

SBIR Topic Number:
AF01-273

SBIR Title:
Integrated Anechoic Chamber Simulation and Validation

Contract Number:
F04611-02-C-0036

SBIR Company Name:
Voss Scientific, LLC
Albuquerque, NM

Technical Project Office:
Air Force Flight Test Center, Edwards AFB, CA

This Air Force SBIR/STTR Innovation Story is an example of Air Force supported SBIR/STTR technology that met topic requirements and has outstanding potential for Air Force and DoD.

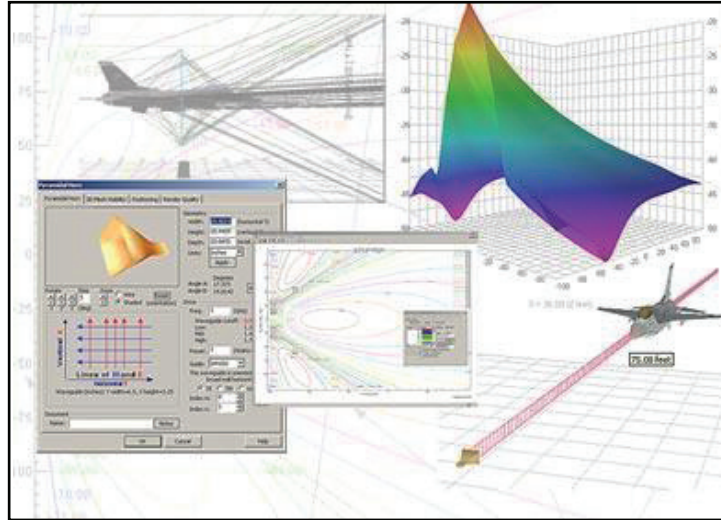


Illustration of the graphical user's interface to Voss Scientific's Integrated Anechoic Chamber Simulation (IACS) software

Integrated Anechoic Chamber Simulation

- The Air Force needs a way of predicting the electromagnetic (EM) environment in an anechoic chamber to improve test data quality
- Voss Scientific developed software designed to statistically and deterministically model the radio frequency (RF) environment inside an anechoic chamber
- The integrated simulation capability produces accurate simulation of the total EM field in the chamber, including the direct field, and the EM field scattered from test assets and other electrically large equipment in the chamber
- The simulation saves chamber time during set-up and characterization of the test range in the chamber, making the chamber more productive and increasing the number of tests completed in the chamber

080035S

A

DISTRIBUTION A:
Approved for public
release; distribution
unlimited.

Air Force Requirement

Electromagnetic (EM) anechoic chambers (shielded volumes designed to attenuate waves) provide electromagnetically "quiet" environments for many types of measurements. Ideally, they absorb all EM energy incident on their interior surfaces and establish an environment where electronic devices and systems can be placed to determine their response to free field conditions or other operational characteristics.

Unfortunately, anechoic chambers do not operate perfectly. Under certain conditions, the anechoic chamber's EM environment can deviate significantly from the required or desired condition. The Air Force needs a way of predicting the EM environment in a chamber to improve test data quality.

SBIR Technology

Voss Scientific, LLC, developed software designed to statistically and deterministically model the radio frequency (RF) environment inside anechoic chambers used by the Air Force. The software, called the Integrated Anechoic Chamber Simulation (IACS) program, computes an approximation of the electromagnetic field inside an anechoic chamber by dividing the problem into independent, tractable portions. IACS computes:

- Radiated fields from the transmit antennas
- Fields reflected from Radar Absorbing Material (RAM)-covered chamber surfaces
- Scattering from equipment that does not contact chamber surfaces
- Field interactions between chamber surfaces and chamber equipment
- Fields derived from all of the scattering mechanisms

The fields scattered by system under test and other large objects in the anechoic chamber are calculated by the Numerical Electromagnetic Code – Basic Scattering Code (NEC-BSC).

Potential Air Force Application

Integrated testing of electronic systems involves generating a complex EM environment around one or more test articles in an anechoic chamber. The perturbation of the EM field due to the presence of the test articles in close proximity to one another can reduce the accuracy of the test results.

Current anechoic chamber simulation capabilities accurately compute the radiated field of many types of antennas, estimate the reflectivity of some RF absorber geometries, and provide limited calculations of the effects of scattering from a single test article. A more accurate and detailed EM simulation of anechoic chambers will enhance user confidence, reduce pre-test set-up time, and speed EM environment verification of integrated electronic testing.

The integrated simulation capability produces an accurate simulation of the EM scattering from test assets and other electrically large equipment in the chamber, and further provides details of the scattering mechanisms (such as locations of major scattering centers). In addition, the integrated chamber simulation software allows the user the ability to describe the effect of any object (size, location, orientation, and material) on the EM environment. The output of the simulation is detailed enough to compute and display complex EM fields accurately anywhere in the chamber and computes statistical bounds on the field for determination of test configuration and anechoic chamber performance.

Thus, the anechoic chamber simulation software saves chamber time during set-up and characterization of the test range in the chamber, making the chamber more productive and increasing the number of tests completed in the chamber.

Company Impact

This Air Force SBIR project has added to Voss Scientific's core expertise in the development of custom software for scientific analysis and simulation. The IACS computer program provides Voss Scientific with a highly sophisticated product that will be of immense value to government and commercial customers alike. No other anechoic chamber prediction and simulation software offers the spectrum of capabilities provided by IACS. The IACS product will afford Voss Scientific with a competitive advantage in areas related to the design and operation of anechoic chambers.

Since 1988, Voss Scientific has provided quality scientific, engineering, and research and development products and services to an expanding government and commercial customer base.



SBIR/STTR

Air Force SBIR Program
AFRL/XP
1864 4th Street
Wright-Patterson AFB OH 45433

AF SBIR/STTR Program Manager: Steve Guilfoos
Website: www.sbirsttrmall.com
Comm: (800) 222-0336
Fax: (937) 255-2219
e-mail: afrl.xppn.dl.sbir.hq@wpafb.af.mil

