

**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>(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;

**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 (worst case):**

Mode	Frequency Range (MHz)	Antenna Gain		Tune-up Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )
		(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.