

RF Exposure Evaluation Declaration

FCC ID: TV7L11AX5
Applicant: Mikrotiks SIA
Product: L11UG-5HaxD-US
NetBox 5 ax
Model No.: L11UG-5HaxD-US
L11UG-5HaxD-NB-US
Brand Name: MikroTik
FCC Rule Part(s): FCC Part 2.1091
Evaluation Date: 2024-02-27
Result: Complies

Reviewed By:

Vincent Yu

Approved By:

Robin Wu



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.

Revision History

Report No.	Version	Description	Issue Date	Note
2308RSU087-U3	V01	Initial Report	2024-03-01	Valid

CONTENTS

Description	Page
1. General 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. RF Exposure Evaluation.....	7
2.1. Test Limits	7
2.1. MPE Exemptions.....	8
2.2. Calculated Result	11

1.4. Product Information

Product Name	L11UG-5HaxD-US NetBox 5 ax
Model No.	L11UG-5HaxD-US L11UG-5HaxD-NB-US
EUT Serial No.	L11UG-5HaxD-US: HEM08NA93Q1/320 L11UG-5HaxD-NB-US: HEQ096MM7FF/339
Wi-Fi Specification	802.11a/n/ac/ax
Antenna Information	Refer to section 1.5
Working Voltage	AC Adapter Input or PoE Input
Operating Temperature	-40 ~ 70°C
Accessories	
AC Adapter	Model No.: SAW30-240-1200G Input Power: 100 - 240V ~ 50/60Hz, 0.8A Output Power: 24.0V = 1.2A 28.8W
Gigabit PoE	Input: 18-57V PIN 4, 5: 18-57V PIN 7, 8 Return
Remark: <ol style="list-style-type: none"> The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer. PoE needs to be used with an AC adapter. L11UG-5HaxD-NB-US only can powered by PoE. For model differences, please refer to the Operation Description document. 	

1.5. Antenna Details

Antenna Type	Antenna Model	Frequency Range (MHz)	Max. PK Gain (dBi)	CDD DG (dBi)	
				For Power	For PSD
Omni Antenna	HGO-antenna-OUT	5150 ~ 5850	7.1	7.1	10.11
Sector Antenna	MTAS-5G-19D120	5150 ~ 5850	19.0	19.0	22.01

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.

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 (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
300-1,500	--	--	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:

$$P_{th}(mW) = \{ERP_{20cm} (d / 20cm)^x \quad d \leq 20cm$$

$$P_{th}(mW) = \{ERP_{20cm} \quad 20cm < d \leq 40cm$$

Where

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

and

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

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

(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)(i)(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	3450R ² /f ²
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 in 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.

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

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.

2.3. Calculated Result

Test Mode	Frequency Band (MHz)	Max. Conducted Power (dBm)	Antenna Gain (dBi)	Max.ERP (dBm)
802.11a/n/ac/ax	5180 ~ 5240	1.85	19.0	18.70
	5260 ~ 5320	10.75	19.0	27.60
	5500 ~ 5720	10.57	19.0	27.42
	5745 ~ 5825	16.80	19.0	33.65

For single RF source, Option B

Test Mode	R (m)	Max. ERP (mW)	Threshold P (mW)
Wi-Fi (NII)	0.20	2317.4	3060

Note: R is from user manual.

Therefore, the device qualifies for RF exposure test exemption.