RF Exposure Evaluation Declaration

FCC ID	:	XBG-BA1GMNRCH12
IC	:	21285-BA1GMNRCH12
Applicant	:	AVALUE TECHNOLOGY INCORPORATION
Application Type	:	Certification
Product	:	Intercom
Model Name	:	Monarch 12
Model Number	:	BUTTERFLYMX.M12.1
Trade Mark	:	ButterflyMX
FCC Classification	:	Digital Transmission System (DTS) Direct Sequence Spread spectrum (DSS) Unlicensed National Information Infrastructure (NII)
FCC Rule Part(s)	:	FCC Part 2.1091
ISED Standard	:	RSS-102 Issue 6
Received Date	:	December 05, 2023

Tested By : Owen Tsai

(Owen Tsai)

Reviewed By : Paddy Chen

(Paddy Chen)

Approved By : Chenz Ker

(Chenz Ker)

Testing Laboratory
3261

The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standards through the calibration of the equipment and evaluated measurement uncertainty herein.

Revision History

Report No.	Version	Description	Issue Date	Note
2312TWN801-U6	1.0	Original Report	2024-02-19	

CONTENTS

General Information

Applicant	AVALUE TECHNOLOGY INCORPORATION
Applicant Address	7F, 228, Lian-cheng Road, Zhonghe Dist., New Taipei City 235, Taiwan
Manufacturer	ButterflyMX, inc.
Manufacturer Address	44 West 28th Street, 4th Floor New York, NY 10001
Test Site	MRT Technology (Taiwan) Co., Ltd
Test Site Address	No. 38, Fuxing Second Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C)
MRT FCC Registration No.	291082
Test Device Serial No.	N/A ☐ Production ☒ Pre-Production ☐ Engineering

Test Facility / Accreditations

1. MRT facility is a FCC registered (Reg. No. 291082) test facility with the site description report on file and is designated by the FCC as an Accredited Test Firm.
2. MRT facility is an IC registered (MRT Reg. No. 21723) test laboratory with the site description on file at Industry Canada.
3. MRT Lab is accredited to ISO 17025 by the Taiwan Accreditation Foundation (TAF Cert. No. 3261) in EMC, Telecommunications and Radio testing for FCC (Designation Number: TW3261), Industry Canada, EU and TELEC Rules.

