

15 FCC §15.247(i), §2.1091 & IC RSS-102 - RF Exposure Information

15.1 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

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 ²)	Averaging Time (Minutes)
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 ^{0.5}	0.0042 f ^{0.5}	f/150	6
1 500-15 000	61.4	0.163	10	6
15 000-150 000	61.4	0.163	10	616000 / f ^{1.2}
150 000-300 000	0.158 f ^{0.5}	4.21 x 10 ⁻⁴ f ^{0.5}	6.67 x 10 ⁻⁵ f	616000 / f ^{1.2}

Note: f is frequency in MHz

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

15.2 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

15.3 MPE Results

1) MPE Calculation of 900 MHz Radio:

<u>Maximum peak output power at antenna input terminal (dBm):</u>	<u>28.49</u>
<u>Maximum peak output power at antenna input terminal (mW):</u>	<u>706.32</u>
<u>Prediction distance (cm):</u>	<u>20</u>
<u>Prediction frequency (MHz):</u>	<u>927.6</u>
<u>Maximum Antenna Gain, typical (dBi):</u>	<u>0</u>
<u>Maximum Antenna Gain (numeric):</u>	<u>1.0</u>
<u>Power density of prediction frequency at 20.0 cm (mW/cm²):</u>	<u>0.141</u>
<u>Power density of prediction frequency at 20.0 cm (W/m²):</u>	<u>1.41</u>
<u>MPE limit for uncontrolled exposure at prediction frequency (mW/cm²):</u>	<u>0.618</u>
<u>MPE limit for uncontrolled exposure at prediction frequency (W/m²):</u>	<u>6.18</u>

2) MPE Calculation of Co-location of 2.4 GHz Wi-Fi & Bluetooth Radio (FCC ID: JUP-76577WFBT):

Radio Type	Operating Frequency (MHz)	MPE Limit	Conducted Power (mW)	Duty Cycle	Antenna Gain (dBi)	Gain (numeric)	Power Density at 20cm (mW/cm ²)	% of MPE	Co-located % of MPE @ 20 cm
900 MHz Radio On									
900 MHz Radio	927.6	0.618	706.32	100%	0	1.0	0.141	22.82	-
900 MHz Radio with 2.4 GHz Wi-Fi Radio on									
2.4 GHz Wi-Fi Radio FCC ID: JUP-76577WFBT	2412	1	74.30	100%	4.0	2.51	0.037	3.7%	26.52
900 MHz Radio with 2.4 GHz BT Radio On									
2.4 GHz FHSS Radio FCC ID: JUP-76577WFBT	2402	1	0.92	100%	4.0	2.51	0.00046	0.046%	22.87
Note: 2.4 GHz Wi-Fi and Bluetooth is a combined radio, Wi-Fi & BT can not transmit simultaneously.									

15.4 Test Result

This device complies with the MPE limit at 20 cm for uncontrolled exposure environment.