Another EMC resource
from EMC Standards

Integrating wireless modules Taster

Helping you solve your EMC problems

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Module 16: Integrating wireless modules (transmitters and receivers) into products

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The 'radio module' discussed here…

- Could be a separate module, plugged or soldered onto the main PCB (or connected using wires)…
  - or plugged into a product connector, e.g. a PCMCIA or 'USB stick' radio module
- Or it could be an area of a PCB that has been dedicated to the radio functions
- Those of you who are radio designers will know a great deal more about radio than the presenter…
  - but this training course concerns EMC

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16. Integrating wireless modules
(transmitters and receivers) into products

16.1
'Internal EMC' and adding radio modules

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'Internal EMC'

- The radio module and the rest of the product must not interfere with each other…
  - similar issues as for "external" EMC, but the close proximity makes 'near-field' interference more likely
- The internal EMC problems that arise when adding a radio module to a product are…
  - a radio transmitter (TX) is a 'noisy' device, so can easily interfere with the rest of the product…
  - a radio receiver (RX) is a sensitive device, and can easily suffer interference from the emissions from the product

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16. Integrating wireless modules (transmitters and receivers) into products

16.2

Threats from radio module, to other circuits

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Threats *from* the radio module to the rest of the product

('traditional' narrowband radio systems considered in this section)

- **The TX may only be outputting a few tens or hundreds of milliwatts…**
  - **but close to its antenna the field strength can be very high, possibly as much as 100V/m or 100A/m…**
  - **partly caused by the intense near-fields within one-sixth of a wavelength (λ/6) distance…**
    - **e.g. < 56mm at 900MHz, < 28mm at 1.8GHz, <20mm at 2.5GHz…**
    - **e.g. a 10mW Bluetooth transmitter can inject 40mA at 2.5GHz into a wire or trace very close to its antenna**

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Threats *from* the radio module to the rest of the product continued…

- **Whip antennas use the product's 'ground structure' as their counterpoise…**
  - **essentially the other half of a dipole antenna…**
  - **so strongly interfering RF currents, voltages and fields can be created in other locations…**
  - **depending upon the product's design and PCB layout…**
    - **a product without a fully shielded enclosure will probably require a large unbroken 0V plane**
- **Loop antennas don't have a counterpoise, but can create strong fields nearby**

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