

# **1 FCC §2.1091 - RF Exposure**

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## **1.1 Applicable Standards**

According to §2.1091 (Mobile Devices) 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 <sup>2</sup> )	Averaging Time (minute)
<b>Limits for General Population/Uncontrolled Exposure</b>				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f <sup>2</sup> )	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

Note: f = frequency in MHz

\* = Plane-wave equivalent power density

## **1.2 MPE Prediction**

Predication of MPE limit at a given distance, Equation from 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

### 1.3 Test Results

#### Cellular Band

##### Downlink (Directional Antenna)

Maximum peak output power at antenna input terminal (dBm): 15.98  
Maximum peak output power at antenna input terminal (mW): 39.627  
Prediction distance (cm): 30  
Prediction frequency (MHz): 881.5  
Antenna Gain, typical (dBi): 8.5  
Maximum Antenna Gain (numeric): 7.0795  
Power density at predication frequency and distance (mW/cm<sup>2</sup>): 0.025  
MPE limit for uncontrolled exposure at predication frequency (mW/cm<sup>2</sup>): 0.588

##### Downlink (Omni Directional Antenna)

Maximum peak output power at antenna input terminal (dBm): 15.98  
Maximum peak output power at antenna input terminal (mW): 39.627  
Prediction distance (cm): 30  
Prediction frequency (MHz): 881.5  
Antenna Gain, typical (dBi): 3.5  
Maximum Antenna Gain (numeric): 2.239  
Power density at predication frequency and distance (mW/cm<sup>2</sup>): 0.0079  
MPE limit for uncontrolled exposure at predication frequency (mW/cm<sup>2</sup>): 0.588

#### Uplink

Maximum peak output power at antenna input terminal (dBm): 15.88  
Maximum peak output power at antenna input terminal (mW): 38.726  
Prediction distance (cm): 30  
Prediction frequency (MHz): 836.5  
Antenna Gain, typical (dBi): 8.5  
Maximum Antenna Gain (numeric): 7.0795  
Power density at predication frequency and distance (mW/cm<sup>2</sup>): 0.0243  
MPE limit for uncontrolled exposure at predication frequency (mW/cm<sup>2</sup>): 0.558

**PCS Band****Downlink (Directional Antenna)**

Maximum peak output power at antenna input terminal (dBm): 16.04  
Maximum peak output power at antenna input terminal (mW): 40.180  
Prediction distance (cm): 30  
Prediction frequency (MHz): 1960  
Antenna Gain, typical (dBi): 10  
Maximum Antenna Gain (numeric): 10  
Power density at predication frequency and distance (mW/cm<sup>2</sup>): 0.036  
MPE limit for uncontrolled exposure at predication frequency (mW/cm<sup>2</sup>): 1.0

**Downlink (Omni Directional Antenna)**

Maximum peak output power at antenna input terminal (dBm): 16.04  
Maximum peak output power at antenna input terminal (mW): 40.180  
Prediction distance (cm): 30  
Prediction frequency (MHz): 1960  
Antenna Gain, typical (dBi): 5  
Maximum Antenna Gain (numeric): 3.1622  
Power density at predication frequency and distance (mW/cm<sup>2</sup>): 0.0113  
MPE limit for uncontrolled exposure at predication frequency (mW/cm<sup>2</sup>): 1.0

**Uplink**

Maximum peak output power at antenna input terminal (dBm): 15.86  
Maximum peak output power at antenna input terminal (mW): 38.548  
Prediction distance (cm): 30  
Prediction frequency (MHz): 1852.5  
Antenna Gain, typical (dBi): 10  
Maximum Antenna Gain (numeric): 10  
Power density at predication frequency and distance (mW/cm<sup>2</sup>): 0.0341  
MPE limit for uncontrolled exposure at predication frequency (mW/cm<sup>2</sup>): 1.0

