

Photometric Test Report

Relevant Standards

- ☒ IES LM-79-2008
- ☒ ANSI C82.77:2017

Prepared For

Espen Technology Inc.

12257 Florence Ave. Santa Fe Springs, CA 90670

Maofu, 021-33507615*8009, maofu@espentech.com

Prepared By

Deliver Co., Ltd.

Block 11, 78 Keling Road, SSTP, Suzhou, China

0512-66801950, kevin.jia@szdeliver.com

Project Number

DLF2108105

Report Number

DLF2108105-12a

Test Date

2021/9/10

Issue Date

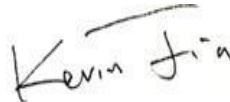
2021/9/22

Prepared By



Wangzun Zhu

Approved By



Kevin Jia

The results contained in this report pertain only to the tested sample.

This report shall not be reproduced, except in full, without written approval of Deliver Co., Ltd.

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP.

1.0 Test Summary

DLC Technical Requirements v5.1

Retrofit Kits for Direct Linear Ambient Luminaires				
Requirement Category	Test Method	Requirements		Test value
Luminaire Output (lm) (Goniophotometer - Section 4.2)	IES LM-79-2008	1500		6083
Minimum Luminaire Efficacy (lm/W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Standard 115	Premium 130	136.9
Power (Input Wattage) (W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Worst Case		44.4
Total Harmonic Distortion (A%) (THD & PF - section 4.3)	ANSI C82.77:2014	20.00%	120V	8.07%
		20.00%	277V	13.23%
Power Factor (THD & PF - section 4.3)	ANSI C82.77:2014	0.9	120V	0.994
		0.9	277V	0.948
Allowable CCTs* (K) (Integrating Sphere - Section 4.1)	IES LM-79-2008	7 step	3045±175	3008
		4 step	3045±100	
Minimum CRI (Integrating Sphere - Section 4.1)	IES LM-79-2008 CIE 13.3-1995	≥80		84
Minimum R9 (Integrating Sphere - Section 4.1)	IES LM-79-2008 CIE 13.3-1995	≥0		10
Minimum Rf (Integrating Sphere - Section 4.1)	ANSI/IES TM-30-18	≥70		86
Minimum Rg (Integrating Sphere - Section 4.1)	ANSI/IES TM-30-18	≥89		97
Minimum IES Rcs,h1 (Integrating Sphere - Section 4.1)	ANSI/IES TM-30-18	-12%≤IES Rcs,h1≤+23%		-11%
Zonal Lumen Requirement (0°-60°) (Goniophotometer - Section 4.2)	IES LM-79-2008	≥40%		75.10%
Corrected UGR (X=4H, Y=8H, 70/50/20%) (Goniophotometer - Section 4.2)	CIE 190-2010	<22		22.8

2.0 Test List

Test Item	Test	Test Date	Model Number	Sample No.
1	Integrating Sphere Test	2021/9/10	VEKM-L42F/HO/830	L1
2	Goniophotometer Test	2021/9/10	VEKM-L42F/HO/830	L1

Remark(If any)

- 1、 This report shall not be used by the client to claim product endorsement by NVLAP, NIST or any agency of the US government.
- 2、 The results reported herein have been performed in accordance with the laboratory's terms of accreditation. 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. This report does not imply that the product(s) has met the criteria for certification.

