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

## Applicable Standard

According to subpart 15.247 (i) and subpart 1.1310, 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

Limits for General Population/Uncontrolled Exposure							
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Averaging Time (minutes)			
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);

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_{i} \frac{S_i}{S_{Limit,i}} \leq 1$$

## **Calculated Data:**

Mode	Frequency Range (MHz)	Antenna Gain		Tune-up Conducted Power		Evaluation Distance	Power Density	MPE Limit	MPE Ratio
		(dBi)	(numeric)	(dBm)	(mW)	(cm)	$(mW/cm^2)$	(mW/cm <sup>2</sup> )	
Wi-Fi	2412~2462	-2.00	0.63	16	39.81	20	0.0050	1.00	0.0050
GPRS 850	824~849	2.00	1.58	27	501.19	20	0.1580	0.55	0.2873
EGPRS 850	824~849	2.00	1.58	21	125.89	20	0.0397	0.55	0.0722
WCDMA Band V	824~849	2.00	1.58	23	199.53	20	0.0629	0.55	0.1144
GPRS 1900	1850~1910	2.00	1.58	24	251.19	20	0.0792	1.00	0.0792
EGPRS 1900	1850~1910	2.00	1.58	19	79.43	20	0.0250	1.00	0.0250
WCDMA Band II	1850~1910	2.00	1.58	23	199.53	20	0.0629	1.00	0.0629

#### Note:

(1) For GPRS/EGPRS Mode, the time based average power is relevant, the difference in between depends on the duty cycle 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 Ave. power compared to slotted Ave. power	-9 dB	-6 dB	-4.25 dB	-3 dB

(2) **Wi-Fi** and **GPRS or WCDMA** can transmit simultaneously; the worst condition is Wi-Fi & GPRS 850, as below:

$$\sum_{i} \frac{S_i}{S_{Limit,i}} \le 1 = 0.0050 + 0.2873 = 0.2923 < 1.0$$

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