Welkin Sciences' MASS technology enables the accurate simulation of actual wartime space environments by providing the ability to emulate radio frequency scintillation so that our country's satellite communications systems can remain unobstructed

WELKIN SCIENCES, LLC

When a nuclear device is detonated at a high altitude, massive distortion can be imparted on RF uplinks and downlinks between satellites and terminals, hindering the ability to communicate. This is especially problematic in this day and age when many countries are looking to acquire nuclear weapons, and the risk they pose to U.S. satellite communications is a growing concern to our national defense. Manufacturers of satellite communication equipment must prepare for this scenario by testing to assess performance of various mitigation techniques.

PHASE III SUCCESS
$11.5M in revenue stemming from MASS and Digital IF – both of which originated as SBIR projects

AGENCIES
DOD, Air Force, Missile Defense Agency, and Army

SNAPSHOT
Welkin Sciences developed a simulator called MASS that enables testing of nuclear scintillation effects on military satellite communication systems. The Air Force uses this SBIR-funded device to ensure U.S. satellite communications remain effective should a high-altitude nuclear device be detonated.

WELKIN SCIENCES, LLC
2 N. Nevada Ave, Suite 1280
Colorado Springs, CO 80903
www.welkinsciences.com

Colorado-based Welkin Sciences came to the table with a technology that emulates the signal distortion caused by high altitude nuclear detonations and can be used to test the satellite communication systems that need to operate during and after such a nuclear event.

Short for the MILSATCOM Atmospheric Scintillation Simulator, MASS is a hardware-in-the-loop (HWIL) channel simulator that replicates the scintillation characteristics created by a high altitude nuclear detonation or natural scintillation. Scintillation refers to the fluctuations in radio wave propagation that result from natural causes or a nuclear detonation. MASS enables accurate simulation of actual wartime space environments by providing the ability to emulate ionospheric radio frequency scintillation using the Defense Threat Reduction Agency's fading channel models, reasonable worst case scenarios, and event scenarios defined by the MASS operator.

"The modular MASS architecture provides dual channel capability that integrates with intermediate frequency (IF) interfaces of ground, airborne, and sea-based MILSATCOM terminals," explains Bill Sward, Project Manager at Welkin Sciences. "MASS provides the only practical method of testing these systems designed with anti-scintillation capability."

This work led the U.S. Air Force to seek out the small business for some specialized testing capabilities after Welkin had completed two highly successful Phase I and Phase II

Welkin Sciences' MASS simulator is used by the U.S. Air Force and enables testing of nuclear scintillation effects on military satellite communication systems

projects with the Missile Defense Agency. Previous scintillation tests had been conducted solely on the modem in the terminal. MASS allows for the ability to conduct HWIL testing on operational uplinks and downlinks including the entire ground terminal and on-orbit satellite.

The Air Force subsequently granted a Phase III contract for the device now known as MASS. The Air Force Operational Test and Evaluation Center (AFOTEC) at Peterson Air Force Base in Colorado used MASS as a HWIL scintillation test capability to ensure military satellite communications can function regardless of natural or manmade signal disruptions. High altitude nuclear detonations pose a potential threat to satellite communication performance by destabilizing the propagation medium through which satellite signals are sent and received.

"The SBIR program is huge; we wouldn't exist without it since all of our work derived from the program"

BILL SWARD
PROJECT MANAGER

Since different scintillation effects occur in different frequency bands, Welkin also developed a second product to properly account for these differences. The Configurable Link Test Set, or CoLTS-LC, is the latest generation of HWIL frequency-selective fading channel simulators. User-defined RF propagation effects include delay, Doppler, amplitude, noise, flat fading, and frequency-selective fading. The Missile Defense Agency is the company's largest purchaser of CoLTS-LC and uses it to perform test and evaluation of anti-scintillation, anti-jam command and control functions employed as part of the nation's Ballistic Missile Defense System.

Lately, Welkin Sciences has been focused on another key aspect of its business, also deriving from the SBIR program. Digital IF is a technology that moves more functionality of ground satellite terminals into the digital domain as compared with the traditional, largely analog architectures. This technology, which began as an Army SBIR, has huge potential with the Defense Information Systems Agency (DISA), which runs the DOD Information Network (DODIN). Digital IF technology provides ground terminals with more flexible switching/routing and enables long distance signal transport. Digital IF allows modems and antennas to be separated by very long distances, which offers a variety of advantages such as distributing communications traffic over multiple terminals, eliminating the need for modems to be co-located with antennas for covert operations, mitigating the degrading effects of jamming and scintillation via spatial diversity, and providing more options for terminal fail-over to improve link availability.

"The SBIR program is huge; we wouldn't exist without it since all of our work derived from the program," adds Sward. "We are doing what SBIR companies are supposed to do. You don't stop at a Phase II. You make that transition. That's where the real revenue and opportunities to grow the company come in."

SBIR·STTR America's Seed Fund™ POWERED BY SBA