

IES LM-79-08

1. Product Description

General Information:

Two samples were received on 2015-04-12. One was tested in integrating sphere and the other was tested in goniophotometer.

Model Tested: VO-A19-XW-9

Manufacturer: VAOPTO

Product Designation: Omnidirectional LED Lamp

Burning Time Before Test: 0 hour(For New Products)

Rated Values:

Rated Voltage/Frequency: AC 120V 60Hz

Rated Power: 9W

Nominal CCT: 2700K

2. Standards Used

- IESNA LM-79-08: Approved Method: Electrical & Photometric Measurement of Solid-state Lighting Products
- ANSI C82.77-2002: Harmonic Emission Limits – Related Power Quality Requirements for Lighting

3. Description of Test Equipment

Device	Manufacture	Model No	Serial No	Test Range	Calibration date	Calibration due date
2.0m integrating sphere	EVERFINE	R98	11010018	N/A	2014-12-27	2015-12-27
High accuracy array spectroradiometer	EVERFINE	HAAS-2000	1012016T	380-780nm	2015-03-25	2016-03-24
Digital CC&CV DC Power Supply	EVERFINE	WY305	1101047	30V/5A	2015-03-05	2016-03-05
Temperature/humidity/clock	Victor	VC230	EE209	0~40℃0~90%	2013-04-01	2016-03-31
Standard Light Source	EVERFINE	D204	LSD090808	N/A	2015-08-05	2016-08-05
Special zero-voltage synchronous switching AC	EVERFINE	DPS1010	1011001T	N/A	2015-03-05	2016-03-05
AC Power Supply	EVERFINE	VPS1030 PWM	1012017	0-150V, 0-300V	2015-03-05	2016-03-05
DC Power Supply	EVERFINE	WY12010	1009009	30V/5A	2015-03-05	2016-03-05
Power Meter	YOKOGAWA	WT-210	91KB35700	15/30/60/150/300/600 V	2015-03-05	2016-03-05
Goniophotometer	EVERFINE	GO-R5000	YG108492N10120001	1600mm,3000W/10A	2015-03-20	2016-03-20
Thermal Meter	Victor	VC230	EE091	0~40℃0~90%	2013-04-01	2016-03-31
Standard Light Source	EVERFINE	D908	1012003	N/A	2015-05-15	2016-05-14

Statement of Traceability: Bay Area Compliance Laboratories Corp. (Shenzhen) attested that all calibration has been performed using suitable standards traceable to National Primary Standards and International System of Units (SI).

4. Test Method

Product was tested with no seasoning. All stabilization and measurements were made in compliance with IES LM-79-08. The product was operated at rated voltage or at voltage required by manufacturer. The ambient temperature of the sample was maintained at $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$ during measurement. And relative humidity is less than 65%.

Integrating Sphere System

The system includes AC power source, digital power meter, DC power supply, spectrophotometer, and integrating sphere. The integrating sphere system is calibrated by standard light source before measurement.

4π geometry was used during measurement. The product was operated in its intended orientation in application and was recorded in this report.

The uncertainty of the light output (luminous flux) measurements is $U=2.1\%$ ($K=2$), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is $U=32\text{K}$ ($K=2$), at the 95% confidence level. The uncertainty of the CRI is $U=2.0$ ($K=2$), at the 95% confidence level.

The uncertainty of power meter AC current $U=0.19\%$ of rdg, AC Voltage $U=0.15\%$ of rdg, Power $U=0.20\%$ ($K=2$), at the 95% confidence level.

Goniophotometer System

The goniophotometer system is calibrated by standard light source before measurement.

Type C goniophotometer was used for measuring total luminous flux, luminous intensity distribution, and color spatial uniformity. The product was operated in its intended orientation in application and was recorded in this report.

The uncertainty of the luminous intensity is $U=2.82\%$ ($K=2$), at the 95% confidence level.

