

EMF TEST REPORT

Test Report No. : OT-244-RWD-010
Reception No. : 2403001056
Applicant : NEWTC Co., Ltd.
Address : 5F, Hyoryeong-ro 15, Seocho-gu, Seoul, South Korea
Manufacturer : NEWTC Co., Ltd.
Address : 5F, Hyoryeong-ro 15, Seocho-gu, Seoul, South Korea
Type of Equipment : LoRa communication module
FCC ID. : 2BFRW-RM-LORA
Model Name : RM-LORA
Multiple Model Name : N/A
Serial number : N/A
Total page of Report : 7 pages (including this page)
Date of Incoming : March 22, 2024
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SUMMARY

The equipment complies with the regulation; **FCC CFR 47 PART 2.1091**

This test report contains only the result of a single test of the sample supplied for the examination.

It is not a generally valid assessment of the features of the respective products of the mass-production.

This report is not correlated with the "KS Q ISO/IEC 17025 and KOLAS accreditation" of Korean Laboratory Accreditation Scheme.



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Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-244-RWD-010	April 11, 2024	Initial Release	All

1. VERIFICATION OF COMPLIANCE

Applicant : NEWTC Co., Ltd.

Address : 5F, Hyoryeong-ro 15, Seocho-gu, Seoul, South Korea

Contact Person : LEE MIN YONG / Manager

Telephone No. : +82-2-704-4733

FCC ID : 2BFRW-RM-LORA

Model Name : RM-LORA

Brand Name : N/A

Serial Number : N/A

Date : April 11, 2024

EQUIPMENT CLASS	DTS – DIGITAL TRNSMISSION SYSTEM
E.U.T. DESCRIPTION	LoRa communication module
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	KDB 447498 D01 General RF Exposure Guidance v06
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT	Certification
AUTHORIZATION REQUESTED	
Modifications on the Equipment to Achieve Compliance	None

- The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

2. GENERAL INFORMATION

2.1 Product Description

The NEWTC Co., Ltd., Model RM-LORA (referred to as the EUT in this report) is a LoRa communication module. The product specification described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	LoRa communication module
Temperature Range	-40 °C ~ 85 °C
OPERATING FREQUENCY	902.8 MHz ~ 927.3 MHz
MODULATION TYPE	GFSK
RF OUTPUT POWER	-8.34 dBm
ANTENNA TYPE	Dipole Antenna
ANTENNA GAIN	1.84 dBi
Rated Supply Voltage	DC 5.0 V
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	32 MHz

2.2 Alternative type(s)/model(s); also covered by this test report.

- None

3. EUT MODIFICATIONS

- None

4. MAXIMUM PERMISSIBLE EXPOSURE

4.1 RF Exposure Calculation

According to the FCC rule 1.1310 table 1B, the limit for the maximum permissible RF exposure for an uncontrolled environment are $f/1500 \text{ mW/cm}^2$ for the frequency range between 300 MHz and 1 500 MHz and 1.0 mW/cm^2 for the frequency range between 1 500 MHz and 100 000 MHz.

The electric field generated for a 1 mW/cm^2 exposure is calculated as follows:

$$E = \sqrt{(30 * P * G) / d}, \text{ and } S = E^2 / Z = E^2 / 377, \text{ because } 1 \text{ mW/cm}^2 = 10 \text{ W/m}^2$$

Where

S = Power density in mW/cm^2 , Z = Impedance of free space, 377Ω

E = Electric field strength in V/m , G = Numeric antenna gain, and d = distance in meter

Combining equations and rearranging the terms to express the distance as a function of the remaining variable

$$d = \sqrt{(30 * P * G) / (377 * 10 S)}$$

Changing to units of mW and cm , using $P (\text{mW}) = P (\text{W}) / 1000$, $d (\text{cm}) = 0.01 * d (\text{m})$

$$d = 0.282 * \sqrt{(P * G) / S}$$

Where

d = distance in cm , P = Power in mW , G = Numeric antenna gain, and S = Power density in mW/cm^2

4.2 EUT Description

Kind of EUT	LoRa communication module
Device Category	<input type="checkbox"/> Portable (< 20 cm separation) <input checked="" type="checkbox"/> Mobile (> 20 cm separation) <input type="checkbox"/> Others
Exposure	<input checked="" type="checkbox"/> MPE
Evaluation Applied	<input type="checkbox"/> SAR <input type="checkbox"/> SAR Exemption

4.3 Test Result of SAR Exclusion for Portable Devices

According to above equation, the following result was obtained.

Operating Freq. Band (MHz)	Operating Mode	Target Power W/tolerance (dBm)	Max tune up power		Antenna Gain		Safe Distance (cm)	Power Density (mW/cm ²) @ 20 cm Separation	Limit (mW/cm ²)
			(dBm)	(mW)	Log	Linear			
902.8	LoRa	-8.34 ± 0.5	-7.84	0.16	1.84	1.52	0.141	0.000 05	0.601

According to above table, for 902.8 MHz, safe distance,

$$D = 0.282 * \sqrt{(0.16 * 1.52) / 1.00} = 0.141 \text{ cm.}$$

For getting power density at 20 cm separation in above table, following formula was used.

$$S = P * G / (4\pi * R^2) = 0.16 * 1.52 / (4 * \pi * 20^2) = 0.141$$

Where:

S = Power Density,

P = Power input to the external antenna (Output power from the EUT antenna port (dBm) – cable loss (dB)),

G = Gain of Transmit Antenna (linear gain), R = Distance from Transmitting Antenna