

TEST REPORT

Prepared For

AOK LED Light Company Limited

Building 1, ST George's Science and Technology Industrial Park, Shajin Street, Shenzhen

Model: AOK-110WiC

Report Type:	Report is prepared for the client above to present the result of measured temperature of samples and projected lumen maintenance life of LED lighting product according to projecting method from IES: IES TM-21-11
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Report Number:	R2DG170308053-10A1
Test Date:	2017-03-15
Report Date:	2017-03-16
Reviewed By:	Blake Zhang / EE Engineer <i>Blake Zhang</i>
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Note: The test data was only valid for the test sample(s). This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Shenzhen)

(Rev. 2.0, 2012-10-05 effected) This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

1. General Description

Information of Final Products:

Three samples were received on 2017-03-08 and used for testing. The samples were designed with different construction and installation option. Sample with "RSB" option was numbered R2DG170308053-S01. Sample with "RSC" option was numbered R2DG170308053-S02. Sample with "SMA" option was numbered R2DG170308053-S03. Refer to section 6 for more information.

Model Number:	AOK-110WiC
Model Name:	LED Canopy Light
Brand Name:	AOK
Manufacturer:	AOK LED Light Company Limited
Rated Voltage:	100-240 V AC 50/60Hz
Test Voltage:	240V,50Hz
Rated Power:	110W
Driver Brand:	MW
Driver Model:	HLG-120H-48

Information of LED Light Source:

Model Number of LED Light Source:	LUXEON 3030 2D: L130-5070003000W21
Type of LED Components:	LED Package
Manufacturer:	Philips Lumileds

2. Standards Used

- IES TM-21-11 Projecting Long Term Lumen Maintenance of LED Light Sources
- ANSI/UL 1598-2008: Standard for Safety of Luminaires
- Annex A of IES LM-84-14 Recommendations for measurement of IN-SITU conditions LED case temperature

3. Test Method

Lumen maintenance life of LED light source and LED lamp or luminaire (if any) is the elapsed operating time over which an LED light source maintains a given percentage of its initial light output. L_{70} in this report is the time (in hours) when the light output from the LED has dropped to 70% of its initial output.

The LED light source is LED package, array, or module which is tested in IES LM-80-08 test report. Final product means LED lamp or luminaire which the LED light source will be included. TMP_{LED} is the temperature of the thermocouple attachment point on the LED light source package as defined by the manufacturer of the LED light source. The *in situ* temperature of LED light source used in final product was used to calculate the lumen maintenance life of final product, if any.

The *in situ* temperature is measured according to ANSI/UL 1598 and IES LM-84 Annex A. The LED which has the highest temperature was measured at the location of LED case which is specified by LED source manufacturer and detailed by LM-80 report. The hottest LED was found by the following procedure:

An IR thermography may be used to find the hottest LEDs. Or if the layout of PCB is symmetrical, the hottest LED should be at the center or close to the center of the array. Or in question, more than one TMP should be measured to find out the hottest LED. The case temperature of the hottest LED source at *in situ* condition is reported and is used to project L_{70} life time.

The reported temperature value for each point should be the readings of the hybrid recorder after the temperature of each point is stabilized and constant. A temperature is considered constant if the test has been running for at least 3 hours; and three successive readings, taken at 15-minute intervals, are within 1 degree C of one another and are not

rising. Or the test was run for a minimum of 7.5 h. Ambient temperature variations above or below 50 °C have been respectively subtracted from or added to temperatures recorded at points on the device.

The drive current of LED package/module/ array was calculated as the total output current of the driver measured by multimeter, divided by the number of branches in parallel of LEDs.

The calculation of the L₇₀ life is according to IES TM-21-11.

