CASE STUDY INTEL BANGALORE BOOSTS IN-HOUSE ACOUSTIC AND EMC TEST CAPABILITIES – BANGALORE, INDIA

When Intel in Bangalore, India wanted to increase their in-house test capabilities, they turned to the experts in acoustic and EMC test chambers – ETS-Lindgren Engineering India Pvt.Ltd, also located in Bangalore.For acoustic testing, two Custom Anechoic Acoustic Chambers were designed for Precision-Grade Audio and Acoustic Research Measurements per ISO 3745, ANSI S12.35 and S12.55. These chambers provide a precision-grade free field environment used to measure sound source directivity, frequency response, and noise emissions from spherically radiating sound sources. For EMC testing, a SpaceSaver™ 26H EMC Test System was designed for compliant radiated and conducted immunity measurements to international telecom EMC test standards. The integrated Measurement System is designed to support radiated emission, conducted emission and spurious emission measurements.

Custom Anechoic Acoustic Chamber

The baseline chamber design provides a 217 Hz cutoff and is well equipped to perform precision-grade testing of small equipment. The chamber is based on a custom design to meet Intel's specific test requirements

Technical Specifications

- Acoustic chamber with interior working area of 2.032m x 2.032 m x 1.88 m (6 ft 8 in x 6 ft 8 in x 6 ft 2 in) and overall dimensions (excluding ventilation silencers) of 3.05 m x 3.05m x 3.00 m (10 ft x 10 ft x 9 ft 10 in).
- SoundSecure™ acoustic wall and ceiling panels (Model AS-A508) are 20.3 cm (8 in) thick, fabricated of 16-gauge steel exterior panel surface and 22-gauge (>23% open) perforated steel inner panel surface.
- Panels are filled with a sound absorbing insulation material and 2.5 cm (1 in) gypsum bonded to the inside of the outer surface.
- The chamber features a vibration isolated floor system (Model AS-A508FPH). It is isolated from the parent building floor on a 20.3cm (8 in) panelized steel floor system. This system consists of structural steel channels set on isolation rails. The inner surface is fabricated of 11-guage perforated steel.
- Floor panels are filled with a sound absorbing insulation material and 2.5cm (1 in) gypsum bonded to the inside of the outer surface. The panel's underside is fabricated of 16-gauge solid steel. The natural frequency of this isolation system is <10 Hz.
- A grated walking surface is installed on pedestals above the floor absorber.

Chamber Access

- 0.91 m x 2.13 m (3 ft x 7 ft) single-leaf outward-swinging acoustic personnel door mounted on durable cam-lift hinges. Door is magnetically sealed and includes entry/exit handles and push plates.
- Includes an interior wedge door designed with a unique parallel arm to minimize swing radius and interference within the chamber.

Acoustic Absorber

- Full wall, ceiling and floor coverage with 30.5cm (12 in) deep melamine acoustic wedges in a light gray finish resulting in a clean, bright test environment. The wedges are very durable against day-to-day use typical in a precision grade laboratory test environment.
- Melamine is an open-celled foam product which provides excellent sound absorption in a fiber-free environment. It carries a Class A Fire Rating as tested in accordance with ASTM E84.
- Wedges are installed in 0.61 m x 0.61 m (2 ft x 2 ft) wedge banks with an alternating tip orientation using an ETS-Lindgren patented clip system which facilitates easy wedge removal and replacement in the case of damage to the material.

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Grated Working Surface

- The grated working surface is constructed using 3.8cm (1.5 in) thick fiberglass grating sections with 5.1 cm x 5.1 cm (2 in x 2 in) open spaces.
- The grating rests on pedestals placed accordingly to provide a load rating of 40.88 kg per sq m (200 lbs per sq ft).
- Fiberglass grating was shipped in cut sections to fit the interior configuration from wedge tip to wedge tip on all four sides.
- Grating elevation is approximately 5.1 cm (2 in) above the floor absorber wedge tips.
- Space Saver™ 26H EMC Chamber and Test System

The system is integrated with an ETS-Lindgren SpaceSaver™ 26H EMC chamber, providing an environment to support the testing required by Intel Corporation.

Technical Specifications

- Small and compact, the SpaceSaver™ chamber provides a test environment up to 40 GHz for emission pre-scan measurements, susceptibility compliance standards measurements including IEC 61000-4-6, ISO 11452-4, IEC 61000-4-3 and ETSI 301 489 (Audio Break Through and Data Monitoring test for GSM and WCDMA), as well as design and debugging applications.
- The chamber fits within the available parent building clear height of 335 cm (11 ft) and measures 7.62m x 3.05m x 3.05m (25 ft x 10 ft x 10 ft), nominal inside dimensions.
- Fabricated of Series 81 modular RF shielded panels.
- EuroPro™ 2188 series turntable – 1.53 m (6 ft 6 in) diameter with a 1,000 kg (2,205 lbs.) weight capacity.
- Series 201 single-leaf 1.21 m x 2.13 m (4 ft x 7 ft) manually operated RCM RF-shielded door including limit switch for immunity interlock switch.
- Raised 16.5 cm (6 ft 5 in) ground plane with three (3) 30.5 cm x 30.5 cm (12 in x 12 in) access hatches.
- 3 mm (1/8 in) thick dielectric floor underlay and 6 mil polyethylene vapor barrier finished with 3 mm (1/8 in) vinyl floor tile.

RF Shielded Performance Testing

Shield verification testing was performed in accordance with MIL-STD-285 / IEEE-299 at 1 GHz plane wave field. The shielding performance was guaranteed prior to the installation of system components. Field uniformity calibration was performed per IEC 61000-4-3 from 80 MHz to 1 GHz. Certified test reports showed the following performance:

- Magnetic Field:20 dB @ 1 kHz / 56 dB @ 10 kHz / 100 dB @ 200 kHz
- Electric Field: 100 dB from 200 kHz – 50 MHz
- Plane Wave: 100 dB from 50 MHz – 1 GHz
- Microwave:100 dB @ 10 GHz

Anechoic Absorber

- Full coverage with FT-1500 ferrite panels on all walls and ceiling.
- Sidewalls and ceiling feature FAA400 anechoic absorber on top of the ferrite panels. The transmit wall and the receive wall feature EMC-10PCL and FAA-6094 anechoic absorber, respectively, on top of the ferrite tiles.
- Floor panels include 16 pieces of removable hybrid absorber (includes FT-1500C and FAA-400) FlexSorb™ for immunity testing.
- Polyurethane absorber material features a hygroscopic (moisture-resistant) substrate.
- Absorber is tested from 30 to 500 MHz per IEEE Std. 1128-1998 using the coaxial reflectometer method described in part 7.2.3.3.
- Two Naval Research Lab (NRL) broadband swept frequency arches are used to perform RF absorber reflectivity testing from 750 MHz to 18 GHz.
- Power handling is 775W per m^2 (0.5W per in^2).

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), magnetic resonance imaging (MRI), microwave and wireless 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 about ETS-Lindgren is available at www.ets-lindgren.com. Additional information about ESCO and its subsidiaries is available at www.escotechnologies.com.

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