

5 FCC §2.1091, FCC §15.247(i) & ISED RSS-102 – RF Exposure

5.1 Applicable Standards

According to FCC §15.247(i), Radio frequency devices operating under the provisions of this part are subject to the radio frequency radiation exposure requirements specified in §§ 1.1307(b), 1.1310, 2.1091, and 2.1093 of this chapter, as appropriate. Applications for equipment authorization of mobile or portable devices operating under this section must contain a statement confirming compliance with these requirements. Technical information showing the basis for this statement must be submitted to the Commission upon request.

According to FCC §2.1091, 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 ISED RSS-102 Issue 6:

Table 7: RF field strength and power density limits for devices used by the general public (uncontrolled environment)

Frequency range (MHz)	Electric field (V _{RMS} /m)	Magnetic field (A _{RMS} /m)	Power density (W/m ²)	Reference period (minutes)
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	$3.142 f^{0.3417}$	$0.008335 f^{0.3417}$	$0.02619 f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000 / f^{1.2}$
150000-300000	$0.158 f^{0.5}$	$4.21 \times 10^{-4} f^{0.5}$	$6.67 \times 10^{-5} f$	$616000 / f^{1.2}$

5.2 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 (in appropriate units, e.g. mW/cm²)

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

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

5.3 MPE Results for FCC

<u>Maximum output power at antenna input terminal (dBm):</u>	<u>19.93</u>
<u>Maximum output power at antenna input terminal (mW):</u>	<u>98.40</u>
<u>Prediction distance (cm):</u>	<u>20</u>
<u>Prediction frequency (MHz):</u>	<u>923.3</u>
<u>Maximum Antenna Gain, typical (dBi):</u>	<u>1.6</u>
<u>Maximum Antenna Gain (numeric):</u>	<u>1.45</u>
<u>Power density of prediction frequency at 20.0 cm (mW/cm²):</u>	<u>0.0283</u>
<u>FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm²):</u>	<u>0.616</u>

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.0283 mW/cm². Limit is 0.616 mW/cm².

5.4 MPE Results for IC

<u>Maximum output power at antenna input terminal (dBm):</u>	<u>19.93</u>
<u>Maximum output power at antenna input terminal (W):</u>	<u>0.0984</u>
<u>Prediction distance (m):</u>	<u>0.20</u>
<u>Prediction frequency (MHz):</u>	<u>923.3</u>
<u>Maximum Antenna Gain, typical (dBi):</u>	<u>1.6</u>
<u>Maximum Antenna Gain (numeric):</u>	<u>1.45</u>
<u>Power density of prediction frequency at 0.20m (W/m²):</u>	<u>0.2831</u>
<u>IC MPE limit for uncontrolled exposure at prediction frequency (W/m²):</u>	<u>2.784</u>

The device is compliant with the requirement IC MPE limit for uncontrolled exposure. The maximum power density at the distance of 0.20m is 0.2831 W/m². Limit is 2.784 W/m².

Note: LoRa (923.3MHz) and BLE radios cannot transmit simultaneously.