

1. Radio Frequency Exposure

RESULT:

Pass

Test standard : FCC Part 2: Section 2.1091
KDB 447498 D01 General RF Exposure Guidance v06
RSS-102 Issue 6, December 2023

1.1 Product Technical Information

The EUT is a WisNode Bridge Serial Prime which supports Lora wireless technology.

Contains FCC ID: 2AF6B-RAK3172

Contains IC: 25908-RAK3172

The EUT contains a Lora module WisDuo LPWAN Module (M/N: RAK3172) that is without change than it was approved except new antenna (PCB antenna with lower ant gain), additional spurious emissions was performed.

For details refer to the User Manual, Technical Description and Circuit Diagram.

General Information of EUT		Description	
Kind of Equipment:		WisNode Bridge Serial Prime	
Type Designation:		RAK2470	
HMN:		RAK2470	
Operating Voltage:		DC 5-12V	
Testing Voltage:		DC 12V and AC 120V, 60Hz (Power supply to AC/DC Adapter)	
AC/DC Adapter information:		Model: AD-0241200200US-3 Input: AC 100-240V, 50/60Hz Output: DC 12V Factory: AMC Technology Company Ltd.	
Technical Specification of WisDuo LPWAN Module			
Characteristic		Description	
Operating Frequency		902.3 – 914.9MHz for LoRa FHSS 903 – 914.2MHz for LoRa DTS	
Type of Modulation		Lora	
Data Rate:		Data Rate	Indicative physical bit rate [bit/sec]
		0	LoRa Modulation: SF10 / Bandwidth 125 kHz 980
		1	LoRa Modulation: SF9 / Bandwidth 125 kHz 1760
		2	LoRa Modulation: SF8 / Bandwidth 125 kHz 3125
		3	LoRa Modulation: SF7 / Bandwidth 125 kHz 5470
		4	LoRa Modulation: SF8 / Bandwidth 500 kHz 12500
Antenna Number:		1	
Antenna Gain:		2dBi (PCB Layout antenna) (declared by client)	
Model of contained Lora Module:		RAK3172	
FCC ID		2AF6B-RAK3172	
IC ID		25908-RAK3172	

1.2 Product Classification

This device defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at 30 cm is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons.

1.3 Radio Frequency Exposure Limit

For FCC:

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/Controlled Exposure				
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	--	--	1.0	<6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-3.0	614	1.63	*100	<30
3.0-30	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.

For IC:

Field reference level (FRL) exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm (i.e. mobile devices), except when the device operates as follows:

- below 20 MHz and the source-based, time-averaged maximum EIRP of the device is equal to or less than 1 W (adjusted for tune-up tolerance)
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum EIRP of the device is equal to or less than $4.49/f^{0.5}$ W (adjusted for tune-up tolerance), where f is in MHz
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum EIRP of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance)
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum EIRP of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz
- at or above 6 GHz and the source-based, time-averaged maximum EIRP of the device is equal to or less than 5 W (adjusted for tune-up tolerance)

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the EIRP was derived.

1.4 Radio Frequency Exposure Calculation Formula

$$S = \frac{PG}{4\pi R^2}$$

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

or:

$$S = \frac{EIRP}{4\pi R^2}$$

where: EIRP = equivalent (or effective) isotropically radiated power

1.5 Calculation Result

1.5.1 Stand-alone transmission MPE

Mode	Band	P (dBm)	Antenna Gain (dBi)	Power Density (mW/cm ²)	FCC Limit (mW/cm ²)
Lora	902-928MHz	24.08	2	0.086	0.601

Mode	Band	P (dBm)	Antenna Gain (dBi)	Power (W)	IC Limit (W)
Lora	902-928MHz	24.08	2	0.41	1.36

1.5.2 Simultaneous transmission MPE

N/A

Note:

1. R = 0.2m