



Maximum Permissible Exposure

FCC ID: ZWM-M2-6398SV
IC: 11883A-M26398SV
APPLICANT: Ubiquconn Technology, Inc.
Application Type: Certification
Product: Module
Model No.: AP6398SV
FCC Rule Part(s): Part 2.1093 (Portable)
ISED Standard: RSS 102 (issue5)
Test Date: Mar 21, 2022

Reviewed By :

Paddy Chen

(Paddy Chen)

Approved By :

Chenz Ker

(Chenz Ker)



The test results relate only to the samples tested.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report. Test results reported herein relate only to the item(s) tested.

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Revision History

Report No.	Version	Description	Issue Date	Note
2111TWK301-U6	1.0	Original Report	2022-03-31	

1. PRODUCT INFORMATION

1.1. Equipment Description

Product Name	Module
Model No.	AP6398SV
Brand Name	Ubiqconn
Supports Radios Spec.	2.4G: 802.11b/g/n-20 5G: 802.11a/n-20/ac-20/n-40/ac-40/ac-80, Band 1~4 Bluetooth Dual Mode: V5.0
Wi-Fi Specification	802.11a/b/g/n/ac (2TX / 2RX)
Frequency Range	<u>2.4GHz:</u> For 802.11b/g/n-HT20: 2412 ~ 2462 MHz <u>5GHz:</u> For 802.11a/n-HT20/ac-VHT-20: 5180~5320MHz, 5500~5720MHz, 5745~5825MHz For 802.11n-HT40/ ac-VHT40: 5190~5310MHz, 5510~5710MHz, 5755~5795MHz For 802.11ac-VHT80: 5210MHz, 5290MHz, 5530MHz, 5610MHz, 5690MHz, 5775MHz
Modulation Type	BT: FHSS (GFSK, $\pi/4$ DQPSK, 8DPSK) BLE: GFSK (1Mbps / 2Mbps) 802.11b: DSSS, DBPSK, DQPSK, CCK 802.11g/n-20M/n-40M: OFDM, BPSK, QPSK, 16QAM, 64QAM 802.11a/n-20/ac-20/n-40/ac-40/ac-80: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)

1.2. Antenna Description

(Brand: N/A, M/N: FDAH0117, Antenna Type : Dipole)

Antenna Type	Frequency	TX Paths	Max Antenna Gain (dBi)	BF Directional Gain (dBi)	CDD Directional Gain (dBi)	
	Band (MHz)				For Power	For PSD
Wi-Fi External Antenna						
Antenna	2412 ~ 2462	2	3.94	6.95	3.94	6.95
	5150 ~ 5850	2	4.92	7.93	4.92	7.93

Note 1: The EUT supports Cyclic Delay Diversity (CDD) mode, and CDD signals are correlated.

If all antennas have the same gain, G_{ANT} , Directional gain = $G_{ANT} + \text{Array Gain}$, where Array Gain is as follows.

- For power spectral density (PSD) measurements on all devices,
Array Gain = $10 \log (N_{ANT} / N_{SS})$ dB;
- For power measurements on IEEE 802.11 devices,
Array Gain = 0 dB for $N_{ANT} \leq 4$;

Note 2: The EUT also supports Beam Forming mode, and the Beam Forming support 802.11n/ac, not include 802.11a/b/g. BF Directional gain = $G_{ANT} + 10 \log (N_{ANT})$.

Note 3: All information declared by manufacturer.

2. MAXIMUM PERMISSIBLE EXPOSURE (MPE)

2.1. 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				
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 Exposures				
0.3-1.4	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

Note : (1) f= Frequency in MHz , (2) * = Plane-wave equivalent power density

Calculation Formula:

$$Pd = (Pout \cdot G) / (4 \cdot \pi \cdot r^2)$$

Where

Pd = power density in mW/cm²

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

Under normal use condition, is at least 20cm away from the body of the user .

So, this device is classified as **Mobile Device**.

2.2. IC Limits

According to RSS 102 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 Table 4
LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

**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/m ²)	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 x 10 ⁻⁴ $f^{0.5}$	6.67 x 10 ⁻⁵ f	616000/ $f^{1.2}$
Note: f is frequency in MHz. *Based on nerve stimulation (NS). ** Based on specific absorption rate (SAR).				

Calculation Formula:

$$Pd = (Pout * G) / (4 * \pi * r^2)$$

Where

Pd = power density in mW/cm²

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

Under normal use condition, is at least 20cm away from the body of the user .

So, this device is classified as **Mobile Device**.

2.3. Test Result

Band (MHz)	Frequency (MHz)	Output Power (dBm)	Output Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	FCC Limit (mW/cm ²)	IC Limit (mW/cm ²)
BT_3DH5	2402 ~ 2480	8.51	7.10	3.94	20	0.0035	1	0.5351
BLE 5.0_2Mbps	2402 ~ 2480	5.10	3.24	3.94	20	0.0016	1	0.5351
Wi-Fi 2.4G_802.11n20	2412 ~ 2462	25.82	381.94	3.94	20	0.1882	1	0.5366
Wi-Fi 5G_802.11n20	5180 ~ 5825	21.52	141.91	4.92	20	0.0876	1	0.9047

Conclusion :

$$\text{CPD1/LPD1} + \text{CPD2/LPD2} + \dots + \text{CPDN/LPDN} \leq 1$$

CPD : Calculation Power Density

LPD : Limit of Power Density

Mode	Power Density	Limit	Conclusion	Result (≤ 1)
BT	0.0035	1	0.2809	Pass
BLE 5.0	0.0016	1		
Wi-Fi 2.4G	0.1882	1		
Wi-Fi 5G	0.0876	1		

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