

4 FCC §2.1091 & IC RSS-102 - RF Exposure

4.1 Applicable Standards

FCC §2.1091

(a) Requirements of this section are a consequence of Commission responsibilities under the National Environmental Policy Act to evaluate the environmental significance of its actions. See subpart I of part 1 of this chapter, in particular §1.1307(b).

According to §1.1310 and §2.1091 RF exposure is calculated.

Limits for Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*(900/f ²)	6
30-300	61.4	0.163	1.0	6
300-1500	/	/	f/300	6
1500-100,00	/	/	1	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	842/f	2.19/f	*(180/f ²)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/150	30
1500-100,000	/	/	1	30

f = frequency in MHz

* = Plane-wave equivalent power density

Note 1 to Table 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

Note 2 to Table 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

According to IC RSS-102 Issue 2 section 4.4, RF Field Strength Limits for Controlled Use Devices (Controlled Environment).

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m ²)	Time Averaging (min)
0.003 - 1	600	2.19	-	6
1 - 10	600 / f	4.9 / f	-	6
10 - 30	60	4.9 / f	-	6
30 - 300	60	0.163	10*	6
300 - 1 500	3.54 f ^{0.5}	0.0094f ^{0.5}	f/30	6
1 500 - 15 000	137	0.364	50	6
15 000 - 150 000	137	0.364	50	616000 / f ^{1.2}
150 000- 300 000	0.354f ^{0.5}	9.4 x10 ⁻⁴ f ^{0.5}	3.33 x 10 ⁻⁴ f	616000 / f ^{1.2}

Note: f is frequency in MHz

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

Antenna:

The manufacturer does not specify an antenna. A typical vehicle antenna has a gain of 6 dBi was used with this device. This device has provisions for operation in a vehicle, or a fixed location.

Operating Configuration and exposure conditions:

Device category: Mobile per Part 2.1091

Environment: Controlled Exposure

Typical use qualifies for a maximum duty cycle factor of 50%. The manufacturer also markets this device only for occupation use.

- Vehicle Operation: A typical vehicle installation consists of an antenna system with a coaxial cable of the type RG 58 which has a loss of 1 dB for a length of 15 feet.

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

Maximum peak output power at antenna input terminal (dBm):	<u>37.75</u>
Maximum peak output power at antenna input terminal (mW):	<u>5956.6</u>
Prediction distance (cm):	<u>25</u>
Prediction frequency (MHz):	<u>460.075</u>
Maximum Antenna Gain, typical (dBi):	<u>6.0</u>
Maximum Antenna Gain (numeric):	<u>3.98</u>
Cable Loss (dB):	<u>1.0</u>
Power density of prediction frequency at 25 cm (W/m ²):	<u>11.998</u>
Power density of prediction frequency at 25 cm (mW/cm ²):	<u>1.1998</u>
MPE limit for uncontrolled exposure at prediction frequency (W/m ²):	<u>15.34</u>
MPE limit for uncontrolled exposure at prediction frequency (mW/cm ²):	<u>1.534</u>

Note: The conducted power output is 5.956 watt, the coax loss was taken as 1 dB, and Antenna gain was taken as 6 dBi, 50% talk time in 6 minutes

Conclusion

The device complies with the MPE requirements by providing a safe separation distance of 25 cm between the antenna, including any radiating structure, and any persons when normally operated.

Proposed RF exposure safety information to include in User's Manual:

"FCC RF Exposure Requirements":

CAUTION:

The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This device is approved with emissions having a source-based timeaveraging duty factor not exceeding 50%.

Vehicle – Antenna Installation:

- Antennas used for this transmitter must not exceed an antenna gain of 6 dBi
- For rear deck trunk and roof top installations, the antenna must be located at least 25 cm away from rear-seat passengers and bystanders in order to comply with the FCC RF exposure requirements.

The following label will be mounted in conspicuous view on the radio.

