

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 IEEE 802.11 b/g/n 2.4GHz 2T2R Wi-Fi Module.

This report is for FCC CIIPC and ISED C4PC as changed transmit antennas and will be installed into HOST WisGate Soho Pro (MN: RAK7267), radiated spurious emissions for 2.4G WIFI and co-location were re-performed.

HOST WisGate Soho Pro (MN: RAK7267) has Lora, 2.4G WIFI (contains FCC ID: 2AF6B-RAK634, IC: 25908-RAK634) and LTE (contains FCC ID: XMR2023EG915QNA, IC: 10224A-023EG915QNA) functions.

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

General Information of EUT	Description
Kind of Equipment:	Wi-Fi Module
Type Designation:	RAK634
HMN:	RAK7267
Operating Voltage:	DC 9-36V via Solar Battery Kits
Technical Specification of Wi-Fi Module	
Characteristic	Description
Operating Frequency	2412 - 2462 MHz for 802.11b/g/n(HT20) 2422 - 2452 MHz for 802.11n(HT40)
Type of Modulation	DSSS(DBPSK/DQPSK/CCK) OFDM(BPSK/QPSK/16QAM/64QAM)
Data Rate:	1/2/5.5/11 Mbps for 802.11b 6/9/12/18/24/36/48/54 Mbps for 802.11g MCS0 ~ MCS7 for 802.11n
Channel Number:	11 channels for 802.11b/g/n(HT20) 7 channels for 802.11n(HT40)
Antenna Number:	5 MHz
Antenna Gain:	2

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:

Frequency range (MHz)	Electric field (V _{RMS} /m)	Magnetic field (A _{RMS} /m)	Power density (W/m ²)	Reference period (minutes)
10-20	27.46	0.0728	2	6
20-48	58.07 / f ^{0.25}	0.1540 / f ^{0.25}	8.944 / f ^{0.5}	6
48-300	22.06	0.05852	1.291	6
300-6000	3.142 f ^{0.3417}	0.008335 f ^{0.3417}	0.02619 f ^{0.6834}	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000/f ^{1.2}
150000-300000	0.158 f ^{0.5}	4.21 × 10 ⁻⁴ f ^{0.5}	6.67 × 10 ⁻⁵ f	616000/f ^{1.2}

Note: f is frequency in MHz.

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	PG	PG (W)	Power	FCC Limit
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		(dBm)		Density (mW/cm ²)	(mW/cm ²)
WIFI	2.4GHz	25.52	356.45	0.032	1.0

Mode	Band	PG (dBm)	PG (W)	Power Density (W/m ²)	IC Limit (W/m ²)
WIFI	2.4GHz	25.52	356.45	0.315	5.35

1.5.2 Simultaneous transmission MPE

FCC							
Operating Mode	Lora	WIFI	LTE	Sum Ratio	Limit	Verdict	
Lora + WIFI + WCDMA/LTE	0.062	0.032	0.064	0.158	<1	Pass	
IC							
Operating Mode	Lora	WIFI	LTE	Sum Ratio	Limit	Verdict	
Lora + WIFI + WCDMA/LTE	0.133	0.059	0.066	0.258	<1	Pass	

Note:

1. R = 0.3m