

ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR LOW-POWER, NON-LICENSED TRANSMITTER

Test Report No. : W174R-D060

AGR No. : A15OA-150

Applicant : AIRO Co.,LTD.
Address : 203, Hanulteo Bldg, 464-2, Sangsam-ri, Haeryong-myeon, Suncheon-si, Jeollanam-do, South Korea, 58005

Manufacturer : AIRO Co.,LTD.
Address : 203, Hanulteo Bldg, 464-2, Sangsam-ri, Haeryong-myeon, Suncheon-si, Jeollanam-do, South Korea, 58005

Type of Equipment : Router for Aquarium Fish Robot

FCC ID. : 2ALUA-MIRO-9-ROUTER

Model Name : MIRO-9-ROUTER

Serial number : N/A

Total page of Report : 8 pages (including this page)

Date of Incoming : January 29, 2016

Date of issue : April 21, 2017

SUMMARY

The equipment complies with the regulation; *FCC PART 15 SUBPART C Section 15.247*

This test report only contains the result of a single test of the sample supplied for the examination.

It is not a generally valid assessment of the features of the respective products of the mass-production.

Reviewed by:



Jae-Ho Lee / Chief Engineer
ONETECH Corp.

Approved by:



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ONETECH Corp.

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Revision History

Issued Report No.	Issued Date	Revisions	Effect Section
W174R-D060	April 21, 2017	Initial Issue	All

DOCUMENT HISTORY

Revision No.	Issued Date	Revisions	Effect Section
Original	April 21, 2017	Initial Issue	-
Revision 01	April 28, 2017	Modify Device Category	4.2 EUT Description

1. VERIFICATION OF COMPLIANCE

Applicant : AIRO Co.,LTD.
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FCC ID : 2ALUA-MIRO-9-ROUTER
Model Name : MIRO-9-ROUTER
Serial Number : N/A
Date : April 21, 2017

EQUIPMENT CLASS	DSS – PART 15 SPREAD SPECTRUM TRANSMITTER
E.U.T. DESCRIPTION	Router for Aquarium Fish Robot
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.10: 2013
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC PART 15 SUBPART C Section 15.247
Modifications on the Equipment to Achieve Compliance	None
Final Test was Conducted On	3 m, Semi Anechoic Chamber

-. The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

2. GENERAL INFORMATION

2.1 Product Description

The AIRO Co.,LTD., Model MIRO-9-ROUTER (referred to as the EUT in this report) is a Router for Aquarium Fish Robot. Product specification information described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	Router for Aquarium Fish Robot
OPERATING FREQUENCY	2 402 MHz ~ 2 480 MHz
RF OUTPUT POWER	2.70 dBm
NUMBER OF CHANNEL	79 Channels
MODULATION TYPE	GFSK for 1 Mbps
ANTENNA TYPE	Helical Antenna
LIST OF EACH OSC. OR CRYSTAL. FREQ.(FREQ.>=1 MHz)	16 MHz
RATED SUPPLY VOLTAGE	DC 5 V (Adapter) / DC 3.7 V (Battery)

2.2 Alternative type(s)/model(s); also covered by this test report.

-. None

3. EUT MODIFICATIONS

-. None

4. MAXIMUM PERMISSIBLE EXPOSURE

4.1 RF Exposure Calculation

According to the FCC rule 1.1310 table 1B, the limit for the maximum permissible RF exposure for an uncontrolled environment are $f/1500 \text{ mW/cm}^2$ for the frequency range between 300 MHz and 1 500 MHz and 1.0 mW/cm^2 for the frequency range between 1 500 MHz and 100 000 MHz.

The electric field generated for a 1 mW/cm^2 exposure is calculated as follows:

$$E = \sqrt{(30 * P * G) / d}, \text{ and } S = E^2 / Z = E^2 / 377, \text{ because } 1 \text{ mW/cm}^2 = 10 \text{ W/m}^2$$

Where

S = Power density in mW/cm^2 , Z = Impedance of free space, 377Ω

E = Electric field strength in V/m , G = Numeric antenna gain, and d = distance in meter

Combining equations and rearranging the terms to express the distance as a function of the remaining variable

$$d = \sqrt{(30 * P * G) / (377 * 10 S)}$$

Changing to units of mW and cm , using $P (\text{mW}) = P (\text{W}) / 1 000$, $d (\text{cm}) = 0.01 * d (\text{m})$

$$d = 0.282 * \sqrt{(P * G) / S}$$

Where

d = distance in cm , P = Power in mW , G = Numeric antenna gain, and S = Power density in mW/cm^2

4.2 EUT Description

Kind of EUT	Router for Aquarium Fish Robot	
Operating Frequency Band	<input type="checkbox"/> Wireless Microphone: 494.000 MHz ~ 501.000 MHz and 498.200 MHz ~ 505.200 MHz <input type="checkbox"/> WLAN: 2 412 MHz ~ 2 462 MHz <input type="checkbox"/> WLAN: 5 180 MHz ~ 5 240 MHz <input type="checkbox"/> WLAN: 5 745 MHz ~ 5 825 MHz <input checked="" type="checkbox"/> Bluetooth: 2 402 MHz ~ 2 480 MHz <input type="checkbox"/> Bluetooth BLE: 2 402 MHz ~ 2 480 MHz	
Device Category	<input type="checkbox"/> Portable (< 20 cm separation) <input checked="" type="checkbox"/> Mobile (> 20 cm separation) <input type="checkbox"/> Others	
MAX. RF OUTPUT POWER	Bluetooth	2.70 dBm
Exposure Evaluation Applied	<input checked="" type="checkbox"/> MPE <input type="checkbox"/> SAR <input type="checkbox"/> N/A	

4.3 Calculated MPE Safe Distance

According to above equation, the following result was obtained.

Operating Freq. Band (MHz)	Operating Mode	Target Power W/tolerance	Max tune up power		Antenna Gain		Safe Distance (cm)	Power Density (mW/cm ²) @ 20 cm Separation	Limit (mW/ cm ²)
		(dBm)	(dBm)	(mW)	Log	Linear			
2 402 ~ 2 480	1 Mbps	2.2 ± 0.5	2.7	1.85	1.79	1.51	2.22	0.0055	1.00