

RF Exposure Evaluation Declaration

Product Name : KNOT LR9 kit
Brand Name : MikroTik
Model No. : RB924iR-2nD-BT5&BG77&R11e-LR9,
RB924i-2nD-BT5&BG77
FCC ID : TV7924BT5LR9

Applicant : Mikrotikls SIA
Address : Brīvības gatve 214i, Rīga LV-1039 Latvia

Date of Receipt : Jul. 27, 2021
Issued Date : Dec. 20, 2021
Report No. : 2171120R-RFUSMPEV02
Report Version : V1.0



The test results relate only to the samples tested.

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

This report must not be used to claim product endorsement by TAF or any agency of the government.

Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

The test report shall not be reproduced except in full without the written approval of DEKRA Testing and Certification Co., Ltd.

Test Result for Inspection



Product Name : KNOT LR9 kit
 Applicant : Mikrotiks SIA
 Address : Brīvības gatve 214i, Rīga LV-1039 Latvia
 Manufacturer : Mikrotiks SIA
 Address : Brīvības gatve 214i, Rīga LV-1039 Latvi
 Brand Name : MikroTik
 Model No. : RB924iR-2nD-BT5&BG77&R11e-LR9,
 RB924i-2nD-BT5&BG77
 FCC ID : TV7924BT5LR9
 EUT Voltage : DC 5 ~ 24V
 Testing Voltage : AC 120V/60Hz
 Applicable Standard : FCC 47 CFR Part 2.1091 Radiofrequency radiation exposure
 evaluation: mobile devices.
 Test Lab : Hsin Chu Laboratory
 Address : No.372-2, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu
 County 310, Taiwan, R.O.C.
 TEL: +886-3-582-8001 / FAX: +886-3-582-8958
 Test Result : Complied

Documented By :

Amelia Wu

(Amelia Wu / Project Specialist)

Approved By :

Louis Hsu

(Louis Hsu / Deputy Manager)

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Revision History

Version	Description	Issued Date
V1.0	Initial issue of report	Dec. 20, 2021

1. General Information

1.1. EUT General Information

RF General Information			
Evaluation Mode	Frequency Range (MHz)	Operating Frequency (MHz)	Modulation Type
WLAN 2.4 GHz	2400 ~ 2483.5	2412 ~ 2452	802.11b: DSSS 802.11g/n: OFDM
Bluetooth	2400 ~ 2483.5	2402 ~ 2480	LE: GFSK
LoRa	902 ~ 928	903 ~ 927.5	FSK

The difference for each model is shown as below:

Model No.	LoRa Function
RB924iR-2nD-BT5&BG77&R11e-LR9	With
RB924i-2nD-BT5&BG77	Without

Note:

- The above EUT information is declared by the manufacturer.
- This device contains WWAN LTE module is shown as below:

Brand Name	Model No.	FCC ID	WWAN LTE Function	Uplink Frequency Range (MHz)	Downlink Frequency Range (MHz)
Quectel	BG77	XMR201912BG77	LTE Cat M1 Band 2	1850 ~ 1910	1930~1990
			LTE Cat M1 Band 4	1710 ~ 1755	2110 ~ 2115
			LTE Cat M1 Band 5	824 ~ 849	869 ~ 894
			LTE Cat M1 Band 12	699 ~ 716	729 ~ 746
			LTE Cat M1 Band 13	777 ~ 787	746 ~ 756
			LTE Cat M1 Band 25	1850 ~ 1915	1930 ~ 1995
			LTE Cat M1 Band 26	814 ~ 849	859 ~ 894
			LTE Cat M1 Band 66	1710 ~ 1780	2110 ~ 2200
			LTE Cat M1 Band 71	663 ~ 698	617 ~ 652
			LTE Cat M1 Band 85	698 ~ 716	728 ~ 746
			LTE NB-IoT Band 2	1850 ~ 1910	1930~1990
			LTE NB-IoT Band 4	1710 ~ 1755	2110 ~ 2115
			LTE NB-IoT Band 5	824 ~ 849	869 ~ 894
			LTE NB-IoT Band 12	699 ~ 716	729 ~ 746
			LTE NB-IoT Band 13	777 ~ 787	746 ~ 756
			LTE NB-IoT Band 25	1850 ~ 1915	1930 ~ 1995
			LTE NB-IoT Band 26	814 ~ 849	859 ~ 894
			LTE NB-IoT Band 66	1710 ~ 1780	2110 ~ 2200
LTE NB-IoT Band 71	663 ~ 698	617 ~ 652			
LTE NB-IoT Band 85	698 ~ 716	728 ~ 746			