4. Test Equipment

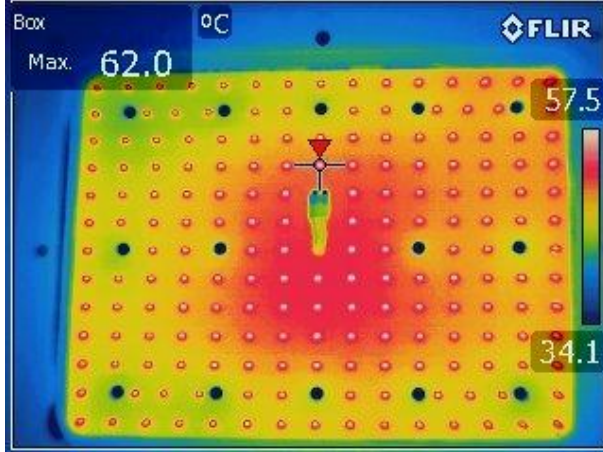
Device	Manufacture	Model No	Serial No	Test Range	Calibration date	Calibration due date
Multimeter	FLUKE	17B	1573 1328	400nV~4000nV, 4V~1000V	2017-03-03	2018-03-02
Hybrid Recorder	YOKOGAWA	DR240	10#	N/A	2017-03-03	2018-03-02
Power Supply	HengPu	HPA 1103	0003394	3KVA	2017-03-03	2018-03-02
Thermography	FLIR	E60	49037877	-20°C-120 °C 0°C-650 °C	N/A	N/A

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).

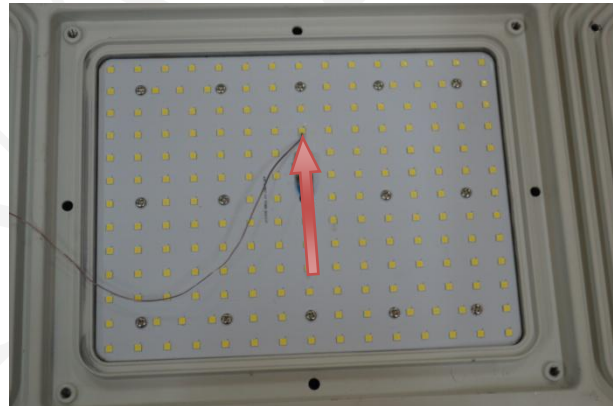
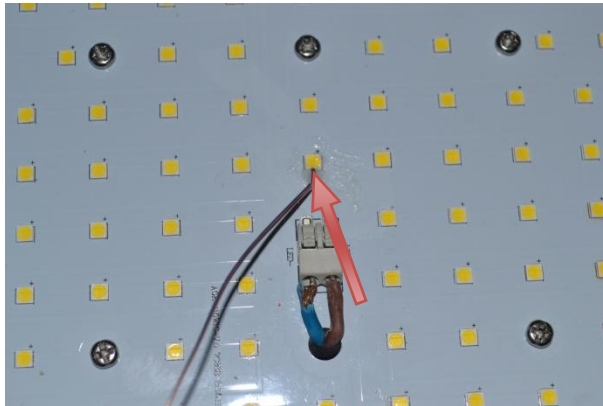
5. In situ Temperature and Driver Current Measurements of Final Product

Sample No.: R2DG170308053-S01

IR thermograph from hot PCBAs of Sample (at 25°C)



Temperature measurement point on TMP_{LED}(at 50°C)



Temperature Measurement Data

Test Condition

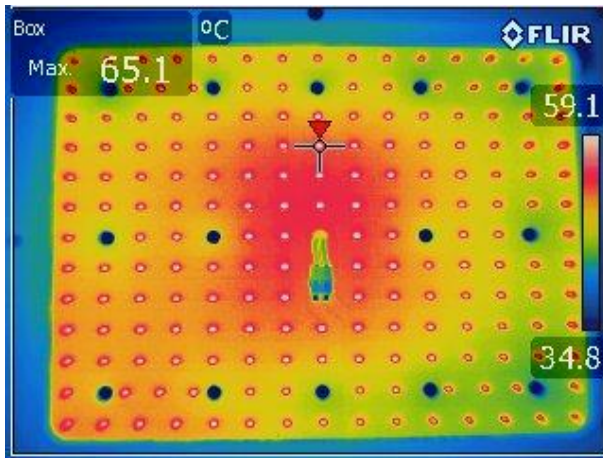
Ambient Temperature: 50°C±5°C
Relative Humidity: 53 %
Supply voltage: 240V 50Hz
Type of thermocouples: T
Test Duration: ≥3.5Hours

