was used to measure the intensity (candelas) at each angle of distribution for each sample.

Ambient temperature was measured equal to the height of the sample mounted on the Goniometer equipment. Each sample was operated at input rated voltage in its designated orientation. Each sample was allowed to stabilize for at least thirty minutes before measurements were made. Electrical measurements including voltage, current, and power were measured using the Xitron or Yokogawa Power Analyzer.

Some graphics were created with Photometrics Plus software.

### Photometric and Electrical Measurements – Integrating Sphere Method

A Labsphere Model CDS 1100 CCD Array Spectroradiometer and Two Meter or Ten Foot Sphere was used to measure correlated color temperature, chromaticity coordinates, and the color rendering index for each SSL unit.

Ambient temperature was measured at a position inside the sphere. Each SSL unit was operated on the client provided driver at the rated input voltage in its designated orientation. Each SSL unit was allowed to stabilize for at least thirty minutes before measurements were made. Electrical measurements including voltage, current, and power were measured using the Xitron or Yokogawa Power Analyzer.

The calibration of the sphere photometer-spectroradiometer system is traceable to the National Institute of Standards and Technology.

### Estimated Total Operating Time

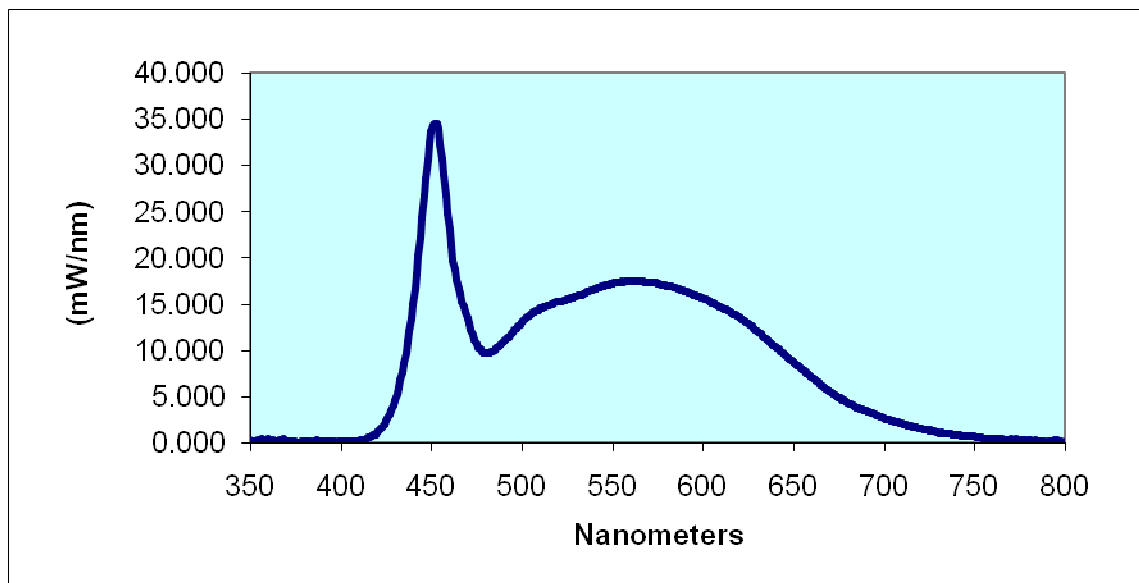
<u>Model No.</u>	<u>Total Hours</u>
ZMS-DL-015	4

