

FCC ID: 2AJ9T-20704

RF EXPOSURE EVALUATION

According to KDB 447498 D01 V06 and FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) Radiation as specified in part 2.1091

Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(i) 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			5	<6
(ii) LIMITS FOR GENERAL POPULATION/UNCONTROLLED EXPOSURE				
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
300-1,500			f/1500	<30
1,500-100,000			1.0	<30

*f = frequency in MHz. * = Plane-wave equivalent power density.*

11.1 Friis transmission formula: $P_d = (P_{out} * G) / (4 * \pi * R^2)$

Where

P_d = Power density in mW/cm²

P_{out} = output power to antenna in mW

G = Numeric gain of the antenna relative to isotropic antenna

π = 3.1416

R = distance between observation point and center of the radiator in cm

At the limit of MPE, $1\text{mW}/\text{cm}^2$, If we know the maximum gain of the antenna, through the calculation, we will know the distance where the MPE limit is reached.

RF Exposure Information: The radiated output power of this device meets the limits of FCC/IC radio frequency exposure limits. This device should be operated with a minimum separation distance of 20cm (8 inches) between the equipment and a person's body.

11.2 Measurement Result

Module Wifi 2.4G Test Mode 11B Transmit Power Max: 15.25dBm
Antenna gain: 1.86dBi

Measured power (dBm)	Tune-up power (dBm)	Max tune-up power (dBm)	Antenna Gain Numeric	Evaluation result (mW/cm ²)	Power density Limits (mW/cm ²)
15.25	15 to 16	16	1.53	0.01215	1

Mainboard Wifi 2.4G Test Mode 11G Transmit Power Max: 14.91dBm
Antenna gain: 2.71dBi

Measured power (dBm)	Tune-up power (dBm)	Max tune-up power (dBm)	Antenna Gain Numeric	Evaluation result (mW/cm ²)	Power density Limits (mW/cm ²)
14.91	14 to 15	15	1.87	0.01174	1

RFID 125KHz, Antenna Gain: 0dBi

TransmitFrequency (KHz)	Mode	H-field Level@3m(dBuV/m)	H-fieldLevel@3m(V/m)	Field intensity limited V/m
125K	ASK	57.04	0.00071	614
NOTE 1: $V/m = 10 * \left(\frac{dB\mu V/m - 120}{20} \right)$				

RFID 13.56MHz, Antenna Gain: 0dBi

TransmitFrequency (MHz)	Mode	H-field Level@3m(dBuV/m)	H- fieldLevel@3m(V/m)	Field intensity limited V/m
13.56	ASK	46.97	0.000223	60.77
NOTE 1: Field intensity limited: $824/f(13.56\text{MHz}) = 60.77 \text{ V/m}$				
NOTE 2: $V/m = 10^{(dB\mu V/m - 120)/20}$				

The imultaneous transmit:

Operating Band	The MPE ratio
Module Wifi 2.4G	0.01215
Mainboard Wifi 2.4G	0.01174
RFID 125KHz	0.00071
RFID 13.56MHz	0.000223

So the simultaneous transmitting antenna pairs as below:

Module Wifi 2.4G+ Mainboard Wifi 2.4G+ RFID 125KHz+ RFID 13.56MHz=
0.01215+0.01174+0.00071+0.000223=0.024823

For the max result: $0.024823 \leq 1.0$, No SAR is required.

*** End of Report ***