

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):	<u>29.80</u>
Maximum peak output power at antenna input terminal (mW):	<u>954.99</u>
Prediction distance (cm):	<u>35</u>
Prediction frequency (MHz):	<u>836.50</u>
Antenna Gain, typical (dBi):	<u>6</u>
Maximum Antenna Gain (numeric):	<u>3.98</u>
Power density at predication frequency and distance (mW/cm ²):	<u>0.247</u>
MPE limit for uncontrolled exposure at predication frequency (mW/cm ²):	<u>0.558</u>

TDMA Cellular Band**Downlink:**

Maximum peak output power at antenna input terminal (dBm):	<u>12.57</u>
Maximum peak output power at antenna input terminal (mW):	<u>18.07</u>
Prediction distance (cm):	<u>35</u>
Prediction frequency (MHz):	<u>881.50</u>
Antenna Gain, typical (dBi):	<u>6</u>
Maximum Antenna Gain (numeric):	<u>3.98</u>
Power density at predication frequency and distance (mW/cm ²):	<u>0.005</u>
MPE limit for uncontrolled exposure at predication frequency (mW/cm ²):	<u>0.588</u>

Uplink:

Maximum peak output power at antenna input terminal (dBm):	<u>29.31</u>
Maximum peak output power at antenna input terminal (mW):	<u>853.10</u>
Prediction distance (cm):	<u>35</u>
Prediction frequency (MHz):	<u>836.50</u>
Antenna Gain, typical (dBi):	<u>6</u>
Maximum Antenna Gain (numeric):	<u>3.98</u>
Power density at predication frequency and distance (mW/cm ²):	<u>0.221</u>
MPE limit for uncontrolled exposure at predication frequency (mW/cm ²):	<u>0.558</u>

TDMA PCS Band**Downlink:**

Maximum peak output power at antenna input terminal (dBm):	<u>10.99</u>
Maximum peak output power at antenna input terminal (mW):	<u>12.56</u>
Prediction distance (cm):	<u>35</u>
Prediction frequency (MHz):	<u>1960.0</u>
Antenna Gain, typical (dBi):	<u>6</u>
Maximum Antenna Gain (numeric):	<u>3.98</u>
Power density at predication frequency and distance (mW/cm ²):	<u>0.003</u>
MPE limit for uncontrolled exposure at predication frequency (mW/cm ²):	<u>1.000</u>

Uplink:

Maximum peak output power at antenna input terminal (dBm):	<u>29.83</u>
Maximum peak output power at antenna input terminal (mW):	<u>961.11</u>
Prediction distance (cm):	<u>35</u>
Prediction frequency (MHz):	<u>1880.0</u>
Antenna Gain, typical (dBi):	<u>6</u>
Maximum Antenna Gain (numeric):	<u>3.98</u>
Power density at predication frequency and distance (mW/cm ²):	<u>0.249</u>
MPE limit for uncontrolled exposure at predication frequency (mW/cm ²):	<u>1.000</u>

GSM Cellular Band**Downlink:**

Maximum peak output power at antenna input terminal (dBm):	<u>14.68</u>
Maximum peak output power at antenna input terminal (mW):	<u>29.38</u>
Prediction distance (cm):	<u>35</u>
Prediction frequency (MHz):	<u>881.6</u>
Antenna Gain, typical (dBi):	<u>6</u>
Maximum Antenna Gain (numeric):	<u>3.98</u>
Power density at predication frequency and distance (mW/cm ²):	<u>0.008</u>
MPE limit for uncontrolled exposure at predication frequency (mW/cm ²):	<u>0.588</u>

Uplink:

Maximum peak output power at antenna input terminal (dBm):	<u>32.83</u>
Maximum peak output power at antenna input terminal (mW):	<u>1918.67</u>
Prediction distance (cm):	<u>35</u>
Prediction frequency (MHz):	<u>836.6</u>
Antenna Gain, typical (dBi):	<u>6</u>
Maximum Antenna Gain (numeric):	<u>3.98</u>
Power density at predication frequency and distance (mW/cm ²):	<u>0.496</u>
MPE limit for uncontrolled exposure at predication frequency (mW/cm ²):	<u>0.558</u>

