Air Force SBIR/STTR

Innovation

Air Force SBIR/STTR Innovation Story

SBIR Topic Number:
AF05-041

SBIR Title:
Electronic Protection for Space-borne Phased Array Antennas

Contract Number:
FA9453-06-C-0068

SBIR Company Name:
Haleakala Research and Development, Inc.
Brookfield, MA

Technical Project Office:
Space Vehicles Directorate
Kirtland AFB, NM

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.

Smart Plasma Antenna

Plasma Frequency Selective Surface (FSS) Radome Technology Protection for Space-borne Phased Array Antennas

- The Air Force needs protection technologies for space-borne phased array antennas used for communications and Intelligence, Surveillance, and Reconnaissance (ISR)
- Haleakala Research and Development, Inc., is advancing state-of-the-art innovations in antenna radomes as an electronic and radio frequency protection for space-borne phased array antennas
- Plasma FSS radome technology can provide protection against net-centric warfare and direct radio frequency attacks
- Potential private sector uses include Worldwide Interoperability for Microwave Access (WIMAX) applications, satellite receiver antennas for Low Earth Orbits (LEO), and commercial last-mile antennas

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Air Force Requirement

The Air Force requirement was to investigate and develop protection technologies for space-borne phased array antennas used for communications and Intelligence, Surveillance, and Reconnaissance (ISR). Future transformational communications and radio frequency (RF)-based ISR space systems will likely involve advanced, high dynamic range transmitter/receiver devices and large, but light-weight, apertures.

Advanced technologies are needed to address satellite system vulnerabilities that are associated with high dynamic range sensors and such large apertures. Vulnerabilities include net-centric and RF attack.

SBIR Technology

Haleakala Research and Development, Inc., is advancing state-of-the-art innovations in antenna radomes as an electronic and RF protection for space-borne phased array antennas. This technology has multiple applications beyond the scope of the original SBIR, including airborne and ground applications. The firm has developed a prototype reconfigurable plasma antenna radome that protects space-based antennas from RF vulnerabilities and, at the same time, intelligently steers and controls the antenna beam. The plasma frequency selective surface antenna radome acts as a reconfigurable shield for the antennas inside.

Reconfigurable, smart, adaptable, plasma antenna prototype and the Haleakala prototype engineer

The type of vulnerabilities that the plasma Frequency Selective Surface (FSS) radome technology can address include net-centric warfare and direct RF attacks (spurious signal attacks, spoofing attacks, etc.).

Potential Air Force Application

The plasma FSS radome technology makes it possible for the Air Force to respond to satellite system vulnerabilities that are associated with high dynamic range sensors and associated large apertures.

Further, the reconfigurable plasma antenna radome provides an innovative technique to improve phased array antenna system capabilities, while reducing susceptibility to potential vulnerabilities that pose a threat to Air Force space-based systems.

Company Impact

This SBIR contract offered Haleakala the opportunity to focus its R&D expertise on the development of a smart plasma antenna prototype which has significant advantages over competing smart antennas. Haleakala is in the process of finding markets for this technology in Worldwide Interoperability for Microwave Access (WIMAX) applications, satellite receiver antennas for non-synchronous satellite orbits, last mile antennas, and base station antennas.

Haleakala is further working toward placing the first commercially feasible gaseous plasma antennas and plasma smart antennas into the general and specialty antennas marketplace. This technology has specific applicability to DoD programs and has caught the interest of major primes which are exploring its applicability. This new technology offers the potential for a new wide range of intelligent antenna solutions which are not available when using conventional antennas.

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