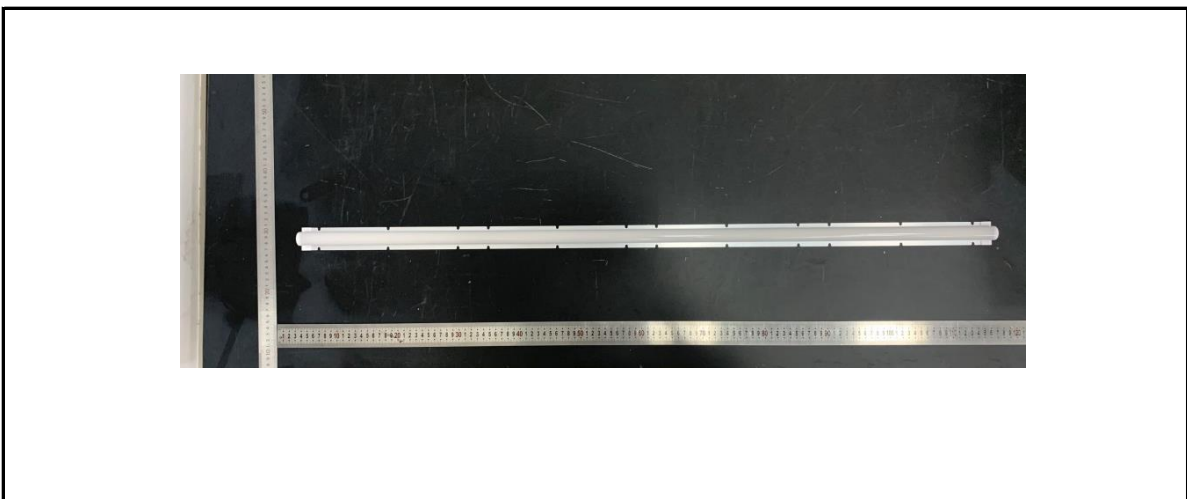
3.0 Production Description

Tested Model: VEKM-L42F/HO/830

Electrical Specification: 120V-277V,50/60HZ

Test in Fixture: Lithonia C2 32 MVOLT GEB10IS

Photos of Luminaire Characteristics



4.0 LM-79 Measurement and Test Results

4.1 Integrating Sphere Test

Model No.	VEKM-L42F/HO/830	Sample ID.	L1
Operate time (Min.)	90	Stabilization time (Min.)	70
Temperature (°C)	25.1	Humidity (%RH)	52.0

Test Method

The samples were tested according to the IES LM-79-2008.

Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$.

The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere.

The voltage of an AC power supply (RMS voltage) or DC power supply (instantaneous voltage) applied to the device under test shall be regulated to within ± 0.2 percent under load.

The sample was measured using 4π geometry and operated at rated voltage and was stabilized before measurement. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at 1 nm intervals over the range of 380 to 780 nm.

Test Result

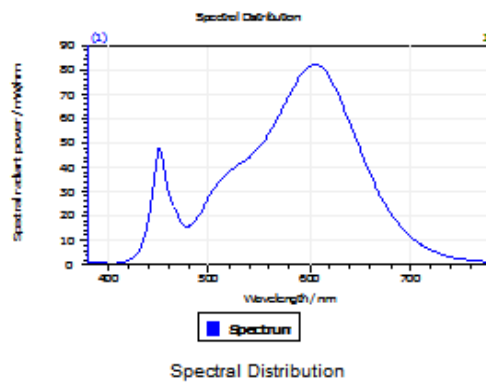
Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD
119.97	60	0.370	44.15	0.994	8.07%
277.00	60	0.169	44.25	0.948	13.23%

CCT (K)	CRI	R9	Duv	Light Output (lm)	Efficacy (lm/W)
3008	83.8	10.2	0.0012	6034	136.4

Rf	Rg	IES Rcs,h1
86	97	-11%

4.1 Integrating Sphere Test

Results



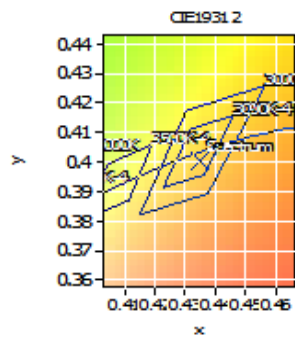
Spectral values

DominantWavelength 583.24 nm
Purity 0.505
PeakWavelength 604.90 nm
Radiant Power 12.11 W
Width50%:

Color Coordinates

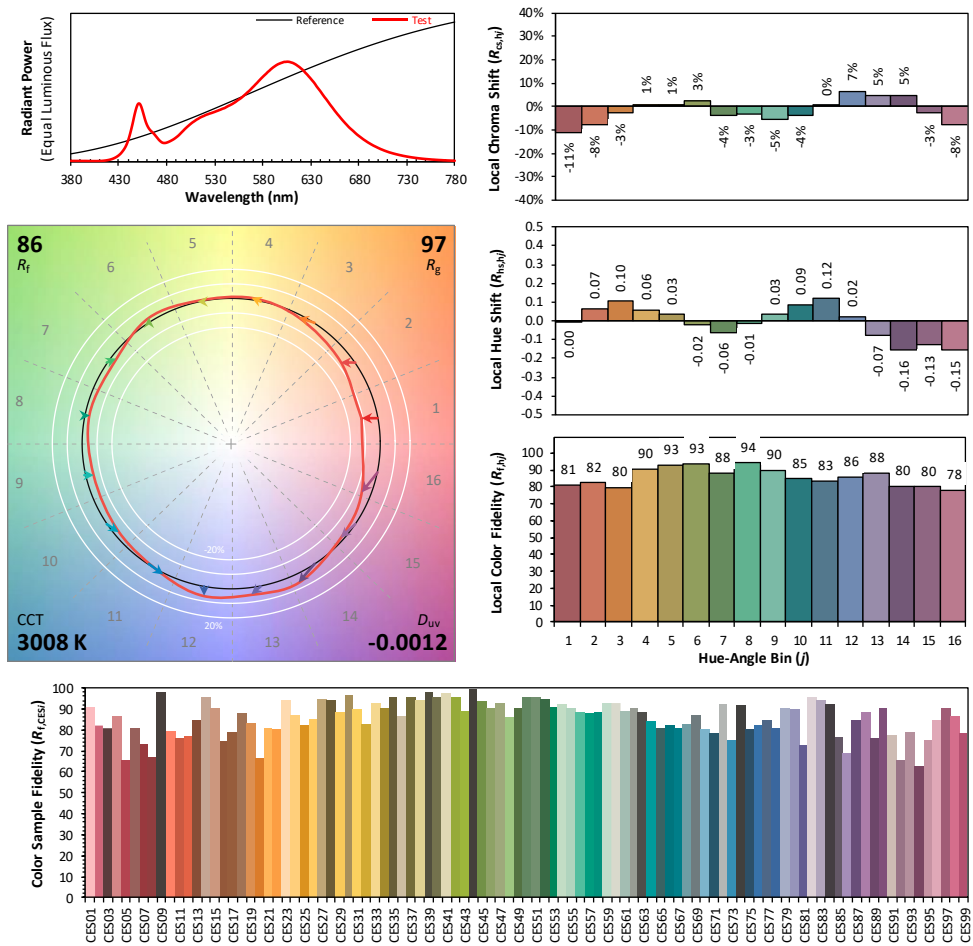
Correlated Color Temperat 3008 K
x: 0.4345 u: 0.2507 u': 0.2507
y: 0.4001 v: 0.3463 v': 0.5195

CRI01	82.8	CRI09	10.2
CRI02	92.6	CRI10	83.4
CRI03	95.5	CRI11	82.9
CRI04	82.4	CRI12	75.4
CRI05	83.6	CRI13	85.3
CRI06	91.7	CRI14	98.3
CRI07	82.2	CRI15	75.1
CRI08	59.6	CRI16	72.1
ResultsCRI	83.8		



PlanckDistance 1.2E-003

4.1 Integrating Sphere Test



lors are for visual orientation purposes only. Created with the ANSI/IES TM-30-18 Calculator Version 2.0

4.0 LM-79 Measurement and Test Results

4.2 Goniophotometer Test

Model No.	VEKM-L42F/HO/830	Sample ID.	L1
Operate time (Min.)	90	Stabilization time (Min.)	45
Temperature (°C)	25.3	Humidity (%RH)	54.0

Test Method

The samples were tested according to the IES LM-79-2008.

Photometric parameters were measured using a type C goniophotometer and software.

The ambient temperature shall be maintained at $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$, measured at a point not more than 1 m from the sample and at the same height as the sample.