Test Result

Hottest TMP_{LED}: 70.2°C
Forward Current(I_F): 97.42mA

Sample No.: R2DG170308053-S02

IR thermograph from hot PCBAs of Sample (at 25°C)



Temperature measurement point on TMP_{LED}(at 50°C)



Temperature Measurement Data

Test Condition

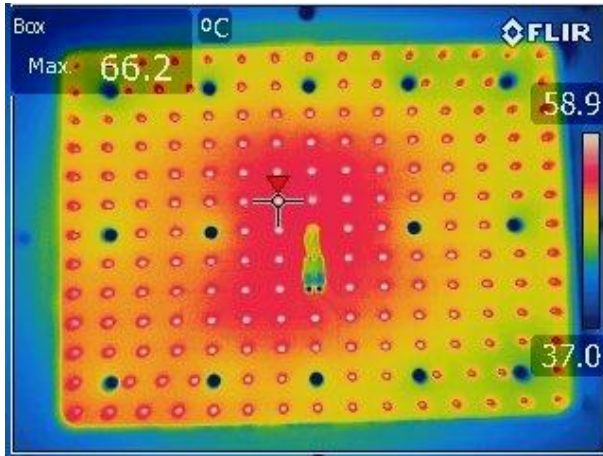
Ambient Temperature: 50°C±5°C
Relative Humidity: 53 %
Supply voltage: 240V 50Hz
Type of thermocouples: T
Test Duration: ≥3.5Hours

Test Result

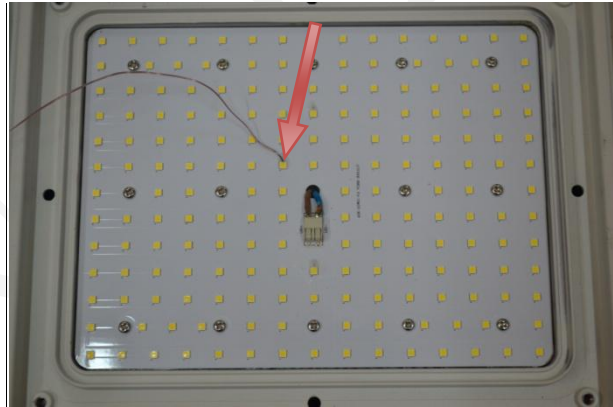
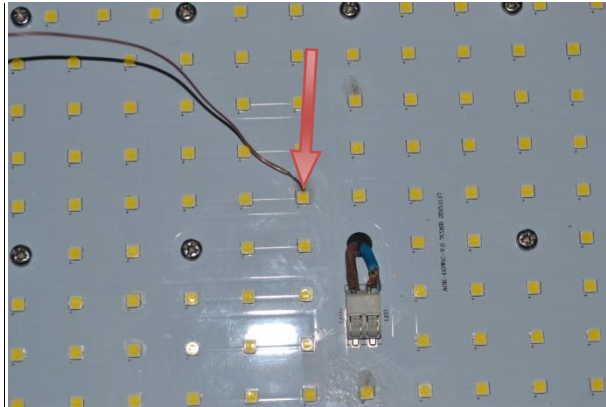
Hottest TMP_{LED}: 72.5°C
Forward Current(I_F): 97.42mA

Sample No.: R2DG170308053-S03

IR thermograph from hot PCBAs of Sample (at 25°C)



Temperature measurement point on TMP_{LED}(at 50°C)



Temperature Measurement Data

Test Condition

- Ambient Temperature: 50°C±5°C
- Relative Humidity: 53 %
- Supply voltage: 240V 50Hz
- Type of thermocouples: T
- Test Duration: ≥3.5Hours

