

§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

Limits for General Population/Uncontrolled Exposure				
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)			
WiFi	2412-2462	4.00	2.51	20.0	100	20	0.050	1.0
WCDMA Band 5	824-849	3	2.00	22.5	177.83	20	0.071	0.55
WCDMA Band 2	1850-1910	3	2.00	22.5	177.83	20	0.071	1.0
LTE Band 4	1710-1755	2.5	1.78	23.5	223.87	20	0.079	1.0
LTE Band 5	824-849	3	2.00	23.0	199.53	20	0.079	0.55
LTE Band 7	2500-2570	2.5	1.78	24.0	251.19	20	0.089	1.0
LTE Band 66	1710-1780	2.5	1.78	23.5	223.87	20	0.079	1.0

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

Consider the transmit simultaneously:

The ratio = $0.05/1.0+0.079/0.55=0.19<1.0$, simultaneous exposure is not required.

Note: To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

Result: Compliance