The voltage of an AC power supply (RMS voltage) or DC power supply (instantaneous voltage) applied to the device under test shall be regulated to within ± 0.2 percent under load.

The samples were operated at rated voltage and was stabilized before measurement. Luminous flux, luminaire efficacy, zonal lumen were calculated from the software taken at 0.5° vertical intervals and 10° horizontal intervals.

Test Conditions

Condition	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
WROST CASE	277.01	60	0.171	44.4	0.940

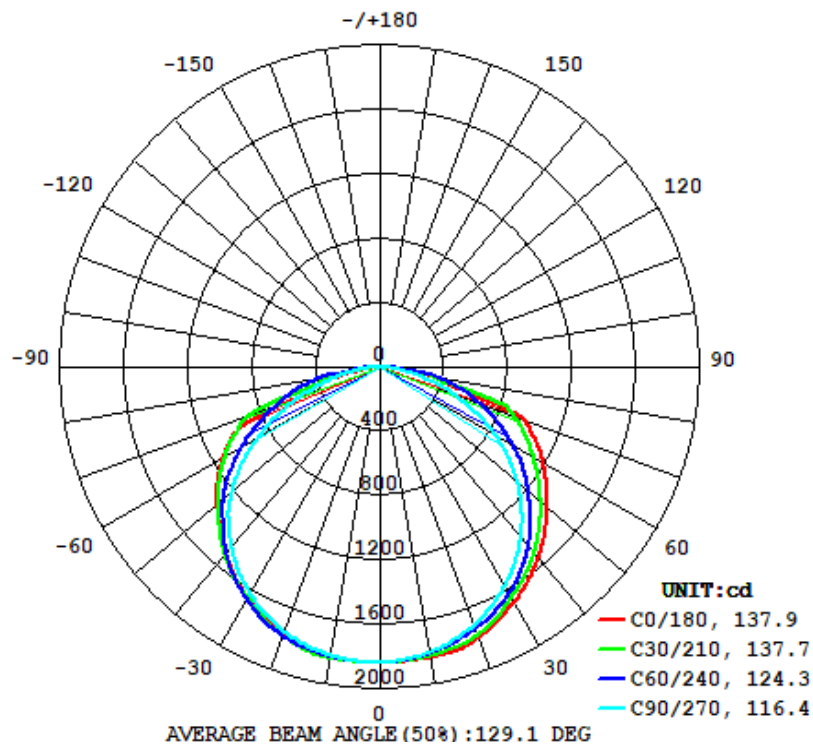
Test Result

Flux (lm)	Field Angle(10%)		Beam Angle(50%)		Luminous Efficacy (lm/W)
	C0-180	C90-270	C0-180	C90-270	
6083	161.0	159.6	137.9	116.4	136.9

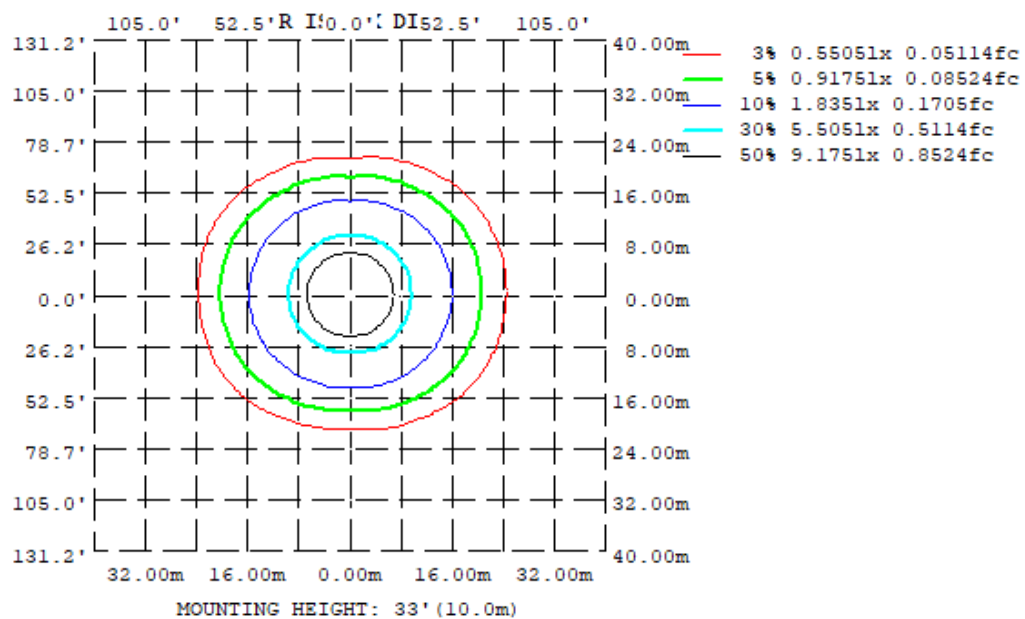
Zonal Lumen Requirement (0° - 60°)	UGR (X=4H, Y=8H, 70/50/20%)	Length (ft)	Lumen (lm/ft)
75.10%	22.8	4	1521

