

MRT Technology (Suzhou) Co., Ltd Phone: +86-512-66308358

Web: www.mrt-cert.com

Report No.: 2308RSU089-U4 Report Version: V01 Issue Date: 2024-02-20

RF Exposure Evaluation Declaration

FCC ID: TV7L23AX52

Applicant: Mikrotikls SIA

Product: mANTBox ax 15s

L23UGSR-5HaxD2HaxD-US

NetMetal ax

Model No.: L22UGS-5HaxD2HaxD-15S-US

L23UGSR-5HaxD2HaxD-US

L23UGSR-5HaxD2HaxD-NM-US

Brand Name: MikroTik

FCC Rule Part(s): FCC Part 2.1091

Evaluation Date: 2024-02-04

Result: Complies

Approved By:

Reviewed By:

Vincent Yu

Robin Wu

Robin Wu

Vincent Yu

ACCREDITED

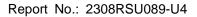
TESTING LABORATORY
CERTIFICATE #3628.01

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.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

Template Version:0.0 1 of 11





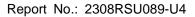
Revision History

| Report No. | Version | Description | Issue Date | Note |
|---------------|---------|----------------|------------|-------|
| 2308RSU089-U4 | V01 | Initial Report | 2024-02-20 | Valid |
| | | | | |



CONTENTS

| | cription | | Page |
|----|----------|---------------------|------|
| 1. | Gener | ral Information | 4 |
| | 1.1. | Applicant | 4 |
| | 1.2. | Manufacturer | 4 |
| | 1.3. | Testing Facility | 4 |
| | 1.4. | Product Information | 5 |
| | 1.5. | Antenna Details | 6 |
| | 1.6. | Applied Standards | 6 |
| 2. | | rposure Evaluation | |
| | 2.1. | Test Limits | 7 |
| | 2.1. | MPE Exemptions | 8 |
| | 2.2. | Calculated Result | 11 |





1. General Information

1.1. Applicant

Mikrotikls SIA

Ūnijas iela 2, Riga, LV-1039 LATVIA

1.2. Manufacturer

Mikrotikls SIA

Ūnijas iela 2, Riga, LV-1039 LATVIA

1.3. Testing Facility

| \boxtimes | Test Site - MRT S | Suzhou Laborator | у | | | | |
|-------------|--|---------------------------|--------------------|--------------------|-------------|--|--|
| | Laboratory Location (Suzhou - Wuzhong) | | | | | | |
| | D8 Building, No.2 | Tian'edang Rd., W | uzhong Economic De | velopment Zone, Su | zhou, China | | |
| | Laboratory Loca | tion (Suzhou - SIP |)) | | | | |
| | 4b Building, Liando U Valley, No.200 Xingpu Rd., Shengpu Town, Suzhou Industrial Park, China | | | | | | |
| | Laboratory Accre | editations | | | | | |
| | A2LA: 3628.01 | | CNAS | s: L10551 | | | |
| | FCC: CN1166 | | ISED: | CN0001 | | | |
| | VOOL: | □R-20025 | □G-20034 | □C-20020 | □T-20020 | | |
| | VCCI: | □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 | Гаiwan Laboratory | 1 | | | | |
| | Laboratory Location (Taiwan) | | | | | | |
| | No. 38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.) | | | | | | |
| | Laboratory Accre | Laboratory Accreditations | | | | | |
| | TAF: 3261 | | | | | | |
| | FCC: 291082, TW | 3261 | ISED: | TW3261 | | | |



1.4. Product Information

| L23UGSR-5HaxD2HaxD-NM-US: HER09ACK29G/332 | | |
|---|--|--|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

Remark:

- 1. The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer.
- 2. PoE needs to be used with an AC adapter. For this report, we select AC Adapter for testing.
- 3. For model differences, please refer to the Operation Description document.



