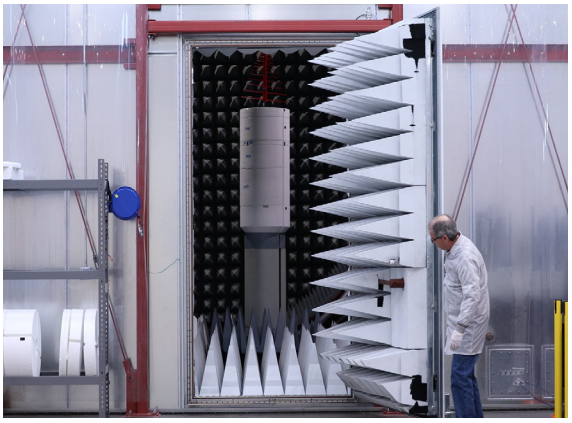
CASE STUDY ANTENNA TEST CHAMBER FOR REDWIRE SPACE - LONGMONT, COLORADO



Redwire Space, a leader in space infrastructure and satellite communications, required a highly specialized Antenna Pattern Measurement (APM) Chamber for testing helix antennas at its Longmont, Colorado facility. ETS-Lindgren was selected to design, manufacture, and install a Spherical Near-Field Scanner Anechoic Chamber that would provide a precise RF-shielded, anechoic environment for accurate antenna characterization. The project demanded a solution that would eliminate external RF interference, support various test configurations, and seamlessly integrate with Redwire's existing RF test instrumentation and software infrastructure. In addition, ensuring ease of use and repeatability in measurements was of paramount importance.

Chamber Overview

ETS-Lindgren delivered a customized anechoic chamber carefully engineered to provide both flexibility and high performance for a variety of testing needs.

RF-Shielded Room & Structural Design

- Interior dimensions: 6.05 m L × 6.05 m W × 6.71 m H (19 ft L × 19 ft W × 22 ft H) with the option for further expansion.
- Seismically rated structure to comply with local building codes.
- RF-shielded access door (RFD-100-F/A) with pneumatic assist for secure and reliable entry.

Ventilation & Environmental Control

- Waveguide air vents (24" x 24") with honeycomb filtering to maintain airflow while preserving RF integrity.
- Integrated with facility HVAC systems to ensure stable temperature and humidity control, supporting a consistent test environment.

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- Dual-line, UL-listed power line filters (2x30A, 50/60 Hz) to eliminate electrical interference and maintain clean power for testing.
- Dedicated grounding system to ensure stable electrical performance.
- LED lighting system provides clear visibility without disrupting RF performance.

This comprehensive design ensures that the chamber meets the highest standards for shielding, environmental control, and electrical stability, providing an ideal environment for precise and accurate testing.

Anechoic Absorber Materials

To create a reflection-free test environment, ETS-Lindgren integrated high-performance anechoic materials throughout the chamber. These materials were strategically positioned to maximize signal attenuation while minimizing interference from reflections.

- For superior signal attenuation, ETS-Lindgren utilized EHP-18PCL and EHP-24PCL pyramidal microwave absorbers on the walls and ceiling. These absorbers were designed to reduce signal reflections, maintaining the integrity of the testing process and ensuring accurate measurements.
- FlexSorb™ coated absorbers were placed strategically on the floor to eliminate reflections and provide a clear, defined test path. These high-performance absorbers helped ensure that signals remained uncontaminated by floor-based interference, enhancing the reliability of the test results.
- To accommodate a variety of testing scenarios, the absorbers were designed for easy repositioning. This adaptability allowed the chamber to be quickly adjusted to meet the needs of different tests, optimizing both the efficiency and versatility of the testing environment.

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This integration of advanced anechoic materials played a critical role in optimizing the chamber's performance, ensuring an ideal environment for accurate and repeatable measurements.

Anechoic Absorber Materials

ETS-Lindgren executed a comprehensive integration and validation process to ensure full functionality and compliance with Redwire's requirements.

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- Conducted RF shielding effectiveness tests in accordance with MIL-STD-285 / IEEE-299 standards.
- Validated shielding performance to ensure minimal electromagnetic interference.

The ETS-Lingren team proceeded to install and calibrate positioners, antennas, and network analyzer components, integrating a laser alignment system for precise EUT placement. Communication interfaces, including GPIB, Ethernet, and RF cabling, were configured to ensure seamless data transfer. On-site tests confirmed the chamber met all performance benchmarks, ensuring optimal functionality.

Finally, ETS-Lindgren provided hands-on training for Redwire engineers on EMQuest™ software operation to ensure efficient test execution. The training covered test sequence automation and optimization for repeatable measurements, as well as report generation and data analysis to streamline workflows and enhance overall efficiency.

Project Impact

With the completion of the Antenna Pattern Measurement Chamber, Redwire Space now has a state-of-the-art RF testing facility for precise antenna measurements. The expanded measurement arc, optimized positioning system, and advanced RF instrumentation enhance testing flexibility and efficiency.

ETS-Lindgren's expertise in engineering and installation ensured the project was delivered on time and within scope. The chamber's robust shielding, high-performance absorbers, and precision measurement capabilities position Redwire for success in next-generation space communications.

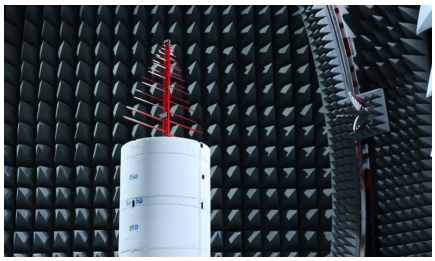
Additionally, Redwire Space recently featured the chamber in its Austin Explains series, highlighting its significance in the company's advancements and innovative work. You can check out the post here.

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 and wireless testing, electromagnetic field (EMF) measurement, radio frequency (RF) personal safety monitoring, magnetic resonance imaging (MRI), and control of acoustic environments.

Headquartered in Cedar Park, Texas, ETS-Lindgren has manufacturing facilities in North America, Europe, and Asia. Additional information about ETS-Lindgren is available at www.ets-lindgren. com. Additional information about ETS-Lindgren's parent company ESCO and its subsidiaries is available at www. escotechnologies.com.

(Image of Positioner and Arc in Redwire Space Longmont)



(Image of the Absorber in Redwire Space in Longmont)