

FCC ID: 2AJ9T-10607

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

Pd the limit of MPE, $1\text{mW}/\text{cm}^2$, If we know the maximum gain of the nd total power input to 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

Wifi 2.4G Test Mode 11B Transmit Power Max: 13.94dBm

Antenna gain: 3.89dBi

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)
13.94	13 to 14	14	2.45	0.01224	1

BLE Test Mode Transmit Power Max: 3.75dBm

Antenna gain: 3.89dBi

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)
3.75	3 to 4	4	2.45	0.00122	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	52.22	0.00041	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	51.44	0.00037	60.77
NOTE 1: Field intensity limited: $824/f(13.56\text{MHz}) = 60.77 \text{ V/m}$				
NOTE 2: $V/m = 10^{(\frac{dB\mu V}{m} - 120)} / 20$				

The imultaneous transmit:

Operating Band	The MPE ratio
Wifi 2.4G	0.01224
BLE	0.00122
RFID 125KHz	0.00041
RFID 13.56MHz	0.00037

So the simultaneous transmitting antenna pairs as below:

Wifi 2.4G+BLE+ RFID 125KHz+ RFID 13.56MHz=
 $0.01224+0.00122+0.00041+0.00037=0.01424$

For the max result: $0.01424 \leq 1.0$, No SAR is required.

*** End of Report ***