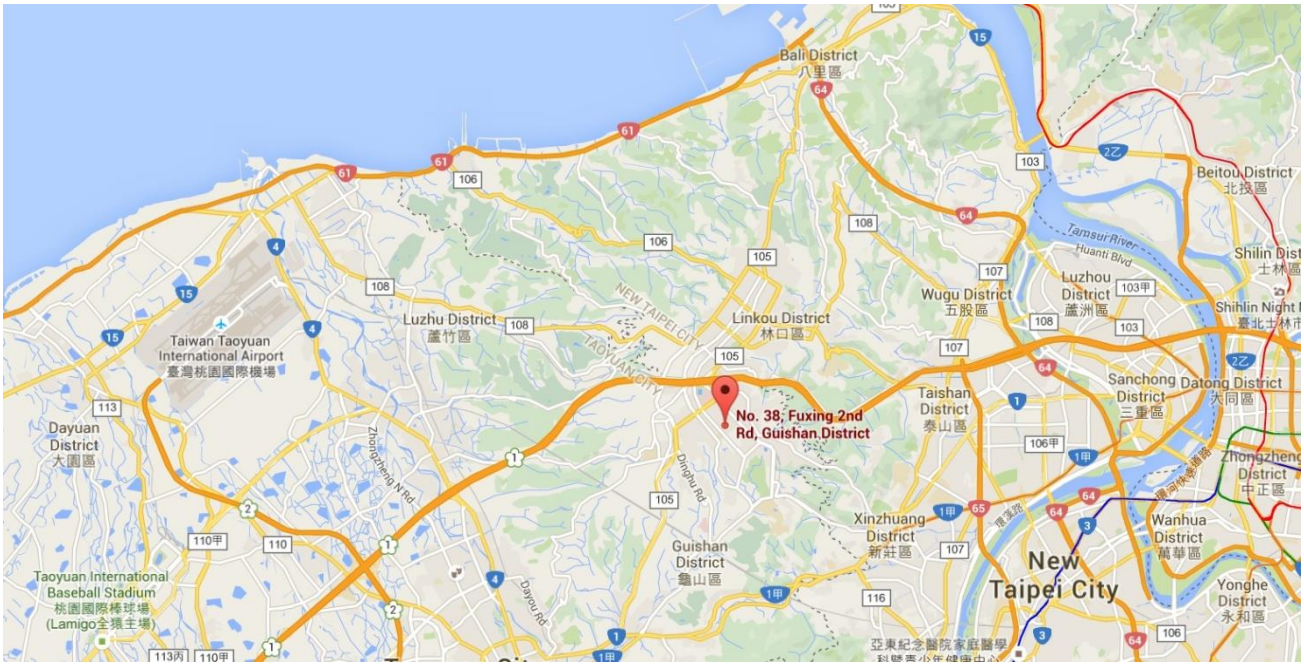
1. INTRODUCTION

1.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Innovation, Science and Economic Development Canada and Certification and Engineering Bureau.

1.2. MRT Test Location

The map below shows the location of the MRT LABORATORY, its proximity to the Taoyuan City. These measurement tests were conducted at the MRT Technology (Taiwan) Co., Ltd. Facility located at No.38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 33377, Taiwan (R.O.C).



2. PRODUCT INFORMATION

2.1. Feature of Equipment under Test

Product Name	Intercom
Trade Mark	ButterflyMX
Model Name	Monarch 12
Model Number	BUTTERFLYMX.M12.1
Supports Radios Spec.	**WPAN:** Bluetooth Dual Mode: V5.0 RFID: 125kHz & 13.56MHz **WLAN:** 2.4G: 802.11b/g/n-20/n-40 5G: 802.11a/n-20/ac-20/n-40/ac-40/ac-80, Band 1,4 **WWAN:** 4G: Band 2,4,5,7,12,13,25,26,38,41
Accessory	
Power Adapter	Brand Name: EDAC Model: EA10731F-240 Input: AC 100-240V~0.2A, 50-60Hz Output: DC 24.0V-2.08A
Power Adapter #2 (This time new addition)	Brand Name: EDAC Model: EA10681H-240 Input: AC 100-240V~2.0A, 50-60Hz Output: DC 24.0V-2.08A 50.0W DC Cable Out: Non-Shielded, 1.2m

2.2. Description of Available Antennas

No.	Manufacturer	Part No.	Antenna Type	Antenna Gain (dBi)		
				BT/BLE	Wi-Fi 2.4G	Wi-Fi 5G
1	INPAQ TECHNOLOGY CO., LTD. (This time new addition)	WA-P-LB-01-315 and WA-P-LB-02-996	PCB	4.45	Ant 0: 4.45 Ant 1: 4.35	Ant 0_B1: 7.26 Ant 1_B1: 7.77 Ant 0_B4: 8.26 Ant 1_B4: 7.06

3. RF Exposure Evaluation

3.1. FCC Limits

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b)

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Average Time (Minutes)
(A) Limits for Occupational/ Control Exposures				
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6
(B) Limits for General Population/ Uncontrolled Exposures				
300-1500	--	--	f/1500	6
1500-100,000	--	--	1	30

f= Frequency in MHz

Calculation Formula: $Pd = (Pout*G)/(4*pi*r^2)$

Where
Pd = power density in mW/cm^2
Pout = output power to antenna in mW
G = gain of antenna in linear scale
Pi = 3.1416
r = distance between observation point and center of the radiator in cm

Pd is the limit of MPE, $1mW/cm^2$. If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

3.2. ISED Limits

According to RSS-102 section 4: Exposure Limits

Table 4: RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m2)	Reference Period (minutes)
0.003-10^{21}	83	90	-	Instantaneous*
0.1-10	-	0.73/f	-	6**
1.1-10	$87/f^{0.5}$	-	-	6**
10-20	27.46	0.0728	2	6
20-48	$58.07/f^{0.25}$	$0.1540/f^{0.25}$	$8.944/f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	$3.142* f^{0.3417}$	$0.008335*f^{0.3417}$	$0.02619*f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000/f^{1.2}$
150000-300000	$0.158* f^{0.5}$	$4.21*10^{-4}* f^{0.5}$	$6.67*10^{-5}*f$	$616000/f^{1.2}$
Note: f is frequency in MHz. *Based on nerve stimulation (NS). ** Based on specific absorption rate (SAR).				

