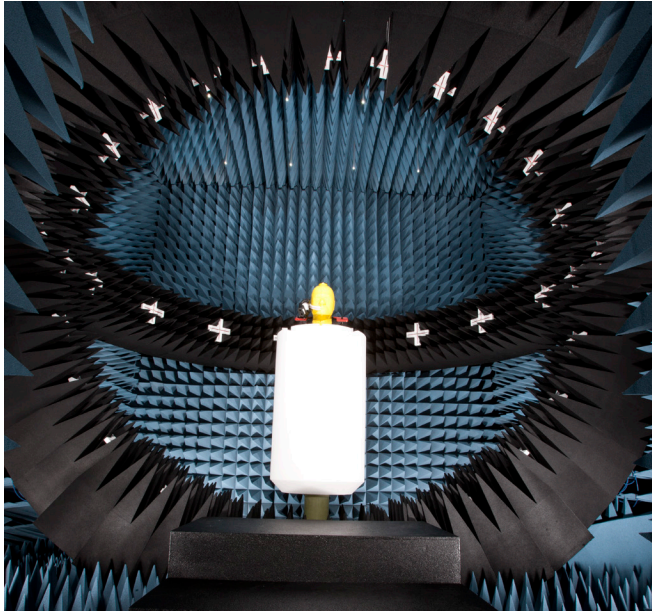


WIRELESS TEST SYSTEMS MIMO OVER-THE-AIR (OTA) TEST SYSTEM



ETS-Lindgren's Model AMS-8700 MIMO Test System (Horizontal Array).
Shown with Optional AMS-8900 APM (Vertical Array).

MODEL AMS-8700

- For LTE and 802.11n MIMO Testing
- Supports Testing per CTIA Test Plan for 2x2 Downlink MIMO Transmit Diversity Over-the-Air Performance Version 1.0
- Acceptance for Evaluation of Receive Diversity
- Complete RF Environment Simulation
- Supports Single Cluster, Multiple Cluster and Uniform Models
- Supports Variable Angles of Arrival, Doppler and Delay Spread
- Multiple Patents for Over-the-Air Testing and Environmental Simulation:
 - Patent Number 20080056340 "Systems and Methods for OTA Performance Testing of Wireless Devices with Multiple Antennas"
 - Patent Number 20080305754 "Systems and Methods for OTA Performance Testing of Wireless Devices"

The antenna array transmits downlink signals from a range of angles of arrival (AoA) simulating the scattered reflections seen by a wireless device in normal operation. The spatial channel emulator uses specially modified spatial channel models to feed each antenna in the array with a statistical sampling of the source signal(s) with appropriate Doppler and delay spreads to emulate the scattering effect of fixed and moving objects within the simulated environment. A positioning system allows the wireless device under test (DUT) to be rotated through the generated field structure to determine its relative performance in different orientations within the simulated environment.

ETS-Lindgren's EMQuest EMQ-108 MIMO OTA Test Option adds a suite of test capabilities to the EMQuest EMQ-100 Antenna Measurement Software. These include specialized tests for evaluating the throughput of a wireless device in the simulated environment, as well as R&D tests to allow evaluation of antenna correlation, along with system calibration and validation tests.

ETS-Lindgren's MIMO OTA Test Systems offer repeatable measurement of radiated performance of wireless devices in a simulated multi-path environment. The system acts as an RF environment simulator that can generate spatial field structures similar to those seen in a wide range of real-world scenarios. Standard conducted channel models can be adapted to equivalent radiated spatial channel models for evaluation of the entire device signal chain, including antennas, device platform, and near field phantom (head, hands, etc.) impact on device performance. The simulated environment is suitable for evaluation of downlink MIMO performance for wireless technologies such as LTE and 802.11n Wi-Fi as well as receive diversity performance of existing wireless technologies per CTIA Test Plan for 2x2 Downlink MIMO and transmit Diversity Over-the-Air Performance Version 1.0.

The system consists of a dual polarized antenna array in an absorber lined fully-anechoic chamber connected to technology specific communication test equipment through a spatial channel emulator. The anechoic chamber provides isolation from interference and reflections in the real-world environment and eliminates unwanted reflections within the test environment.

The baseline system configuration provides a simulated environment suitable for testing typical wireless handsets. Optional configurations are available to increase the uncorrelated test volume. Optional system components add support for antenna pattern measurement and traditional SISO Total Radiated Power (TRP) and Total Isotropic Sensitivity (TIS) testing of wireless devices. An optional theta axis array for antenna pattern measurement and TRP/TIS testing is available.

In 2002, ETS-Lindgren designed and installed the industry's first CTIA Authorized Test Lab (CATL). ETS-Lindgren continues to be leaders in wireless testing with patents on:

- Systems and Methods for OTA Testing of Wireless Systems
- Systems and Methods for OTA Performance Testing of Wireless Devices with Multiple Antennas
- Systems and Methods for Simulating a Multipath Radio frequency Environment

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Baseline Configuration

- Design and Fabricate RF-shielded Enclosure, Nominal Dimensions: 4.9 m (16 ft) x 4.9 m (16 ft) x 3.0 m (10 ft)
- Installation of the Enclosure, Absorber, and System Components
- One Single-leaf, Manually Operated RF-shielded Personnel Door
- Waveguide Vents, Nominal Dimensions 30 cm (12 in) x 30 cm (12 in)
- 50/60 Hz Power-line Filters for EUT, Convenience Outlet and Positioner
- Fiber Optic Light Fixtures
- Connector Panels, Nominal Dimensions 30 cm (12 in) x 30 cm (12 in)
 - N-type Connectors
 - SMA Connectors
 - Fiber Optic Connectors
- Microwave Absorber on all Chamber Surfaces
- MIMO Antenna Structure with 8 Dual-polarized Environment Simulation Antennas
- Communication Antennas
- Cabling, Connectors and Other Integration Items
- 8-port Power Amplifier
- Medium-duty MAPS Positioner
- Laptop Mount for Medium-duty MAPS
- Light-duty Mast for Testing Handsets
- CTIA Ripple Calibration Antenna Mount Kit
- CTIA Ripple Calibration RF-cable Mount Kit
- EMQuest™ EMQ-100 Antenna Pattern Measurement Software
- EMQuest EMQ-108 MIMO OTA Test Package, Includes Throughput Testing Capabilities (Customer Provides Throughput Measurement Package, i.e. IxChariot™, Supported by EMQuest)
- System Control PC with Windows® Software
- Shield Verification Test at 1 GHz per MIL-STD 285/IEEE-299
- Integration of the Test System Components and Training of Lab Personnel on the Use of System
- Warranty per ETS-Lindgren's Standard Warranty for Wireless Chambers and Associated Equipment

Options

- 16 Dual-polarized Antenna Array Upgrade
- High-speed SISO Testing Upgrade
- Optional SAM Mounting Kits
- Optional Precision Sleeve Dipoles
- Optional Equipment Drivers
- Optional EMQuest Software Expansion Packages