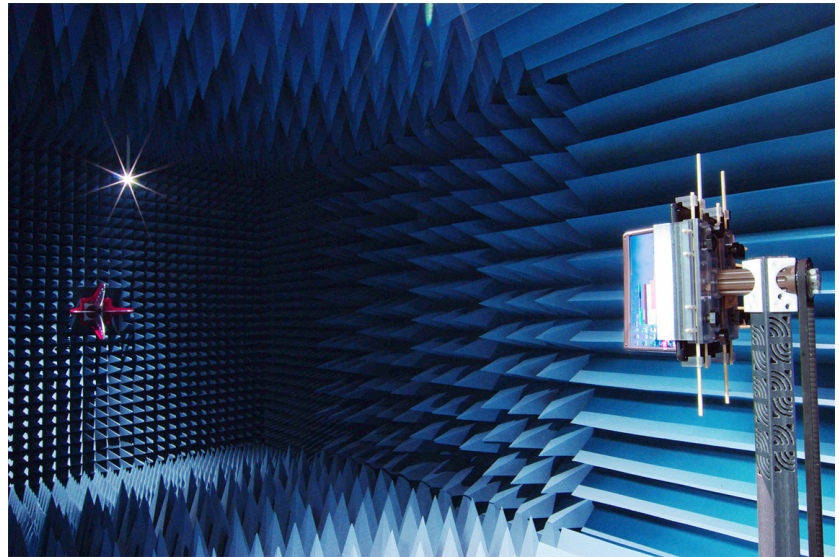


# Gonzaga University Smart Antenna and Radio Lab

**Gonzaga University** received a \$1.1 million grant from the National Science Foundation to build a new Smart Antenna and Radio Lab (SARL). The lab will be used to perform research related to more reliable and secure high-bandwidth wireless communications. This research is expected to result in improved communications for first responder emergency personnel and lead to innovations for “SmartGrid” energy and natural resource management. Ultimately, the new lab will create jobs through industry/university cooperative technology development. By providing access to its state-of-the-art lab, Gonzaga’s SARL will provide the resources for companies to perform research leading to new products and services.



*An ETS-Lindgren Model AMS-8100 Chamber*

To achieve Gonzaga’s research goals for the SARL, ETS-Lindgren provided a Model AMS-8100, a general-purpose RF-shielded anechoic chamber test system designed for antenna pattern testing and Over-The-Air (OTA) radio performance characterization. Included are low directivity communication antennas for a variety of devices, such as Wi-Fi interfaces and mobile handsets. The chamber was customized to meet Gonzaga’s specific research goal to focus on maximizing antenna and radio performance during the product development phase of a wireless device. One of the chamber design goals was to provide Gonzaga with the capability to perform pre-compliance EMC testing.

Key features of the chamber include a MAPS<sup>™</sup> multi-axis positioner and EMQuest<sup>™</sup> software for performing automated 3D antenna radiation pattern measurement and analysis. For maximum test flexibility, the chamber’s inherent 400 MHz to 6 GHz frequency range can be scaled above

and below these frequencies with a full suite of parametric 3D electromagnetic simulation tools. To optimize safety and productivity in the SARL, the chamber was positioned within a .38 m (5”) raised floor that allows cabling to be run outside of the chamber environment, but underneath the footprint of lab personnel.

### Wireless Test System Technical Specifications

- Customized Model AMS-8100 Antenna Measurement System with nominal interior shield dimensions of 3 m W x 5.5 m L x 3 m H (10’ x 18’ x 10’-3”).
- Constructed of Series-81 RF-shielded modular panels.
- Provides far-field measurements at a separation distance of approximately 3.7 m (12’).
- Series 201 RF shielded manually operated door, 1.2 m x 2.1 m (4’ x 7’), with recessed contact mechanism closure.

- Supports a Device under Test (DUT) measuring up to .3 m x .4 m x .6 m (1’ x 1’-6” x 2’) and weighing up to approximately 22 kg. (50 lbs).
- Includes a dielectric floor underlayment at 3 mm (1/8”) thick with a 6 mil polyethylene vapor barrier.
- EMQuest<sup>™</sup> EMQ-100 Antenna Pattern Measurement Software provided with three drivers.
- Configured to perform antenna measurements using a Vector Network Analyzer (VNA). With the VNA, Gonzaga can measure both amplitude and phase with a single phase-locked instrument.

