

FCC §1.1310 & §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)	824-849	2.00	1.58	27.50	562.34	20	0.1767	0.55
PCS1900 (GPRS/EGPRS)	1850-1910	2.00	1.58	24.00	251.19	20	0.0789	1.00
WCDMA Band II	1850-1910	2.00	1.58	23.00	199.53	20	0.0627	1.00
WCDMA Band IV	1710-1755	2.00	1.58	23.00	199.53	20	0.0627	1.00
WCDMA Band V	824-849	2.00	1.58	23.00	199.53	20	0.0627	0.55
LTE Band 2	1850-1910	2.00	1.58	23.50	223.87	20	0.0704	1.00
LTE Band 4	1710-1755	2.00	1.58	23.00	199.53	20	0.0627	1.00
LTE Band 5	824-849	2.00	1.58	25.00	316.23	20	0.0994	0.55
LTE Band 12	699-716	2.00	1.58	22.50	177.83	20	0.0559	0.47
LTE Band 13	777-787	2.00	1.58	22.50	177.83	20	0.0559	0.52

Note 1:

GSM850: Tune-up maximum output power with 4 slots is 30.50 dBm, so the tune-up time based Ave. power compared to slotted Ave. power is 27.50 dBm.

PCS1900: Tune-up maximum output power with 4 slots is 27.00 dBm, so the tune-up time based Ave. power compared to slotted Ave. power is 24.00 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 20 cm distance.