5. Test Result

[Integrating Sphere System]

Total operating time for integrating sphere test: **1.0 hour**

Test orientation: **Base up**

Electrical Measurement

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
120.0	60.0	0.08427	8.893	0.8791

Photometric Measurement

Luminous Flux (lm)	Radiant Flux (W)	Efficacy (lm/W)	CCT (K)	Duv
803.89	2.5028	90.39	2698	-1.45E-03

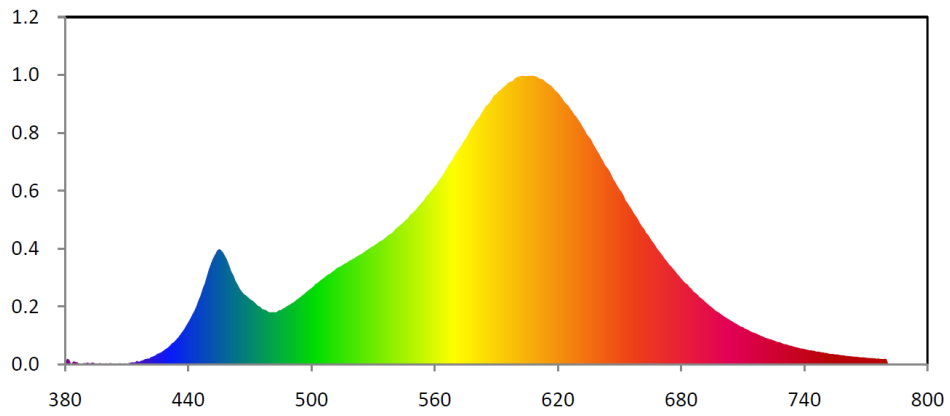
Chromaticity Coordinate

x	y	u	v	u'	v'
0.4575	0.4062	0.2630	0.3502	0.2630	0.5253

Color Rendering Index

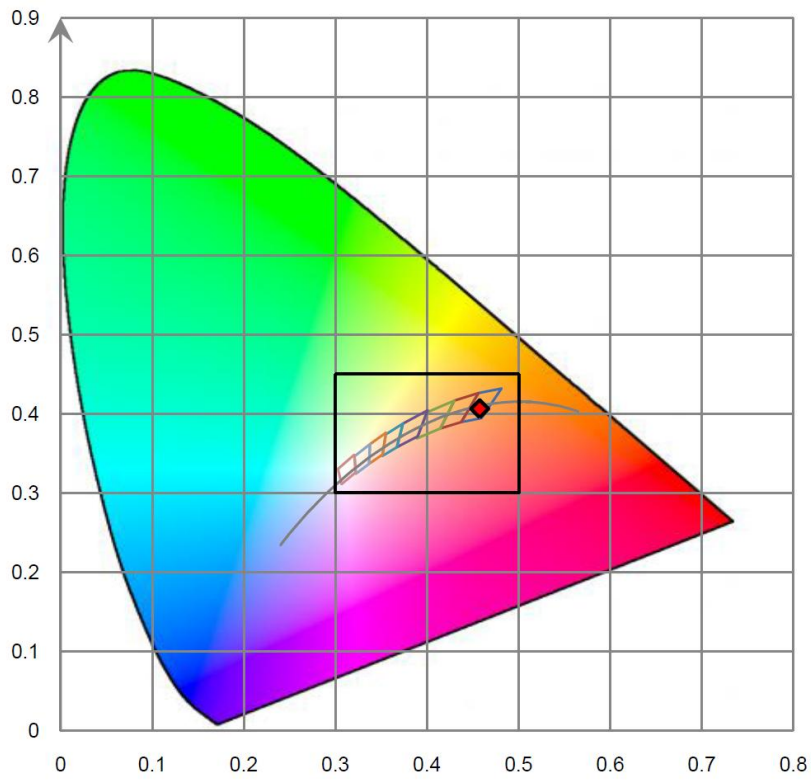
Ra			
80.8			
R1	R2	R3	R4
79	92	93	77
R5	R6	R7	R8
80	91	79	54
R9	R10	R11	R12
3	83	75	76
R13	R14	R15	
83	97	72	

