

§2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

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

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Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	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

$$S = \frac{PG}{4\pi R^2}$$

S = 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)

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

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

Result

Mode/Band	Frequency range (MHz)	Antenna Gain		Tune up Power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
		(dBi)	(numeric)	(dBm)	(mW)			
GPRS850	824-849	3.00	2.00	33.00	1995.26	30.00	0.35	0.55
GPRS1900	1850-1910	3.00	2.00	30.50	1122.02	30.00	0.20	1.00
WCDMA 850	824-849	3.00	2.00	23.00	2.00	30.00	0.35	0.55
WCDMA 1900	1850-1910	3.00	2.00	22.00	2.00	30.00	0.35	1.00
LTE Band 4	1710-1755	2.50	1.78	23.50	223.87	30.00	0.04	1.00
LTE Band 5	824-849	3.00	2.00	23.00	199.53	30.00	0.04	0.55
LTE Band 7	2500-2570	2.50	1.78	23.00	199.53	30.00	0.03	1.00
WLAN	2412-2462	4.00	2.51	20.50	112.20	30.00	0.02	1.00

Note: the maximum gain is external antenna used for MPE calculation.

The WLAN and WWAN can transmit simultaneously:

$$\sum_i \frac{S_i}{S_{Limit,i}}$$

$$=S_{WLAN}/S_{limit-WLAN} + S_{WWAN}/S_{limit-WWAN}$$

$$=0.02/1+0.35/0.55$$

$$=0.66$$

$$< 1.0$$

Note: To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 30cm from nearby persons.

Result: Compliance