RF Exposure Evaluation Declaration

FCC ID:	2ALGLX2000-MP
Applicant:	CASSIA NETWORKS INC
Application Type:	Certification
Product:	X2000/ATX2000 Main PCBA
Model No.:	X2000-MP
Brand Name:	CASSIA
FCC Classification:	Digital Transmission System (DTS) Unlicensed National Information Infrastructure (NII)
Test Procedure(s):	KDB 447498 D01v06
Test Date:	2021.06.17

Reviewed By : Paddy Chen
(Paddy Chen)

Approved By : Chenz Ker
(Chenz Ker)

Testing Laboratory
3261

Revision History

Report No.	Version	Description	Issue Date	Note
2105TW0001-U6	1.0	Initial Report	2021-07-09	Valid

CONTENTS

General Information

Applicant	CASSIA NETWORKS INC
Applicant Address	1840 Majestic Way San Jose, CA 95132,USA
Manufacturer	CASSIA NETWORKS INC
Manufacturer Address	1840 Majestic Way San Jose, CA 95132,USA
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 Taiwan, EU and TELEC Rules.

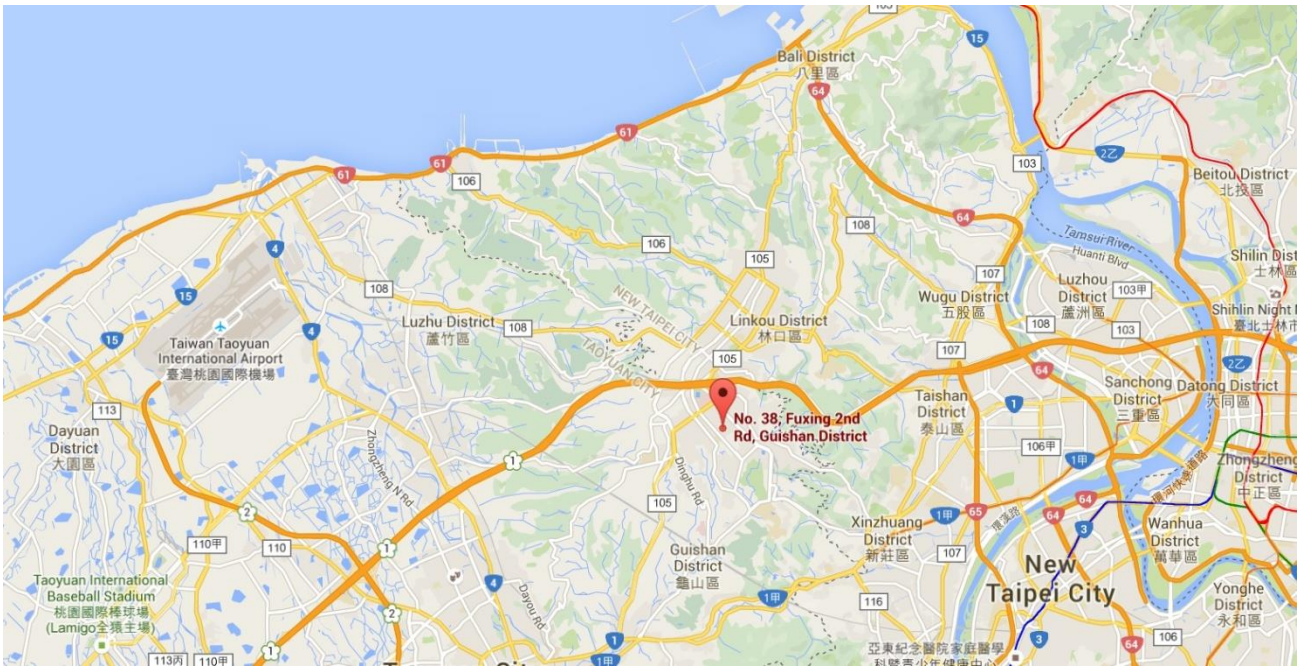
1. INTRODUCTION

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

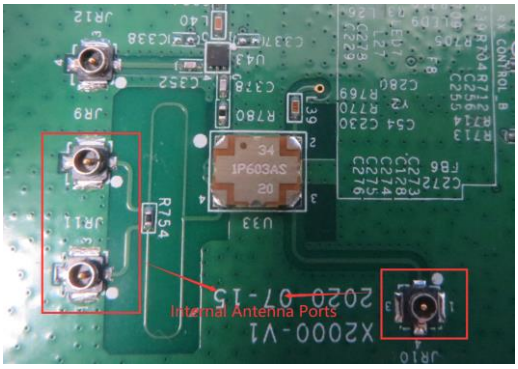
2.1. Equipment Description

Product Name	X2000/ATX2000 Main PCBA
Model No.	X2000, X2000-10, X2000-20
Chip 0 Bluetooth Version	V5.0 (Single Mode)
Chip 1 Bluetooth Version	V5.0 (Single Mode)
Wi-Fi Specification	802.11a/b/g/n/ac
Working Voltage	12Vdc 2.0A or 57Vdc 350mA (PoE)

Remark:

1. PoE adapter was selected by MRT for all testing, due to DC adapter and PoE adapter not selling with product.
2. For new device (X2000-MP), it's a PCBA, same as the internal PCBA of original device (X2000). The difference is shown in the table 1 as below.

