RF Exposure Evaluation Declaration

FCC ID:	TV7C52-5AXD2AXD
Applicant:	Mikrotikls SIA
Product:	hAP ax^2
Model No.:	C52iG-5HaxD2HaxD-TC-US
Brand Name:	MikroTik
FCC Classification:	Digital Transmission System (DTS) Unlicensed National Information Infrastructure (NII)
FCC Rule Part(s)	FCC Part 2.1091
Test Procedure	KDB 447498 D04 Interim General RF Exposure Guidance v01
Result:	Complies

Reviewed By: Vincent Yu

Approved By: Robin Wu

Revision History

Report No.	Version	Description	Issue Date	Note
2212RSU016-U2	Rev. 01	Initial Report	2023-01-09	Valid

CONTENTS

1. General Information

1.1. Applicant

Mikrotikls SIA

Brivibas gatve 214i, Riga, LV-1039 LATVIA

1.2. Manufacturer

Mikrotikls SIA

Brivibas gatve 214i, Riga, LV-1039 LATVIA

1.3. Testing Facility

☐	**Test Site – MRT Suzhou Laboratory**				
	Laboratory Location (Suzhou - Wuzhong) D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China **Laboratory Location (Suzhou - SIP)** 4b Building, Liando U Valley, No.200 Xingpu Rd., Shengpu Town, Suzhou Industrial Park, China				
	Laboratory Accreditations				
	A2LA: 3628.01		CNAS: L10551		
	FCC: CN1166		ISED: CN0001		
	VCCI:	☐R-20025	☐G-20034	☐C-20020	☐T-20020
		☐R-20141	☐G-20134	☐C-20103	☐T-20104
☐	**Test Site – MRT Shenzhen Laboratory**				
	Laboratory Location (Shenzhen) 1G, Building A, Junxiangda Building, Zhongshanyuan Road West, Nanshan District, Shenzhen, China				
	Laboratory Accreditations				
	A2LA: 3628.02		CNAS: L10551		
	FCC: CN1284		ISED: CN0105		
☐	**Test Site – MRT Taiwan Laboratory**				
	Laboratory Location (Taiwan) No. 38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)				
	Laboratory Accreditations				
	TAF: L3261-190725				
	FCC: 291082, TW3261		ISED: TW3261		

1.4. Product Information

Product Name	hAP ax^2
Model No.	C52iG-5HaxD2HaxD-TC-US
Wi-Fi Specification	802.11a/b/g/n/ac/ax, VHT
Hardware Version	r3
Software Version	RouterOS v7
Antenna Information	Refer to section 1.5
Working Voltage Range	12~28VDC (24VDC Nominal)
Working Temperature	0 ~ 50°C
Accessory	
Adapter	Model: SAW30-240-1200U A Input: 100-240V ~ 50//60Hz 0.8A Output: 24.0V ⎓ 1200mA
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)	Max Peak Gain (dBi)	CDD Directional Gain (dBi)	
			For Power	For PSD
Wi-Fi Antenna (2*2 MIMO)				
PCB Antenna	2.400 ~ 2483.5	5.50	5.50	8.51
	5150 ~ 5250	3.20	3.20	6.21
	5250 ~ 5350	4.20	4.20	7.21
	5470 ~ 5725	5.20	5.20	8.21
	5725 ~ 5850	5.00	5.00	8.01
	5850 ~ 5895	4.70	4.70	7.71

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} + 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 = 3.01;

- For power measurements on IEEE 802.11 devices,

  Array Gain = 0 dB for $N_{ANT} \leq 4$;

1.6. Device Classification

According to the user manual, the antenna of this device is at least 38 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 λ/2π, 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 λ/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^2f
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.

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

2.2. Test Result

Product	hAP ax^2
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	29.31	5.50	34.81	0.38	1.8450	2.772
802.11a/n/ac/ax	5180 ~ 5240	28.48	3.20	31.68	0.38	0.8974	2.772
	5260 ~ 5320	23.78	4.20	27.98	0.38	0.3828	2.772
	5500 ~ 5720	23.88	5.20	29.08	0.38	0.4932	2.772
	5745 ~ 5825	26.51	5.00	31.51	0.38	0.8630	2.772
	5845 ~ 5885	26.92	4.70	31.62	0.38	0.8851	2.772

Note:

1. EIRP (dBm) = Max. Conducted Power (dBm) + Max. Antenna Gain (dBi)
2. ERP (W) = $10^{[\text{ERP (dBm)} - 30)]/10}$ = $10^{[\text{EIRP (dBm)} - 2.15 \text{ (dB)} - 30]/10}$
3. Threshold ERP (W) = 19.2 * R^2 (W) = 19.2 * 0.38^2 (W) = 2.772 (W)

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

Exposure Ratio = 1.8450 / 2.772 + 0.8974 / 2.772 = 0.9892 < 1.

Therefore, this device meets the RF Exposure requirements when it is installed and operated with a minimum distance of 38cm between the radiator and user.

The End