12 FCC §90.1217, §2.1091 & IC RSS-102 - RF Exposure Information

12.1 Applicable Standards

According to FCC §90.1217 and §1.1307(b), 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 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)	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$^{0.5}$	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

12.2 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

For 9 dBi gain antenna (worst case: 20 MHz bandwidth, 802.11 a mode High channel=4975 MHz)

Maximum peak output power at antenna input terminal (dBm):	18.76
Maximum peak output power at antenna input terminal (mW):	75.16
Prediction distance (cm):	20
Prediction frequency (MHz):	4975
Maximum Antenna Gain (dB):	9
Maximum Antenna Gain (numeric):	7.94
Power density of prediction frequency at 20 cm (mW/cm^2):	0.12
Power density of prediction frequency at 20 cm (W/m^2):	1.2
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	10

For 28 dBi gain antenna (worst case: 20 MHz bandwidth, 802.11 a mode low channel=4955 MHz)

Maximum peak output power at antenna input terminal (dBm):	0.89
Maximum peak output power at antenna input terminal (mW):	1.23
Prediction distance (cm):	20
Prediction frequency (MHz):	4955
Maximum Antenna Gain (dB):	28
Maximum Antenna Gain (numeric):	630.96
Power density of prediction frequency at 20 cm (mW/cm^2):	0.15
Power density of prediction frequency at 20 cm (W/m^2):	1.5
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	10

Conclusion

The device complies with the MPE requirements by providing a safe separation distance of at least 20 cm between the antenna with 28 and 9 dBi effective gains, including any radiating structure, and any persons when normally operated.