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

## Applicable Standard

According to subpart FCC §1.1307 (b)(1) and §2.1091 systems operating under the provisions of t his 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

## Test Data

Predication of MPE limit at a given distance

$$S = PG/4\pi R^2$$

Where:

$S$ = power density (in appropriate units, e.g. mW/cm$^2$)
$P$ = 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)

## GSM Cellular Band (Part 22H):

| Mode | Frequency (MHz) | Antenna Gain | | Conducted Power | | Evaluation Distance (cm) | Power Density (mW/cm$^2$) | MPE Limit (mW/cm$^2$) |
|---|---|---|---|---|---|---|---|---|
| | | (dBi) | (numeric) | (dBm) | (mW) | | | |
| Uplink | 836.6 | 14 | 25.119 | 8.6 | 7.244 | > 400 | 0.00009 | 0.558 |
| Downlink | 881.6 | 8 | 6.310 | 14.59 | 28.774 | > 400 | 0.00009 | 0.588 |

**GSM PCS Band (Part 24E):**

| Mode | Frequency (MHz) | Antenna Gain | | Conducted Power | | Evaluation Distance (cm) | Power Density (mW/cm$^2$) | MPE Limit (mW/cm$^2$) |
|---|---|---|---|---|---|---|---|---|
| | | (dBi) | (numeric) | (dBm) | (mW) | | | |
| Uplink | 1880.0 | 14 | 25.119 | 9.10 | 8.128 | > 400 | 0.00010 | 1.00 |
| Downlink | 1960.0 | 8 | 6.310 | 14.19 | 26.242 | > 400 | 0.00008 | 1.00 |

**CDMA Cellular Band (Part 22H):**

| Mode | Frequency (MHz) | Antenna Gain | | Conducted Power | | Evaluation Distance (cm) | Power Density (mW/cm$^2$) | MPE Limit (mW/cm$^2$) |
|---|---|---|---|---|---|---|---|---|
| | | (dBi) | (numeric) | (dBm) | (mW) | | | |
| Uplink | 836.52 | 14 | 25.119 | 9.95 | 9.886 | > 400 | 0.00012 | 0.558 |
| Downlink | 881.52 | 8 | 6.310 | 14.19 | 26.242 | > 400 | 0.00008 | 0.588 |

**CDMA PCS Band (Part 24E):**

| Mode | Frequency (MHz) | Antenna Gain | | Conducted Power | | Evaluation Distance (cm) | Power Density (mW/cm$^2$) | MPE Limit (mW/cm$^2$) |
|---|---|---|---|---|---|---|---|---|
| | | (dBi) | (numeric) | (dBm) | (mW) | | | |
| Uplink | 1880.0 | 14 | 25.119 | 9.60 | 9.120 | > 400 | 0.00012 | 1.00 |
| Downlink | 1960.0 | 8 | 6.310 | 14.45 | 27.861 | > 400 | 0.00008 | 1.00 |

**WCDMA AWS Band (Part 27):**

| Mode | Frequency (MHz) | Antenna Gain | | Conducted Power | | Evaluation Distance (cm) | Power Density (mW/cm$^2$) | MPE Limit (mW/cm$^2$) |
|---|---|---|---|---|---|---|---|---|
| | | (dBi) | (numeric) | (dBm) | (mW) | | | |
| Uplink | 1732.4 | 14 | 25.119 | 9.35 | 8.610 | > 400 | 0.000108 | 1.0 |
| Downlink | 2132.4 | 8 | 6.310 | 14.70 | 29.512 | > 400 | 0.000093 | 1.0 |

**Result:** The device meets FCC MPE limit at 400 cm distance.