1.5. Antenna Details

| Antenna Type | Antenna Model | Frequency Range | Max. PK | CDD DG | |
|------------------|--------------------------|-----------------|------------|-----------|---------|
| | | | Gain (dBi) | (dl | Bi) |
| | | | | For Power | For PSD |
| Omni Antenna | HGO-antenna-OUT | 2400 ~ 2483.5 | 3.3 | 3.3 | 6.31 |
| Onini Antenna | ngo-antenna-oo i | 5150 ~ 5850 | 7.1 | 7.1 | 10.11 |
| Sector Antenna | MTAS-5G-19D120 | 5150 ~ 5850 | 19.0 | 19.0 | 22.01 |
| Integral Antonna | Built-in cross-polarized | 2400 ~ 2483.5 | 12.0 | 12.0 | 15.01 |
| Integral Antenna | sector antenna | 5150 ~ 5850 | 14.0 | 14.0 | 17.01 |

Notes:

- 1. The EUT only supports Cyclic Delay Diversity (CDD) mode, and CDD signals are correlated.
- 2. The antenna specification is provided by the applicant.

| Optional Antenna | L23UGSR- 5HaxD2HaxD-US | L23UGSR- 5HaxD2HaxD-NM-US | L22UGS- 5HaxD2HaxD-15S-US |
|---------------------|---------------------------|------------------------------|------------------------------|
| Omni Antenna | \boxtimes | \boxtimes | |
| Sector Antenna | \boxtimes | \boxtimes | |
| Integral Antenna | | | |

Note: The model L23UGSR-5HaxD2HaxD-US and L23UGSR-5HaxD2HaxD-NM-US can be equipped with 2 external antennas, and model L22UGS-5HaxD2HaxD-15S-US only have one built-in antenna.

1.6. Device Classification

According to the operating environment and product manual, this device is classified as a fixed installation equipment. Therefore, the RF exposure assessment requirements in § 2.1091 are used to evaluate MPE.

1.7. Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

FCC Part 2.1091 & KDB 447498 D04 Interim General RF Exposure Guidance v01



2. RF Exposure Evaluation

2.1. Test 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 | Electric Field | Magnetic Field | Power Density | Average Time | | | |
|---|--|----------------|------------------------|--------------|--|--|--|
| (MHz) | Strength (V/m) | Strength (A/m) | (mW/cm²) | (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 | | | |
| 300-1,500 | | | f/300 | <6 | | | |
| 1,500-100,000 | | | 5 | <6 | | | |
| (B) Limits for General Population/ Uncontrolled Exposures | | | | | | | |
| 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 | | | |
| 300-1,500 | | | f/1500 | <30 | | | |
| 1,500-100,000 | | | 1.0 | <30 | | | |

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



2.2. MPE Exemptions

For single RF sources (i.e., any single fixed RF source, mobile device, or portable device, as defined in paragraph §1.1307(b)(2) of this section): A single RF source is exempt if:

(Option A) The available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption may not be used in conjunction with other exemption criteria other than those in paragraph §1.1307(b)(3)(ii)(A) of this section.

Medical implant devices may only use this exemption and that in paragraph §1.1307(b)(3)(ii)(A);

(Option B) Or the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). P is given by:

$$P th(mW) = \{ERP_{20cm}(d / 20cm)^x d \le 20cm\}$$

$$P th(mW) = \{ERP_{20cm} 20cm < d \le 40cm\}$$

Where

$$x = -\log_{10}\left(\frac{60}{ERP_{20cm}\sqrt{f}}\right)$$
 and f is in GHz;

and

$$ERP_{20cm}(mW) = \{2040f \ 0.3GHz \le f < 1.5GHz\}$$

$$ERP_{20cm}(mW) = \{3060 \ 1.5GHz \le f \le 6GHz \$$

(Option C) Or using Table 1 and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. 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 (1.64 linear value).



