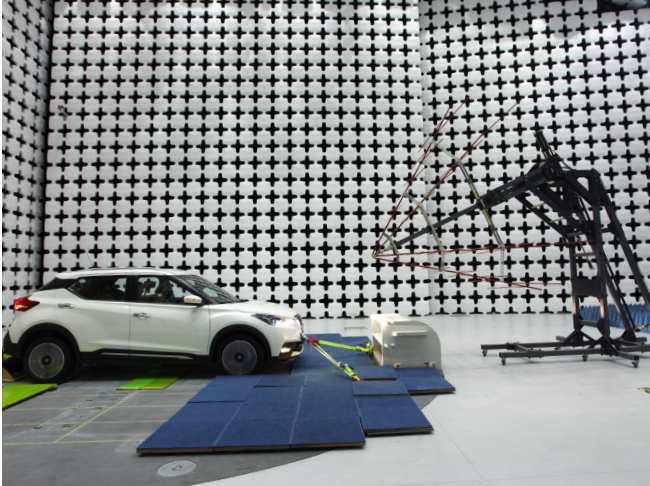


CASE STUDY NISSAN - GUANGZHOU, CHINA



When Nissan Automotive in Guangzhou, China desired a world-class Automotive Test Facility, they turned to the experts at ETS-Lindgren. ETS-Lindgren designed and installed a turnkey Automotive EMC and Antenna Measurement System, consisting of a tapered anechoic chamber, an AVL 8.2 m (27 ft) diameter chassis dynamometer (CD) and turntable, an EMC system for radiated emissions and radiated susceptibility testing, and a passive antenna pattern testing system. Air conditioning was also provided in the chambers. The chambers were designed to comply with industry standards CISPR 12/16/25, ISO 11451/11452, R10-03/04, SAE, and ANSI C63.4.

Chamber Technical Specifications

- **Field Uniformity A:** Floor absorber FS-300 was provided with a test distance = 2 m (7 ft), $Q_z = 1.5$ m (5 ft), $R_x = 1.0$ m (H) (3 ft). The chamber performance meets the 6 dB uniformity requirement from 20 MHz to 18 GHz. The test was setup for site attenuation A.
- **Field Uniformity B:** Floor absorber FS-300 was provided with a test distance = 2 m (7 ft), $Q_z = 5 \times 2$ m (7 ft). Test distance = 2 m (7 ft), $R_x = 1.0$ m (H) (3 ft). A 55 point ray-tracing algorithm simulating chamber performance was used to predict field peaking or dipping from 20 MHz to 18 GHz. The test was setup for site attenuation B.
- **Field Uniformity C:** $Q_z = 6$ m (20 ft), R_x Height = 150 cm (59 in) required uniformity is 4 dB below 1 GHz, and 6 dB from 1 GHz to 2.9 GHz.

- The 10-meter chamber interior dimensions are 21 m (69 ft) long x 12 m (40 ft) wide x 8 m (26 ft) high with a 5 m (16 ft) diameter quiet zone at 10 m (33 ft) according to CISPR 16-1-4 (an independent laboratory verified this specification). It is designed for automotive EMC testing in accordance with commercial standards CISPR 12, CISPR 25, ISO 11451, ISO 11452 and IEC 61000-4-3, as well as military standard MIL-STD-461E.

Tapered Anechoic Chamber

The rectangular section (interior shield-to-shield size) is 18 m long x 15 m wide x 14 m high (59 ft x 49 ft x 46 ft); the tapered section is 36.6 m (120 ft) long. Construction included:

- **Series 81 Cell-Type Modular Shielding:** Galvanized steel laminated to high-density particle and/or plywood board core with zinc plated clamping sections to resist corrosion.

- **Raised Floor:** 6 mm (.25 in) polyethylene floor underlay, 3.9 mm (.15 in) thick dielectric floor underlay. The chamber ground plane of galvanized steel supports vehicles up to 3 tonnes (3.5 tons).
- **Main Chamber Door:** SRFSD-F/A-100 sliding door with automatic pneumatic locking/unlocking system and electrical sliding system. Ramp and lift compatible.
- **Personnel Door:** RFD-F/A-100 Swing Door swing door capable of supporting both ferrite and foam absorber with pneumatic locking/unlocking system.
- **UL-listed LRW Series Powerline Filters:** Filters provide a minimum 100 dB attenuation at frequencies above 14 kHz when measured according to MIL-STD-220A.

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Anechoic Materials

ETS-Lindgren DSH- and EHP-series RF absorbers are optimized absorber designs with proven absorber and chamber anechoic performance for RF test and measurement, from 30 MHz to 40 GHz and above. The specific absorber types included ETS-Lindgren's DuraSorb™ polystyrene absorber with superior water resistant and RF reflectivity performance that meets UL94 HBF and DIN4102 B2 combustibility and flammability classifications. The FlexSorb™ absorber provided is flexible, non-hygroscopic, and fire retardant while resisting breakage; it is ideally suited for the high traffic areas of the chamber. The anechoic material provided also included FT-1500 and FAA-1500H polyurethane absorber used for full coverage of the receive end wall, FT-1500 and DSH-1250H for full coverage of the rectangular region, FT-1500, DSH-600H and EHP-24WGCL for full coverage of the walls and ceiling in the tapered section, and FT-1500, DSH-600H, EHP-18PCL, and EHP-24PCL for partial coverage on the flooring.

RF Shielded Rooms

ETS-Lindgren's RF rooms utilize the S81 cell type-shielding panel noted above and LRW 15, 30, and 100 Amp, 50/60 Hz, UL-listed powerline filters for lighting and CD control panel. The VESDA systems provided include a fire alarm and CO/H₂ gas detection:

- Shielded Dynamometer Pit Room: Dimensions are 10.5 m x 10.5 m x 3.4 m high (34 ft x 34 ft x 11 ft) with 12 mm (.5 in) welded steel plate and S81 cell type shielding as floor.
- Shielded Control Room: Dimensions are 3.5 m (12 ft) high (about 40 m²) with 400 mm (16 in) high raised vinyl sheet floor with 300 kg (660 lbs)/m² loading.
- Shielded Amp Room: Dimensions are 5.6 m x 4.6 m x 3.5 m high (11 ft x 15 ft x 12 ft) with 600 mm (24 in) high raised vinyl sheet floor with 500kg (1,100 lbs)/m² loading.
- Shielded Room for Tapered Section: Dimensions are 5.6 m x 4.6 m x 3.5 m high (18 ft x 15 ft x 12 ft), 100 mm (4 in) high raised vinyl sheet floor with 500 kg (1,100 lbs)/m² loading.

Instruments, Components and Software

ETS-Lindgren provided all necessary components for a complete turnkey system including all powerline filters, antennas, field probes, waveguide air vents, connector panels, pipe penetrations, etc. ETS-Lindgren also provided the test instrumentation supported by its industry leading EMQuest™ Antenna Pattern Measurement software and TILE!™ (Total Integrated Lab Environment) software for EMC testing.

Antenna Pattern Measurement System

The ETS-Lindgren design provides Nissan with the optimal solution for in-vehicle antenna and hemispherical 3D antenna pattern measurements at the full-vehicle level. The 3D measurement system is ideal for measuring medium and low gain antennas and providing complete 3D characterization of an antenna or wireless communication device on a vehicle. The 2D measurement system works together with an 8.2 m (27 ft) dynamometer turntable to achieve the pattern measurement for low frequency vehicle mounted antennas.

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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