

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				
300 – 1 500	--	--	f/300	6
1 500 - 100000	--	--	5	6
(B) Limits for General Population / Uncontrol Exposures				
300 – 1 500	--	--	f/1500	6
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, f/1500 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

Antenna 1 – Patch Antenna

Frequency (MHz)	Peak output power (dBm)	Antenna gain (dBi)	Power density at 20 cm (mW/cm ²)	Limit (mW/cm ²)
902.750	24.12	1.70	0.076	0.60
915.250	24.25	1.70	0.078	0.61
927.250	24.30	1.70	0.079	0.62

Antenna 2 – Reverse Polarized Antenna

Frequency (MHz)	Peak output power (dBm)	Antenna gain (dBi)	Power density at 20 cm (mW/cm ²)	Limit (mW/cm ²)
902.750	24.12	9.00	0.408	0.60
915.250	24.25	9.00	0.420	0.61
927.250	24.30	9.00	0.425	0.62

Result: The power density does NOT exceed the limit