

**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**

Limits for occupational/Controlled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Averaging Time (Minutes)
0.3-1.34	614	1.63	*(100)	6
1.34-30	1842/f	4.89/f	*(900/f <sup>2</sup> )	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/cm<sup>2</sup>)

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		Tune up Average power	Evaluation Distance (cm)	Power Density (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )
	(dBi)	(numeric)	(dBm)	(mW)	(mW)			
824-849	1.0	1.26	33.5	2238.72	279.84	40	0.02	2.75
1850-1910	3.5	2.24	29.5	891.25	111.41	40	0.01	5.00
400-470	3.5	2.24	43.5	22387.21	11193.61	40	1.25	1.33

Note:

For GSM mode, the Time-base average power was consideration, Average power as below:

GSM850:  $2238.72 \times (1/8) \text{mW} = 279.84 \text{mW}$ .

PCS1900:  $891.25 \times (1/8) \text{mW} = 111.41 \text{mW}$ .

For DMR mode, the duty cycle of 50% was consideration, Average power as below:

$22387.21 \times 50\% \text{mW} = 11193.61 \text{mW}$ .

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

The ratio= $\text{MPE}/\text{limit}_{824\text{MHz}} + \text{MPE}/\text{limit}_{410\text{MHz}} = 0.02/2.75 + 1.25/1.33 = 0.95 < 1.0$ , simultaneous exposure is not required.

The ratio= $\text{MPE}/\text{limit}_{1850\text{MHz}} + \text{MPE}/\text{limit}_{410\text{MHz}} = 0.01/5.00 + 1.25/1.33 = 0.94 < 1.0$ , simultaneous exposure is not required.

To maintain compliance with the FCC’s RF exposure guidelines, place the equipment at least 40 cm from nearby persons to antenna.

**Result: Compliance**