

Innovation

Air Force SBIR/STTR Innovation Story

SBIR Topic Number:
SB962-069

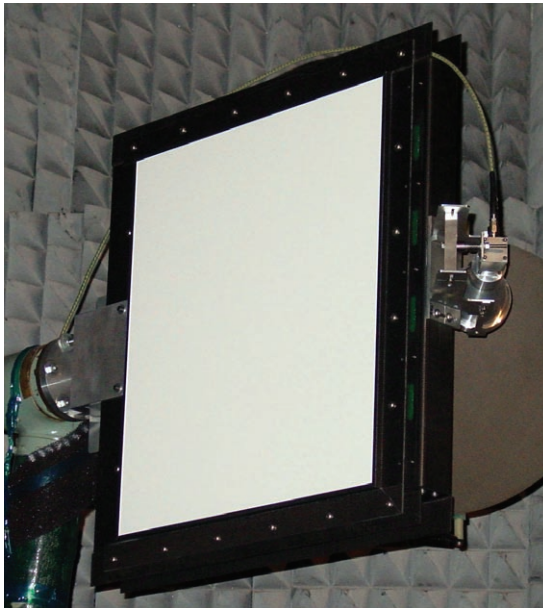
This Air Force SBIR/STTR Innovation Story is an example of Air Force supported SBIR technology that met topic requirements and has outstanding potential for Air Force and DOD.

Title:
Microelectromechanical
Systems (MEMS)
Demonstration Radar
System

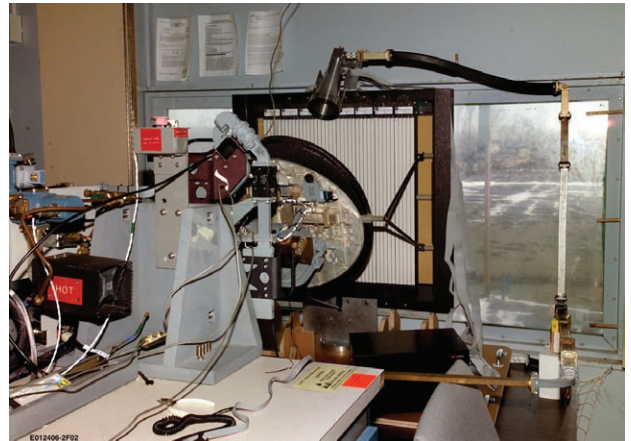
AF Contract Number:
F19628-03-C-0052

SBIR Company Name:
Radant Technologies,
Inc. Stow, MA

**Technical Project
Office:**
AFRL Sensors
Directorate
AFRL/SNHA,
Hanscom AFB, MA



The 0.4m² MEMS Electronically Steerable Antenna in Radant's Antenna Test Chamber



Rear view of the 0.4m² MEMS ESA integrated with a Lockheed APG-67 Radar System

Microelectromechanical Systems (MEMS) Demonstration Radar System

- The Air Force and other DoD components require lightweight, low power, Electronically Steerable Antennas (ESA) for rapid scanning and diverse multiple target functions such as tracking and fire control.
- The Air Force SBIR Program is supporting development of a lightweight, electronically scanning antenna using Microelectromechanical Systems (MEMS) technology. This technology could provide significant improvements in battlefield information superiority and airspace dominance for US and Allied Warfighters.

ESC 06-0502

A

DISTRIBUTION A:
Approved for public
release; distribution
unlimited.

Air Force Requirement

The DoD requires lightweight, low power, and low-cost Electronically Steerable Antennas (ESA) such as those needed by high-performance Airborne Moving Target Indicator (AMTI) and Surface Moving Target Indicator (SMTI) radars. Rapid beam scanning, beam agility, the performance of diverse functions such as multiple target tracking and fire control, reduced Radar Cross Section (RCS), and reduced physical profile are some of the numerous performance benefits to systems employing an ESA. These radar systems require a large power-aperture product, but must be lightweight enough for aerostats and airships, as required by the U.S. Army Joint Land Attack Cruise Missile Defense Elevated Netted Sensor (JLENS) program.

SBIR Technology

For the first time, a lightweight, electronically scanning antenna using Microelectromechanical Systems (MEMS) technology has been used for airborne and surface target detection, while interfaced with an existing radar system. The demonstration ESA contains 25,000 MEMS devices, electronically scans 120 degrees and operates over a 1-GHz bandwidth at X-band. The 0.4 square meter antenna was built to demonstrate feasibility of much larger antennas, exceeding 8 square meters. Much of the enhanced antenna performance is attributed to the employment of MEMS switches instead of traditional semiconductor-based switching technologies. The MEMS switches manufactured by Radant MEMS, Inc. have a volume of only 1.5 cubic millimeters and are produced by wafer capping of a micro-mechanical switch mechanism that travels less than 1 micrometer in 10 microseconds. Extremely high reliability exceeding 900 billion switch cycles has been demonstrated in multiple DoD laboratories, and this feat is unmatched anywhere.

Potential Air Force Application

The MEMS ESA results in dramatic savings of weight, prime power and cost in comparison to conventional active ESAs. The MEMS DRS has been included as a risk reduction effort in the acquisition strategy of the Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System (JLENS) Major Defense Acquisition Program (MDAP). The JLENS requirement is to develop a very low-cost, lightweight and low-power usage Sensor System (suitable for aerostats and airships) that provides significant military value by improving battlefield information superiority and airspace dominance for US and Allied Warfighters as well as Homeland Security. Other radar and communication applications requiring a lightweight, low prime power and low cost Electronically Steerable Antenna can also benefit from the technology developed here.

Company Impact

This SBIR program has been instrumental in developing this novel antenna technology as well as the core MEMS switch technology. Radant Technologies is actively seeking additional applications for the antenna technology developed here while Radant MEMS has launched a series of commercially available MEMS switch products. Funding for this effort is responsible for increasing employment growth at Radant as well as for sustaining many high-technology jobs. Longer term, this funding is critical for growing key business segments within both Radant Technologies (Lightweight and Low-Cost Electronically Steerable Antennas) and Radant MEMS (MEMS switches and components) that will lead to increasing high technology employment at both companies as this technology matures.



U.S. AIR FORCE

SBIR/STTR

Air Force SBIR Program
AFRL/XR
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) 255-2329
e-mail: afrl.xptt.dl.sbir.hq@wpafb.af.mil

