

4 FCC §2.1091 & §15.247(i) - RF Exposure

4.1 Applicable Standards

According to FCC §15.247(i) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

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)
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 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

4.3 MPE Results

14.5 dBi antenna:

Maximum peak output power at antenna input terminal (dBm): 15.91

Maximum peak output power at antenna input terminal (mW): 38.9942

Prediction distance (cm): 20

Prediction frequency (MHz): 2445

Maximum Antenna Gain, typical (dBi): 14.5

Maximum Antenna Gain (numeric): 28.1838293

Power density of prediction frequency at 20.0 cm (mW/cm²): 0.21864

FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm²): 1.0

7 dBi antenna:

<u>Maximum peak output power at antenna input terminal (dBm):</u>	<u>16.96</u>
<u>Maximum peak output power at antenna input terminal (mW):</u>	<u>49.659</u>
<u>Prediction distance (cm):</u>	<u>20</u>
<u>Prediction frequency (MHz):</u>	<u>2445</u>
<u>Maximum Antenna Gain, typical (dBi):</u>	<u>7</u>
<u>Maximum Antenna Gain (numeric):</u>	<u>5.012</u>
<u>Power density of prediction frequency at 20.0 cm (mW/cm²):</u>	<u>0.0495</u>
<u>FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm²):</u>	<u>1.0</u>

3.5 dBi antenna:

<u>Maximum peak output power at antenna input terminal (dBm):</u>	<u>17.78</u>
<u>Maximum peak output power at antenna input terminal (mW):</u>	<u>59.9791</u>
<u>Prediction distance (cm):</u>	<u>20</u>
<u>Prediction frequency (MHz):</u>	<u>2445</u>
<u>Maximum Antenna Gain, typical (dBi):</u>	<u>3.5</u>
<u>Maximum Antenna Gain (numeric):</u>	<u>2.23872</u>
<u>Power density of prediction frequency at 20.0 cm (mW/cm²):</u>	<u>0.0267</u>
<u>FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm²):</u>	<u>1.0</u>

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.22 mW/cm². Limit is 1.0 mW/cm².