Photometric Test Report

Relevant Standards

☑IES LM-79-2008
☑ANSI C82.77:2014
☑UL1598-2008

Prepared For

LED ONE DISTRIBUTION, INC

45885 HOTCHKISS ST FREMONT, CA 94539

Susan Miller ,+1 510 770 1189 ,Susan.Miller@ledonedistribution.com

Prepared By

Deliver Co.， Ltd.
Block 11, 78 Keling Road, SSTP, Suzhou, China
0512-66801950,kevin.jia@szdeliver.com

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Prepared By	**Approved By**
Wangzun Zhu	Kevin Jia

1.0 Test Summary

DLC Technical Requirements v4.3

Indoor - High-Bay Luminaires for Commercial and Industrial Buildings				
Requirement Category	**Test Method**	**Requirements**	**Test value**	**Results (Fail/Pass)**
Lamp Output (lm)	IES LM-79-2008	10000	22671	P
Zonal Lumen Requirement (20°-50°)	IES LM-79-2008	⩾30%	50.90%	P
Minimum Luminaire Efficacy (lm/W)	IES LM-79-2008	130	134.7	P
Alowable CCTs* (K)	IES LM-79-2008	5700	5035	P
Minimum CRI	IES LM-79-2008 CIE 13.3-1995	70	82.3	P
L90 Lumen maintenance (hours)	IES LM-80-2015 IES TM-21-2011	36000	＞36000	P
L90 Lumen maintenance (hours)	IES LM-80-2015 IES TM-21-2011	50000	＞50000	P
Power Factor	ANSI C82.77:2014	0.873	0.968	P
Total Harmonic Distortion (A%)	ANSI C82.77:2014	25.00%	6.54%	P
In-Situ Temperature Measurement Test for LED (°C)	UL1598-2008/ UL1993-2012	105	65.1	P
In-Situ Temperature Measurement Test for Driver (°C)	UL1598-2008/ UL1993-2012	90	44.7	P

2.0 Test List

Test Item	Test	Test Date	Model Number	Sample No.
1	Integrating Sphere Test for the lower CCT	2018/11/14	LOD-LHB160W-30	B1
	Integrating Sphere Test for the higher CCT	2018/11/14	LOD-LHB160W-50	B2
2	Goniophotometer Test	2018/11/14	LOD-LHB160W-30	B1
3	THD and PF Test	2018/11/14	LOD-LHB160W-30	B1
4	In-Situ Temperature Measurement Test	2018/11/14	LOD-LHB160W-30	B1

Remark(If any)
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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

Luminaire Description:

Electrical Specification: 120V-277V,50/60HZ,161W

Light source: SPMWH1228xxxxxxxxx

Manufacturer Of Light Source: Samsung Electronics Co., LTD.

Photos of Luminaire Characteristics


4.0 LM-79 Measurement and Test Results

4.1 Integrating Sphere Test for the lower CCT

Model No.	LOD-LHB160W-30	Sample ID.	B1
Opreate time (Min.)	90	Stabilization time (Min.)	45

Test Method
The samples were tested according to the IES LM-79-2008.
Photometric paramters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25º C ± 1º 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 Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
25.1	120.01	60	1.412	168.80	0.996

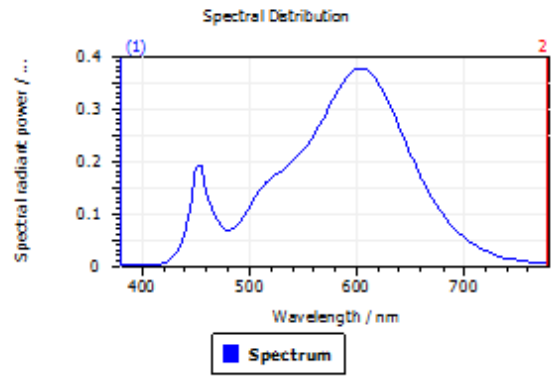
Test Result

CCT (K)	CRI (Ra)	Duv
2934	82.3	2.8E-04

4.1 Integrating Sphere Test for the lower CCT

Spectroradiometric Parameters

Results



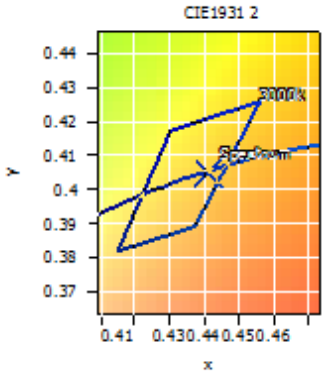
Spectral Distribution

Spectral values

DominantWavelength	583.21 nm
Purity	0.540
PeakWavelength	603.40 nm
Width50%:	122.05 nm

