

4 §1.1307(b) (1) & 2.1091 - RF EXPOSURE

4.1 Applicable Standard

According to §1.1307 & 2.1091 RF exposure is calculated.

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 (minute)
Limits for General Population/Uncontrolled Exposure				
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

4.2 MPE Prediction

Predication of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

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

Where: S = power density

P = power input to antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

AMPS Cellular Band

Downlink:

Maximum peak output power at antenna input terminal (dBm): 11.94

Maximum peak output power at antenna input terminal (mW): 15.63

Prediction distance (cm): 35

Prediction frequency (MHz): 881.50

Antenna Gain, typical (dBi): 6

Maximum Antenna Gain (numeric): 3.98

Power density at predication frequency and distance (mW/cm²): 0.004

MPE limit for uncontrolled exposure at predication frequency (mW/cm²): 0.588

Uplink:

Maximum peak output power at antenna input terminal (dBm): 29.80
Maximum peak output power at antenna input terminal (mW): 954.99
Prediction distance (cm): 35
Prediction frequency (MHz): 836.50
Antenna Gain, typical (dBi): 6
Maximum Antenna Gain (numeric): 3.98
Power density at predication frequency and distance (mW/cm²): 0.247
MPE limit for uncontrolled exposure at predication frequency (mW/cm²): 0.558

TDMA Cellular Band**Downlink:**

Maximum peak output power at antenna input terminal (dBm): 12.57
Maximum peak output power at antenna input terminal (mW): 18.07
Prediction distance (cm): 35
Prediction frequency (MHz): 881.50
Antenna Gain, typical (dBi): 6
Maximum Antenna Gain (numeric): 3.98
Power density at predication frequency and distance (mW/cm²): 0.005
MPE limit for uncontrolled exposure at predication frequency (mW/cm²): 0.588

Uplink:

Maximum peak output power at antenna input terminal (dBm): 29.31
Maximum peak output power at antenna input terminal (mW): 853.10
Prediction distance (cm): 35
Prediction frequency (MHz): 836.50
Antenna Gain, typical (dBi): 6
Maximum Antenna Gain (numeric): 3.98
Power density at predication frequency and distance (mW/cm²): 0.221
MPE limit for uncontrolled exposure at predication frequency (mW/cm²): 0.558

TDMA PCS Band**Downlink:**

Maximum peak output power at antenna input terminal (dBm): 10.99
Maximum peak output power at antenna input terminal (mW): 12.56
Prediction distance (cm): 35
Prediction frequency (MHz): 1960.0
Antenna Gain, typical (dBi): 6
Maximum Antenna Gain (numeric): 3.98
Power density at predication frequency and distance (mW/cm²): 0.003
MPE limit for uncontrolled exposure at predication frequency (mW/cm²): 1.000

Uplink:

Maximum peak output power at antenna input terminal (dBm): 29.83
Maximum peak output power at antenna input terminal (mW): 961.11
Prediction distance (cm): 35
Prediction frequency (MHz): 1880.0
Antenna Gain, typical (dBi): 6
Maximum Antenna Gain (numeric): 3.98
Power density at predication frequency and distance (mW/cm²): 0.249
MPE limit for uncontrolled exposure at predication frequency (mW/cm²): 1.000

GSM Cellular Band**Downlink:**

Maximum peak output power at antenna input terminal (dBm): 14.68
Maximum peak output power at antenna input terminal (mW): 29.38
Prediction distance (cm): 35
Prediction frequency (MHz): 881.6
Antenna Gain, typical (dBi): 6
Maximum Antenna Gain (numeric): 3.98
Power density at predication frequency and distance (mW/cm²): 0.008
MPE limit for uncontrolled exposure at predication frequency (mW/cm²): 0.588

Uplink:

Maximum peak output power at antenna input terminal (dBm): 32.83
Maximum peak output power at antenna input terminal (mW): 1918.67
Prediction distance (cm): 35
Prediction frequency (MHz): 836.6
Antenna Gain, typical (dBi): 6
Maximum Antenna Gain (numeric): 3.98
Power density at predication frequency and distance (mW/cm²): 0.496
MPE limit for uncontrolled exposure at predication frequency (mW/cm²): 0.558

GSM PCS Band**Downlink:**

Maximum peak output power at antenna input terminal (dBm): 12.59
Maximum peak output power at antenna input terminal (mW): 18.16
Prediction distance (cm): 35
Prediction frequency (MHz): 1960.0
Antenna Gain, typical (dBi): 6
Maximum Antenna Gain (numeric): 3.98
Power density at predication frequency and distance (mW/cm²): 0.005
MPE limit for uncontrolled exposure at predication frequency (mW/cm²): 1.000

Uplink:

Maximum peak output power at antenna input terminal (dBm): 30.18
Maximum peak output power at antenna input terminal (mW): 1042.32
Prediction distance (cm): 35
Prediction frequency (MHz): 1880.0
Antenna Gain, typical (dBi): 6
Maximum Antenna Gain (numeric): 3.98
Power density at predication frequency and distance (mW/cm²): 0.269
MPE limit for uncontrolled exposure at predication frequency (mW/cm²): 1.000

CDMA Cellular Band**Downlink:**

Maximum peak output power at antenna input terminal (dBm): 10.08
Maximum peak output power at antenna input terminal (mW): 10.19
Prediction distance (cm): 35
Prediction frequency (MHz): 881.40
Antenna Gain, typical (dBi): 6
Maximum Antenna Gain (numeric): 3.98
Power density at predication frequency and distance (mW/cm²): 0.003
MPE limit for uncontrolled exposure at predication frequency (mW/cm²): 0.588

Uplink:

Maximum peak output power at antenna input terminal (dBm): 25.64
Maximum peak output power at antenna input terminal (mW): 366.44
Prediction distance (cm): 35
Prediction frequency (MHz): 836.40
Antenna Gain, typical (dBi): 6
Maximum Antenna Gain (numeric): 3.98
Power density at predication frequency and distance (mW/cm²): 0.095
MPE limit for uncontrolled exposure at predication frequency (mW/cm²): 0.558

CDMA PCS Band**Downlink:**

Maximum peak output power at antenna input terminal (dBm): 10.13
Maximum peak output power at antenna input terminal (mW): 10.30
Prediction distance (cm): 35
Prediction frequency (MHz): 1960.00
Antenna Gain, typical (dBi): 6
Maximum Antenna Gain (numeric): 3.98
Power density at predication frequency and distance (mW/cm²): 0.003
MPE limit for uncontrolled exposure at predication frequency (mW/cm²): 1.000

Uplink:

Maximum peak output power at antenna input terminal (dBm): 24.03
Maximum peak output power at antenna input terminal (mW): 252.93
Prediction distance (cm): 35
Prediction frequency (MHz): 1880.00
Antenna Gain, typical (dBi): 6
Maximum Antenna Gain (numeric): 3.98
Power density at predication frequency and distance (mW/cm²): 0.065
MPE limit for uncontrolled exposure at predication frequency (mW/cm²): 1.000

4.3 Test Result

The device is compliant with the requirement MPE limit for uncontrolled exposure at predication frequency 1.0 mW/cm². The maximum power density at the distance of 35 cm was 0.496 mW/cm². Thus, the requirement of at least 35 cm required by the manufacturer is in compliance with the MPE requirement.