

FCC §1.1310 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to 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.

Calculation formula:

Prediction of power density at the distance of the applicable MPE limit

$S = PG/4\pi R^2$ = 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:

Band	Channel No.	Tune up RF Output Power (dBm)			
		GPRS 1 TX Slot	GPRS 2 TX Slot	GPRS 3 TX Slot	GPRS 4 TX Slot
Cellular	128	33.0	33.0	31.0	31.0
	190	33.0	33.0	31.0	31.0
	251	33.0	33.0	31.0	31.0
PCS	512	30.0	30.0	28.0	28.0
	661	30.0	30.0	28.0	28.0
	810	30.0	30.0	28.0	28.0

The time based average power is relevant, the difference in between depends on the duty of the TDMA signal

Number of Time slot	1	2	3	4
Duty cycle	1:8	1:4	1:2.66	1:2
Time based average power compared to slotted average power	-9 dB	-6 dB	-4.25 dB	-3 dB

Band	Channel No.	Tune up time based average power (dBm)			
		GPRS 1 TX Slot	GPRS 2 TX Slot	GPRS 3 TX Slot	GPRS 4 TX Slot
Cellular	128	24.0	27.0	26.8	28.0
	190	24.0	27.0	26.8	28.0
	251	24.0	27.0	26.8	28.0
PCS	512	21.0	24.0	23.8	25.0
	661	21.0	24.0	23.8	25.0
	810	21.0	24.0	23.8	25.0

Frequency (MHz)	Tune up time based average power		Antenna Gain (dBi)	Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
	(dBm)	(mW)				
824-849	28.0	630.96	2.5	20.00	0.22	0.55
1850-1910	25.0	316.23	2.5	20.00	0.11	1.00

Result: The device meet FCC MPE at 20 cm distance.