Test Result

- Hottest TMP_{LED}: 75°C
- Forward Current(I_F): 97.42mA

6. Lumen Maintenance Data of LED Light Source from LM-80 Report

Test Data for 55°C Case Temperature		Test Data for 85°C Case Temperature		Test Data for 105°C Case Temperature	
Time (hours)	Lumen Maintenance (%)	Time (hours)	Lumen Maintenance (%)	Time (hours)	Lumen Maintenance (%)
1000	99.26	1000	98.97	1000	98.91
2000	98.64	2000	98.43	2000	98.15
3000	98.36	3000	98.01	3000	97.68
4000	97.69	4000	97.28	4000	96.74
5000	97.25	5000	96.71	5000	96.27
6000	96.81	6000	96.24	6000	95.73
7000	96.34	7000	95.77	7000	95.36
8000	95.84	8000	95.66	8000	95.25
9000	95.49	9000	95.19	9000	94.56

7. Calculate Result of Life Time Projection

Sample No.: R2DG170308053-S01

Temperature Interpolation at 70.2° C (projection based on in-situ temperature entered)	
$T_{s,1}$ (°C)	55.00
$T_{s,1}$ (K)	328.15
α_1	4.645E-06
B_1	0.995
$T_{s,2}$ (°C)	85.00
$T_{s,2}$ (K)	358.15
α_2	4.178E-06
B_2	0.988
E_a/k_b	-4.15E+02
A	1.312E-06
B_0	0.992
$T_{s,i}$ (°C)	70.20
$T_{s,i}$ (K)	343.35
α_i	4.392E-06
Reported L₇₀(9k) at 70.2°C (hours)	>54000

Sample No.: R2DG170308053-S02

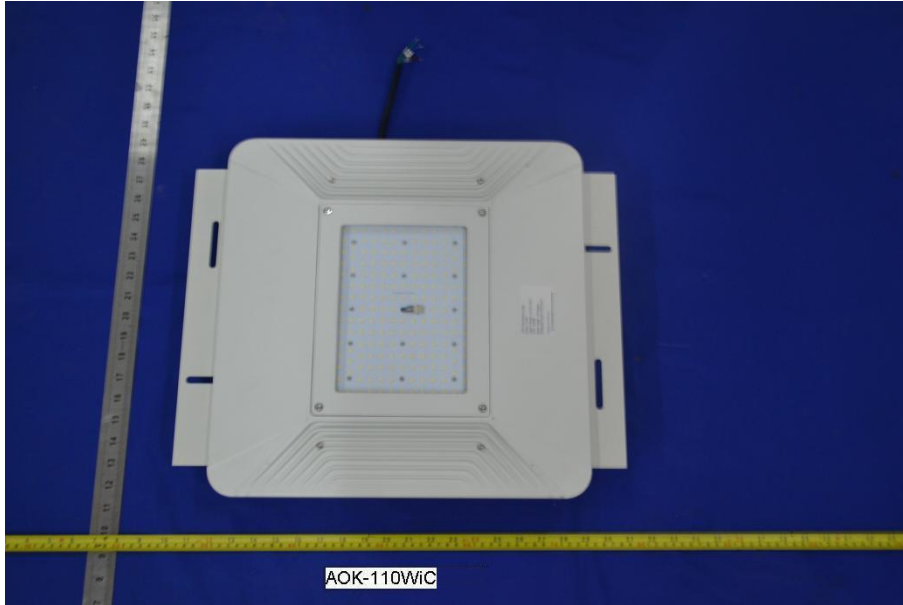
Temperature Interpolation at 72.5° C (projection based on in-situ temperature entered)	
$T_{s,1}$ (°C)	55.00
$T_{s,1}$ (K)	328.15
α_1	4.645E-06
B_1	0.995
$T_{s,2}$ (°C)	85.00
$T_{s,2}$ (K)	358.15
α_2	4.178E-06
B_2	0.988
E_a/k_b	-4.15E+02
A	1.312E-06
B_0	0.992
$T_{s,i}$ (°C)	72.50
$T_{s,i}$ (K)	345.65
α_i	4.357E-06
Reported $L_{70}(9k)$ at 72.5° C (hours)	>54000

