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

Report No.: RDG180525001-00B

## **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

### 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:

$$\sum_{i} \frac{S_{i}}{S_{Limit,i}} \le 1$$

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<sup>\* =</sup> Plane-wave equivalent power density

### Worst case as below:

Frequency (MHz)	Antenna Gain		Tune up Conducted Power		Tune up Average power	Evaluation Distance	Power Density	MPE Limit (mW/cm <sup>2</sup> )
	(dBi)	(numeric)	(dBm)	(mW)	(mW)	(cm)	(mW/cm <sup>2</sup> )	
824-849	1.0	1.26	32.5	1778.28	222.29	50	0.009	2.75
1850-1910	3.5	2.24	31.0	1258.93	157.37	50	0.011	5.0
136-174	3.2	2.09	43.1	20417.38	10208.69	50	0.679	1.0

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Note:

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

GSM850: 1778.28\*(1/8)mW=222.29mW. PCS1900: 1258.93\*(1/8)mW=157.37mW.

For DMR mode, the duty cycle of 50% was consideration, Average power as below: 20417.38\*50%mW=10208.69mW.

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

The ratio=MPE/limit $_{824MHz}$ +MPE/limit $_{DMR}$ =0.009/2.75+0.679/1.0=0.682 $\leq$ 1.0.

The ratio=MPE/limit<sub>1850MHz</sub>+MPE/limit<sub>DMR</sub>= $0.011/5.0+0.679/1.0=0.681 \le 1.0$ .

To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 50 cm from nearby persons.

**Result: Compliance** 

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