Electromagnetic Compatibility

Oklahoma State University has developed a national reputation for state-of-art EMC analytical facilities

Introduction:

With the prolific use of wireless, broadband and other equipment that are sources of electromagnetic interference, research into critical systems vulnerable to interference or damage is a growing priority. Oklahoma State University is already a national leader in research and analysis of electromagnetic compatibility (EMC) standards widely used by private industry, government agencies and the military.

Definition:

EMC is the area of electrical engineering concerned with designing equipment with the ability to operate within certain standards without creating electromagnetic emissions that interfere with, or even damage, other equipment and systems. Examples of systems that can be vulnerable to electromagnetic interference include aviation and satellites, manufacturing, communications, and power transmission. A key concern is also the deliberate use of electromagnetic pulses or interference to damage systems such as the power grid.

Currently at OSU:

The School of Electrical and Computer Engineering has developed electromagnetic simulation and analysis facilities at its Richmond Hill Research Complex. The Robust Electromagnetic Field Testing and Simulation Laboratory features cutting-edge test facilities unique among academia in the United States. These facilities include a large reverberation chamber and an adjacent anechoic chamber. The reverberation chamber is designed to expose equipment to electromagnetic radiation to measure impact and measure energy produced by devices. Researchers also use the reverberation chamber to train engineers from all over the world and across the United States on how to utilize these highly specialized facilities and tools. A variety of U.S. military personnel, including those from the Naval Surface Warfare Center, frequently avail themselves of this training. Because of the advanced capabilities of these facilities, the laboratory is also used by a number of other outside organizations including NASA, the National Science Foundation, the Federal Aviation Administration, and companies like Boeing and a major equipment manufacturer, Ditch Witch. These OSU ex-

OSU students prepare an unmanned aerial vehicle for testing in the Robust Electromagnetic Field Testing and Simulation Laboratory at the Richmond Hill Research Complex. They are working in the facility's reverbertion chamber.

"How do you know when it fails? The tricky thing about electromagnetic compatibility faults is they leave no trace. You can't go in and see where something burned up."

- Chuck Bunting, Ph.D., School of Electrical and Computer Engineering

perts are also known for their advanced simulation methodologies that are used by organizations to calculate how much electromagnetic radiation is produced by or affects a device. Measurements from simulations are validated in the chambers, providing precise data.

Potential:

Increased use of ever more powerful equipment with the potential to produce electromagnetic interference is boosting the need to test and analyze these systems to ensure they meet standards of electromagnetic compatibility. Analyzing the vulnerability of critical systems, such as for aviation and spaceflight, is essential for safe and reliable operation. With the proliferation of unmanned aerial systems, the REFTAS testing facilities are increasingly being used to test UAV exposure to electromagnetic energy, which may interfere with flight controls. Another key concern is the vulnerability of basic national assets to unintentional or deliberate impacts of electromagnetic radiation. Power grids, the banking system, and GPS systems are only a few of the potentially vulnerable assets. EMC-related issues include the effects of electromagnetic energy on appliances connected to the Internet and the operation of driverless vehicles. The susceptibility to interference of such new technology is only now being examined. With existing expertise and advanced testing and analytical equipment for electromagnetic radiation, OSU's team will continue to attract national groups needing to design, improve, and protect equipment to operate effectively and in compliance with electromagnetic compatibility standards.

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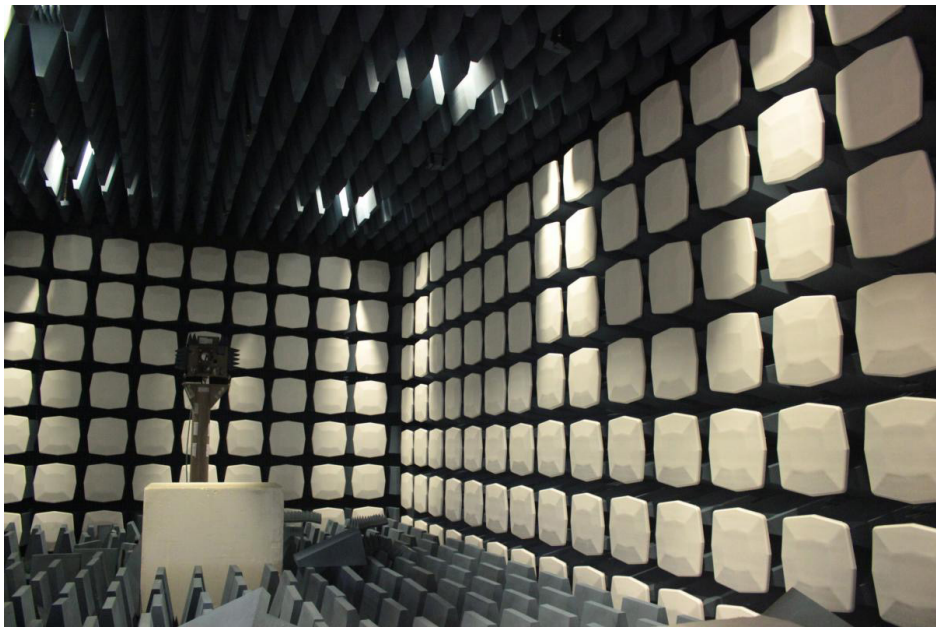

The chamber in the Robust Electromagnetic Field Testing and Simulation Laboratory (REFTAS) determines the directional emissions spectrum from a variety of equipment and systems including unmanned aerial systems and their sensors.

OKLAHOMA STATE UNIVERSITY
REFTAS
ROBUST ELECTROMAGNETIC FIELD TESTING AND SIMULATION LABORATORY

Conclusion:

Although electromagnetic energy has been a part of our industrial world for as long as there have been electric motors, today interference causes wide-ranging problems for evermore sensitive equipment and instruments. Facilities and experts at OSU's Richmond Hill Research Complex provide a national clientele with analytical tools to meet their needs, while OSU engineers conduct basic and applied research to advance the science.

For more information, contact the OSU Vice President for Research at vpr@okstate.edu or 405-744-6501.