



RADIO TEST REPORT

Report No.: STS2305310H02

Issued for

Mikrotiks SIA

Brivibas gatve 214i, Riga, Latvia, LV-1039

Product Name:	CME Gateway
Brand:	MikroTik
Model Number:	CME22-2n-BG77
Series Model(s):	N/A
FCC ID:	TV7CMEBG77
Test Standard:	FCC 47CFR §2.1091

Any reproduction of this document must be done in full. No single part of this document may be reproduced without permission from STS, all test data presented in this report is only applicable to presented test sample.





Test Report Certification

Applicant's Name..... : Mikrotikls SIA
 Address : Brivibas gatve 214i, Riga, Latvia, LV-1039
Manufacturer's Name : Mikrotikls SIA
 Address : Brivibas gatve 214i, Riga, Latvia, LV-1039

Product Description

Product Name..... : CME Gateway
 Brand : MikroTik
 Model Number : CME22-2n-BG77
 Series Model(s) : N/A

Standards..... : FCC 47CFR §2.1091
 447498 D04 Interim General RF Exposure Guidance v01

This report shall not be reproduced except in full, without the written approval of STS, this document only be altered or revised by STS, personal only, and shall be noted in the revision of the document.

Date of Test..... :
 Date of receipt of test item : 12 May 2023
 Date (s) of performance of tests : 12 May 2023 ~ 14 June 2023
 Date of Issue..... : 14 June 2023
 Test Result..... : **Pass**

Testing Engineer : *Chris Chen*

 (Chris Chen)

Technical Manager : *Sean She*

 (Sean she)

Authorized Signatory : *Bovey Yang*

 (Bovey Yang)





TABLE OF CONTENTS

1. GENERAL INFORMATION	5
1.1 GENERAL DESCRIPTION OF THE EUT	5
1.2 TEST FACTORY	6
2. FCC 47CFR §2.1091 REQUIREMENT	7
2.1 TEST STANDARDS	7
2.2 LIMIT	7
2.3 TEST RESULT	10





Revision History

Rev.	Issue Date	Report No.	Effect Page	Contents
00	14 June 2023	STS2305310H02	ALL	Initial Issue





