

FCC §1.1307 (b) (1) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 1.1307 (b)(1), 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

Limits for Occupational/Controlled Exposure

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Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (Minutes)
0.3-1.34	614	1.63	*(100)	6
1.34-30	1842/f	4.89/f	*(900/f ²)	6
30-300	61.4	0.163	1.0	6
300-1500	/	/	f/300	6
1500-100,000	/	/	5.0	6

f = frequency in MHz

* = Plane-wave equivalent power density

Result

Calculated Formulary:

Predication of MPE limit at a given distance

$$S = \frac{PG}{4\pi R^2}$$

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, the power gain factor, is normally numeric gain.

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

Worst case as below:

Frequency (MHz)	Antenna Gain		Tune up Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
	(dBi)	(numeric)	(dBm)	(mW)			
824-849	0	1.00	34	2511.89	42	0.113	2.74
1850-1910	1	1.26	30	1000.00	42	0.057	5.00
410-470	3.5	2.24	43.7	23442.29	42	1.184	1.36

Note:

Duty cycle is 50% about PTT function for DMR mode. So the average tune up conducted power is 11721.15mW for this mode. And this device will be using for Occupational person and must place the equipment at least 42cm from any persons' body to antenna, which is declared by manufacture.

Simultaneous transmitting consideration: GSM850 and DMR, or PCS1900 and DMR

The ratio= $MPE/limit_{824MHz}+MPE/limit_{410MHz}=0.113/2.74+1.184/1.36=0.91 < 1.0$, simultaneous exposure is not required.

The ratio= $MPE/limit_{1850MHz}+MPE/limit_{410MHz}=0.057/5.00+1.184/1.36=0.88 < 1.0$, simultaneous exposure is not required.

To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 42cm from nearby persons to antenna.

Result: Compliance