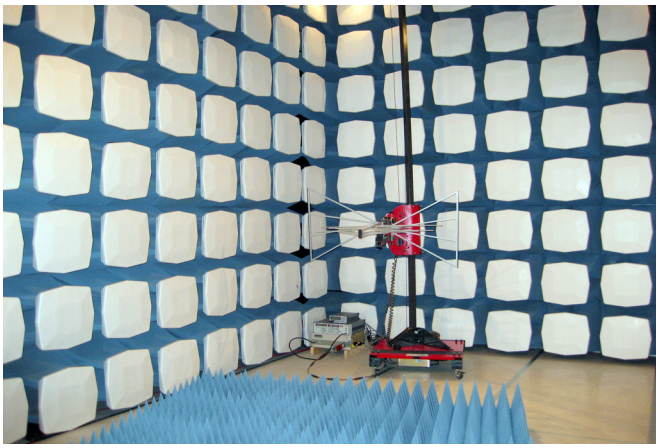
CASE STUDY BUREAU VERITAS LABORATORY – LITTLETON, MASSACHUSETTS



Bureau Veritas is an international company founded in 1828 and headquartered in Paris, France. It is one of the world's leaders in conformity assessment and certification services, helping clients to manage risk and enhance their performance in the fields of quality, health and safety, environment and social responsibility (QHSE). Bureau Veritas serves in excess of 300,000 customers around the world with over 850 locations covering 140 countries. It is recognized and accredited by major national and international organizations. Among its customers, Bureau Veritas Electrical and Electronics currently maintains long standing relationships with all the major U.S. telecommunications companies, plus many top-level technology developers, computer and server manufacturers, electronics providers and a majority of U.S. retailers. Bureau Veritas employees have extensive experience in testing protocols including radio and telecommunications, electromagnetic interference, electrical safety, environmental simulation, performance testing, factory audit, benchmarking, and certification to international standards. (For more information, visit Bureau Veritas' website at http://www.bureauveritas.com/ee.) When Bureau Veritas decided to expand its test capabilities at its laboratory in Littleton, Massachusetts, the company contracted with ETS-Lindgren, an industry leader in the manufacture of components and systems that measure, shield, and control electromagnetic and acoustic energy. Bureau Veritas recognized ETS-Lindgren's considerable expertise in the design and installation of turnkey shielding systems for electromagnetic (EMC) testing. ETS-Lindgren provided two identical Free Space Anechoic Test chambers; specifically, its model FACT™ 3-2.0 Standard Plus chambers for testing in accordance with global industry standards, including those issued by CISPR, VCCI, ANSI, IEC, FCC, SAE and others.

EMC Test Chamber Technical Specifications

- Two each, three meter, high-performance RF shielded anechoic FACT 3-2.0 chambers, each with nominal dimensions of 30 ft (9.1 m) long x 18 ft (5.5 m) wide x 18 ft (5.5 m) high.
- Constructed of ETS-Lindgren's popular Series 81™ modular RF shielded panels with 100 dB performance at 200 kHz (magnetic field), 200 kHz to 50 MHz (electric field), 50 MHz to 1 GHz (plane wave) and 10 GHz (microwave). This performance was tested and guaranteed prior to the installation of system components and absorber.
- Single-leaf 4 ft (1.2 m) wide x 8 ft (2.4 m) high manually operated Recessed Contact Mechanism (RCM) RF shielded door on each chamber, including a limit switch to accommodate an immunity interlock switch.
- Model 2188-2.03 two meter (6.56 ft) diameter turntable for a 1,000 kg (2,200 lbs.) distributed load rating.
- Model 2175 Antenna Mast for 1 m to 4 m antenna scanning.
- Raised 6.5 in (165 mm) nominal reflective ground plane with four 12 in (305 mm) square access hatches.
- Model 4340 digital CCTV system, complete with PC and display.
- Two way intercom system.
- Accessories provided include power line filters, light fixtures, wave guide air vents, and connector panels – all specially designed to maintain the RF shielding integrity of the host chambers.
- Chambers are designed for testing per FCC Part 15/18 and CISPR 16 for radiated emission and IEC 61000-4-3 for radiated immunity.

Anechoic Absorber Treatment

Anechoic treatment of the chambers includes 100% coverage of all wall and ceiling surfaces in addition to removable absorber conveniently provided on floor carts as required for immunity testing. 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 NSA data. ETS-Lindgren uses the Naval Research Lab (NRL) broadband swept frequency arch measurement method to test its absorber. Absorbers are tested for reflectivity performance from 1 GHz to 18 GHz. A coaxial reflectometer is used to test at frequencies between 30 MHz to 1000 MHz in accordance with IEEE Standard 1128.

Key Absorber Features Include

- FerroSorb™ technology: A combination of high-performance FT-1500 ferrite tile panels with FAA-600H polyurethane EMC absorber on the walls and ceiling. Floor carts feature FS-400 absorber.
- RF power handling of 200 V/m capability continuous wave.
- Material composition is high performance combustion limiting, non-hygroscopic polyurethane.
- Fire retardancy is provided in accordance with industry standards NRL Report 8093 (Tests 1, 2 and 3), DIN 4102 B2, UL 94 HBF, and others.

Chamber Performance Specifications

The FACT 3-2.0 chambers were guaranteed for better than +/- 3.5 dB NSA performance below 1 GHz. Once tested, they achieved worst case NSA performance of +/- 3.3 dB and therefore comply with the global EMC regulatory requirements of +/- 4 dB for a three meter distance per ANSI C63.4 and CISPR 16-1-4 for a semi-anechoic chamber. The FACT 3-2.0 chambers were also guaranteed to achieve better than 6 dB field uniformity. Finished chambers were measured in accordance with IEC 61000-4-3 for the frequency range of 80 MHz to 2 GHz and achieved worst case field uniformity of 5.5 dB. The FACT 3-2.0 chambers were guaranteed to achieve better than 6 dB Site VSWR (SVSWR) performance for performing emission testing in a fully anechoic chamber for the frequency range of 1 GHz to 18 GHz. Finished chambers were tested in accordance with CISPR 16-1-4 for SVSWR performance and were found in compliance providing better than 6 dB SVSWR results.

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.

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