

# 1 Safety Human Exposure


## 1.1 Radio Frequency Exposure Compliance

### 1.1.1 Electromagnetic Fields

RESULT:

Pass

#### Test Specification

Test item	:	WisLink LPWAN Concentrator
		RAK5148
Identification / Type No.	:	(Trademark:  )
FCC ID	:	2AF6B-RAK5148
IC	:	25908-RAK5148
HVIN	:	RAK5148
Test standard	:	CFR47 FCC Part 2: Section 2.1091 CFR47 FCC Part 1: Section 1.1310 FCC KDB Publication 447498 D01 v06 FCC KDB Publication 865664 D02 v01r02 RSS-102 Issue 5 February 2021

#### 1.1.1.1 RF Exposure Compliance Requirement for FCC

**FCC requirement:** Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 20cm normally can be maintained between the user and the device.

Antenna information:

One UFL connector (Hirose U. FL-R-SMT) for external antenna, a Rod antenna (ANT0) or an Omni antenna for (ANT1) provided by client, 6.00 dBi for Rod antenna (ANT0).

#### ➤ Radio Frequency Exposure Limit

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )
300-1,500	--	--	f/1500
1,500-100,000	--	--	1.0

#### ➤ Radio Frequency Exposure Calculation Formula

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

where: S = power density (in appropriate units, e.g. mW/cm<sup>2</sup>)  
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

#### a) RF Exposure Evaluation standalone operations (worse case)

Mode	*Measured RF Output Power (dBm)	EIRP (dBm)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	FCC Limit (mW/cm <sup>2</sup> )
2.4G Lora	17.97	8.0	20	0.079	1.0

Note:

1. \*2.4GHz Lora RF Output Power: Refer to CN23346K 002

#### ➤ Conclusion

Therefore, the maximum calculations result of above are meet the requirement of Radio Frequency Exposure (MPE) limit.

#### 1.1.1.2 RF Exposure Compliance Requirement for IC

The EUT shall comply with the requirement of RSS-102 section 2.5.2.

##### Exemption from Routine Evaluation Limits – RF Exposure Evaluation

RF 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, except when the device operates as follows:

at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. 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;

- RF exposure evaluation exempted power for 2.4GHz: 2.67 W

##### The nominal maximum conducted output power specified:

Antenna information:

One UFL connector (Hirose U. FL-R-SMT) for externa antenna, a Rod antenna (ANT0) or an Omni antenna for (ANT1) provided by client, 6.00 dBi for Rod antenna (ANT0).

The Max. e.i.r.p. for 2.4GHz Lora: 25.97 dBm = 0.3954 W

**“RF Radiation Exposure Statement Caution: This Transmitter must be installed to provide a separation distance of at least 20 cm from all persons.”**