

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;

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 (worst case):

Mode	Frequency Range (MHz)	Antenna Gain		Tune-up Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
		(dBi)	(numeric)	(dBm)	(mW)			
GSM850 (GPRS/EGPRS)	824.2-848.8	3.00	2.00	29.50	891.25	30	0.1572	0.55
PCS1900 (GPRS/EGPRS)	1850.2-1909.8	3.00	2.00	25.50	354.81	30	0.0626	1.00
WCDMA Band II	1852.4-1907.6	3.00	2.00	23.50	223.87	30	0.0395	1.00
WCDMA Band V	826.4-846.6	3.00	2.00	23.00	199.53	30	0.0352	0.55

Note 1:

GPRS850: Tune-up maximum output power with 1 slot is 33.50 dBm, 2 slots is 33.00 dBm, 3 slots is 33.00 dBm, 4 slots is 32.50 dBm, so the tune-up time based Ave. power compared to slotted Ave. power is 29.50dBm.
 EGPRS850: Tune-up maximum output power with 1 slot is 26.50 dBm, 2 slots is 26.50 dBm, 3 slots is 26.00 dBm, 4 slots is 25.50 dBm, so the tune-up time based Ave. power compared to slotted Ave. power is 22.50 dBm.
 GPRS1900: Tune-up maximum output power with 1 slot is 31.50 dBm, 2 slots is 30.00 dBm, 3 slots is 29.00 dBm, 4 slots is 28.50 dBm, so the tune-up time based Ave. power compared to slotted Ave. power is 25.50dBm.
 EGPRS1900: Tune-up maximum output power with 1 slot is 26.00 dBm, 2 slots is 25.50 dBm, 3 slots is 25.00 dBm, 4 slots is 24.50 dBm, so the tune-up time based Ave. power compared to slotted Ave. power is 21.50 dBm.

Number of Time slot	1	2	3	4
Duty Cycle	1:8	1:4	1:2.66	1:2
Time based Ave. power compared to slotted Ave. power	-9 dB	-6 dB	-4.26 dB	-3 dB

Result: The device meet FCC MPE at 30 cm distance.