Color Coordinates

Correlated Color Temperatu		2934 K		
x:	0.4413	u: 0.2531	u': 0.2531	
y:	0.4048	v: 0.3482	v': 0.5223	
CRI01		80.7	CRI09	5.2
CRI02		91.2	CRI10	80.0
CRI03		96.1	CRI11	79.6
CRI04		80.2	CRI12	70.7
CRI05		81.1	CRI13	83.2
CRI06		89.5	CRI14	98.7
CRI07		82.0	CRI15	73.0
CRI08		57.8	CRI16	70.3
ResultsCRI		82.3		



PlanckDistance 2.8E-004

4.0 LM-79 Measurement and Test Results

4.2 Integrating Sphere Test for the higher CCT

Model No.	LOD-LHB160W-50	Sample ID.	B2
Opreate time (Min.)	90	Stabilization time (Min.)	45

Test Method
The samples were tested according to the IES LM-79-2008. Photometric paramters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25º C ± 1º 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 Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
25.1	119.99	60	1.421	169.90	0.996

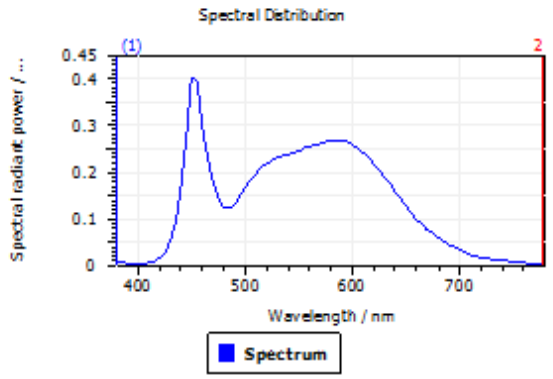
Test Result

CCT (K)	CRI (Ra)	Duv
5035	84.3	2.1E-03

4.2 Integrating Sphere Test for the higher CCT

Spectroradiometric Parameters

Results



Spectral Distribution

Spectral values

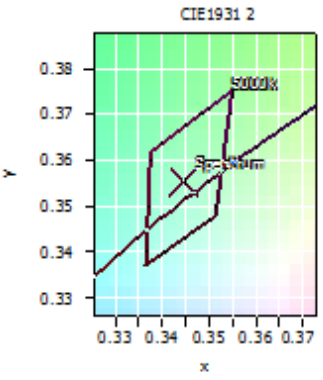
DominantWavelength	570.17 nm
Purity	0.100
PeakWavelength	452.63 nm
Width50%:	26.27 nm

Color Coordinates

Correlated Color Temperatu		5035 K			
x:	0.3445	u:	0.2096	u':	0.2096
y:	0.3554	v:	0.3243	v':	0.4864

CRI01	82.5	CRI09	11.2
CRI02	90.3	CRI10	76.6
CRI03	94.5	CRI11	82.5
CRI04	83.1	CRI12	64.9
CRI05	83.3	CRI13	84.8
CRI06	86.1	CRI14	97.4
CRI07	86.7	CRI15	76.9
CRI08	67.5	CRI16	74.4

ResultsCRI 84.3



PlanckDistance 2.1E-003

4.0 LM-79 Measurement and Test Results

4.3 Goniophotometer Test

Model No.	LOD-LHB160W-30	Sample ID.	B1
Opreate time (Min.)	90	Stabilization time (Min.)	45

Test Method
The samples were tested according to the IES LM-79-2008.
Photometric paramters were measured using a type C goniophotometer and software.
The ambient temperature shall be maintained at 25° C ± 1° 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^{o} vertical intervals and 10^{o} horizontal intervals.