Sample No.: R2DG170308053-S03

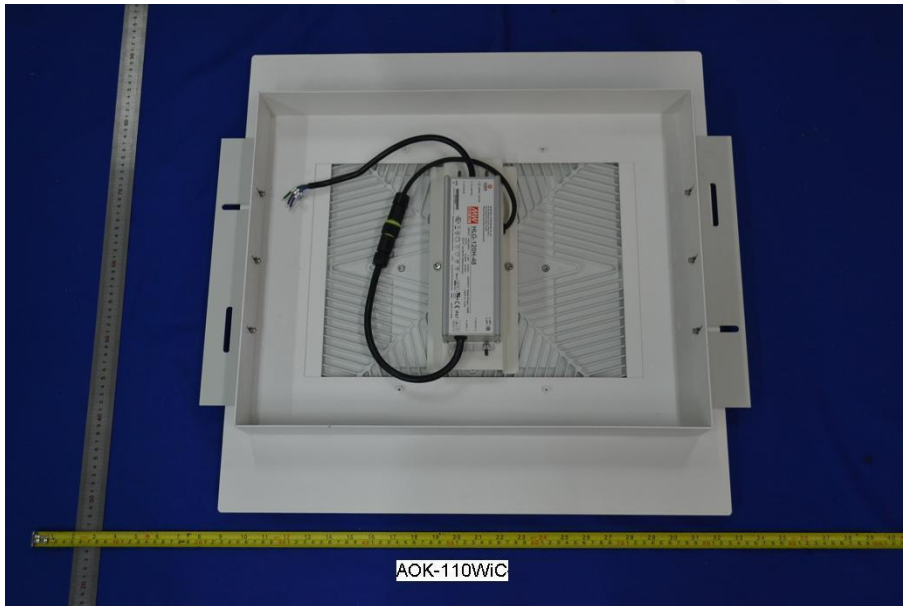
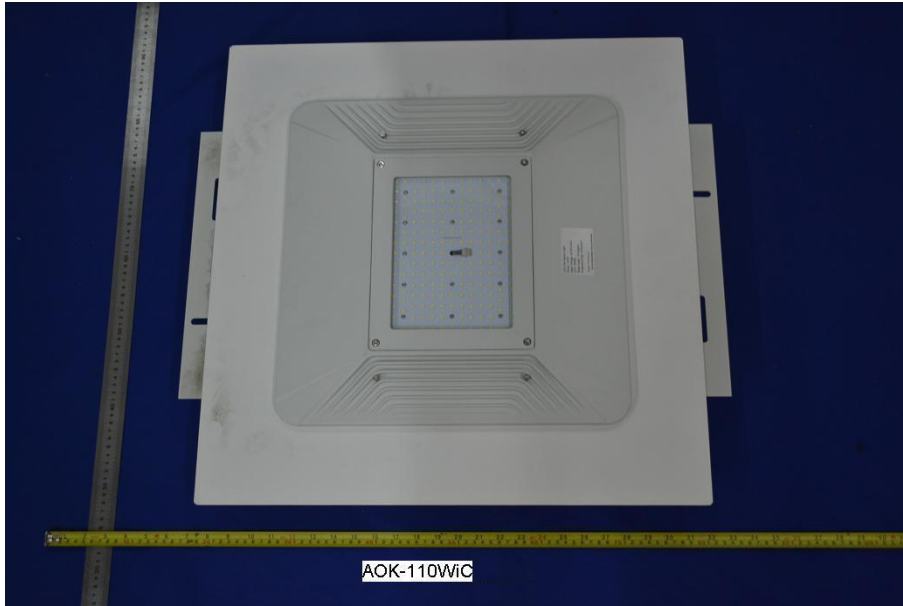
Temperature Interpolation at 75° C (projection based on in-situ temperature entered)	
$T_{s,1}$ (°C)	55.00
$T_{s,1}$ (K)	328.15
α_1	4.645E-06
B_1	0.995
$T_{s,2}$ (°C)	85.00
$T_{s,2}$ (K)	358.15
α_2	4.178E-06
B_2	0.988
E_a/k_b	-4.15E+02
A	1.312E-06
B_0	0.992
$T_{s,i}$ (°C)	75.00
$T_{s,i}$ (K)	348.15
α_i	4.320E-06
Reported $L_{70}(9k)$ at 75°C (hours)	>54000

