



RF EXPOSURE EVALUATION REPORT

APPLICANT : MARMA SECURITY INC

PRODUCT NAME : MarmaSecurity V2.0

MODEL NAME : MarmaSecurity V2.0

BRAND NAME : Marma Security Inc

FCC ID : 2BKM9-MSDV2

STANDARD(S) : 47 CFR Part 2(2.1091)

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Edited by:

Zeng Xiaoying
Zeng Xiaoying (Rapporteur)

Approved by:

Shen Junsheng
Shen Junsheng (Supervisor)

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MORLAB

ShenzhenMorlab Communications Technology Co., Ltd.
FL.1-3, Building A, FeiYang Science Park, No.8 LongChang Road,
Block67, BaoAn District, ShenZhen, GuangDong Province, P. R. China

Tel: 86-755-36698555
Fax: 86-755-36698525
Http://www.morlab.cn
E-mail: service@morlab.cn





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Change History		
Version	Date	Reason for change
1.0	2024-08-29	First edition



1. Technical Information

Note: Provide by applicant.

1.1 Applicant and Manufacturer Information

Applicant:	MARMA SECURITY INC
Applicant Address:	211 Hebron Circle, Sacramento, California, United States
Manufacturer:	MARMA SECURITY INC
Manufacturer Address:	211 Hebron Circle, Sacramento, California, United States

1.2 Equipment under Test (EUT) Description

Product Name:	MarmaSecurity V2.0	
Sample No.:	1#	
Hardware Version:	WIFI Gateway - QM8400 - MAR24 - VER 1.1	
Software Version:	mt7986a-emmc-20240413-single-image	
Frequency Bands:	Bluetooth	2402MHz-2480MHz
	WLAN 2.4GHz	2412MHz-2472MHz
	WLAN 5GHz	5180MHz-5240MHz; 5745MHz-5825MHz
Modulation Mode:	Bluetooth	GFSK
	WLAN 2.4GHz	DSSS, OFDM, OFDMA
	WLAN 5GHz	OFDM, OFDMA
Antenna Information:	Bluetooth	
	Antenna Type:	FPC Antenna
	Antenna Gain:	0.38dBi
	WLAN 2.4GHz	
	Antenna Type:	ANT 1: FPC Antenna ANT 2: PCB Antenna ANT 3: PCB Antenna ANT 4: FPC Antenna
	Antenna Gain:	ANT 1: 2.71dBi ANT 2: 2.35dBi ANT 3: 2.91dBi ANT 4: 4.18dBi



Antenna Information:	WLAN 5GHz		
	Antenna Type:	5180MHz-5240MHz	Copper Tube Antenna
		5745MHz-5825MHz	ANT 1: FPC Antenna ANT 2: PCB Antenna ANT 3: PCB Antenna ANT 4: FPC Antenna
	Antenna Gain:	5180MHz-5240MHz	ANT 1: 2.77dBi ANT 2: 2.09dBi ANT 3: 2.27dBi ANT 4: 2.76dBi
		5745MHz-5825MHz	ANT 1: 1.16dBi ANT 2: 0.42dBi ANT 3: 1.39dBi ANT 4: 1.24dBi

1.3 Applied Reference Documents

Leading reference documents for testing:

Identity	Document Title	Method Determination /Remark
47 CFR Part 2(2.1091)	Radio Frequency Radiation Exposure Assessment: mobile devices	No deviation
KDB 447498 D01v06	General RF Exposure Guidance	No deviation
Note 1: Additions to, deviation, or exclusions from the method shall be judged in the "method determination" column of add, deviate or exclude from the specific method shall be explained in the "Remark" of the above table.		
Note 2: When the test result is a critical value, we will use the measurement uncertainty give the judgment result based on the 95% confidence intervals.		



2. Device Category and RF Exposure Limit

Per user manual, based on 47 CFR 2.1091, this device belongs to mobile device category with General Population/Uncontrolled exposure.

Mobile Devices:

47 CFR 2.1091(b)

For purposes of this section, a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons. In this context, the term "fixed location" means that the device is physically secured at one location and is not able to be easily moved to another location. Transmitting devices designed to be used by consumers or workers that can be easily re-located, such as wireless devices associated with a personal computer, are considered to be mobile devices if they meet the 20 centimeter separation requirement.

General Population/Uncontrolled Exposure:

The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity. Warning labels placed on low-power consumer devices such as cellular telephones are not considered sufficient to allow the device to be considered under the occupational/controlled category, and the general population/uncontrolled exposure limits apply to these devices.