Test Conditions

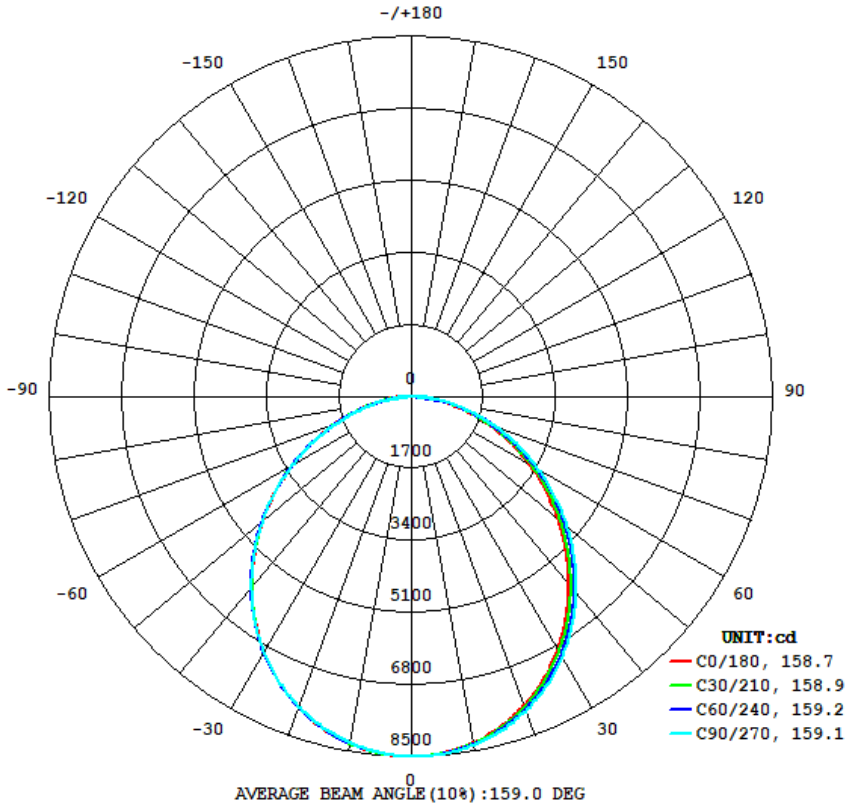
Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
25.1	119.97	60	1.409	168.30	0.996	Light Down

Test Result

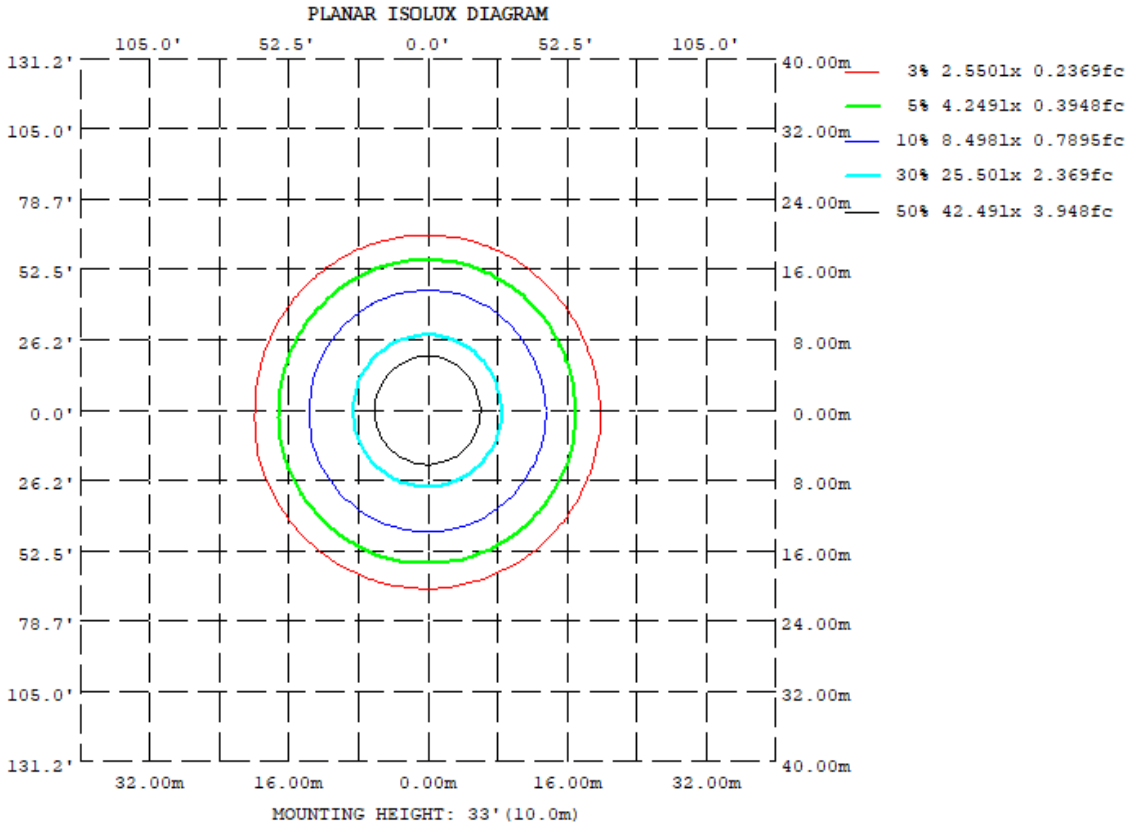
Flux(lm)	Zonal Lumen Requirement(20°-50°)	Field Angle(10%)		Beam Angle(50%)		Luminous Efficacy (lm/W)
		Horizontal Spread	Vertical Spread	Horizontal Spread	Vertical Spread	
22671	50.90%	158.7	159.1	104.4	106.7	134.7

