

FCC §1.1307(b) & 2.1091 - MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.247 (i) and subpart 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

Result

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

For worst case:

Mode	Frequency (MHz)	Antenna Gain [#]		Tune up conducted power [#]		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
		(dBi)	(numeric)	(dBm)	(mW)			
BLE	2402-2480	2.45	1.76	1.0	1.26	20	0.0004	1
LTE Band 2	1850-1910	2.59	1.82	21.0	125.89	20	0.045	1
LTE Band 4	1710-1755	2.5	1.78	21.0	125.89	20	0.045	1
LTE Band 5	824-849	-1.72	0.67	21.5	141.25	20	0.019	0.549
LTE Band 12	699-716	-3.17	0.48	21.0	125.89	20	0.012	0.466

Note: The tune-up power and antenna gain was declared by the applicant.

Simultaneous transmitting consideration (worst case):

The ratio=MPE_{BLE}/limit_{BLE} + MPE_{LTE Band 2}/limit_{LTE Band 2} = 0.0004/1+0.045 /1=0.045<1.0

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

Result: Compliant.