

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) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm²)	Averaging Time (minutes)
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f ²)	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/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);

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 ²)	(mW/cm ²)
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.