GSM PCS Band**Downlink:**

Maximum peak output power at antenna input terminal (dBm):	<u>12.59</u>
Maximum peak output power at antenna input terminal (mW):	<u>18.16</u>
Prediction distance (cm):	<u>35</u>
Prediction frequency (MHz):	<u>1960.0</u>
Antenna Gain, typical (dBi):	<u>6</u>
Maximum Antenna Gain (numeric):	<u>3.98</u>
Power density at predication frequency and distance (mW/cm ²):	<u>0.005</u>
MPE limit for uncontrolled exposure at predication frequency (mW/cm ²):	<u>1.000</u>

Uplink:

Maximum peak output power at antenna input terminal (dBm):	<u>30.18</u>
Maximum peak output power at antenna input terminal (mW):	<u>1042.32</u>
Prediction distance (cm):	<u>35</u>
Prediction frequency (MHz):	<u>1880.0</u>
Antenna Gain, typical (dBi):	<u>6</u>
Maximum Antenna Gain (numeric):	<u>3.98</u>
Power density at predication frequency and distance (mW/cm ²):	<u>0.269</u>
MPE limit for uncontrolled exposure at predication frequency (mW/cm ²):	<u>1.000</u>

CDMA Cellular Band**Downlink:**

Maximum peak output power at antenna input terminal (dBm):	<u>10.08</u>
Maximum peak output power at antenna input terminal (mW):	<u>10.19</u>
Prediction distance (cm):	<u>35</u>
Prediction frequency (MHz):	<u>881.40</u>
Antenna Gain, typical (dBi):	<u>6</u>
Maximum Antenna Gain (numeric):	<u>3.98</u>
Power density at predication frequency and distance (mW/cm ²):	<u>0.003</u>
MPE limit for uncontrolled exposure at predication frequency (mW/cm ²):	<u>0.588</u>

Uplink:

Maximum peak output power at antenna input terminal (dBm):	<u>25.64</u>
Maximum peak output power at antenna input terminal (mW):	<u>366.44</u>
Prediction distance (cm):	<u>35</u>
Prediction frequency (MHz):	<u>836.40</u>
Antenna Gain, typical (dBi):	<u>6</u>
Maximum Antenna Gain (numeric):	<u>3.98</u>
Power density at predication frequency and distance (mW/cm ²):	<u>0.095</u>
MPE limit for uncontrolled exposure at predication frequency (mW/cm ²):	<u>0.558</u>

CDMA PCS Band**Downlink:**

Maximum peak output power at antenna input terminal (dBm):	<u>10.13</u>
Maximum peak output power at antenna input terminal (mW):	<u>10.30</u>
Prediction distance (cm):	<u>35</u>
Prediction frequency (MHz):	<u>1960.00</u>
Antenna Gain, typical (dBi):	<u>6</u>
Maximum Antenna Gain (numeric):	<u>3.98</u>
Power density at predication frequency and distance (mW/cm ²):	<u>0.003</u>
MPE limit for uncontrolled exposure at predication frequency (mW/cm ²):	<u>1.000</u>

Uplink:

Maximum peak output power at antenna input terminal (dBm):	<u>24.03</u>
Maximum peak output power at antenna input terminal (mW):	<u>252.93</u>
Prediction distance (cm):	<u>35</u>
Prediction frequency (MHz):	<u>1880.00</u>
Antenna Gain, typical (dBi):	<u>6</u>
Maximum Antenna Gain (numeric):	<u>3.98</u>
Power density at predication frequency and distance (mW/cm ²):	<u>0.065</u>
MPE limit for uncontrolled exposure at predication frequency (mW/cm ²):	<u>1.000</u>

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.