

4 FCC §2.1091 - RF Exposure Information

4.1 Applicable Standards

FCC §2.1091, (a) Requirements of this section are a consequence of Commission responsibilities under the National Environmental Policy Act to evaluate the environmental significance of its actions. See subpart I of part 1 of this chapter, in particular §1.1307(b).

According to §1.1310 and §2.1091 RF exposure is calculated.

Limits for Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-1.34	614	1.63	*(100)	6
1.34-30	1842/f	4.89/f	*(900/f ²)	6
30-300	61.4	0.163	1.0	6
300-1500	/	/	f/300	6
1500-100,000	/	/	5	6

f = frequency in MHz

* = Plane-wave equivalent power density

4.2 MPE Prediction

Prediction 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

Modulation: D-LMR
Frequency: 769-775 MHz

<u>Duty Cycle (TDMA 4 slots)</u>	<u>25%</u>
<u>Maximum peak output power at antenna input terminal (dBm):</u>	<u>29.89</u>
<u>Maximum peak output power at antenna input terminal (mW):</u>	<u>974.990</u>
<u>Prediction distance (cm):</u>	<u>35</u>
<u>Prediction frequency (MHz):</u>	<u>774.9</u>
<u>Maximum Antenna Gain, typical (dBi):</u>	<u>15</u>
<u>Maximum Antenna Gain (numeric):</u>	<u>31.62</u>
<u>Power density of prediction frequency at 35 cm (mW/cm²):</u>	<u>0.501</u>
<u>MPE limit for uncontrolled exposure at prediction frequency (mW/cm²):</u>	<u>2.583</u>

Modulation: D-LMR
Frequency: 799-805 MHz

<u>Duty Cycle (TDMA 4 slots)</u>	25%
<u>Maximum peak output power at antenna input terminal (dBm):</u>	29.84
<u>Maximum peak output power at antenna input terminal (mW):</u>	963.829
<u>Prediction distance (cm):</u>	35
<u>Prediction frequency (MHz):</u>	804.9
<u>Maximum Antenna Gain, typical (dBi):</u>	15
<u>Maximum Antenna Gain (numeric):</u>	31.62
<u>Power density of prediction frequency at 35 cm (mW/cm²):</u>	0.495
<u>MPE limit for uncontrolled exposure at prediction frequency (mW/cm²):</u>	2.683

Modulation: D-LMR
Frequency: 806-824 MHz

<u>Duty Cycle (TDMA 4 slots)</u>	25%
<u>Maximum peak output power at antenna input terminal (dBm):</u>	29.83
<u>Maximum peak output power at antenna input terminal (mW):</u>	961.612
<u>Prediction distance (cm):</u>	35
<u>Prediction frequency (MHz):</u>	815
<u>Maximum Antenna Gain, typical (dBi):</u>	15
<u>Maximum Antenna Gain (numeric):</u>	31.62
<u>Power density of prediction frequency at 35 cm (mW/cm²):</u>	0.494
<u>MPE limit for uncontrolled exposure at prediction frequency (mW/cm²):</u>	2.717

Modulation: D-LMR
Frequency: 851-869 MHz

<u>Duty Cycle (TDMA 4 slots)</u>	25%
<u>Maximum peak output power at antenna input terminal (dBm):</u>	29.62
<u>Maximum peak output power at antenna input terminal (mW):</u>	916.220
<u>Prediction distance (cm):</u>	35
<u>Prediction frequency (MHz):</u>	868.9
<u>Maximum Antenna Gain, typical (dBi):</u>	15
<u>Maximum Antenna Gain (numeric):</u>	31.62
<u>Power density of prediction frequency at 35 cm (mW/cm²):</u>	0.471
<u>MPE limit for uncontrolled exposure at prediction frequency (mW/cm²):</u>	2.896

Modulation: TETRA
Frequency: 809-824 MHz

<u>Duty Cycle (TDMA 4 slots)</u>	25%
<u>Maximum peak output power at antenna input terminal (dBm):</u>	29.73
<u>Maximum peak output power at antenna input terminal (mW):</u>	939.723
<u>Prediction distance (cm):</u>	35
<u>Prediction frequency (MHz):</u>	809.1
<u>Maximum Antenna Gain, typical (dBi):</u>	15
<u>Maximum Antenna Gain (numeric):</u>	31.62
<u>Power density of prediction frequency at 35 cm (mW/cm²):</u>	0.483
<u>MPE limit for uncontrolled exposure at prediction frequency (mW/cm²):</u>	2.697