Table 1

Diff	Original (X2000)	New (X2000-MP)	Remark
1	With Enclosure	Without Enclosure, only PCBA	Remove enclosure and do not change PCBA design.
2	With three internal BLE antennas	Without Internal BLE antenna	Remove BLE internal antennas, but reserve the antenna connect, the function of these internal antenna ports will be closed by software. 
3	Without Omni Antenna	Add Omni antennas for BLE and Wi-Fi 2.4G and 5G	Add some omni antennas for BLE and Wi-Fi, but the Power setting and power will not be greater than the original device under directional antennas.

2.2. Description of Available Antennas

Antenna Type	Model No.	Manufacturer	Frequency Band (MHz)	T_X Paths	Ant Gain (dBi)
BLE (External Antenna)					
Directional	**DF24-30V14F**	DIPOLE COMMUNICATIONS LIMITED	2402 ~ 2480	1	**14.0**
Directional	DB24-40V14A				14.0
Directional	DB24-120VH14A				14.0
Directional	DB24-65V12A				12.0
Directional	DF24-60V12M				12.0
Directional	DB24-90V11A				11.0
Directional	DF24-90V11M				11.0
Directional	DF24-110V10F				10.0
Directional	DB24-120V10A				10.0
Directional	DB24-120VH09A				9.0
Directional	TDJ-2400BKC14	Kenbotong Technology Co., Ltd.			14.0
Directional	TDJ-2400BFE				14.0
Directional	KBT120VP13-24RT0				13.0
Directional	TDJ-2400BKCH70				11.0
Directional	SPDG16T2	SuperPass Company Inc.			12.2
Directional	OSCAR18	Siretta Ltd			10.0
Directional	iANT214-2400	Extronics Ltd.			8.5
Directional	iANT214-2400D				8.0
Directional	iANT221				7.5
Wi-Fi (Internal Antenna)					
PCB	N2420DTS	Airgain	2412 ~ 2462	1	3.70
			5150 ~ 5725	1	6.60
			5725 ~ 5850	1	7.30

Wi-Fi & BLE (External Antenna)					
Omni	iANT213-2400	Extronics Ltd.	2402 ~ 2480	1	6.0
			2412 ~ 2462	1	6.0
			5150 ~ 5850	1	6.0
Omni	**iANT216M**	**Extronics Ltd.**	**2402 ~ 2480**	**1**	**6.0**
			2412 ~ 2462	**1**	**6.0**
			5150 ~ 5850	1	6.0
Omni	iANT212	Extronics Ltd.	2402 ~ 2480	1	2.0
			2412 ~ 2462	1	2.0
			5150 ~ 5850	1	2.0
Omni	**MHODB24490507NM-IP**	**PCTEL, Inc.**	2402 ~ 2480	1	5.0
			2412 ~ 2462	1	5.0
			5150 ~ 5850	**1**	**7.0**

Note 1: Bluetooth and Wi-Fi 2.4G or Wi-Fi 5G can transmit simultaneously, but it can not transmit simultaneously between the Bluetooth chips.

Note 2: Only the directional antenna (DF24-30V14F) was selected for all test, the same power setting with the different BLE external antennas.

Note 3: The omni antenna (iANT216M) was selected for Wi-Fi 2.4G & BLE test, omni antenna (MHODB24490507NM-IP) was selected for Wi-Fi 5G test, the same power setting with the different external omni antennas.

Note 3: All messages as above are declared by manufacturer.

3. RF Exposure Evaluation

3.1. 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. Test Result of RF Exposure Evaluation

Product	X2000/ATX2000 Main PCBA
Test Item	RF Exposure Evaluation

Test Mode	Frequency Band (MHz)	Maximum conducted power (dBm)	Antenna Gain (dBi)	Maximum EIRP (dBm)	Power Density at R = 20 cm (mW/cm^2)	Limit (mW/cm^2)
Bluetooth	2402 ~ 2480	7.94	14.0	21.94	0.0311	1
Wi-Fi	2412 ~ 2462	24.27	6.0	30.27	0.2117	1
	5180 ~ 5825	15.92	7.3	23.22	0.0418	1

CONCLUSION:

The max Power Density at R (20 cm) = 0.0311mW/cm^2 + 0.2117 mW/cm^2 + 0.0418 mW/cm^2 = 0.2846 mW/cm^2 < 1 mW/cm^2.

Therefore, the Min Safety Distance is 20cm.

The End

Appendix A - External Photograph

Refer to “2105TW0001-External Photo” file.

Appendix B - Internal Photograph

Refer to “2105TW0001-Internal Photo” file.