4.3 Goniophotometer Test

Light Distrubtion Curve



Isolux Plot



4.3 Goniophotometer Test

Zonal Lumen Summary

γ	C0	C45	C90	C135	C180	C225	C270	C315
10	8301	8323	8350	8355	8323	8311	8296	8275
20	7755	7815	7880	7881	7795	7791	7774	7720
30	6889	6994	7098	7084	6943	6953	6942	6858
40	5772	5914	6044	6020	5824	5855	5845	5745
50	4516	4668	4801	4771	4560	4591	4575	4481
60	3209	3350	3471	3450	3238	3258	3234	3158
70	1937	2044	2134	2129	1944	1939	1903	1855
80	779.7	847.0	899.2	906.8	783.9	754.4	713.6	696.8
90	24.60	26.71	38.19	46.17	31.11	15.89	1.440	1.715
100	1.702	4.269	6.605	4.199	1.803	4.697	6.756	4.805
110	2.552	4.897	2.880	5.852	3.207	6.230	4.586	6.682
120	3.829	8.714	10.18	10.10	5.211	10.62	11.95	11.98
130	5.023	14.34	12.95	12.26	7.449	16.87	15.48	15.93
140	5.847	13.26	17.60	14.58	9.489	16.40	20.69	16.63
150	6.690	12.46	17.37	12.05	11.40	15.97	20.58	15.67
160	7.394	9.398	12.71	9.050	12.87	14.01	16.29	13.40
170	7.461	7.866	9.214	7.657	11.22	11.08	11.04	10.91
180	10.03	10.09	9.594	10.02	10.08	10.09	9.807	9.747

DEG	LUMINOUS INTENSITY:cd

5.0 THD and PF Test

Model No.	LOD-LHB160W-30	Sample ID.	B1

Test Method
The samples were tested according to the ANSI C82.77:2002. The total harmonic distortion shall be measured to the 40th order. The ambient temperature condition was maintained at 25º C ± 1º C. The sample measurements were made using a digital power meter and power supply. The sample was operated at rated voltage and was stabilized before measurement. The total harmonic distortion were calculated.

Test Results

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD
25.1	277.07	60	0.620	166.4	0.968	6.54%
25.1	120.01	60	1.412	168.8	0.996	7.14%

6.0 In-Situ Temperature Measurement Test

Model No.	LOD-LHB160W-30	Sample ID.	B1

Test Method
In-Situ Temperature Measurement Test is conducted according to UL 1598, Section 14. The samples were tested and properly mounted in the troffer which is mounted in recessed ceiling. The testing was conducted in a room with ambient temperature of 25°C±5°C. The apparatus construction followed those described in UL 1598 for normal temperature testing. Thermocpuples were placed on the LED package in the locations indicated by LM-80 report. The temperature was recorded after the lamp was operating for a minimum of 7.5 hours, or the lamp was running for a minimum of 3 hours and three successive readings taken at 15 min intervals are within 1 °C of one another and are not rising.