### Accessories

- Model 3164-06 open boundary quad-ridged horn antenna with 300 MHz to 6 GHz performance.
- Model 3102 conical log spiral antenna with 1 GHz to 10 GHz performance.

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- Dual line, UL listed 2 x 30 amps, 50/60 Hz power line filters.
- Model 2115 medium duty and Model 2020 heavy duty multi-axis positioners with turntable, removable mast, motor drives, rotary joint and fiber-optic interface to the controller.
- 2090-OPT1 Multi-Device Positioning controller with four (4) integral RF switches.
- Waveguide air vents treated with filter foam/vent absorber, 305 mm x 305 mm (12" x 12").
- 12" x 18" (305 mm x 457 mm) connector panel fitted with SMA and N-type connectors, an Ethernet RJ45 to fiber optic media converter as well as an ether-foil 10/100 Ethernet EMI/RFI filter.
- Five beam laser with tripod for leveling the Multi-Axis Positioning System (MAPS).
- Fiber optic lighting with eight (8) light feeds.
- RF cables.

## RF Shielded Chamber Performance

- 100 dB at 200 kHz – Magnetic field
- 100 dB from 200 kHz to 50 MHz – Electric field
- 100 dB from 50 MHz to 10 GHz – Plane Wave and Microwave

## Anechoic Absorber Treatment

Anechoic treatment of the chamber includes 100% coverage of all wall and ceiling surfaces in addition to the floor. ETS-Lindgren's unique engineering and manufacturing process ensures excellent agreement between computed and measured performance. This excellent agreement has been documented

between predicted performance and actual measured data.

ETS-Lindgren is the only absorber manufacturer that tests every piece of absorber it manufactures. Each piece of absorber is tested per IEEE Standard 1128-1998. ETS-Lindgren verifies the material performance in the range of 30 MHz to 18 GHz utilizing a coaxial vertical reflectometer (30 to 1000 MHz) and an NRL arch (1 to 18 GHz). The fire retardant composition is tested in accordance with industry standards such as NRL Report 8093 (Tests 1, 2 and 3), UL 94 HBF, and others.

The absorber provided was manufactured and tested at ETS-Lindgren's 120,000 sq ft (11,148 sq m) manufacturing facility in Durant, Oklahoma - the world's largest - capable of producing over 10.5 million board feet of absorber per year.

## Gonzaga AMS-8100 Chamber Features

- Model EHP-24PCL 24" pyramidal microwave absorber and EHP-24WGCL 24" wedge microwave material on sidewalls.
- Model EHP-18PCL 18" on the transmit and receive walls as well as ceiling and floor.
- Model EHP-18WGCL 18" wedge microwave absorber for partial coverage on ceiling and floor.

## Integration and Training

To facilitate immediate use of the test chamber, ETS-Lindgren integrated the complete AMS-8100 test system. Training of Gonzaga University personnel on the use of the EMQuest™ EMQ-100 software was also provided.

## About ETS-Lindgren

ETS-Lindgren is an international manufacturer of components and systems that measure, shield, and control electromagnetic and acoustic energy. The company's products are used for electromagnetic compatibility (EMC), microwave, wireless and Magnetic Resonance Imaging (MRI) testing, electromagnetic field (EMF) measurement, radio frequency (RF) personal safety monitoring, and control of acoustic environments. Headquartered in Cedar Park, Texas, ETS-Lindgren has manufacturing facilities in North America, Europe and Asia.

The company is a wholly owned subsidiary of ESCO Technologies, a leading supplier of engineered products for growing industrial and commercial markets. ESCO is a New York Stock Exchange listed company (symbol ESE) with headquarters in St. Louis, Missouri.

Additional information is available at [www.ets-lindgren.com](http://www.ets-lindgren.com). Additional information about ESCO and its subsidiaries is available at [www.escotechnologies.com](http://www.escotechnologies.com).