1.2. Test Facility

Laboratory Information

USA : **FCC Registration Number: TW3024**
Canada : **CAB identifier : TW3024**

The address and introduction of DEKRA Testing and Certification Co., Ltd. laboratories can be founded in our Web site: <http://www.dekra.com.tw>

If you have any comments, please don't hesitate to contact us. Our test sites as below:

Test Laboratory	DEKRA Testing and Certification Co., Ltd.
Address	1. No.372-2, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County 31061, Taiwan, R.O.C. 2. No.372, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County 31061, Taiwan, R.O.C.
Phone number	1. +886-3-582-8001 2. +886-3-582-8001
Fax number	1. +886-3-582-8958 2. +886-3-582-8958
E mail address	info.tw@dekra.com
Website	http://www.dekra.com.tw
Note: Test site number for address 1 includes SR2-H. Test site number for address 2 includes CB2-H, CB3-H, CB4-H, SR10-H and SR12-H.	

2. RF Exposure Evaluation

2.1. Test Limit

(A) Test Limit for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm ²)	Averaging Time E ² , H ² or S (minutes)
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
300-1500	-	-	f/300	<6
1500-100,000	-	-	5	<6

(B) Test Limit for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm ²)	Averaging Time E ² , H ² or S (minutes)
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
300-1500	-	-	f/1500	<30
1500-100,000	-	-	1.0	<30

Note: f = frequency in MHz; *Plane-wave equivalent power density

Power Density (S) is calculated by the following formula:

$$S=(P*G)/4\pi R^2$$

where:

S = power density (in appropriate units, e.g. mW/ cm²)

P = power input to the antenna (in appropriate units, e.g., mW)

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

π = 3.1416

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

2.2. Test Result of RF Exposure Evaluation

Exposure Environment: General Population / Uncontrolled Exposure

Evaluation Mode	E.I.R.P (dBm)	E.I.R.P (mW)	Power Density (mW/cm ²)	Limit (mW/cm ²)	Test Result (PASS/FAIL)
WLAN 2.4 GHz	21.162	130.677	0.026	1.000	PASS
Bluetooth LE	8.790	7.568	0.002	1.000	PASS
LoRa	8.190	6.592	0.001	1.000	PASS
LTE Cat M1 Band 2	27.000	501.187	0.100	1.000	PASS
LTE Cat M1 Band 4	27.000	501.187	0.100	1.000	PASS
LTE Cat M1 Band 5	27.000	501.187	0.100	0.549	PASS
LTE Cat M1 Band 12	27.000	501.187	0.100	0.466	PASS
LTE Cat M1 Band 13	27.000	501.187	0.100	0.518	PASS
LTE Cat M1 Band 25	27.000	501.187	0.100	1.000	PASS
LTE Cat M1 Band 26	27.000	501.187	0.100	0.543	PASS
LTE Cat M1 Band 66	27.000	501.187	0.100	1.000	PASS
LTE Cat M1 Band 71	27.000	501.187	0.100	1.000	PASS
LTE Cat M1 Band 85	27.000	501.187	0.100	1.000	PASS
LTE NB-IoT Band 2	27.000	501.187	0.100	1.000	PASS
LTE NB-IoT Band 4	27.000	501.187	0.100	1.000	PASS
LTE NB-IoT Band 5	27.000	501.187	0.100	0.549	PASS
LTE NB-IoT Band 12	27.000	501.187	0.100	0.466	PASS
LTE NB-IoT Band 13	27.000	501.187	0.100	0.518	PASS
LTE NB-IoT Band 25	27.000	501.187	0.100	1.000	PASS
LTE NB-IoT Band 26	27.000	501.187	0.100	0.543	PASS
LTE NB-IoT Band 66	27.000	501.187	0.100	1.000	PASS
LTE NB-IoT Band 71	27.000	501.187	0.100	0.442	PASS
LTE NB-IoT Band 85	27.000	501.187	0.100	0.466	PASS

Distance (cm): 20

Co-location**Conclusion:**

The formula of calculated the MPE is:

$$\text{CPD1} / \text{LPD1} + \text{CPD2} / \text{LPD2} + \dots \text{etc.} < 1$$

CPD = Calculation power density

LPD = Limit of power density

Simultaneous Transmission Analysis Mode:

1. WLAN 2.4 GHz function + WWAN LTE function = $0.026 + 0.226 = 0.252$, therefore the maximum calculations of above situations are less than the "1" limit.
2. Bluetooth function + WWAN LTE function = $0.002 + 0.226 = 0.228$, therefore the maximum calculations of above situations are less than the "1" limit.
3. LoRa function + WWAN LTE function = $0.001 + 0.226 = 0.227$, therefore the maximum calculations of above situations are less than the "1" limit.

Note:

1. The above EUT information is declared by the manufacturer.
2. The results are evaluated using the maximum power.