Modulation: TETRA
Frequency: 854-869 MHz

Duty Cycle (TDMA 4 slots) 25%
Maximum peak output power at antenna input terminal (dBm): 29.9
Maximum peak output power at antenna input terminal (mW): 977.237
Prediction distance (cm): 35
Prediction frequency (MHz): 860
Maximum Antenna Gain, typical (dBi): 15
Maximum Antenna Gain (numeric): 31.623
Power density of prediction frequency at 35 cm (mW/cm²): 0.502
MPE limit for uncontrolled exposure at prediction frequency (mW/cm²): 2.867

Modulation: C4FM
Frequency: 769-775 MHz

Duty Cycle 100%
Maximum peak output power at antenna input terminal (dBm): 30.8
Maximum peak output power at antenna input terminal (mW): 1202.264
Prediction distance (cm): 35
Prediction frequency (MHz): 772
Maximum Antenna Gain, typical (dBi): 15
Maximum Antenna Gain (numeric): 31.62
Power density of prediction frequency at 35 cm (mW/cm²): 2.47
MPE limit for uncontrolled exposure at prediction frequency (mW/cm²): 2.573

Modulation: C4FM
Frequency: 799-805 MHz

Duty Cycle 100%
Maximum peak output power at antenna input terminal (dBm): 30.94
Maximum peak output power at antenna input terminal (mW): 1241.652
Prediction distance (cm): 35
Prediction frequency (MHz): 802
Maximum Antenna Gain, typical (dBi): 15
Maximum Antenna Gain (numeric): 31.623
Power density of prediction frequency at 35 cm (mW/cm²): 2.551
MPE limit for uncontrolled exposure at prediction frequency (mW/cm²): 2.673

Modulation: FM (channel spacing 20 KHz)
Frequency: 806-824 MHz

Duty Cycle 100%
Maximum peak output power at antenna input terminal (dBm): 30.37
Maximum peak output power at antenna input terminal (mW): 1088.930
Prediction distance (cm): 35
Prediction frequency (MHz): 806.1
Maximum Antenna Gain, typical (dBi): 15
Maximum Antenna Gain (numeric): 31.62
Power density of prediction frequency at 35 cm (mW/cm²): 2.237
MPE limit for uncontrolled exposure at prediction frequency (mW/cm²): 2.687

Modulation: FM (channel spacing 20 KHz)
Frequency: 851-869 MHz

<u>Duty Cycle</u>	<u>100%</u>
<u>Maximum peak output power at antenna input terminal (dBm):</u>	<u>30.43</u>
<u>Maximum peak output power at antenna input terminal (mW):</u>	<u>1104.079</u>
<u>Prediction distance (cm):</u>	<u>35</u>
<u>Prediction frequency (MHz):</u>	<u>851.1</u>
<u>Maximum Antenna Gain, typical (dBi):</u>	<u>15</u>
<u>Maximum Antenna Gain (numeric):</u>	<u>31.62</u>
<u>Power density of prediction frequency at 35 cm (mW/cm²):</u>	<u>2.268</u>
<u>MPE limit for uncontrolled exposure at prediction frequency (mW/cm²):</u>	<u>2.837</u>

Modulation: FM (channel spacing 25 KHz)
Frequency: 806-824 MHz

<u>Duty Cycle</u>	<u>100%</u>
<u>Maximum peak output power at antenna input terminal (dBm):</u>	<u>30.36</u>
<u>Maximum peak output power at antenna input terminal (mW):</u>	<u>1086.426</u>
<u>Prediction distance (cm):</u>	<u>35</u>
<u>Prediction frequency (MHz):</u>	<u>806.1</u>
<u>Maximum Antenna Gain, typical (dBi):</u>	<u>15</u>
<u>Maximum Antenna Gain (numeric):</u>	<u>31.62</u>
<u>Power density of prediction frequency at 35 cm (mW/cm²):</u>	<u>2.232</u>
<u>MPE limit for uncontrolled exposure at prediction frequency (mW/cm²):</u>	<u>2.687</u>

Modulation: FM (channel spacing 25 KHz)
Frequency: 851-869 MHz

<u>Duty Cycle</u>	<u>100%</u>
<u>Maximum peak output power at antenna input terminal (dBm):</u>	<u>30.45</u>
<u>Maximum peak output power at antenna input terminal (mW):</u>	<u>1109.175</u>
<u>Prediction distance (cm):</u>	<u>35</u>
<u>Prediction frequency (MHz):</u>	<u>868.9</u>
<u>Maximum Antenna Gain, typical (dBi):</u>	<u>15</u>
<u>Maximum Antenna Gain (numeric):</u>	<u>31.62</u>
<u>Power density of prediction frequency at 35 cm (mW/cm²):</u>	<u>2.279</u>
<u>MPE limit for uncontrolled exposure at prediction frequency (mW/cm²):</u>	<u>2.896</u>

Conclusion

The device complies with the MPE requirements by providing a safe separation distance of at least 35 cm between the antenna with maximum 15 dBi gain, including any radiating structure, and any persons when normally operated.