

## 4 FCC §15.247 (i), §2.1091 & IC RSS-102 – RF Exposure

### 4.1 Applicable Standard

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 <sup>2</sup> )	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 <sup>2</sup> )	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

Before equipment certification is granted, the procedure of IC RSS-102 must be followed concerning the exposure of humans to RF fields.

According to IC RSS-102 Issue 2 section 4.1, RF limits used for general public will be applied to the EUT.

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m <sup>2</sup> )	Time Averaging (min)
0.003 - 1	280	2.19	-	6
1 - 10	280 / f	2.19 / f	-	6
10 - 30	28	2.19 / f	-	6
30 – 300	28	0.073	2*	6
300 – 1 500	1.585 f <sup>0.5</sup>	0.0042 f <sup>0.5</sup>	f / 150	6
1 500 – 15 000	61.4	0.163	10	6
15 000 – 150 000	61.4	0.163	10	616000/f <sup>1.2</sup>
150 000- 300 000	0.158 f <sup>0.5</sup>	4.21 x 10 <sup>-4</sup> f <sup>0.5</sup>	6.67 x 10 <sup>-5</sup> f	616000/f <sup>1.2</sup>

**Note:** f is frequency in MHz

\* = Power density limit is applicable at frequencies greater than 100 MHz

## 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

For Dipole Antenna:

<u>Maximum peak output power at antenna input terminal (dBm):</u>	20.44
<u>Maximum peak output power at antenna input terminal (mW):</u>	110.6624
<u>Prediction distance (cm):</u>	20
<u>Prediction frequency (MHz):</u>	2412
<u>Maximum Antenna Gain, typical (dBi):</u>	2.0
<u>Maximum Antenna Gain (numeric):</u>	1.584
<u>Power density of prediction frequency at 20.0 cm (mW/cm<sup>2</sup>):</u>	0.034892
<u>Power density of prediction frequency at 20.0 cm (W/m<sup>2</sup>):</u>	0.348923
<u>MPE limit for uncontrolled exposure at prediction frequency (mW/cm<sup>2</sup>):</u>	1.0
<u>MPE limit for uncontrolled exposure at prediction frequency (W/m<sup>2</sup>):</u>	10

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.035 mW/c m<sup>2</sup> (0.35 W/ m<sup>2</sup>).

For PCB Antenna:

<u>Maximum peak output power at antenna input terminal (dBm):</u>	20.44
<u>Maximum peak output power at antenna input terminal (mW):</u>	110.6624
<u>Prediction distance (cm):</u>	20
<u>Prediction frequency (MHz):</u>	2412
<u>Maximum Antenna Gain, typical (dBi):</u>	1.0
<u>Maximum Antenna Gain (numeric):</u>	1.258
<u>Power density of prediction frequency at 20.0 cm (mW/cm<sup>2</sup>):</u>	0.027716
<u>Power density of prediction frequency at 20.0 cm (W/m<sup>2</sup>):</u>	0.27716
<u>MPE limit for uncontrolled exposure at prediction frequency (mW/cm<sup>2</sup>):</u>	1.0
<u>MPE limit for uncontrolled exposure at prediction frequency (W/m<sup>2</sup>):</u>	10

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.028 mW/cm<sup>2</sup> (0. 28 W/ m<sup>2</sup>).