# FCC §15.247(i) & IC RSS §102 - RF Exposure

#### **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.

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	

#### Limits for General Population/Uncontrolled Exposure

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 field.

According to RSS-102 Issue 5 § (2.5.2)

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz<sup>6</sup> and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than  $4.49/f^{0.5}$  W (adjusted for tune-up tolerance), where *f* is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than  $1.31 \times 10^{-2} f^{0.6834}$  W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

## **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 (in appropriate units, e.g. mW/cm<sup>2</sup>);

P = power input to the antenna (in appropriate units, e.g., mW);

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

### **MPE Results**

Maximum tune-up peak output power at antenna input terminal (dBm):	<u>21.0</u>		
Maximum tune-up peak output power at antenna input terminal (mW):			
Prediction distance (cm):	<u>20</u>		
Prediction frequency (MHz):	2437		
Maximum Antenna Gain, typical (dBi):	3.1		
Maximum Antenna Gain (numeric):	2.04		
Power density of prediction frequency at 20.0 cm (mW/cm <sup>2</sup> ):	0.051		
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm <sup>2</sup> ):	<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  $0.051 \text{ mW/cm}^2$ . Limit is  $1.0 \text{ mW/cm}^2$ .

Note: Since 3.1 dBi antenna and 2.5 dBi antenna has same conducted power level, therefore, RF exposure evaluation was based on the highest gain 3.1 dBi.

## **RF** exposure evaluation exemption for IC

The max tune-up peak conducted output power is 21.0 dBm at 2437 MHz and the antenna gain is 3.1 dBi, so the e.i.r.p is 24.1 dBm (0.257W).

Exemption from Routine Evaluation Limit is:  $1.31 \times 10^{-2} f^{0.6834} = 1.31 \times 10^{-2} \times 2412^{0.6834} = 2.68 > 0.257$ 

So the device is compliance exemption from Routine Evaluation Limits -RF exposure Evaluation.

**Result:** The device meets exemption limits at greater than 20 cm distance as a mobile device specified in RSS-102 § 2.5.2.

Note: If the device built into a host as a portable usage, the additional RF exposure evaluation may be required as specified by §2.1093 and RSS-102 § 2.5.1.