**RESULTS OF TESTS**

Spectral Distribution over Visible Wavelengths

nm	mW/nm	nm	mW/nm	nm	mW/nm	nm	mW/nm
350	0.311	460	22.950	570	17.351	680	4.293
355	0.201	465	16.666	575	17.188	685	3.813
360	0.384	470	13.476	580	16.954	690	3.454
365	0.189	475	10.705	585	16.701	695	3.039
370	0.081	480	9.670	590	16.350	700	2.650
375	0.132	485	10.029	595	15.977	705	2.336
380	0.140	490	10.883	600	15.584	710	2.058
385	0.104	495	11.890	605	15.159	715	1.800
390	0.157	500	13.018	610	14.620	720	1.500
395	0.153	505	13.826	615	14.161	725	1.312
400	0.114	510	14.477	620	13.555	730	1.150
405	0.174	515	14.853	625	12.865	735	0.980
410	0.209	520	15.175	630	12.058	740	0.874
415	0.523	525	15.485	635	11.201	745	0.745
420	1.094	530	15.844	640	10.359	750	0.664
425	2.314	535	16.175	645	9.525	755	0.450
430	4.572	540	16.574	650	8.673	760	0.470
435	8.653	545	16.933	655	7.939	765	0.000
440	14.947	550	17.195	660	7.105	770	0.358
445	24.428	555	17.385	665	6.295	775	0.242
450	33.702	560	17.463	670	5.561	780	0.240
455	32.319	565	17.459	675	4.880		

**Sample No. 254168-1  
Spectral Data Over Visible Wavelengths**



## RESULTS OF TESTS (cont'd)

### Photometric and Electrical Measurements at 25°C – Integrating Sphere Method

Intertek Sample No.	Correlated Color Temperature (K)	CRI -Ra	CRI -R9	DUV	CIE 31' Chromaticity Coordinate (x)	CIE 31' Chromaticity Coordinate (y)	CIE 76' Chromaticity Coordinate (u')	CIE 76' Chromaticity Coordinate (v')
	254168-1	5959	86.80	31.1	0.001	0.323	0.336	0.202

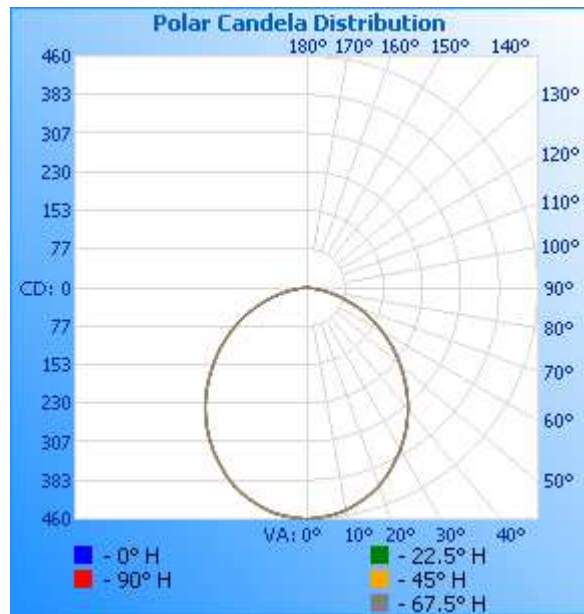
Intertek Sample No.	Base Orientation	Input Voltage (Vac)	Input Current (mA)	Input Power (Watts)	Input Power Factor	Current ATHD (%)
254168-1	UP	120.0	123.2	14.52	0.983	15.61

### Photometric and Electrical Measurements – Distribution Method

Intertek Sample No.	Base Orientation	Input Voltage (Vac)	Input Current (mA)	Input Power (Watts)	Input Power Factor	Absolute Luminous Flux (Lumens)	Lumen Efficacy (Lumens Per Watt)
254168-1	UP	120.0	123.5	14.55	0.981	1189	81.72