**Band 4****Downlink (Bidirectional)**

Maximum peak output power at antenna input terminal (dBm): 15.80  
Maximum peak output power at antenna input terminal (mW): 38.460  
Prediction distance (cm): 30  
Prediction frequency (MHz): 2150  
Antenna Gain, typical (dBi): 10  
Maximum Antenna Gain (numeric): 10  
Power density at predication frequency and distance (mW/cm<sup>2</sup>): 0.014  
MPE limit for uncontrolled exposure at predication frequency (mW/cm<sup>2</sup>): 1.0

**Downlink (Omnidirectional)**

Maximum peak output power at antenna input terminal (dBm): 15.80  
Maximum peak output power at antenna input terminal (mW): 38.460  
Prediction distance (cm): 30  
Prediction frequency (MHz): 2150  
Antenna Gain, typical (dBi): 5  
Maximum Antenna Gain (numeric): 3.163  
Power density at predication frequency and distance (mW/cm<sup>2</sup>): 0.0044  
MPE limit for uncontrolled exposure at predication frequency (mW/cm<sup>2</sup>): 1.0

**Uplink**

Maximum peak output power at antenna input terminal (dBm): 16  
Maximum peak output power at antenna input terminal (mW): 39.811  
Prediction distance (cm): 30  
Prediction frequency (MHz): 1710.8  
Antenna Gain, typical (dBi): 10  
Maximum Antenna Gain (numeric): 10  
Power density at predication frequency and distance (mW/cm<sup>2</sup>): 0.036  
MPE limit for uncontrolled exposure at predication frequency (mW/cm<sup>2</sup>): 1.0

**Band 13 & Band 17****Downlink (Bidirectional)**

<u>Maximum peak output power at antenna input terminal (dBm):</u>	<u>15.78</u>
<u>Maximum peak output power at antenna input terminal (mW):</u>	<u>37.845</u>
<u>Prediction distance (cm):</u>	<u>30</u>
<u>Prediction frequency (MHz):</u>	<u>751</u>
<u>Antenna Gain, typical (dBi):</u>	<u>8.5</u>
<u>Maximum Antenna Gain (numeric):</u>	<u>7.080</u>
<u>Power density at predication frequency and distance (mW/cm<sup>2</sup>):</u>	<u>0.0238</u>
<u>MPE limit for uncontrolled exposure at predication frequency (mW/cm<sup>2</sup>):</u>	<u>0.500</u>

**Downlink (Omnidirectional)**

<u>Maximum peak output power at antenna input terminal (dBm):</u>	<u>15.78</u>
<u>Maximum peak output power at antenna input terminal (mW):</u>	<u>37.845</u>
<u>Prediction distance (cm):</u>	<u>30</u>
<u>Prediction frequency (MHz):</u>	<u>751</u>
<u>Antenna Gain, typical (dBi):</u>	<u>3.5</u>
<u>Maximum Antenna Gain (numeric):</u>	<u>2.239</u>
<u>Power density at predication frequency and distance (mW/cm<sup>2</sup>):</u>	<u>0.0075</u>
<u>MPE limit for uncontrolled exposure at predication frequency (mW/cm<sup>2</sup>):</u>	<u>0.500</u>

**Uplink**

<u>Maximum peak output power at antenna input terminal (dBm):</u>	<u>15.98</u>
<u>Maximum peak output power at antenna input terminal (mW):</u>	<u>39.628</u>
<u>Prediction distance (cm):</u>	<u>30</u>
<u>Prediction frequency (MHz):</u>	<u>706.5</u>
<u>Antenna Gain, typical (dBi):</u>	<u>8.5</u>
<u>Maximum Antenna Gain (numeric):</u>	<u>7.080</u>
<u>Power density at predication frequency and distance (mW/cm<sup>2</sup>):</u>	<u>0.0249</u>
<u>MPE limit for uncontrolled exposure at predication frequency (mW/cm<sup>2</sup>):</u>	<u>0.471</u>

**Results**

For uplink and downlink, the highest power density levels at **30 cm** are below the MPE uncontrolled exposure limit.

**--- END OF REPORT ---**