

# Hardware

## GPS and Pace Makers/Pacemakers

With respect to GPS modules, they are merely receivers operating at two low power radio signals (L1 – Civilian and L2-Military). The civilian frequency is 1575.42 MHz in the UHF band. I am not aware of any documentation/literature where a GPS module's radiated emissions has been shown to cause interference. This is a signal we are all being hit with every day just like music radio signals. GPS units simply receive the broadcasted signal.

In addition to using FCC compliant RADIO and GPS modules, the Marcus Radio Modules have passed FCC Part 15 Class A (Commercial/Industrial/Vehicle) or Class B (Residential/In-home) specifications. Part B is recommended for any consumer product in close proximity to a user's unintentional emission sensitive areas (head/chest) and include cell phones, calculators, radios, computers, mp3 players, etc...

- Coleman GPRS – FCC Part 15 Class A
- MRM Tuna – FCC Part 15 Class A
- MRM Wahoo I/II – FCC Part 15 Class B
- FCC Grant Attached

Our devices also undergo PTCRB (GSM/UMTS Standards Body) certification for the purposes of isolating any unintentional emissions that might interfere with carrier frequencies, towers, communication, etc... These tests are based on our recommended product configuration including antenna placement and proximity to the radio module.

The FDA and the Health Industry Manufacturer's Association (HIMA) specifically recommends a separation of six inches between any handheld wireless radio and a pacemaker. In fact, you will find this caution in Garmin manuals for handhelds with radio receivers/transmitters. Given the prevalence of GPS and mobile phones, it is expect that modern pacemakers are accordingly shielded (see below).

The American Heart Association states:

- "Modern pacemakers have built-in features to protect them from most types of interference produced by other electrical devices you might encounter in your daily routine."
- "Cellphones available in the United States (less than 3 watts) don't seem to damage pulse generators or affect how the pacemaker works. "

The AMA also publishes a list of devices that may interfere with pacemakers. Currently, no GPS handheld or vehicle mounted devices are listed.

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