

## **FCC§1.1307& §2.1091 – MAXIMUM PERMISSIBLE EXPOSURE (MPE)**

### **Applicable Standard**

According to subpart §2.1091 and subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

<b>(B) Limits for General Population/Uncontrolled Exposure</b>				
<b>Frequency Range (MHz)</b>	<b>Electric Field Strength (V/m)</b>	<b>Magnetic Field Strength (A/m)</b>	<b>Power Density (mW/cm<sup>2</sup>)</b>	<b>Averaging Time (minutes)</b>
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f <sup>2</sup> )	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz; \* = Plane-wave equivalent power density;

According to §1.1310 and §2.1091 RF exposure is calculated.

Calculated Formulary:

Predication of MPE limit at a given distance

$S = PG/4\pi R^2$  = 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);

**Calculated Data:**

Mode	Max Tune-up power (dBm)	ERP/EIRP Limit (dBm)	Max Antenna Gain (dBi)
GSM 850/ GPRS 850	31	38.45	7.45
GSM1900/ GPRS1900	30	33.00	3.00

Mode	Frequency	Antenna Gain		Max Average Time-base Output Power		Evaluation Distance	Power Density	MPE Limit
	(MHz)	(dBi)	(numeric)	(dBm)	(mW)	(cm)	(mW/cm <sup>2</sup> )	(mW/cm <sup>2</sup> )
GSM 850/ GPRS850	824.2	8.45	7.00	26	398.11	20	0.55	0.55
GSM1900/ GPRS1900	1880.0	13.02	20.04	24	251.19	20	1.00	1.00

Mode	Max Allow Antenna Gain (dBi)
GSM 850/ GPRS850	7.0
GSM1900/ GPRS1900	3.0

**Note :**

## 1. The target output power:

GSM 850: 30.5±0.5dBm, Maximum power 31dBm, Max Average Time-base power 22dBm;  
 GSM 1900: 29±1dBm, Maximum power 30dBm, Max Average Time-base power 21dBm;  
 GPRS 850: 1 slot 30.5±0.5dBm, 2 slots 30.5±0.5dBm, 3 slots 29.5±0.5dBm, 4 slots 28.5±0.5dBm  
 Max Average Time-base power 26dBm;  
 GPRS 1900: 1 slot 29±1dBm, 2slots 29±1dBm, 3 slots 27.5±0.5dBm, 4 slots 26.5±0.5dBm  
 Max Average Time-base power 24dBm.

which declared by the manufacturer.

Number of Time slot	1	2	3	4
Duty Cycle	1:8.3	1:4.15	1:2.77	1:2.08
Time based Ave. power compared to slotted Ave. power	-9 dB	-6 dB	-4.26 dB	-3 dB

2. To meet RF exposure & ERP/ERIP, the maximum net gain of antennas allowed are 7.0dBi@ GSM 850/ GPRS 850 and 3.00@ GSM1900/ GPRS1900. The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.