In-Situ Temperature Measurement Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
25.2	120.05	60	1.414	168.40	0.992	Base Up

Test Results

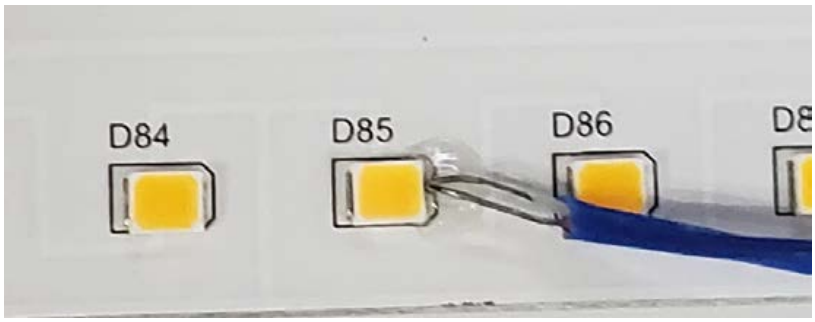
Thermocouple Location	Manufacturer Declared Current(mA)	Temperature for Lighting source(°C)	LED Model Number	LM-80 Limit Current(mA)	LM-80 Limit Temp.(°C)
TMP of LEDs	78.5	65.1	SPMWH1228x xxxxxxxx	120	105
Ambient temperature	N/A	25.0			

Thermocouple Location	Limit Temp (°C)	Temperature for Drive (°C)	Drive Model Number
TMP of Drive 1	90	44.7	**SLP50-I1100 120-277 W D1 P**
TMP of Drive 2	90	50.2	**SLP96-I2200 120-277 W D1 S**

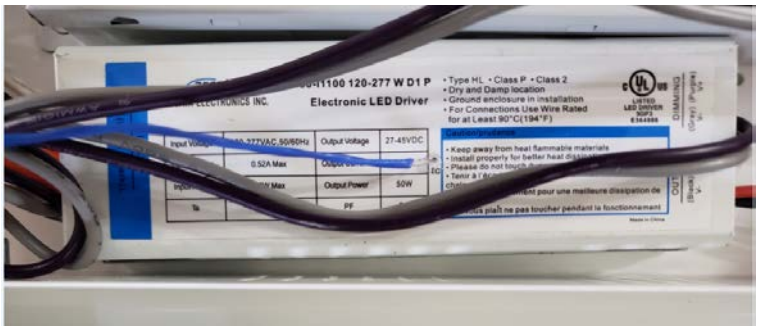
Life time expectation at 50,000 hours of operation with Driver Case Temperature (Tc) at maximum of 90°C not to be exceed as indicated in the Driver specification sheet

6.0 In-Situ Temperature Measurement Test

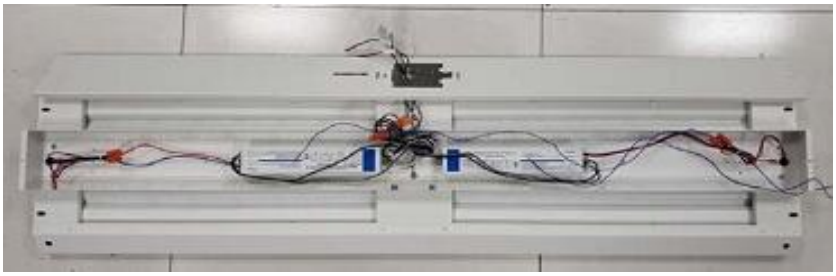
Test Photos



LED Driver 1



LED Driver 2



7.0 Equipment Information

Test Equipment			
Equipment ID	Equipment Name	Last Calibration	Calibration Due Date
DLF107	Integrating Sphere System	2017/12/28	2018/12/27
DLF108	Auxiliary Lamp	2017/12/28	2018/12/27
DLF122	Measurement Standard Lamp Standard Lamp Type: 220 V, 0.4720 A, Tungsten, Omni-derectional	2017/12/28	2018/12/27
DLF116	AC Power Source	2017/12/28	2018/12/27
DLF113	Power Meter	2017/12/28	2018/12/27
DLF112	Temperature Recorder	2017/12/28	2018/12/27
DLF114	Temperature & Humidity Datalogger	2017/12/28	2018/12/27
DLF101	Goniophotometer	2017/12/28	2018/12/27
DLF125	Standard Lamp Standard Lamp Type: 76.58 V, 6.7875 A, Tungsten, Omni-derectional	2017/12/28	2018/12/27
DLF104	AC Power Source	2017/12/28	2018/12/27
DLF507	DC Power Source	2017/12/28	2018/12/27
DLF102	Power Meter	2017/12/28	2018/12/27
DLF111	Temperature & Humidity Datalogger	2017/12/28	2018/12/27
DLF119	Power Meter	2017/12/28	2018/12/27
DLF031	Temperature data logger	2017/12/28	2018/12/27
DLF022	Digital power meter	2017/12/28	2018/12/27
DLF003	Temperature & Humidity Datalogger	2017/12/28	2018/12/27

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