### Intensity (Candlepower) Summary at 25°C - Candelas

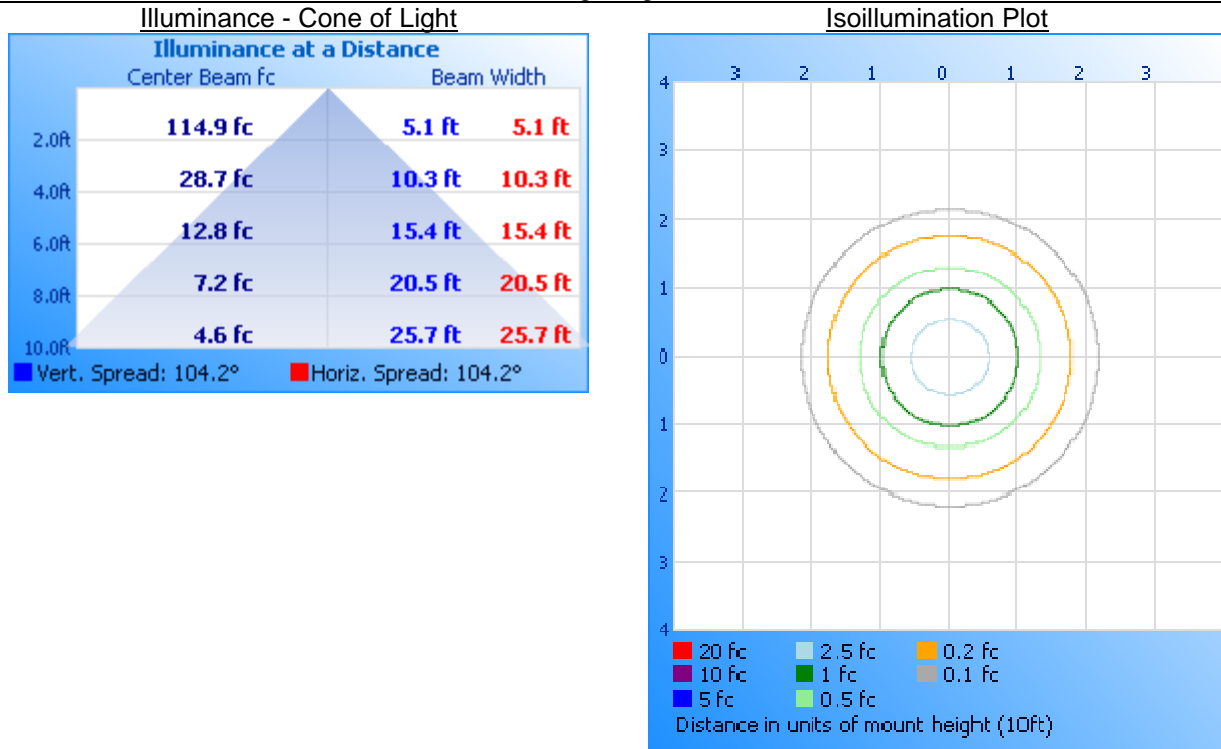
Angle	0	22.5	45	67.5	90
0	460	460	460	460	460
5	456	456	456	457	457
10	449	449	449	449	450
15	436	436	436	436	436
20	419	419	420	420	420
25	397	397	397	397	397
30	372	372	372	372	372
35	344	344	344	344	345
40	313	314	314	314	314
45	279	280	280	280	280
50	244	245	245	245	244
55	209	210	209	210	209
60	173	175	174	173	173
65	137	139	138	137	137
70	100	103	102	102	101
75	66	68	68	68	67
80	34	35	38	36	35
85	7	9	11	9	8
90	0	0	0	0	0



## RESULTS OF TESTS (cont'd)

### Illumination Plots

Mounting Height: 10 ft.



### Zonal Lumen Summary and Percentages at 25°C

Zone	Lumens	% Luminaire
0-30	349.2	29.4
0-40	564.4	47.5
0-60	967.3	81.4
60-90	221.3	18.6
0-90	1189	100.0
90-180	0.0	0.0
0-180	1189	100.0

### Zonal Lumens and Percentages at 25°C

Zone	Lumens	% Luminaire
0-10	43.3	3.6
10-20	123.0	10.3
20-30	182.9	15.4
30-40	215.1	18.1
40-50	215.7	18.1
50-60	187.2	15.8
60-70	136.1	11.5
70-80	71.6	6.0
80-90	13.5	1.1

Picture (not to scale)



CONCLUSION

The results tabulated in this report are representative of the actual test samples submitted for this report only. The data is provided to the client for further evaluation. Compliance to the referenced specification requirements was not determined in this report.

In Charge Of Tests:

Handwritten signature of Joseph Schledorn in black ink.

Joseph Schledorn  
Engineer  
Lighting Division

Attachment:  
254168-1Q.IES

Report Reviewed By:

Handwritten signature of Jacki Swiernik in black ink.

Jacki Swiernik  
Staff Engineer  
Lighting Division