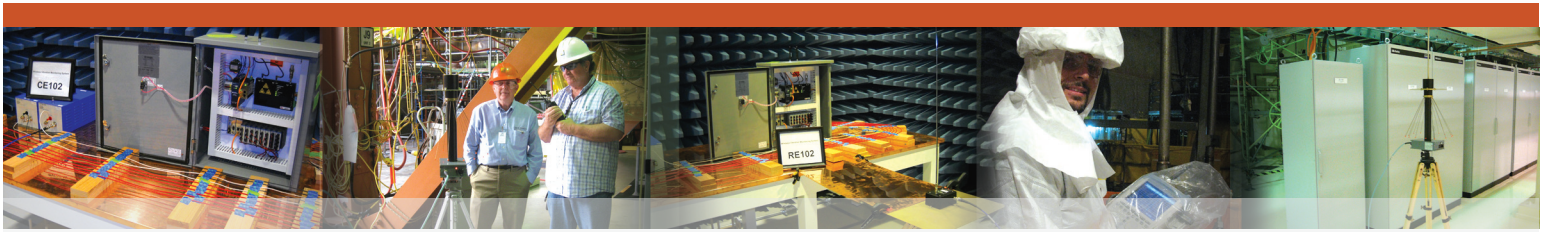




IMPLEMENTATION OF WIRELESS TECHNOLOGIES

What are the Electromagnetic Compatibility (EMC) Considerations?



Are Exclusion Zones Enough?

The use of wireless technologies has become widespread for a number of applications. This technology is even finding its way into nuclear power where it provides enormous potential for improving the productivity, efficiency, and safety of plant activities and processes. Wireless technology can and has been used to some extent in nuclear power reactors for applications such as voice communication (radios), pager networks, Wi-Fi network connectivity, wireless video cameras, equipment condition monitoring, radiation monitoring, and asset tracking.

There are numerous factors which affect the adoption of wireless technologies within the nuclear industry including social acceptance, costs, and security. Another major concern preventing the implementation and use of wireless devices, especially mobile devices, is electromagnetic interference (EMI). EMI can have a direct impact on the safe and reliable operation of a nuclear power reactor. The vulnerability to EMI of plant equipment 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 provides a number of methods to assist nuclear power plants in justifying the use of wireless technologies for numerous applications while providing better flexibility for its use. For existing plant equipment, it may take a combination of visual inspections, EME characterizations, and immunity testing of select equipment to gather the level of confidence necessary to allow the use of wireless devices. As a last resort, exclusion zones can be implemented to protect sensitive equipment and minimize the risk to the safe and reliable operation of the plant.

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

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

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

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*** 10CFR50 Appendix B Program**