Relative Spectral Power Distribution

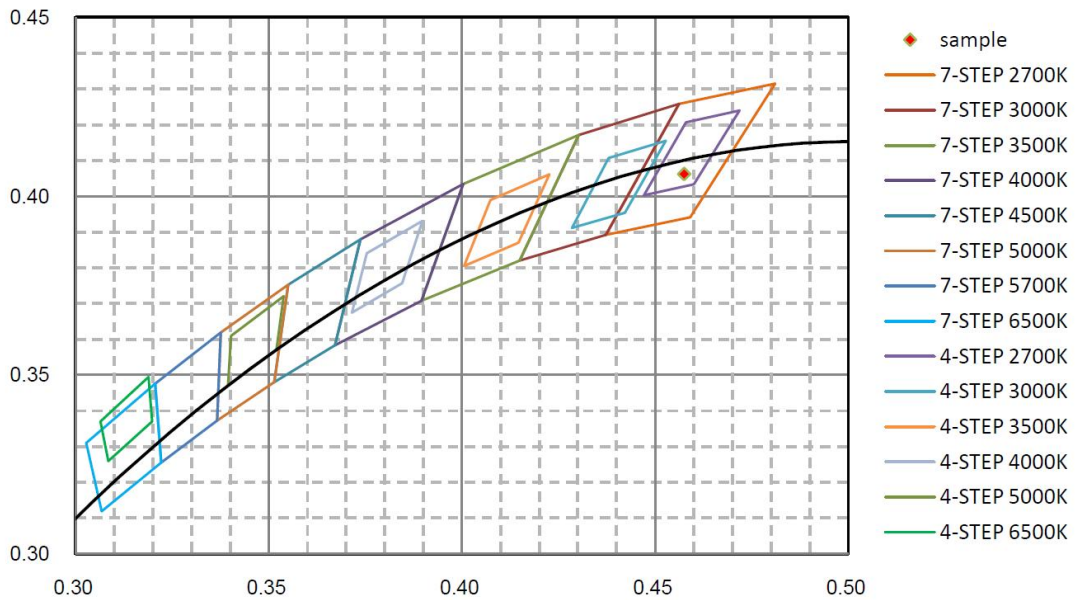


nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	9.427E-02	465	4.461E+00	550	8.975E+00	635	1.338E+01	720	1.632E+00
385	1.563E-01	470	3.837E+00	555	9.654E+00	640	1.238E+01	725	1.414E+00
390	8.227E-02	475	3.383E+00	560	1.046E+01	645	1.138E+01	730	1.203E+00
395	3.491E-02	480	3.056E+00	565	1.132E+01	650	1.027E+01	735	1.041E+00
400	7.664E-02	485	3.181E+00	570	1.233E+01	655	9.268E+00	740	9.040E-01
405	5.713E-02	490	3.557E+00	575	1.323E+01	660	8.286E+00	745	7.940E-01
410	4.961E-02	495	3.994E+00	580	1.425E+01	665	7.398E+00	750	6.824E-01
415	2.119E-01	500	4.478E+00	585	1.518E+01	670	6.549E+00	755	5.932E-01
420	3.406E-01	505	4.980E+00	590	1.585E+01	675	5.775E+00	760	5.135E-01
425	6.227E-01	510	5.415E+00	595	1.642E+01	680	5.050E+00	765	4.550E-01
430	9.799E-01	515	5.820E+00	600	1.685E+01	685	4.454E+00	770	3.937E-01
435	1.567E+00	520	6.176E+00	605	1.692E+01	690	3.868E+00	775	3.436E-01
440	2.470E+00	525	6.530E+00	610	1.685E+01	695	3.351E+00	780	3.242E-01
445	3.765E+00	530	6.939E+00	615	1.649E+01	700	2.897E+00	785	0.000E+00
450	5.560E+00	535	7.325E+00	620	1.594E+01	705	2.517E+00	790	0.000E+00
455	6.774E+00	540	7.812E+00	625	1.520E+01	710	2.200E+00	795	0.000E+00
460	5.787E+00	545	8.355E+00	630	1.434E+01	715	1.878E+00	800	0.000E+00

CIE 1931 x y Chromaticity Diagram



7-Step & 4-Step Chromaticity Quadrangles



[Goniophotometer System]

Total operating time for luminous intensity distribution: **1.0 hour**

Test orientation: **Base up**

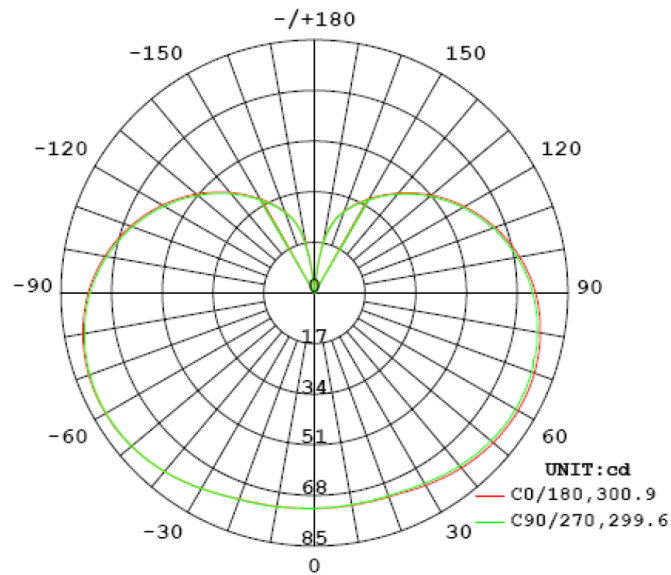
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60.0	0.0839	8.927	0.8864

