

FCC Maximum Permissible Exposure (MPE) Estimation Report

Report Number	: 68.950.22.0463.01A	Date of Issue:	June 6, 2022
Model / HVIN	: AP6398S2		
Product Type	: Wi-Fi and Bluetooth functionalities module		
Applicant	: Roboteam Home Technology (Shenzhen) Co., Ltd		
Address	: 22F, CHANGFU JINMAO BUILDING NO.5 SHIHUA ROAD, FUTIAN DISTRICT, 518000 SHENZHEN, PEOPLE'S REPUBLIC OF CHINA		
Manufacturer	: Roboteam Home Technology (Shenzhen) Co., Ltd		
Address	: 22F, CHANGFU JINMAO BUILDING NO.5 SHIHUA ROAD, FUTIAN DISTRICT, 518000 SHENZHEN, PEOPLE'S REPUBLIC OF CHINA		
Test Result	: <input checked="" type="checkbox"/> Positive <input type="checkbox"/> Negative		
Total pages including Appendices	: 9		

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2 Details about the Test Laboratory

Details about the Test Laboratory

Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Building 12 & 13, Zhiheng Wisdomland Business Park, Nantou Checkpoint
Road 2, Nanshan District
Shenzhen 518052
P.R. China

Telephone: 86 755 8828 6998

Fax: 86 755 8828 5299

FCC Registration No.: 514049

FCC Designation Number: CA5009

IC Registration No.: 10320A

3 Description of the Equipment Under Test

Product:	Wi-Fi and Bluetooth functionalities module
Model no.:	AP6398S2
Brand name:	t e m i
Hardware Version Identification No. (HVIN)	AP6398S2
FCC ID:	2ASJLAP6398S2
IC:	24774-AP6398S2
Options and accessories:	N/A
Rating:	Supplied by 3.3VDC
RF Transmission Frequency:	2402-2480MHz for BR+EDR+BLE 2412-2462MHz for 2.4GWiFi 5150-5350MHz, 5470-5725MHz, 5745-5825MHz for 5GWiFi
Antenna Type:	Integrated antenna
Antenna 1	2.4GHz: -0.5dBi Max for Ant0 0.5dBi Max for Ant1 5GHz: 2.0dBi Max for Ant0 1.5dBi Max for Ant1
Antenna 2	2.4GHz: -5.0dBi Max for Ant0 -2.5dBi Max for Ant1 5GHz: 0.5dBi Max for Ant0 0.5dBi Max for Ant1
Description of the EUT:	The Equipment Under Test (EUT) is a Wi-Fi and Bluetooth functionalities module which support Bluetooth function and Wi-Fi operated at 5GHz and 2.4GHz. Only 2.4GWiFi included in this report.

NOTE 1: The above EUT's information is declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

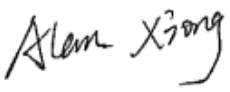

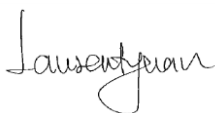
NOTE 2: This report contains two kinds of antenna, they are identical only except antenna gain, testing only performed at the antenna support higher gain.

4 Test Specifications

Test Standards	
ANSI Std C95.1-1992	Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz.(IEEE Std C95.1-1991)
KDB 447498 D01	General RF Exposure Guidance v06

5 General Information

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Prepared By Project Engineer	2022-06-06	Alan Xiong	
	Date	Name	Signature
			
Approved by Section Manager	2022-06-06	Laurent Yuan	
	Date	Name	Signature

6 RF Exposure Requirements

An estimation of MPE in this application for product is used to ensure if it complies with the rules of the standard in the regulation list above.

Maximum permissible exposure (MPE) refers to the RF energy that is acceptable for human exposure. It is broken down into two categories, Occupational/controlled and General population/uncontrolled.

Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

A rough estimation of the expected exposure in power flux density on a given point can be made with the following equation:

$$S = \frac{P \times G}{4 \times \pi \times R^2}$$

Where:

S = power density

P = power input to the antenna

G = numeric gain of the antenna in the direction of interest relative to an isotropic radiator

R= distance to the centre of radiation of the antenna

EIRP = P*G

The antenna of the product, under normal use condition is at least 20 cm away from the body of the user. Warning statement to the user for keeping at least 20cm separation distance and the prohibition of operating to a person has been printed on the user's manual. Therefore, the S of the device is calculated with R=20cm, and if it is below the limit S, then we can conclude the device complies with the rules.

7 FCC MPE Limits

We analysis if it comply with the limits for General population/uncontrolled exposure. The FCC MPE limits for field strength and power density are given in 47CFR 1.1310(Table below). These limits are generally based on recommended exposure guidelines published by the National Council on Radiation Protection and Measurements (NCRP), and also partly based on guidelines recommended by the American National Standards Institute (ANSI) in Section 4.1 of ANSI/IEEE C95.1.

(A) Limits for Occupational/controlled Exposure				
Frequency Range(MHz)	Electric Field Strength(E)(V/m)	Magnetic Field Strength(H)(A/m)	Power Density (S)(mW/cm ²)	Averaging Time (minute) E ² , H ² or S
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f ²)*	6
30-300	61.4	0.163	1.0	6
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6
(B) Limits for General Population/uncontrolled Exposure				
Frequency Range(MHz)	Electric Field Strength(E)(V/m)	Magnetic Field Strength(H)(A/m)	Power Density (S)(mW/cm ²)	Averaging Time (minute) E ² , H ² or S
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	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	

8 RF Exposure Evaluation (FCC)

8.1.1 Calculation of Power Density for Single Chain Transmitters

Mode	EIRP (dBm)	EIRP (mW)	R (m)	S (W/m ²)	Limit (W/m ²)	% of limit
BT	7.16	5.20	0.2	0.01	1.0	1%
BLE	4.61	2.89	0.2	0.006	1.0	0.6%
2.4GWiFi	17.9	61.66	0.2	0.12	1.0	12%
5GWiFi	19.4	87.10	0.2	0.17	1.0	17%

8.1.2 Calculation of Simultaneous Transmission

In order to ensure compliance with the EMF for a controlled environment, the sum of the ratios of the power density to the corresponding EMF should not exceed unity. That is

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

The product also has multiple transmitters. The simultaneous transmission possibilities are as below:

No.	Simultaneous Tx Combination	S (W/m ²)	Limit (W/m ²)
1	BT+2.4GWiFi	0.13	1.0
2	BLE+2.4GWiFi	0.126	1.0
3	BT+5GWiFi	0.18	1.0
4	BLE+5GWiFi	0.176	1.0

8.1.3 Conclusion

According to the table above, we can conclude that the limit percentage of above supporting frequency bands calculation results are less than 1, therefore, the product meets the requirements.