



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 radio 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

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S)(mW/cm ²)	Averaging Times E ² , H ² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-100000			5	6

(b) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S)(mW/cm ²)	Averaging Times E ² , H ² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/500	30
1500-100000			1.0	30

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



2. MPE Calculation Method

S (mW/cm²)=P*G/4Pi*R²

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

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 757MHz

1)For Maximum output power 40W:

Table with 7 columns: 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/cm²), Minimum Distance to human body (cm). Rows: Lowest, Middle, Highest.

2)For Maximum output power 20W:

Table with 7 columns: 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/cm²), Minimum Distance to human body (cm). Rows: Lowest, Middle, Highest.



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3.2 For downlink: 869MHz to 894MHz:

1) For Maximum output power 40W:

GSM:

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	12.5	17.8	46.2	41686.9383	2.899	142.7549
Middle	12.5	17.8	46.4	43651.5832	2.938	145.1073
Highest	12.5	17.8	46.3	42657.9519	2.978	142.4796

CDMA:

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	12.5	17.8	46.3	42657.9519	2.903	144.3084
Middle	12.5	17.8	46.5	44668.3592	2.938	146.7876
Highest	12.5	17.8	46.4	43651.5832	2.973	144.2506

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	12.5	17.8	46.2	41686.9383	2.907	142.5584
Middle	12.5	17.8	46.4	43651.5832	2.938	145.1073
Highest	12.5	17.8	46.2	41686.9383	2.970	141.0383

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	12.5	17.8	46.1	40738.0277	2.913	140.7813
Middle	12.5	17.8	46.3	42657.9519	2.938	143.4463
Highest	12.5	17.8	46.2	41686.9383	2.963	141.2048

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2)For Maximum output power 20W:

GSM:

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	12.5	17.8	43.2	20892.9613	2.899	101.0627
Middle	12.5	17.8	43.1	20892.9613	2.938	100.3897
Highest	12.5	17.8	43.2	20892.9613	2.978	99.71324

CDMA:

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	12.5	17.8	43.1	20892.9613	2.903	100.9931
Middle	12.5	17.8	43.4	21877.6162	2.938	102.7281
Highest	12.5	17.8	43.2	20892.9613	2.973	99.79706

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	12.5	17.8	43.3	21379.6209	2.907	102.0922
Middle	12.5	17.8	43.2	20892.9613	2.938	100.3897
Highest	12.5	17.8	43.4	21877.6162	2.970	102.1732

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	12.5	17.8	43.3	21379.6209	2.913	101.987
Middle	12.5	17.8	43.4	21877.6162	2.938	102.7281
Highest	12.5	17.8	43.5	22387.2114	2.963	103.4783



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3.3 For downlink: 1930MHz ~ 1995MHz

1) For Maximum output power 40W:

GSM:

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	12.5	17.8	46.2	41686.9383	5.0	108.7002
Middle	12.5	17.8	46.4	43651.5832	5.0	111.2321
Highest	12.5	17.8	46.3	42657.9519	5.0	109.9588

CDMA:

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	12.5	17.8	46.3	42657.9519	5.0	109.9588
Middle	12.5	17.8	46.2	41686.9383	5.0	108.7002
Highest	12.5	17.8	46.4	43651.5832	5.0	111.2321

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	12.5	17.8	46.5	44668.3592	5.0	112.5201
Middle	12.5	17.8	46.5	44668.3592	5.0	112.5201
Highest	12.5	17.8	46.2	41686.9383	5.0	108.7002

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	12.5	17.8	46.3	42657.9519	5.0	109.9588
Middle	12.5	17.8	46.2	41686.9383	5.0	108.7002
Highest	12.5	17.8	46.4	43651.5832	5.0	111.2321

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2)For Maximum output power 20W:

GSM:

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	12.5	17.8	43.3	21379.6209	5.0	77.8449
Middle	12.5	17.8	43.4	21877.6162	5.0	78.7463
Highest	12.5	17.8	43.2	20892.9613	5.0	76.9538

CDMA:

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	12.5	17.8	43.1	20417.3794	5.0	76.0729
Middle	12.5	17.8	43.3	21379.6209	5.0	77.8449
Highest	12.5	17.8	43.5	22387.2114	5.0	79.6581

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	12.5	17.8	43.5	22387.2114	5.0	79.6581
Middle	12.5	17.8	43.4	21877.6162	5.0	78.7463
Highest	12.5	17.8	43.3	21379.6209	5.0	77.8449

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	12.5	17.8	43.4	21877.6162	5.0	78.7463
Middle	12.5	17.8	43.5	22387.2114	5.0	79.6581
Highest	12.5	17.8	43.2	20892.9613	5.0	76.9538



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3.4 For downlink: 2110 MHz to 2155MHz

1)For Maximum output power 40W:

CDMA:

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	12.5	17.8	46.3	42657.9519	5.0	109.9588
Middle	12.5	17.8	46.4	43651.5832	5.0	111.2321
Highest	12.5	17.8	46.2	41686.9383	5.0	108.7002

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	12.5	17.8	46.4	43651.5832	5.0	111.2321
Middle	12.5	17.8	46.2	41686.9383	5.0	108.7002
Highest	12.5	17.8	46.5	44668.3592	5.0	112.5201

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	12.5	17.8	46.2	41686.9383	5.0	108.7002
Middle	12.5	17.8	46.4	43651.5832	5.0	111.2321
Highest	12.5	17.8	46.3	42657.9519	5.0	109.9588



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2) For Maximum output power 20W:

CDMA:

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	12.5	17.8	43.2	20892.9613	5.0	76.9538
Middle	12.5	17.8	43.4	21877.6162	5.0	78.7463
Highest	12.5	17.8	43.5	22387.2114	5.0	79.6581

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	12.5	17.8	43.3	21379.6209	5.0	77.8449
Middle	12.5	17.8	43.2	20892.9613	5.0	76.9538
Highest	12.5	17.8	43.4	21877.6162	5.0	78.7463

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	12.5	17.8	43.2	20892.9613	5.0	76.9538
Middle	12.5	17.8	43.4	21877.6162	5.0	78.7463
Highest	12.5	17.8	43.5	22387.2114	5.0	79.6581

Conclusion:

So the recommend use distance away from EUT external antenna is larger than 1.5913 meter.