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	CBCP (cd)	S/MH (C0/180)	S/MH (C90/270)
832.538	93.26	81.89	1.61	1.60

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I _{max}):	300.9	300.6	299.6	299.9	300.25
Field Angle (10% I _{max}):	346.7	346.1	346.1	347.2	346.53

Luminous Intensity (cd) Distribution Data

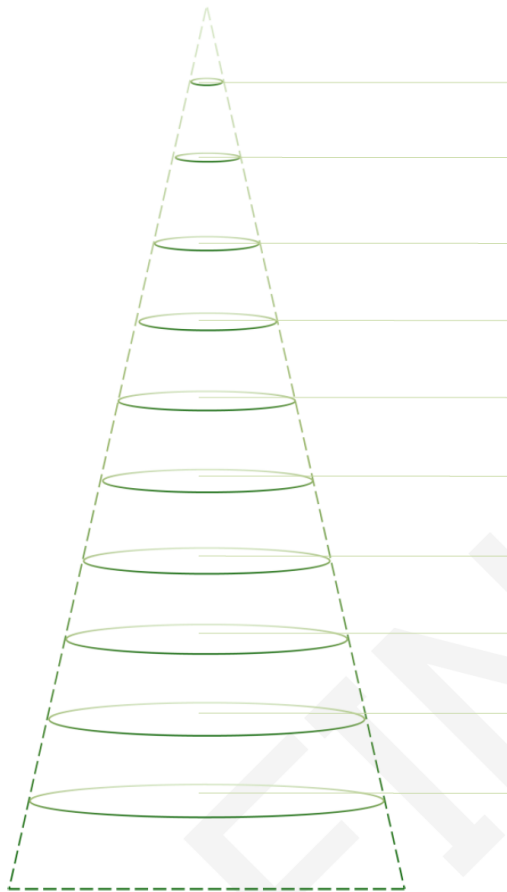
C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	72	72	72	72	72	72	72	72
5.0°	72	73	73	73	73	73	73	72
10.0°	73	73	73	73	73	73	73	73
15.0°	73	73	73	73	73	73	73	73
20.0°	74	74	74	74	74	74	73	73
25.0°	75	75	75	75	75	74	74	74
30.0°	76	76	76	76	76	76	75	75
35.0°	77	78	78	78	77	77	76	76
40.0°	78	79	79	79	78	78	77	77
45.0°	79	80	80	80	79	79	78	78
50.0°	80	81	81	81	80	79	79	79
55.0°	81	81	82	81	80	80	79	79
60.0°	81	82	82	82	81	80	79	79
65.0°	81	81	82	82	81	80	79	79
70.0°	81	81	81	81	80	79	79	79
75.0°	80	80	81	80	79	79	78	78
80.0°	79	79	80	79	78	77	77	77
85.0°	78	78	78	78	77	76	76	76
90.0°	76	76	77	76	75	75	74	74
95.0°	74	74	74	74	73	72	72	72
100.0°	71	72	72	72	71	70	70	70
105.0°	69	69	69	69	68	67	67	67
110.0°	66	66	66	66	65	64	64	65
115.0°	62	63	63	62	62	61	61	61
120.0°	59	59	59	59	58	58	58	58
125.0°	55	55	55	55	55	54	54	55
130.0°	52	52	52	51	51	51	51	51
135.0°	48	48	48	48	47	47	47	48
140.0°	44	44	44	44	43	43	44	44
145.0°	40	40	40	40	40	40	40	40
150.0°	37	36	36	36	36	36	36	37
155.0°	33	33	33	32	32	33	33	33
160.0°	29	29	29	29	29	29	29	29
165.0°	24	24	23	24	24	25	25	25
170.0°	17	16	13	16	14	17	17	18
175.0°	3	3	0	0	0	3	3	1
180.0°	0	0	0	0	0	0	0	0

Luminous Intensity (cd) Distribution Data (cont.)

