

EMF TEST REPORT

Test Report No. : OT-218-RWD-069

Reception No. : 2104003190

Applicant : Geoplan Co.,Ltd.

Address : 622, Geumjeong SKV1, 142, LS-ro, Dongan-gu, Anyang-si, Gyeonggi-do, Republic of Korea

Manufacturer : Geoplan Co., Ltd.

Address : 622, Geumjeong SKV1, 142, LS-ro, Dongan-gu, Anyang-si, Gyeonggi-do, Republic of Korea

Type of Equipment : Zigbee/BLE Module

FCC ID. : 2ASPN-GEO-MB310

Model Name : GEO-MB310

Serial number : N/A

Total page of Report : 7 pages (including this page)

Date of Incoming : July 06, 2021

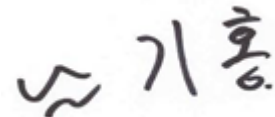
Date of issue : August 19, 2021

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.



Tested by
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ONETECH Corp.

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CONTENTS

PAGE

1. VERIFICATION OF COMPLIANCE	4
2. GENERAL INFORMATION	5
2.1 PRODUCT DESCRIPTION.....	5
2.2 ALTERNATIVE TYPE(S)/MODEL(S); ALSO COVERED BY THIS TEST REPORT.....	5
3. EUT MODIFICATIONS.....	5
4. MAXIMUM PERMISSIBLE EXPOSURE	6
4.1 RF EXPOSURE CALCULATION	6
4.2 EUT DESCRIPTION.....	6
4.3 CALCULATED MPE SAFE DISTANCE FOR BLUETOOTH LE	7
4.4 CALCULATED MPE SAFE DISTANCE FOR ZIGBEE.....	7

Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-218-RWD-069	August 19, 2021	Initial Release	All

1. VERIFICATION OF COMPLIANCE

Applicant : Geoplan Co.,Ltd.

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Contact Person : Youngha Shin / General Manager

Telephone No. : +82-31-689-5541

FCC ID : 2ASPN-GEO-MB310

Model Name : GEO-MB310

Brand Name : N/A

Serial Number : N/A

Date : August 19, 2021

EQUIPMENT CLASS	DTS – DIGITAL TRNSMISSION SYSTEM
E.U.T. DESCRIPTION	Zigbee/BLE Module
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 KDB 558074 D01 15.247 Meas Guidance v05r02
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 Geoplan Co.,Ltd., Model GEO-MB310 (referred to as the EUT in this report) is a Zigbee/BLE Module. The product specification described herein was obtained from product data sheet or user's manual.

Device Type	Zigbee/BLE Module	
Operating Frequency	Bluetooth LE	2 402 MHz ~ 2 480 MHz
	Zigbee	2 405 MHz ~ 2 480 MHz
RF Output Power	Bluetooth LE	8.05 dBm
	Zigbee	-0.84 dBm
Number of Channel	Bluetooth LE	40 Channels
	Zigbee	16 Channels
Modulation Type	Bluetooth LE	GFSK
	Zigbee	
Antenna Type	PCB Antenna	
Antenna Gain	0.79 dBi	
Rated Supply Voltage	DC 5.0 V	
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	32 MHz	

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 $f/1500$ mW/cm² for the frequency range between 300 MHz and 1 500 MHz and 1.0 mW/cm² for the frequency range between 1 500 MHz and 100 000 MHz.

The electric field generated for a 1 mW/cm² 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/cm², Z = Impedance of free space, 377 Ω

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/cm²

4.2 EUT Description

Kind of EUT	Zigbee/BLE Module
Device Category	☐ Portable (< 20 cm separation) ☐ Mobile (> 20 cm separation) ☒ Others
Exposure Evaluation Applied	☒ MPE ☐ SAR ☐ N/A

4.3 Calculated MPE Safe Distance for Bluetooth LE

According to above equation, the following result was obtained.

Operating Freq. Band (MHz)	Operating Mode	Target Power W/tolerance (dBm)	Max tune up power		Antenna Gain		Safe Distance (cm)	Power Density (mW/cm ²) @ 20 cm Separation	Limit (mW/cm ²)
			(dBm)	(mW)	Log	Linear			
2 402 ~ 2 480	Bluetooth LE	8.05 ± 1.0	9.05	8.04	0.79	1.20	0.88	0.001 9	1.00

Note. - Bluetooth and Zigbee not transmit simultaneously.

According to above table, for 2 402 ~ 2480 MHz Band(LE), safe distance,

$$D = 0.282 * \sqrt{(8.04 * 1.20)/1.00} = 0.88 \text{ cm.}$$

For getting power density at 20 cm separation in above table, following formula was used.

$$S = P * G / (4\pi * R^2) = 8.04 * 1.20 / (4 * \pi * 20^2) = 0.001 9$$

Where:

S = Power Density,

P = Power input to the external antenna (Output power from the EUT antenna port (dBm) – cable loss (dB)),

G = Gain of Transmit Antenna (linear gain), R = Distance from Transmitting Antenna

4.4 Calculated MPE Safe Distance for Zigbee

According to above equation, the following result was obtained.

Operating Freq. Band (MHz)	Operating Mode	Target Power W/tolerance (dBm)	Max tune up power		Antenna Gain		Safe Distance (cm)	Power Density (mW/cm ²) @ 20 cm Separation	Limit (mW/cm ²)
			(dBm)	(mW)	Log	Linear			
2 405 ~ 2 480	Zigbee	-0.84 ± 1.0	0.16	1.04	0.79	1.20	0.31	0.000 2	1.00

Note. - Bluetooth and Zigbee not transmit simultaneously.

According to above table, for 2 405 ~ 2480 MHz Band(Zigbee), safe distance,

$$D = 0.282 * \sqrt{(1.04 * 1.20)/1.00} = 0.31 \text{ cm.}$$

For getting power density at 20 cm separation in above table, following formula was used.

$$S = P * G / (4\pi * R^2) = 1.04 * 1.20 / (4 * \pi * 20^2) = 0.000 2$$

Where:

S = Power Density,

P = Power input to the external antenna (Output power from the EUT antenna port (dBm) – cable loss (dB)),

G = Gain of Transmit Antenna (linear gain), R = Distance from Transmitting Antenna