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

| RF Source Frequency (MHz) | Threshold ERP (watts) | | |
|---------------------------|------------------------|--|--|
| 0.3-1.34 | 1920R ² | | |
| 1.34-30 | 3450R²/f² | | |
| 30-300 | 3.83R ² | | |
| 300-1,500 | 0.0128R ² f | | |
| 1,500-100,000 | 19.2R ² | | |

For multiple RF sources: Multiple RF sources are exempt if:

- (A) The available maximum time-averaged power of each source is no more than 1 mW and there is a separation distance of two centimeters between any portion of a radiating structure operating and the nearest portion of any other radiating structure in the same device, except if the sum of multiple sources is less than 1 mW during the time-averaging period, in which case they may be treated as a single source (separation is not required). This exemption may not be used in conjunction with other exemption criteria other than those is paragraph §1.1307(b)(3)(i)(A) of this section. Medical implant devices may only use this exemption and that in paragraph §1.1307(b)(3)(i)(A).
- (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.

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

Where:

a = number of fixed, mobile, or portable RF sources claiming exemption using paragraph §1.1307(b)(3)(i)(B) of this section for P_{th} , including existing exempt transmitters and those being added.

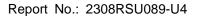
b = number of fixed, mobile, or portable RF sources claiming exemption using paragraph 1.1307(b)(3)(i)(C) of this section for Threshold ERP, including existing exempt transmitters and those being added.

c = number of existing fixed, mobile, or portable RF sources with known evaluation for the specified minimum distance including existing evaluated transmitters.

 P_i = the available maximum time-averaged power or the ERP, whichever is greater, for fixed, mobile, or portable RF source i at a distance between 0.5 cm and 40 cm (inclusive).

 $P_{th,i}$ = the exemption threshold power (P_{th}) according to paragraph §1.1307(b)(3)(i)(B) of this section for fixed, mobile, or portable RF source i.

 ERP_j = the ERP of fixed, mobile, or portable RF source j.





 $ERP_{th,j}$ = exemption threshold ERP for fixed, mobile, or portable RF source j, at a distance of at least $\lambda/2\pi$ according to the applicable formula of paragraph §1.1307(b)(3)(i)(C) of this section.

Evaluated_k = the maximum reported SAR or MPE of fixed, mobile, or portable RF source k either in the device or at the transmitter site from an existing evaluation at the location of exposure.

Exposure Limit_k = either the general population/uncontrolled maximum permissible exposure (MPE) or specific absorption rate (SAR) limit for each fixed, mobile, or portable RF source k, as applicable from §1.1310 of this chapter.



Report No.: 2308RSU089-U4

2.3. Calculated Result

| Test Mode Frequency Band | | Max. Total Conducted | Antenna Gain | Max. ERP |
|--------------------------|-------------|----------------------|--------------|----------|
| | (MHz) | Power (dBm) | (dBi) | (dBm) |
| VHT, 802.11b/g/n/ax | 2412 ~ 2462 | 23.89 | 12.0 | 33.74 |
| | 5180 ~ 5240 | 6.88 | 14.0 | 18.73 |
| 000 44 - 1-1-1-1 | 5260 ~ 5320 | 15.86 | 14.0 | 27.71 |
| 802.11a/n/ac/ax | 5500 ~ 5720 | 15.57 | 14.0 | 27.42 |
| | 5745 ~ 5825 | 16.8 | 19.0 | 33.65 |

For single RF source, Option C

| Test Mode | λ/2π | R | Max. ERP | Thresholds ERP |
|-------------|--------|------|----------|----------------|
| | (m) | (m) | (mW) | (mW) |
| Wi-Fi (DTS) | 0.0198 | 0.49 | 2365.9 | 4800.0 |
| Wi-Fi (NII) | 0.0092 | 0.49 | 2317.4 | 4800.0 |

Note: R is from user manual.

For multiple RF sources

The 2.4GHz Wi-Fi and 5GHz Wi-Fi can transmit simultaneously, so the Max Simultaneous Transmission = 2365.9/4800.0 (DTS) + 2317.4/4800.0 (NII) = 0.9757 < 1

Therefore, the device qualifies for RF exposure test exemption.