

RF exposure

According to FCC part 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 § 1.1307(b)

Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength(V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Average time
(A) Limits for Occupational / Control Exposures				
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 - 100000	--	--	5	6
(B) Limits for General Population / Uncontrol Exposures				
0.3 – 1.34	614	1.63	*(100)	30
1.34 – 30	824/f	2.19/f	*(180/f ²)	30
3.0 - 300	27.5	0.073	0.2	30
300 – 1 500	--	--	f/1500	30
1 500 – 100 000	--	--	1	30

f= frequency in MHz

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

Where,

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

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

P_d the limit of MPE, 1 mW/cm². If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

Results

Operation mode	Frequency (MHz)	Max Tune-up Average Power(dBm)	Antenna gain (dBi)	Power density at 20 cm(mW/cm ²)	Limit (mW/cm ²)
BDR 1 Mbps	2 402 ~ 2 480	3.00	3.40	0.000 87	1
EDR 3 Mbps	2 402 ~ 2 480	3.00		0.000 87	1
LE 1Mbps	2 402 ~ 2 480	3.00		0.000 87	1
802.11b	2 412 ~ 2 462	11.00		0.005 48	1
802.11g	2 412 ~ 2 462	9.00		0.003 46	1
802.11n_HT20	2 412 ~ 2 462	9.00		0.003 46	1
802.11n_HT40	2 422 ~ 2 452	8.00		0.002 75	1

Operation mode	Frequency (MHz)	Reading at 3 m (dB μ V)	Correction factor (dB/m)	Result at 3 m (dB μ V/m)	Result at 3 m (V/m)	Electric field strength at 20 cm (V/m)	Limit (V/m)
RFID	13.562 MHz	29.04	19.79	48.73	0.000 27	23.520 27	60.75

Note.

Electric field strength at 20 cm (V/m) = Result at 3 m (V/m) + Distance correction factor*

*Distance correction factor = $20 * \log (\text{measure distance (3 m)} / \text{evaluate distance (0.2 m = 20 cm)}) = 23.52$