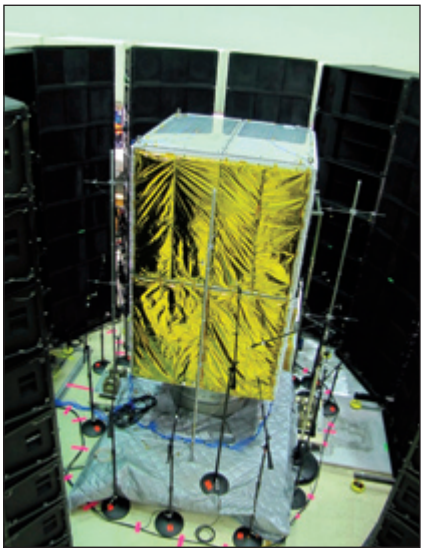
Direct Field Acoustic Testing Techniques

The DFAT™ method uses a direct acoustic pressure field to excite the test article rather than the diffuse field created in an acoustic chamber. The direct field is created by placing acoustic speaker cabinets around the test article in such a manner as to create an equal sound pressure field at the surface of the test article. The speaker cabinets contain multiple drivers that can cover a frequency range from 25 Hz to 20 kHz. Power amplifiers are used to drive the speakers. The amplifiers control the voltage, power and frequency range sent to each acoustic driver. The amplifiers are networked and programmed to provide cross-over frequency and filter characteristics, voltage, temperature and current limits as well as phase alignment and timing delays. Multiple control microphones and a Spectral Dynamics JAGUAR Narrow-band Acoustic Control System are used to control the test. The controller provides numerous over-test protection features including; overall and nth octave RMS alarm and abort limits, narrow-band peak and RMS alarm and/or abort limits on any control or measurement channel as well as software and hardware abort switches.

The low cost and mobility of this method have been the primary reasons for its growing popularity. The method is convenient because MSI (Maryland Sound International) brings all required sound system, power generation and distribution and data acquisition and control equipment. All equipment is leased for each test event. There is no large investment in a facility, equipment or personnel required on the part of the customer. A diesel generator is the preferred power source, therefore providing clean on-site electrical power in a consistent configuration for connection to the MSI power distribution equipment. This removes the demand for large quantities of power from the test facility. In addition, testing can be performed at a much lower cost per test compared to the installation, operation and maintenance of a standard high intensity reverberant acoustic chamber system. Finally, mobility allows this test method to be performed at almost any time and placed in the normal test article integration and test flow. The test equipment is completely portable and no special facility or infrastructure is required.

The Multiple-Input-Multiple-Output (MIMO) control scheme is recommended MSI standard practice. MIMO control uses multiple control points (inputs) to measure the field characteristics at discrete locations to compute multiple drive signals (outputs) that result in a more uniform and diffuse sound field. Although MSI retains backward compatibility with the Single-Input-Single-Output (SISO) control methodology, it is now mainly used for experimentation and characterization and is not recommended for system level testing.



Device under test surrounded by monitoring microphones and loudspeakers for high-intensity excitation.