

A State of the Art Anechoic Chamber for Air vehicle Testing at Alenia Aeronautica

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Abstract

A state of the art electromagnetic anechoic chamber has recently been built by Alenia Aeronautica at Caselle South Plant: this paper shows its main features and testing capabilities. It also describes a simulation analysis to predict the electromagnetic performance of the chamber and the typology of the acceptance tests.

The anechoic chamber is a full anechoic chamber, and it has been designed to carry out tests mainly on fighter and unmanned aircraft. Moreover, tests can be carried out on every SUT that is compatible with the dimensions of the main access door. A system to extract exhaust gas was installed in order to carry out tests on a wide variety of vehicles.

The anechoic chamber has been designed to carry out both HIRF/EMC and High Sensitivity tests: in particular HIRF/EMC tests in the frequency range 30MHz ÷ 18GHz with the capability of radiating a very high intensity electromagnetic field and High Sensitivity tests, such as installed (on SUT) antenna pattern measurement in the frequency range 500MHz ÷ 18GHz.

During the design phase and before construction of the full-scale chamber, a 1/12th scale model, metal-lined chamber had been manufactured to assess the desired electromagnetic performance. Moreover, during the construction phase, simulation campaigns were performed both to define the detailed internal layout and test acceptance methodology for particular cases not covered by the standards.

The size (shield to shield) of chamber is 30m wide, 30m long and 20m high, and the 18m wide by 8.5m high main door allows the SUT access. The shielded structure is a cube of 3mm-thick steel panels welded together, and it guarantees values of shielding effectiveness more than 100 dB in the frequency range 100kHz to 20GHz. The floor surface includes a 10 metre diameter turntable to rotate a 30 ton SUT with an angular accuracy of $\pm 0.02^\circ$ and a pathway to allow SUT access. Both the pathway and the turntable are permanently covered by ferrite tiles. A hoist system permits lifting of the SUT (max 25 tons) up to 10 metres from the turntable centre enabling EMC testing on aircraft with the landing gear retracted.

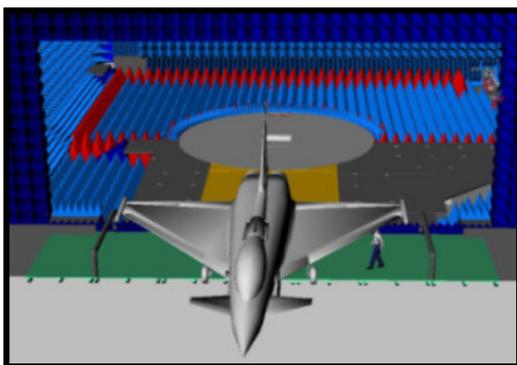


Figure 1 access of the aircraft through the main door

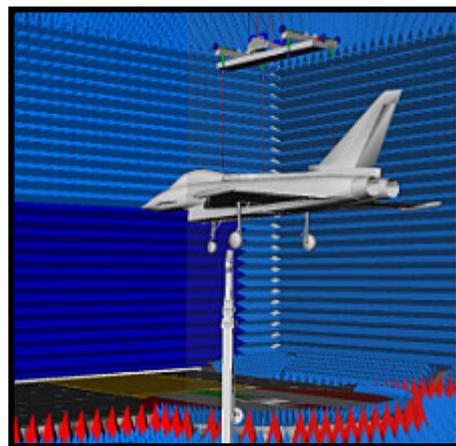


Figure 2 lifting of the aircraft for the execution of the test

This paper describes the anechoic chamber design and, in particular, the special ability to perform the test along the diagonal direction of the square base in order to increase distance between the test antenna and the SUT and also decrease the number of first and second order spurious reflections that reach the quiet zone.