8. Final Product Photo

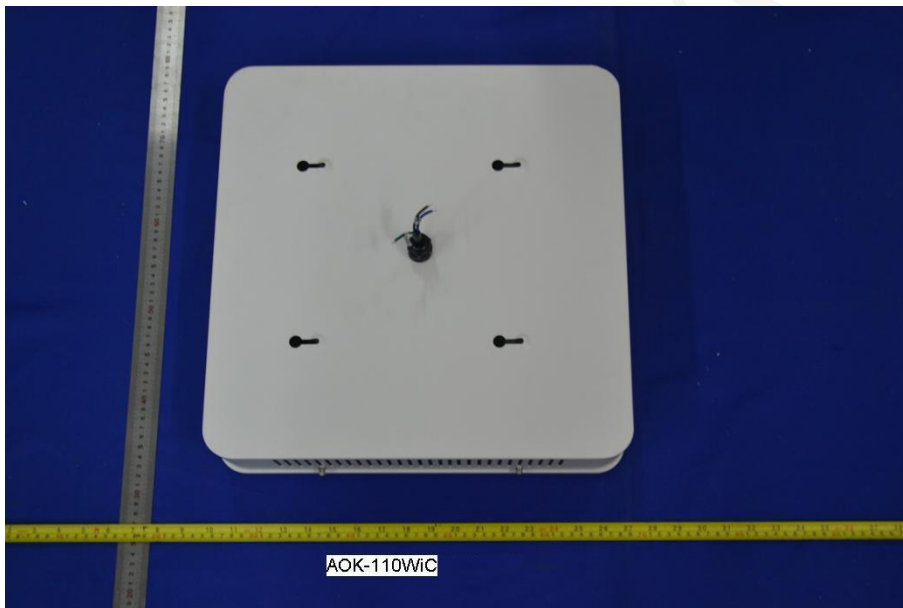
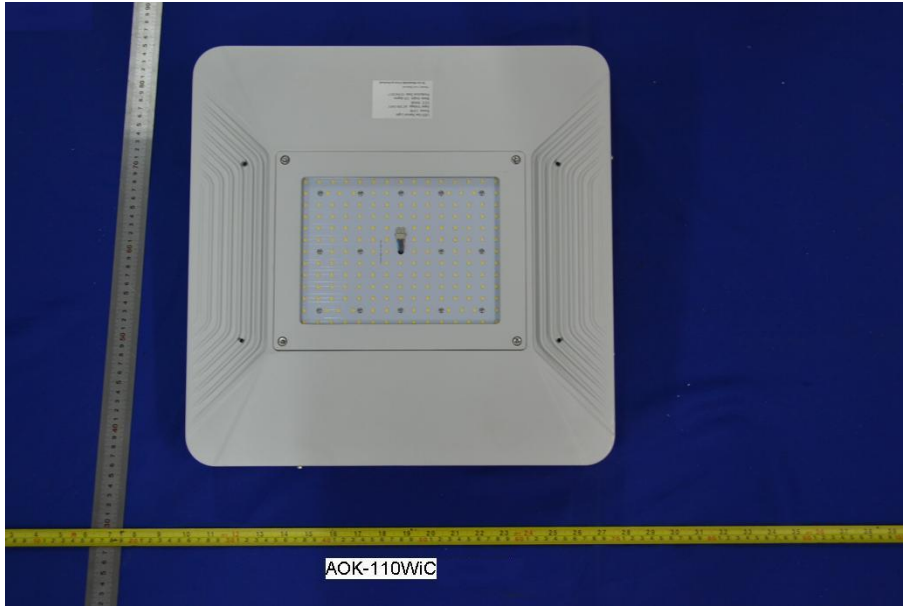
Sample No.: R2DG170308053-S01



Sample No.: R2DG170308053-S02



Sample No.: R2DG170308053-S03



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