1. GENERAL INFORMATION

1.1 GENERAL DESCRIPTION OF THE EUT

Product Name	CME Gateway								
Brand	MikroTik								
Model Number	CME22-2n-BG77								
Series Model(s)	N/A								
Model Difference	N/A								
Product Description	The EUT is CME Gateway.								
	<table border="1"> <tr> <td>Operation Frequency:</td> <td> CAT-M: Band 2:1850~1910MHz Band 4:1710~1755MHz Band 5:824~849MHz Band 12:699~716MHz Band 13:777~787MHz Band 25:1850~1915MHz Band 26:814~849MHz Band 66:1710~1780MHz Band 85: 698~716 MHz NB-IoT: Band 2:1850~1910MHz Band 4:1710~1755MHz Band 5:824~849MHz Band 12:699~716MHz Band 13:777~787MHz Band 25:1850~1915MHz Band 66:1710~1780MHz Band 71:663~698MHz Band 85: 698~716 MHz 2.4G WLAN: 802.11b/g/n 20: 2412~2462 MHz 802.11n(40MHz):2422~2452MHz </td> </tr> <tr> <td>Modulation Type:</td> <td> CAT-M: QPSK/16QAM NB-IoT: BPSK/QPSK 2.4G WLAN: 802.11b(DSSS):CCK,DQPSK,DBPSK 802.11g(OFDM):BPSK,QPSK,16-QAM,64-QAM 802.11n(OFDM):BPSK,QPSK,16-QAM,64-QAM </td> </tr> <tr> <td>Antenna gain:</td> <td>4.53dBi</td> </tr> <tr> <td>Antenna Designation:</td> <td>PCB</td> </tr> </table>	Operation Frequency:	CAT-M: Band 2:1850~1910MHz Band 4:1710~1755MHz Band 5:824~849MHz Band 12:699~716MHz Band 13:777~787MHz Band 25:1850~1915MHz Band 26:814~849MHz Band 66:1710~1780MHz Band 85: 698~716 MHz NB-IoT: Band 2:1850~1910MHz Band 4:1710~1755MHz Band 5:824~849MHz Band 12:699~716MHz Band 13:777~787MHz Band 25:1850~1915MHz Band 66:1710~1780MHz Band 71:663~698MHz Band 85: 698~716 MHz 2.4G WLAN: 802.11b/g/n 20: 2412~2462 MHz 802.11n(40MHz):2422~2452MHz	Modulation Type:	CAT-M: QPSK/16QAM NB-IoT: BPSK/QPSK 2.4G WLAN: 802.11b(DSSS):CCK,DQPSK,DBPSK 802.11g(OFDM):BPSK,QPSK,16-QAM,64-QAM 802.11n(OFDM):BPSK,QPSK,16-QAM,64-QAM	Antenna gain:	4.53dBi	Antenna Designation:	PCB
	Operation Frequency:	CAT-M: Band 2:1850~1910MHz Band 4:1710~1755MHz Band 5:824~849MHz Band 12:699~716MHz Band 13:777~787MHz Band 25:1850~1915MHz Band 26:814~849MHz Band 66:1710~1780MHz Band 85: 698~716 MHz NB-IoT: Band 2:1850~1910MHz Band 4:1710~1755MHz Band 5:824~849MHz Band 12:699~716MHz Band 13:777~787MHz Band 25:1850~1915MHz Band 66:1710~1780MHz Band 71:663~698MHz Band 85: 698~716 MHz 2.4G WLAN: 802.11b/g/n 20: 2412~2462 MHz 802.11n(40MHz):2422~2452MHz							
	Modulation Type:	CAT-M: QPSK/16QAM NB-IoT: BPSK/QPSK 2.4G WLAN: 802.11b(DSSS):CCK,DQPSK,DBPSK 802.11g(OFDM):BPSK,QPSK,16-QAM,64-QAM 802.11n(OFDM):BPSK,QPSK,16-QAM,64-QAM							
	Antenna gain:	4.53dBi							
Antenna Designation:	PCB								
Rating	Input: PoE Input: DC 18-57 V 2-pin terminal input: DC 12-57 V								
Adapter	Model: MT48-480095-11SGE Input: 100-240V~, 50/60Hz, 1.0A Max Output: DC 48.0V, 0.95A								
Hardware Version	r2								
Software Version	ROS 7.6								



1.2 TEST FACTORY

SHENZHEN STS TEST SERVICES CO., LTD

Add. : A 1/F, Building B, Zhuoke Science Park, No.190 Chongqing Road, HepingShequ,
Fuyong Sub-District, Bao'an District, Shenzhen, Guang Dong, China

FCC test Firm Registration Number: 625569

IC test Firm Registration Number: 12108A

A2LA Certificate No.: 4338.01





2. FCC 47CFR §2.1091 REQUIREMENT

2.1 TEST STANDARDS

Follow the maximum permissible exposure (MPE) limits specified in 447498 D04 Interim General Radio Frequency Exposure Guidelines v01. The gain of the antenna used in the product was extracted from the supplied antenna data sheet and the maximum total power input to the antenna was also measured. Calculate the distance from the product to the MPE limit by the formula.

2.2 LIMIT

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

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

(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_{th} (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_{th} is given by:

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

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

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

d = the separation distance (cm);



(C) Or using below table 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).

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	$3.83 R^2$.
300-1,500	$0.0128 R^2f$.
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 (b)(3)(i)(A) of Part 1.1307. Medical implant devices may only use this exemption and that in paragraph (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 (b)(3)(i)(B) of Part 1.1307 for Pth, including existing exempt transmitters and those being added.

b = number of fixed, mobile, or portable RF sources claiming exemption using paragraph (b)(3)(i)(C) of Part 1.1307 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.

