



RF Exposure Compliance Requirement

1. Standard requirement

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radia frequency energy level in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.2m normally can be maintained between the user and the device.

(a) Limits for Occupational / Controlled Exposure

Table with 5 columns: Frequency Range (MHz), Electric Field Strength (E) (V/m), Magnetic Field Strength (H) (A/m), Power Density (S)(mW/cm²), Averaging Times |E|², |H|² or S (minutes). Rows include frequency ranges from 0.3-3.0 to 1500-100000.

(b) Limits for General Population / Uncontrolled Exposure

Table with 5 columns: Frequency Range (MHz), Electric Field Strength (E) (V/m), Magnetic Field Strength (H) (A/m), Power Density (S)(mW/cm²), Averaging Times |E|², |H|² or S (minutes). Rows include frequency ranges from 0.3-1.34 to 1500-100000.

Note: f=frequency in MHz; *Plane-wave equivalent power density



2. MPE Calculation Method

$$S \text{ (mW/cm}^2\text{)} = P * G / 4\pi * R^2$$

S= Power Density (mW/cm²)

P=Peak RF conducted output Power (mW)

G=EUT Antenna numeric gain (numeric)

R= Separation distance between radiator and human body (cm);

$$R = \sqrt{(P * G) / 4\pi * S}$$

From the maximum EUT RF output power, as well as the gain of the used antenna, according to the RF power density limit above, the minimum distance between the antenna and human body will be calculated.

3. Calculated Result

3.1 For downlink: 728MHz to 746MHz

LTE:

Frequency (MHz) F	Maximum Antenna Gain (dBi)	Maximum Antenna Gain (Numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Limit of Power Density (S) (mW/cm ²)	Minimum Distance to human body (cm)
Lowest	10	10	33.7	2344.229	1.461	35.75
Middle	10	10	32.8	1905.461	1.474	32.08
Highest	10	10	33.6	2290.868	1.487	35.02

3.2 For uplink: 698MHz to 716MHz

LTE:

Frequency (MHz) F	Maximum Antenna Gain (dBi)	Maximum Antenna Gain (Numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Limit of Power Density (S) (mW/cm ²)	Minimum Distance to human body (cm)
Lowest	10	10	16.9	48.9779	1.411	5.26
Middle	10	10	17.1	51.2861	1.414	5.37
Highest	10	10	17.0	50.1187	1.417	5.30



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3.3 For downlink: 746MHz to 757MHz:

LTE:

Frequency (MHz) F	Maximum Antenna Gain (dBi)	Maximum Antenna Gain (Numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Limit of Power Density (S) (mW/cm ²)	Minimum Distance to human body (cm)
Lowest	10	10	33.7	2344.229	1.497	35.30
Middle	10	10	33.5	2238.721	1.503	34.43
Highest	10	10	33.3	2137.962	1.509	33.59

3.4 For uplink: 776MHz to 787MHz:

LTE:

Frequency (MHz) F	Maximum Antenna Gain (dBi)	Maximum Antenna Gain (Numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Limit of Power Density (S) (mW/cm ²)	Minimum Distance to human body (cm)
Lowest	10	10	17.1	51.2861	1.557	5.12
Middle	10	10	17.8	60.256	1.503	5.65
Highest	10	10	18.1	64.5654	1.569	5.72

3.5 For downlink: 869MHz to 894MHz:

1) WCDMA::

Frequency (MHz) F	Maximum Antenna Gain (dBi)	Maximum Antenna Gain (Numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Limit of Power Density (S) (mW/cm ²)	Minimum Distance to human body (cm)
Lowest	10	10	32.7	1862.087	1.744	29.15
Middle	10	10	32.7	1905.461	1.763	29.33
Highest	10	10	33.0	1995.262	1.783	29.85



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2) LTE:

Frequency (MHz) F	Maximum Antenna Gain (dBi)	Maximum Antenna Gain (Numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Limit of Power Density (S) (mW/cm ²)	Minimum Distance to human body (cm)
Lowest	10	10	32.9	1994.9845	1.743	30.18
Middle	10	10	33.3	2137.962	1.763	31.07
Highest	10	10	32.8	1905.461	1.509	31.71

3.6 For uplink: 824MHz to 849MHz:

1)WCDMA::

Frequency (MHz) F	Maximum Antenna Gain (dBi)	Maximum Antenna Gain (Numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Limit of Power Density (S) (mW/cm ²)	Minimum Distance to human body (cm)
Lowest	10	10	23.3	213.7962	1.654	10.14
Middle	10	10	23.3	213.7962	1.673	10.09
Highest	10	10	23.1	204.1738	1.692	9.80

2) LTE:

Frequency (MHz) F	Maximum Antenna Gain (dBi)	Maximum Antenna Gain (Numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Limit of Power Density (S) (mW/cm ²)	Minimum Distance to human body (cm)
Lowest	10	10	22.4	173.7801	1.653	9.09
Middle	10	10	23.1	204.1738	1.673	9.86
Highest	10	10	22.3	169.1738	1.693	8.91



