Embedded antenna frequently asked questions

What are the limitations of an off-the-shelf antenna?

Off-the-shelf antennas are designed to operate in free space without objects in the near field, except perhaps a ground plane if that is a necessary part of the antenna configuration. Operating a free space antenna close by your host components may cause significant detuning and significantly compromise range performance.

The near field is generally defined as wavelength divided by 2 pi, that's about 2cm at 2.4 GHz, 6cm at 868 MHz, 12cm at 433 MHz and so on.

Effective embedded antenna implementation requires the host hardware to be considered an integral part of the antenna design and individual development is required.

A detuned antenna with poor impedance match may cause your radio transmitter and/or receiver to become unstable, reducing system performance and potentially introducing spurious emissions outside of regulatory limits.

I need a custom embedded antenna to minimise the size of my product, how small can it be?

Antenna gain and directional properties directly impact your operational range. In the majority of applications an omnidirectional antenna pattern is desired to provide consistently high performance in all directions.

Gain for an omnidirectional antenna reduces significantly when the element dimensions are less than a quarter of a wavelength. These antennas are often referred to as 'electrically small'.

The minimum dimensions are a trade-off involving less gain and less useable bandwidth. A variety of techniques can be applied to electrically small resonators to provide optimum efficiency and good impedance matching.

Your radio system path budget for a desired operational range can be assessed and minimum dimensions estimated early in the project development. We can help guide the host package design and select the best trade-offs of size and power consumption (transmitter power) for the desired operational range.

PCB mounted chip antennas look very attractive from a space point of view, are they any good?

All embedded antenna designs have trade-offs impacting gain, directional properties, proximity effects, bandwidth and cost. The chip antenna component itself is usually small but requires a very specific and critical PCB layout, space that may have been best utilised for an alternative antenna configuration.

The chip antenna application note layout may occupy more PCB area than a trace only custom antenna offering significantly better performance and much lower cost.

Our product uses an 868 / 915 MHz short range radio and a GSM module. We failed regulatory tests for spurious emissions. What solutions are available?

Intermodulation and harmonic products may be produced when two radio modules are operated in close proximity. New radio frequencies can be generated that are not present when either module is operated individually.

Once the problem has been identified, solutions can be found by controlling the isolation between each antenna and in some cases introducing additional filters in the antenna feeder. We are equipped to accurately measure spurious emissions to 10 GHz.

We see large variations in operational range from one location to another. Can this be improved with a change of antenna?

A change may help if the existing antenna is susceptible to the user environment in some way. For example a very high Q antenna may be detuned by operation in close proximity to metal foil backed plaster board.

The most common explanation is that radio activity in other bands is blocking your product to some degree. Radio module receiver specifications vary tremendously in regards to their ability to reject out-of-band signals.

Our radio module, system and antenna design experience make us well placed to help diagnose the problem and identify the most appropriate remedial solutions.

We have problems with a radio module transmitter interfering with our product. Can you help?

Digital modulation schemes used by modules in close proximity to your product may cause EMC immunity issues. Local field strengths inside your product, particularly from co-located GSM modules/antenna, far exceed regulatory performance limits. Products with audio paths can be particularly troublesome.

We have test capability and experience in remedial development when dealing with RF immunity problems.

What are the advantages of using your services?

Module vendors and antenna manufacturers may offer sound advice in general but are naturally constrained by their product offerings.

We offer you a fully independent view with the benefit of over 30 years of radio and embedded antenna design and development.

We are hands-on engineers. We may use simulation tools where appropriate, but the bulk of our antenna development is carried out on the bench.

We place a breadboard antenna under development into a sample of your product at the earliest opportunity. If a prototype isn't available yet, we configure a hardware model that offers a similar environment for the antenna. This provides rapid progress with the minimum of unwelcome surprises.

Where possible, we provide a fixed proposal against agreed deliverables and timescales.

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