



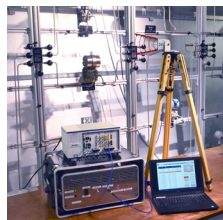
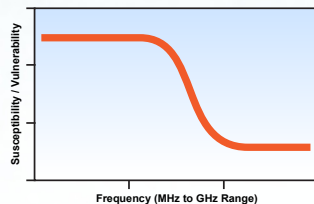
IMPLEMENTATION OF WIRELESS TECHNOLOGIES

Are Exclusion Zones Enough?

A major concern preventing the implementation and use of wireless devices, especially mobile devices in the nuclear industry, is electromagnetic interference (EMI). EMI can have a direct impact on the safe and reliable operation of a nuclear power reactor. The vulnerability of plant equipment to EMI and the unknown threat of malfunction because of wireless devices should be investigated prior to the implementation of wireless technologies.

The traditional method of relying upon exclusion zones for protection may be too constraining to realize the full benefits that wireless technologies have to offer. AMS has developed a comprehensive approach to addressing the EMI concerns of wireless devices consisting of:

1. Walkdowns of sensitive I&C equipment to verify good EMC practices have been followed during their installation,
2. Review of available site documentation associated with plant equipment, EMI operating experience, and wireless devices to identify potential areas of concern,
3. Determination of exclusion zone distances based upon industry guidance and/or laboratory guidance,
4. Characterization of the plant's electromagnetic environment to identify existing RF levels, and
5. In-situ immunity testing of plant equipment to determine its vulnerability to wireless signals.



Wireless Device	Distance (Feet)
iPad	8
Cell Phone	9
Laptop Computer	3
Wireless Dosimeter	1
Wireless Vibration Sensor	2
Walkie Talkie	13

The information gathered from the evaluation and testing of wireless devices and plant equipment will culminate in the justification necessary for nuclear power plants to fully realize the benefits that wireless technology can offer.

Evaluation/Testing Approaches

Walk Down and Evaluation of Critical Equipment for Vulnerability to Wireless

- Location of critical equipment with regard to the use of mobile and fixed wireless devices
- Review of shielding, grounding, and cable routing practices

Evaluation of EMC Test Reports for Immunity to Wireless

- Determine the level and frequency of radiated susceptibility testing that may have been performed on the equipment
- Evaluate the radiated emissions from the equipment
- Compare the equipment configuration during testing with the plant installation

Exclusion Distance Determination

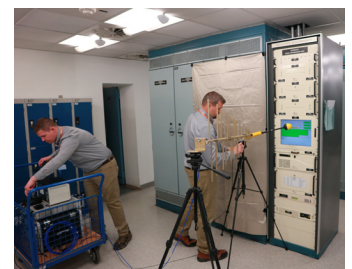
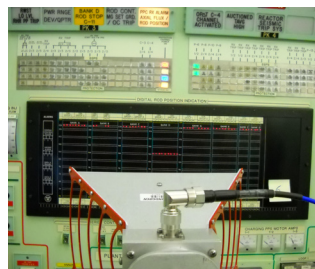
- Develop based on guidance from EPRI TR-102323 Rev4 and NRC Reg Guide 1.180 Rev1
- Evaluation of mobile versus fixed devices
- Distance calculations based upon transmitter and antenna properties
- Testing of transmitters for measured performance at the site or in a laboratory environment

Site Mapping to Identify Vulnerability to Wireless Signals

- Determine the existing level of RF in the plant
- Identify potential equipment which may be susceptible to wireless signals

Susceptibility Testing of Equipment to Wireless Transmitters

- Test representative equipment in a training center or simulator for susceptibility
- Test plant equipment in-situ during an outage to determine its threshold and vulnerability to wireless signals
- Establish exclusion zones based upon the results of the testing or determine modifications necessary to improve the equipment's susceptibility



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10CFR50 Appendix B Program

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