4.2 Goniophotometer Test

Light Distrubtion Curve



Isolux Plot



4.2 Goniophotometer Test

Zonal Lumen Summary

γ	C0	C45	C90	C135	C180	C225	C270	C315
10	1831	1811	1798	1814	1836	1831	1820	1830
20	1790	1756	1707	1747	1771	1783	1752	1795
30	1682	1639	1566	1616	1655	1668	1627	1692
40	1544	1469	1375	1447	1504	1504	1448	1529
50	1367	1270	1129	1241	1330	1308	1212	1347
60	1180	1040	824.3	1010	1138	1076	895.0	1122
70	955.8	800.7	483.1	753.8	569.7	814.0	529.5	874.8
80	307.8	287.6	156.7	220.2	122.2	270.5	199.2	339.8
90	4.321	3.162	0.6923	0.9642	0.9456	1.141	0.9831	7.465
100	0.8698	0.7592	0.6261	0.6674	0.7077	0.7574	0.8210	0.8728
110	0.8278	0.7532	0.7305	0.6783	0.8549	0.8653	1.044	0.7689
120	0.7156	0.8068	0.8058	0.6999	0.6480	0.9300	1.046	0.5806
130	0.8207	1.017	0.8751	0.7210	0.9070	1.001	1.084	0.9270
140	0.9467	1.177	1.026	0.9264	1.202	1.209	1.221	1.250
150	0.8966	1.200	1.052	0.9548	1.345	1.352	1.175	1.311
160	0.9764	1.033	1.115	0.9340	1.131	1.238	1.137	1.066
170	0.8774	1.125	1.151	0.9618	1.050	0.9696	0.9932	1.062
180	1.148	1.174	1.119	1.119	1.124	1.076	1.115	1.119
DEG	LUMINOUS INTENSITY:cd							

