

RF Exposure Evaluation Declaration

FCC ID: TV7C53-5AXD2AXD
Applicant: Mikrotiks SIA
Product: hAP ax³
Model No.: C53UiG+5HPaxD2HPaxD-US
Brand Name: MikroTik
FCC Classification: Digital Transmission System (DTS)
Unlicensed National Information Infrastructure (NII)
FCC Rule Part(s): Part15 Subpart C (Section 15.247)
Result: Complies

Reviewed By:

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The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standards through the calibration of the equipment and evaluated measurement uncertainty herein.

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Revision History

Report No.	Version	Description	Issue Date	Note
2207RSU013-U4	Rev. 01	Initial Report	2022-09-28	Invalid
2207RSU013-U4	Rev. 02	Update the antenna gain for NII-2C band in clause 1.5 and update the calculation results in clause 2.2	2022-11-03	Valid

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1.4. Product Information

Product Name	hAP ax ³
Model No.	C53UiG+5HPaxD2HPaxD-US
Wi-Fi Specification	802.11a/b/g/n/ac/ax, VHT
Hardware Version	r3
Software Version	RouterOS v7
Antenna Information	Refer to section 1.7
Working Voltage Range	12~28VDC (24VDC Nominal)
Working Temperature	0 ~ 70°C
Accessory	
Adapter	Model: SAW36-240-1500U Input: 100-240V ~ 50/60Hz, 1.3A Output: 24V, 1.5A
Remark: The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer.	

1.5. Antenna Details

Antenna Type	Frequency Band (MHz)	Number of spatial streams	Max Peak Gain (dBi)	CDD Directional Gain (dBi)	
				For Power	For PSD
Wi-Fi Antenna (2*2 MIMO)					
Dipole Antenna	2412 ~ 2462	1	3.3	3.3	6.31
	5180 ~ 5240	1	5.5	5.5	8.51
	5260 ~ 5320		5.5	5.5	8.51
	5500 ~ 5720		6.0	6.0	9.01
	5745 ~ 5825		5.5	5.5	8.51

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

For CDD transmissions, directional gain is calculated as follows, $N_{ANT} = 2$, $N_{SS} = 1$.

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,
 $\text{Array Gain} = 10 \log (N_{ANT} / N_{SS}) \text{ dB} = 3.01$;
- For power measurements on IEEE 802.11 devices,
 $\text{Array Gain} = 0 \text{ dB}$ for $N_{ANT} \leq 4$;

1.6. Device Classification

According to the user manual, the antenna of this device is at least 37 cm away from the body of the user, this device is classified as a Mobile Device. So, the RF exposure evaluation requirements of § 2.1091 for mobile device exposure conditions subject to MPE limits.

2. RF Exposure Evaluation

2.1. Test Limits

According to FCC Part 2.1091, 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 cm is normally maintained between the RF source's radiating structure(s) and the body of the user or nearby persons.

According to FCC Part 1.1307(b)(3)(i)(C), for the exemption in Table 1 to apply, R must be at least $\lambda/2\pi$, where λ is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole.

Table 1 to § 1.1307(b)(3)(i)(C) - Single RF Sources Subject to Routine Environmental Evaluation

RF Source Frequency (MHz)	Threshold ERP (watts)
0.3-1.34	1.920 R ²
1.34-30	3.450 R ² /f ²
30-300	3.83 R ²
300-1500	0.0128 R ² f
1500-100,000	19.2 R ²

f = frequency in MHz, R = minimum separation distance in meters.

According to FCC Part 1.1307(b)(3)(ii)(B), in the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation.

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1$$

2.2. Test Result

Product	hAP ax ³
Test Item	RF Exposure Evaluation

Test Mode	Frequency Band (MHz)	Max. Conducted Power (dBm)	Max. Antenna Gain (dBi)	Max. EIRP (dBm)	Compliance Distance (R) (m)	ERP (W)	Threshold ERP (W)
802.11b/g/n/ax, VHT	2412 ~ 2462	28.72	3.3	32.02	0.37	0.9705	2.628
802.11a/n/ac/ax	5180 ~ 5240	28.78	5.5	34.28	0.37	1.6331	2.628
	5260 ~ 5320	22.88	5.5	28.38	0.37	0.4198	2.628
	5500 ~ 5720	23.67	6.0	29.67	0.37	0.5649	2.628
	5745 ~ 5825	28.65	5.5	34.15	0.37	1.5849	2.628

Note:

1. $EIRP \text{ (dBm)} = \text{Max. Conducted Power (dBm)} + \text{Max. Antenna Gain (dBi)}$
2. $ERP \text{ (W)} = 10^{[ERP \text{ (dBm)} - 30]/10} = 10^{[EIRP \text{ (dBm)} - 2.15 \text{ (dB)} - 30]/10}$
3. $\text{Threshold ERP (W)} = 19.2 * R^2 \text{ (W)} = 19.2 * 0.37^2 \text{ (W)} = 2.628 \text{ (W)}$

The 2.4GHz WLAN and 5GHz WLAN can transmit simultaneously.

$$\text{Exposure Ratio} = 0.9705 / 2.772 + 1.6331 / 2.772 = 0.9905 < 1.$$

Therefore, this device meets the RF Exposure requirements when it is installed and operated with a minimum distance of 37cm between the radiator and user.