f= Frequency in MHz

Calculation Formula: $Pd = (Pout*G)/(4*pi*r^2)$

Where

Pd = power density in mW/cm^2

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

r = distance between observation point and center of the radiator in cm

Pd is the limit of MPE, $1mW/cm^2$. If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

3.3. Test Result of RF Exposure Evaluation

For FCC

Product	Intercom
Test Item	RF Exposure Evaluation

Antenna Gain: Refer to clause 2.2.

Test Mode	Frequency Band (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	Maximum EIRP (dBm)
BT/BLE	2402 ~ 2480	9.27	4.5	13.77
WLAN 2.4G	2412 ~ 2462	29.00	4.45	33.45
WLAN 5G	5180 ~ 5240 5745 ~ 5825	18.98	8.26	27.24
WWAN	1850 ~ 1915	24.41	2.46	26.87

Test Mode	Frequency Band (MHz)	Maximum EIRP (dBm)	Compliance Distance (cm)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
BT/BLE	2402 ~ 2480	13.77	21	0.0043	1
WLAN 2.4G	2412 ~ 2462	33.45	21	0.3993	1
WLAN 5G	5180 ~ 5240 5745 ~ 5825	27.24	21	0.0956	1
WWAN	1850 ~ 1915	26.87	21	0.0878	1

CONCLUSION:

BT and WLAN 2.4GHz Band and WWAN can transmit simultaneously.

The max Power Density at R (20.00 cm) = $0.0043mW/cm^2 + 0.3993mW/cm^2 + 0.0878mW/cm^2 = 0.4914mW/cm^2 < 1mW/cm^2$.

BT and WLAN 5GHz Band and WWAN can transmit simultaneously.

The max Power Density at R (20.00 cm) = $0.0043mW/cm^2 + 0.0956mW/cm^2 + 0.0878mW/cm^2 = 0.1877mW/cm^2 < 1mW/cm^2$.

Therefore, the compliance Distance R = 21cm.

For ISED

Antenna Gain: Refer to clause 2.2.

Test Mode	Frequency Band (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	Maximum EIRP (dBm)
BT/BLE	2402 ~ 2480	9.27	4.5	13.77
WLAN 2.4G	2412 ~ 2462	29.00	4.45	33.45
WLAN 5G	5180 ~ 5240 5745 ~ 5825	18.98	8.26	27.24
WWAN	1850 ~ 1915	24.41	2.46	26.87

Test Mode	Frequency Band (MHz)	Maximum EIRP (dBm)	Compliance Distance (cm)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
BT/BLE	2402 ~ 2480	13.77	21	0.0043	0.5351
WLAN 2.4G	2412 ~ 2462	33.45	21	0.3993	0.5366
WLAN 5G	5180 ~ 5240 5745 ~ 5825	27.24	21	0.0956	0.9047
WWAN	1850 ~ 1915	26.87	21	0.0878	0.4476

CONCLUSION:

The BT and WLAN 2.4GHz and WWAN can transmit simultaneously.

CPD = Calculation Power Density, LPD = Limit of Power Density

For R = 21cm

CPD1/LPD1 + CPD2/LPD2 + CPD4/LPD4= 0.0043 / 0.5351 + 0.3993 / 0.5366 + 0.0878 / 0.4476= 0.9483< 1.

The BT and WLAN 5GHz and WWAN can transmit simultaneously.

CPD = Calculation Power Density, LPD = Limit of Power Density

For R = 21cm

CPD1/LPD1 + CPD3/LPD3 + CPD4/LPD4 = 0.0043 / 0.5351 + 0.0956 / 0.9047 + 0.0878 / 0.4476 = 0.3099< 1.

Therefore, the compliance Distance R = 21cm.

The End