UGR Table - Corrected

UGR Table - Corrected

Reflectances											
Ceiling Cavity		70	70	50	50	30	70	70	50	50	30
Walls		50	30	50	30	30	50	30	50	30	30
Floor Cavity		20	20	20	20	20	20	20	20	20	20
Room Size		UGR Viewed Crosswise					UGR Viewed Endwise				
X=2H	Y=2H	17.7	19.4	18.0	19.7	20.0	18.9	20.6	19.3	20.9	21.3
	3H	19.4	20.9	19.8	21.2	21.6	21.0	22.6	21.4	22.9	23.3
	4H	19.9	21.4	20.3	21.7	22.1	21.4	22.9	21.8	23.2	23.6
	6H	20.3	21.6	20.7	22.0	22.4	21.7	23.0	22.1	23.4	23.8
	8H	20.3	21.6	20.8	22.0	22.4	21.6	22.9	22.0	23.3	23.7
	12H	20.4	21.6	20.8	22.0	22.4	21.6	22.9	22.0	23.2	23.7
4H	2H	18.7	20.1	19.1	20.5	20.9	19.6	21.1	20.0	21.4	21.8
	3H	20.7	21.9	21.1	22.3	22.7	22.1	23.3	22.5	23.7	24.1
	4H	21.4	22.6	21.9	23.0	23.4	22.5	23.6	23.0	24.1	24.5
	6H	21.9	22.9	22.4	23.3	23.8	22.8	23.8	23.3	24.2	24.7
	8H	22.0	22.9	22.5	23.4	23.8	22.8	23.7	23.2	24.1	24.6
	12H	22.0	22.9	22.5	23.4	23.8	22.8	23.6	23.2	24.1	24.5
8H	4H	22.0	22.9	22.5	23.4	23.8	22.9	23.8	23.3	24.2	24.7
	6H	22.7	23.4	23.2	23.9	24.4	23.2	24.0	23.7	24.4	24.9
	8H	22.8	23.5	23.3	24.0	24.5	23.2	23.9	23.7	24.4	24.9
	12H	22.9	23.5	23.4	24.0	24.6	23.2	23.8	23.7	24.3	24.8
12H	4H	22.1	22.9	22.5	23.4	23.8	22.9	23.7	23.4	24.2	24.7
	6H	22.7	23.4	23.3	23.9	24.4	23.3	23.9	23.8	24.4	24.9
	8H	22.9	23.5	23.4	24.0	24.6	23.3	23.9	23.8	24.4	24.9

Maximum UGR = 24.9

4.2 Goniophotometer Test

ZONAL LUMEN SUMMARY

	Zonal (lm)		Total (lm)	Percent
0-10	174.52	0 - 10	174.52	2.87%
10-20	508.50	0 - 20	683.02	11.23%
20-30	788.48	0 - 30	1471.50	24.19%
30-40	982.93	0 - 40	2454.43	40.35%
40-50	1070.59	0 - 50	3525.02	57.94%
50-60	1043.94	0 - 60	4568.96	75.10%
60-70	895.16	0 - 70	5464.12	89.82%
70-80	517.79	0 - 80	5981.91	98.33%
80-90	95.82	0 - 90	6077.73	99.91%
90-100	0.96	0 - 100	6078.69	99.92%
100-110	0.83	0 - 110	6079.52	99.93%
110-120	0.78	0 - 120	6080.30	99.95%
120-130	0.75	0 - 130	6081.05	99.96%
130-140	0.81	0 - 140	6081.86	99.97%
140-150	0.72	0 - 150	6082.58	99.99%
150-160	0.52	0 - 160	6083.10	99.99%
160-170	0.29	0 - 170	6083.39	100.00%
170-180	0.10	0 - 180	6083.49	100.00%

5.0 Equipment Information

Test Equipment			
Equipment ID	Equipment Name	Last Calibration Date	Calibration Due Date
DLF107	Integrating Sphere System	2020/12/26	2021/12/25
DLF108	Auxiliary Lamp	2020/12/26	2021/12/25
DLF122	Measurement Standard Lamp Standard Lamp Type: 220 V, 0.4720 A, Tungsten, Omni-derectional	2020/12/26	2021/12/25
DLF116	AC Power Source	2020/12/26	2021/12/25
DLF113	Power Meter	2020/12/26	2021/12/25
DLF112	Temperature Recorder	2020/12/26	2021/12/25
DLF114	Temperature & Humidity Datalogger	2020/12/26	2021/12/25
DLF101	Goniophotometer	2020/12/26	2021/12/25
DLF125	Standard Lamp Standard Lamp Type: 76.58 V, 6.7875 A, Tungsten, Omni-derectional	2020/12/26	2021/12/25
DLF104	AC Power Source	2020/12/26	2021/12/25
DLF507	DC Power Source	2020/12/26	2021/12/25
DLF102	Power Meter	2020/12/26	2021/12/25
DLF111	Temperature & Humidity Datalogger	2020/12/26	2021/12/25
DLF119	Power Meter	2020/12/26	2021/12/25
DLF031	Temperature data logger	2020/12/26	2021/12/25
DLF022	Digital power meter	2020/12/26	2021/12/25
DLF003	Temperature & Humidity Datalogger	2020/12/26	2021/12/25

***** End of Test Report*****