Table 1 Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f ²)	30
30-300	27.5	0.073	0.2	30
300-1500	-	-	f/1500	30
1500-100,000	-	-	1.0	30

f = frequency in MHz * = Plane-wave equivalent power density



3. Maximum Average Power Summary

➤ Maximum Average Power for Bluetooth

Wireless Mode	Channel	Frequency (MHz)	Max. Average Power (dBm)	Tune-up Limit (dBm)
Bluetooth	CH 39	2480	5.12	5.50

➤ Maximum Average Power for SISO

Wireless Mode	Channel	Frequency (MHz)	Max. Average Power (dBm)	Tune-up Limit (dBm)
WLAN 2.4GHz ANT 4	CH 7	2442	25.58	26.00
WLAN 5GHz U-NII-1 ANT 4	CH 36	5180	23.78	24.00
WLAN 5GHz U-NII-3 ANT 4	CH 165	5825	25.03	25.50

➤ Maximum Average Power for MIMO

Wireless Mode	Channel	Frequency (MHz)	Max. Average Power (dBm)	Tune-up Limit (dBm)
WLAN 2.4GHz	CH 13	2472	19.69	20.00
WLAN 5GHz U-NII-1	CH 36	5180	21.22	21.50
WLAN 5GHz U-NII-3	CH 149	5745	21.83	22.00

Note 1: According to KDB 447498, MPE assessment is based on source-based time-averaged maximum conducted output power of the RF channel requiring assessment, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions.

Note 2: The maximum average power (e.i.r.p) refers to report (Report No.: SZ24070014W01/W02/W03).



4. RF Exposure Assessment

➤ Standalone Transmission Assessment

<Standalone Antenna Transmission Assessment>

Bands	Frequency (MHz)	Tune-up Power(dBm)	Antenna Gain(dBi)	E.I.R.P. (mW)	Power Density (mW/cm ²)	Limit for MPE (mW/cm ²)
Bluetooth	2480	5.50	0.38	3.87	0.001	1.0
WLAN 2.4GHz ANT4	2442	26.00	4.18	1042.32	0.207	1.0
WLAN 5GHz U-NII-1 ANT 4	5180	24.00	2.76	474.24	0.094	1.0
WLAN 5GHz U-NII-3 ANT 4	5825	25.50	1.24	472.06	0.094	1.0

<MIMO Transmission Assessment>

Bands	Frequency (MHz)	Tune-up Power(dBm)	Directional Gain(dBi)	E.I.R.P. (mW)	Power Density (mW/cm ²)	Limit for MPE (mW/cm ²)
WLAN 2.4GHz	2442	20.00	9.09	810.96	0.161	1.0
WLAN 5GHz U-NII-1	5180	21.50	8.50	1000.00	0.199	1.0
WLAN 5GHz U-NII-3	5745	22.00	7.08	809.10	0.161	1.0

Note 1: The WLAN 2.4GHz directional gain = $10\log(10^{G1/20}+10^{G2/20})^2/2 = 9.09\text{dBi}$; WLAN 5GHz directional gain = $10\log(10^{G1/20}+10^{G2/20})^2/2 = 8.50\text{dBi}$ and 7.08dBi for U-NII-1 and U-NII-3 band.

Note 2: For 2.4G/5G WLAN, only the worst case will be used for calculating the power density.

Note 3: MPE calculate method

$$S = PG/4\pi R^2$$

Where: S= Power density (in appropriate units, e.g. mW/cm²)

P = Time-average maximum tune-up power (in appropriate units, e.g. dBm)

G = numeric gain of the antenna (in appropriate units, e.g. dBi)

R = Separation distance to the centre of radiation of the antenna (20cm)

**➤ Simultaneous Transmission Assessment:****Multi-Band Simultaneous Transmission Consideration**

Simultaneous Transmission Consideration	Position	Applicable Combination
	Body	WLAN 5GHz U-NII-1 MIMO + WLAN 5GHz U-NII-3 MIMO+ Bluetooth WLAN 2.4GHz MIMO + WLAN 5GHz U-NII-3 MIMO+ Bluetooth

Note 1:This device contains transmitters that may operate simultaneously, therefore simultaneous transmission analysis is required as below.

Applicable Combination	Transmission Bands	Power Density (mW/cm²)	Limit (mW/cm²)	Simultaneous Transmission Result
WLAN 5GHz U-NII-1 MIMO + WLAN 5GHz U-NII-3 MIMO+ Bluetooth	WLAN 5GHz U-NII-1 MIMO	0.199	1.0	0.361
	WLAN 5GHz U-NII-3 MIMO	0.161	1.0	
	Bluetooth	0.001	1.0	
WLAN 2.4GHz MIMO + WLAN 5GHz U-NII-3 MIMO+ Bluetooth	WLAN 2.4GHz MIMO	0.161	1.0	0.323
	WLAN 5GHz U-NII-3 MIMO	0.161	1.0	
	Bluetooth	0.001	1.0	

Note 1: Formula for result=Power density₁/ limit₁ + Power density₂/ limit₂ ≤1.

Note 2: The highlight applicable combination is the worst condition.

➤ Conclusion:

According to 47 CFR 2.1091, this device complies with human exposure basic restrictions.



Annex A Testing Laboratory Information

1. Identification of the Responsible Testing Laboratory

Laboratory Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Laboratory Address:	FL.1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
Telephone:	+86 755 36698555
Facsimile:	+86 755 36698525

2. Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Address:	FL.1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China

3. Facilities and Accreditations

All measurement facilities used to collect the measurement data are located at FL.3, Building A, FeiYang Science Park, Block 67, BaoAn District, Shenzhen, 518101 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.10-2013 and CISPR Publication 22; the FCC designation number is CN1192, the test firm registration number is 226174.

END OF REPORT