$\begin{matrix} C \\ \backslash \\ Y \end{matrix}$	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	72	72	72	72	72	72	72	72
5.0°	72	72	72	72	72	72	72	72
10.0°	72	72	72	72	72	72	73	73
15.0°	73	72	72	72	72	72	73	73
20.0°	73	73	72	72	72	73	73	73
25.0°	74	73	73	73	73	73	74	74
30.0°	75	74	74	74	74	74	75	75
35.0°	76	75	75	75	75	75	76	76
40.0°	77	76	76	76	76	76	77	77
45.0°	78	77	77	77	77	77	78	78
50.0°	78	78	78	77	77	78	78	79
55.0°	79	78	78	78	78	78	79	80
60.0°	79	79	78	78	78	78	79	80
65.0°	79	79	78	78	78	78	79	80
70.0°	78	78	78	78	77	78	78	79
75.0°	78	78	78	77	77	77	78	79
80.0°	77	77	77	76	76	76	77	78
85.0°	76	76	76	75	75	75	75	76
90.0°	74	74	74	74	73	73	74	75
95.0°	72	72	72	72	71	71	72	73
100.0°	70	70	70	70	69	69	70	71
105.0°	67	67	67	67	67	66	67	68
110.0°	64	64	64	64	64	64	64	65
115.0°	61	61	61	61	61	60	61	62
120.0°	58	58	58	58	57	57	58	58
125.0°	55	55	55	55	54	54	54	55
130.0°	51	51	51	51	51	50	51	51
135.0°	47	47	47	47	47	47	47	47
140.0°	44	44	44	44	43	43	43	44
145.0°	40	40	40	40	40	40	40	40
150.0°	37	37	37	36	36	36	36	36
155.0°	33	33	33	33	33	32	32	32
160.0°	29	29	29	29	29	29	29	29
165.0°	25	25	25	25	25	25	24	24
170.0°	17	17	17	18	17	17	16	17
175.0°	1	1	1	1	1	1	1	0
180.0°	0	0	0	0	0	0	0	0

Average Area Illumination Figure

Angle: 90.00°. Flux out: 138.5 lm.



Height (m)	Diameter (cm)	$E_{avg}(lx)$	$E_{max}(lx)$
0.5	100.0	176.4	289.7
1.0	200.0	44.1	72.4
1.5	300.0	19.6	32.2
2.0	400.0	11.0	18.1
2.5	500.0	7.1	11.6
3.0	600.0	4.9	8.0
3.5	700.0	3.6	5.9
4.0	800.0	2.8	4.5
4.5	900.0	2.2	3.6
5.0	1000.0	1.8	2.9

Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	1.7	0.21	0-5	1.7	0.21
5-10	5.2	0.62	0-10	6.9	0.83
10-15	8.6	1.04	0-15	15.5	1.87
15-20	12.0	1.44	0-20	27.6	3.31
20-25	15.4	1.86	0-25	43.0	5.17
25-30	18.9	2.26	0-30	61.9	7.43
30-35	22.3	2.68	0-35	84.1	10.11
35-40	25.6	3.07	0-40	109.7	13.18
40-45	28.8	3.46	0-45	138.5	16.64
45-50	31.8	3.82	0-50	170.3	20.46
50-55	34.4	4.13	0-55	204.7	24.59
55-60	36.8	4.42	0-60	241.5	29.01
60-65	38.7	4.65	0-65	280.2	33.66
65-70	40.2	4.83	0-70	320.5	38.49
70-75	41.2	4.95	0-75	361.7	43.44
75-80	41.8	5.02	0-80	403.5	48.46
80-85	41.8	5.02	0-85	445.3	53.48
85-90	41.3	4.97	0-90	486.6	58.45
90-95	40.4	4.85	0-95	527.0	63.30
95-100	38.9	4.67	0-100	565.8	67.97
100-105	36.9	4.43	0-105	602.8	72.40
105-110	34.6	4.16	0-110	637.4	76.56
110-115	32.0	3.84	0-115	669.4	80.40
115-120	29.1	3.50	0-120	698.5	83.90
120-125	26.1	3.14	0-125	724.6	87.04
125-130	23.0	2.76	0-130	747.6	89.80
130-135	19.9	2.39	0-135	767.6	92.19
135-140	16.9	2.03	0-140	784.4	94.22
140-145	14.0	1.68	0-145	798.4	95.90
145-150	11.2	1.35	0-150	809.6	97.25
150-155	8.7	1.05	0-155	818.4	98.30
155-160	6.5	0.78	0-160	824.8	99.08
160-165	4.4	0.53	0-165	829.3	99.61
165-170	2.5	0.30	0-170	831.8	99.91
170-175	0.7	0.09	0-175	832.5	100.00
175-180	0.0	0.00	0-180	832.5	100.00

6. Product Photo



*****END OF REPORT*****