

1. MAXIMUM PERMISSIBLE EXPOSURE (MPE)

1.1 Standard Applicable

According to § 1.1307(b)(1) and KDB 447498 D01 General RF Exposure Guidance v06, system operating under the provisions of this section shall be operating in a manner that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure.

(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/1500	30
1500-100000	/	/	1	30

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

1.2 MPE Calculation Method

$$S = (30 * P * G) / (377 * R^2)$$

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 (in appropriate units, e.g., cm)

1.3 MPE Calculation Result

Model No.: CT2020, CT2030, CT202x(x=1-9), CT203x(x=1-9)

FCC ID: 2AHAF-CT2020

Device category: Mobile device

For GSM850:

Maximum peak output power: 32.24 (dBm)

Maximum peak output power at antenna input terminal: 1674.94 (mW)

Prediction distance: >20(cm)

Prediction frequency: 836.6 (MHz)

Antenna gain: 1 (dBi)

Directional gain (numeric gain): 1.26

The worst case is power density at prediction frequency at 20cm: 0.42(mw/cm²)

MPE limit for general population exposure at prediction frequency: 0.56 (mw/cm²)

For GSM1900:

Maximum peak output power: 28.81 (dBm)

Maximum peak output power at antenna input terminal: 760.33 (mW)

Prediction distance: >20(cm)

Prediction frequency: 1880.0 (MHz)

Antenna gain: 1 (dBi)

Directional gain (numeric gain): 1.26

The worst case is power density at prediction frequency at 20cm: 0.19(mw/cm²)

MPE limit for general population exposure at prediction frequency: 1 (mw/cm²)

For WCDMA850:

Maximum peak output power: 22.94 (dBm)

Maximum peak output power at antenna input terminal: 196.79 (mW)

Prediction distance: >20(cm)

Prediction frequency: 846.6 (MHz)

Antenna gain: 1 (dBi)

Directional gain (numeric gain): 1.26

The worst case is power density at prediction frequency at 20cm: 0.05(mw/cm²)

MPE limit for general population exposure at prediction frequency: 0.56 (mw/cm²)

For WCDMA1900:

Maximum peak output power: 22.98 (dBm)

Maximum peak output power at antenna input terminal: 198.61 (mW)

Prediction distance: >20(cm)

Prediction frequency: 1852.4 (MHz)

Antenna gain: 1 (dBi)

Directional gain (numeric gain): 1.26

The worst case is power density at prediction frequency at 20cm: 0.04(mw/cm²)
MPE limit for general population exposure at prediction frequency: 1 (mw/cm²)

For Wi-Fi:

Maximum peak output power: 9.39 (dBm)

Maximum peak output power at antenna input terminal: 8.69 (mW)

Prediction distance: >20(cm)

Prediction frequency: 2462 (MHz)

Antenna gain: 0 (dBi)

Directional gain (numeric gain): 1

The worst case is power density at prediction frequency at 20cm: 0.002(mw/cm²)

For BT:

Maximum peak output power: 1.628 (dBm)

Maximum peak output power at antenna input terminal: 1.45 (mW)

Prediction distance: >20(cm)

Prediction frequency: 2480 (MHz)

Antenna gain: 0 (dBi)

Directional gain (numeric gain): 1

The worst case is power density at prediction frequency at 20cm: 0.0003(mw/cm²)

For simultaneous:

GSM850+BT+Wi-Fi: 0.4223(mw/cm²)

GSM1900+BT+Wi-Fi: 0.1923(mw/cm²)

WCDMA850+BT+Wi-Fi: 0.0523(mw/cm²)

WCDMA1900+BT+Wi-Fi: 0.0423(mw/cm²)

GSM850+ Wi-Fi: 0.422 (mw/cm²)

GSM1900+ Wi-Fi: 0.192 (mw/cm²)

WCDMA850+ Wi-Fi: 0.052 (mw/cm²)

WCDMA1900+ Wi-Fi: 0.042 (mw/cm²)

GSM850+ BT: 0.4203 (mw/cm²)

GSM1900+ BT: 0.1903(mw/cm²)

WCDMA850+ BT: 0.052(mw/cm²)

WCDMA1900+ BT: 0.042(mw/cm²)

Result: Pass