

4 FCC §2.1091, §15.247(i) & IC RSS §102 - 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

According to RSS-102, For the purpose of this standard, Industry Canada has adopted the SAR and RF field strength limits established in Health Canada's RF exposure guideline, Safety Code 6.18

RF Field Strength Limits for Devices Used by the General Public
(Uncontrolled Environment)

Frequency Range (MHz)	Electric Field Strength (V/m rms)	Magnetic Field Strength (A/m rms)	Power Density (W/m ²)	Reference Period (minutes)
Limits for General Population/Uncontrolled Exposure				
0.003-10	83	90	-	Instantaneous*
0.1-10	-	0.73/f	-	6**
1.1-10	87/f ^{0.5}	-	-	6**
10-20	27.46	0.0728	2	6
20-48	58.07/f ^{0.25}	0.1540/f ^{0.25}	8.944/f ^{0.5}	6
48-300	22.06	0.05852	1.291	6
300-6000	3.142f ^{0.3417}	0.008335f ^{0.3417}	0.02619f ^{0.6834}	6
6000-15000	61.4	0.163	10	6
1500-100,000	61.4	0.163	10	616000/f ^{1.2}
150000-300000	0.158f ^{0.5}	421 x 10 ⁻⁴ f ^{0.5}	6.67 x 10 ⁻⁵ f	616000/f ^{1.2}

Note: f is frequency in MHz. *Based on nerve stimulation (NS). ** Based on specific absorption rate (SAR).

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

RF Exposure for FCC

<u>Maximum peak output power at antenna input terminal (dBm):</u>	<u>22.85</u>
<u>Maximum peak output power at antenna input terminal (mW):</u>	<u>192.7525</u>
<u>Prediction distance (cm):</u>	<u>25</u>
<u>Prediction frequency (MHz):</u>	<u>2412</u>
<u>Maximum Antenna Gain, typical (dBi):</u>	<u>13</u>
<u>Maximum Antenna Gain (numeric):</u>	<u>19.95262</u>
<u>Power density of prediction frequency at 25.0 cm (mW/cm²):</u>	<u>0.49</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 25 cm is 0.49 mW/cm². Limit is 1.0 mW/cm².

RF Exposure for IC

<u>Maximum peak output power at antenna input terminal (dBm):</u>	<u>22.85</u>
<u>Maximum peak output power at antenna input terminal (mW):</u>	<u>192.7525</u>
<u>Prediction distance (cm):</u>	<u>25</u>
<u>Prediction frequency (MHz):</u>	<u>2412</u>
<u>Maximum Antenna Gain, typical (dBi):</u>	<u>13</u>
<u>Maximum Antenna Gain (numeric):</u>	<u>19.95262</u>
<u>Power density of prediction frequency at 25.0 cm (W/m²):</u>	<u>4.9</u>
<u>FCC MPE limit for uncontrolled exposure at prediction frequency (W/m²):</u>	<u>5.366</u>

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 25 cm is 4.9 W/m². Limit is 5.366 W/m².