Pi = 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).

Pth,i = the exemption threshold power (Pth) according to paragraph (b)(3)(i)(B) of this section for fixed, mobile, or portable RF source i.

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

ERPth,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 (b)(3)(i)(C) of Part 1.1307.

Evaluatedk = 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 Limitk = 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.



2.3 TEST RESULT

Turn up

Mode	Detector	Turn up Power
CAT-M Band 2	AV	21±1dBm
CAT-M Band 4	AV	21±1dBm
CAT-M Band 5	AV	21±1dBm
CAT-M Band 12	AV	21±1dBm
CAT-M Band 13	AV	21±1dBm
CAT-M Band 25	AV	21±1dBm
CAT-M Band 26	AV	21±1dBm
CAT-M Band 66	AV	21±1dBm
CAT-M Band 85	AV	22±1dBm
NB-IoT Band 2	AV	21±1dBm
NB-IoT Band 4	AV	21±1dBm
NB-IoT Band 5	AV	21±1dBm
NB-IoT Band 12	AV	21±1dBm
NB-IoT Band 13	AV	21±1dBm
NB-IoT Band 25	AV	21±1dBm
NB-IoT Band 66	AV	21±1dBm
NB-IoT Band 71	AV	21±1dBm
NB-IoT Band 85	AV	25±1dBm
2.4G WLAN	AV	18±1dBm



Protocol	Fre. (MHz)	Separation distance (cm)	Max Turn up power (dBm)	ANT Gain (dBi)	Max EIRP (dBm)	Power Density (mW/cm ²)	Limit (mW/cm ²)	Ratio	Result
CAT-M Band 2	1850	20	22.00	4.53	26.53	0.089	1	0.09	Pass
CAT-M Band 4	1710	20	22.00	4.53	26.53	0.089	1	0.09	Pass
CAT-M Band 5	824	20	22.00	4.53	26.53	0.089	0.55	0.16	Pass
CAT-M Band 12	699	20	22.00	4.53	26.53	0.089	0.47	0.19	Pass
CAT-M Band 13	777	20	22.00	4.53	26.53	0.089	0.52	0.17	Pass
CAT-M Band 25	1850	20	22.00	4.53	26.53	0.089	1	0.09	Pass
CAT-M Band 26	814	20	22.00	4.53	26.53	0.089	0.54	0.16	Pass
CAT-M Band 66	1710	20	22.00	4.53	26.53	0.089	1	0.09	Pass
CAT-M Band 85	698	20	23.00	4.53	27.53	0.113	0.47	0.24	Pass
NB-IoT Band 2	1850	20	22.00	4.53	26.53	0.089	1	0.09	Pass
NB-IoT Band 4	1710	20	22.00	4.53	26.53	0.089	1	0.09	Pass
NB-IoT Band 5	824	20	22.00	4.53	26.53	0.089	0.55	0.16	Pass
NB-IoT Band 12	699	20	22.00	4.53	26.53	0.089	0.47	0.19	Pass
NB-IoT Band 13	777	20	22.00	4.53	26.53	0.089	0.52	0.17	Pass
NB-IoT Band 25	1850	20	22.00	4.53	26.53	0.089	1	0.09	Pass
NB-IoT Band 66	1710	20	22.00	4.53	26.53	0.089	1.14	0.08	Pass
NB-IoT Band 71	663	20	22.00	4.53	26.53	0.089	0.44	0.20	Pass
NB-IoT Band 85	698	20	26.00	4.53	30.53	0.225	0.47	0.48	Pass
2.4G WLAN	2437	20	19.00	4.53	23.53	0.089	1	0.09	Pass

Multiple transmission:

CAT-M + WLAN = 0.24 + 0.09 = 0.33 < 1

NB-IoT + WLAN = 0.48 + 0.09 = 0.57 < 1

Note: 1. The Maximum power is less than the limit, complies with the exemption requirements.

*****END OF THE REPORT*****