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3.7 For downlink: 1930MHz ~ 1995MHz

1)WCDMA:

Frequency (MHz) F	Maximum Antenna Gain (dBi)	Maximum Antenna Gain (Numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Limit of Power Density (S) (mW/cm ²)	Minimum Distance to human body (cm)
Lowest	10.0	10.0	32.7	1862.087	1.0	38.50
Middle	10.0	10.0	32.7	1862.087	1.0	38.50
Highest	10.0	10.0	33.0	1995.262	1.0	39.86

2) LTE:

Frequency (MHz) F	Maximum Antenna Gain (dBi)	Maximum Antenna Gain (Numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Limit of Power Density (S) (mW/cm ²)	Minimum Distance to human body (cm)
Lowest	10.0	10.0	31.4	1380.384	1.0	33.15
Middle	10.0	10.0	31.8	1513.561	1.0	34.71
Highest	10.0	10.0	31.2	1348.963	1.0	32.77

3.8 For uplink: 1850MHz ~ 1915MHz

1)WCDMA:

Frequency (MHz) F	Maximum Antenna Gain (dBi)	Maximum Antenna Gain (Numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Limit of Power Density (S) (mW/cm ²)	Minimum Distance to human body (cm)
Lowest	10.0	10.0	22.5	177.8279	1.0	11.89
Middle	10.0	10.0	22.3	169.8244	1.0	11.63
Highest	10.0	10.0	22.1	162.181	1.0	11.36

2) LTE:

Frequency (MHz) F	Maximum Antenna Gain (dBi)	Maximum Antenna Gain (Numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Limit of Power Density (S) (mW/cm ²)	Minimum Distance to human body (cm)
Lowest	10.0	10.0	22.4	173.7801	1.0	11.76
Middle	10.0	10.0	22.4	173.7801	1.0	9.30
Highest	10.0	10.0	22.0	158.4893	1.0	11.23



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3.9 For downlink: 2110MHz ~ 2155MHz

1)WCDMA:

Frequency (MHz) F	Maximum Antenna Gain (dBi)	Maximum Antenna Gain (Numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Limit of Power Density (S) (mW/cm ²)	Minimum Distance to human body (cm)
Lowest	10.0	10.0	32.5	1778.279	1.0	37.62
Middle	10.0	10.0	32.4	1737.801	1.0	37.19
Highest	10.0	10.0	32.0	1584.893	1.0	35.52

2) LTE:

Frequency (MHz) F	Maximum Antenna Gain (dBi)	Maximum Antenna Gain (Numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Limit of Power Density (S) (mW/cm ²)	Minimum Distance to human body (cm)
Lowest	10.0	10.0	33.4	2187.762	1.0	41.73
Middle	10.0	10.0	32.1	1621.810	1.0	35.93
Highest	10.0	10.0	32.0	1584.893	1.0	35.52

3.10 For uplink: 1710MHz ~ 1755MHz

1)WCDMA:

Frequency (MHz) F	Maximum Antenna Gain (dBi)	Maximum Antenna Gain (Numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Limit of Power Density (S) (mW/cm ²)	Minimum Distance to human body (cm)
Lowest	10.0	10.0	17.2	52.4807	1.0	6.46
Middle	10.0	10.0	17.4	54.9541	1.0	6.61
Highest	10.0	10.0	16.7	46.7735	1.0	6.10

2) LTE:

Frequency (MHz) F	Maximum Antenna Gain (dBi)	Maximum Antenna Gain (Numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Limit of Power Density (S) (mW/cm ²)	Minimum Distance to human body (cm)
Lowest	10.0	10.0	17.6	57.544	1.0	6.77
Middle	10.0	10.0	18.0	63.0957	1.0	7.09
Highest	10.0	10.0	17.0	50.1187	1.0	6.31



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3.11 For downlink: 2620MHz to 2690MHz

LTE:

Frequency (MHz) F	Maximum Antenna Gain (dBi)	Maximum Antenna Gain (Numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Limit of Power Density (S) (mW/cm ²)	Minimum Distance to human body (cm)
Lowest	10.0	10.0	32.1	1621.81	1.0	35.93
Middle	10.0	10.0	32.6	1819.701	1.0	38.06
Highest	10.0	10.0	31.3	1348.963	1.0	32.77

3.12 For uplink: 2500MHz to 2570MHz

LTE:

Frequency (MHz) F	Maximum Antenna Gain (dBi)	Maximum Antenna Gain (Numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Limit of Power Density (S) (mW/cm ²)	Minimum Distance to human body (cm)
Lowest	10.0	10.0	18.1	64.5654	1.0	7.17
Middle	10.0	10.0	17.1	51.2861	1.0	6.39
Highest	10.0	10.0	15.5	39.8107	1.0	5.62

Conclusion:

So the recommend use distance away from EUT external antenna is larger than 0.4173 meter.