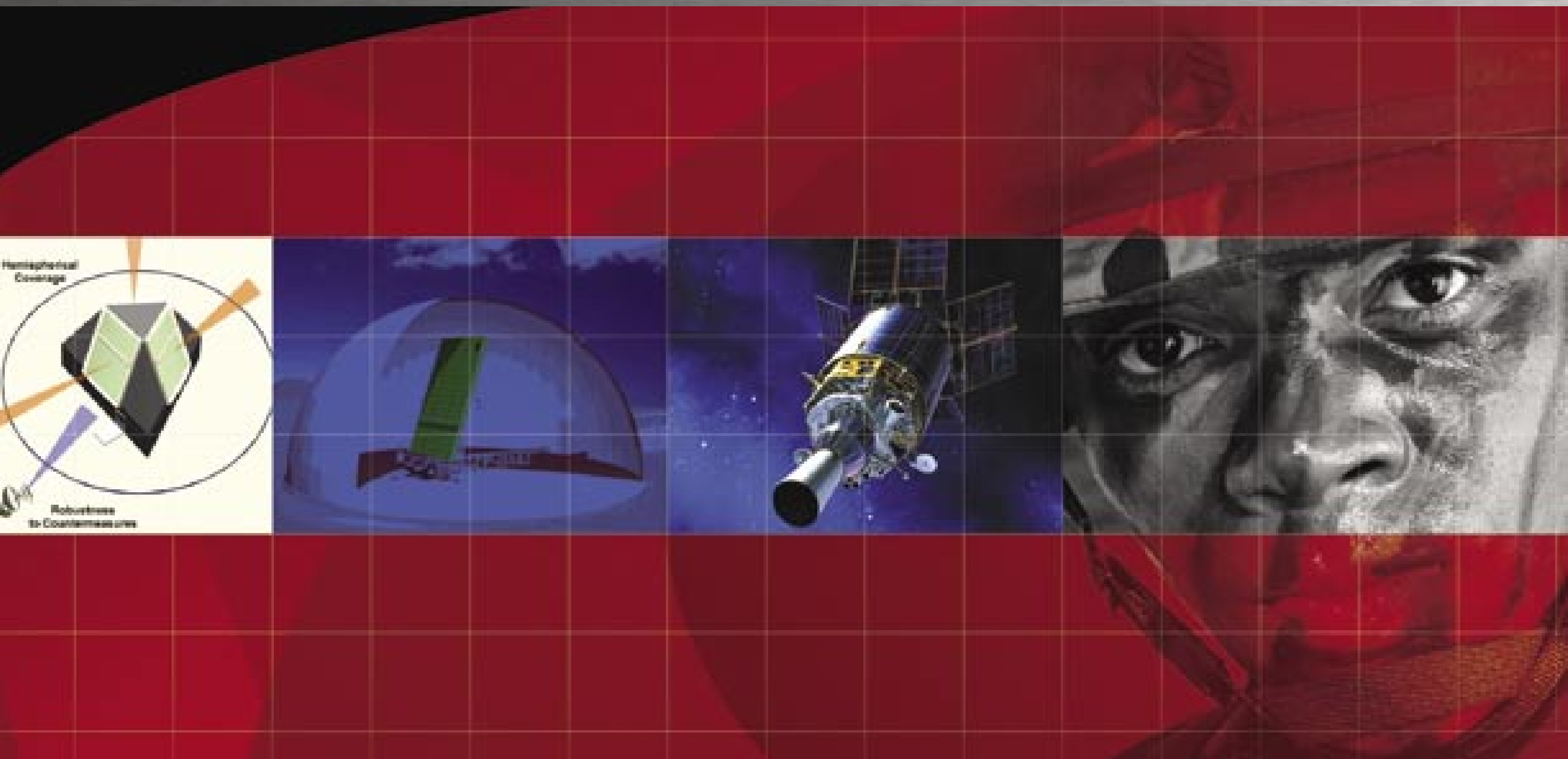
SMDC/ARSTRAT

Technical Center

RST

Radar Systems Technology



Summary

- Based on technologies that demonstrate greatly enhanced, even revolutionary capabilities
- Develop Next Generation Radar Demonstrator testbed capability
- Develop a Silicon Germanium (SiGe) transmit and receive (T/R) chip for low cost scalable phased array panels
- Explore Gallium Nitride (GaN) microwave power amplifier technology
- Integration of Low Power Density pilot array

The RST Program develops advanced radar technologies that will greatly enhance existing radar systems.

Future missile defense systems must demonstrate improved performance over current state-of-the-art radar systems. The Radar Systems Technology (RST) program focuses on four primary areas of radar performance improvement: sensitivity, signal/data processing, enhanced transportability, and increased performance of receivers/exciters. The program is based on technologies that demonstrate greatly enhanced, even revolutionary, capabilities at the system level. A test bed capability for the Next Generation Radar (NGR) is being developed to meet future Ballistic Missile Defense (BMD) system acquisition, track, and discrimination requirements for advanced threat sets.

RST

Radar Systems Technology

Overview

To enhance future Ballistic Missile Defense (BMD) system capabilities, the Radar Systems Technology (RST) program focuses on four primary areas of radar performance improvement: improved sensitivity, signal/data processing, enhanced transportability, and increased performance of receivers/exciters. The RST program is sponsored by the Missile Defense Agency Deputy for Advanced Technology (MDA/DV) and involves the Army, Air Force, and Navy. The RST program is based on a proven, successful philosophy of targeted, incremental investment in key enabling component technologies that will demonstrate greatly enhanced, even revolutionary, capabilities at the system level.

Benefits for Tomorrow's Defense

To realize advancements in target acquisition and discrimination timelines, future endoatmospheric and exoatmospheric missile defense systems require performance advances over current state-of-the-art radar systems. The U.S. Army Space and Missile Defense Command/U.A. Army Forces Strategic Command (SMDC/ARSTRAT) Technical Center is developing advanced radar technologies that will increase existing radar system performance capabilities. A test bed capability for the Next Generation Radar (NGR) is being developed. This sensor is designed to meet future BMD system acquisition, track, and discrimination requirements for advanced threat sets.

Technical Concept

The Next Generation Radar Demonstrator includes a Low Power Density pilot array with Open System Architecture and advanced technologies. The signal and data processing techniques, such as distributed aperture and extended bandwidth applications, enhance discrimination capabilities. To improve transportability to meet future BMD mission requirements, the focus is on developing scalable, low power density, air cooled, low-cost antenna arrays. Advanced receiver/exciter technologies will improve dynamic range and enable enhanced capabilities in severe clutter and countermeasures.

For improved sensitivity, high power Gallium Arsenide (GaAs) power amplifier technology and advanced thermal management techniques and materials are being used to enable higher power radiating elements or lower prime power losses.

In addition to GaAs power amplifier technology, Gallium Nitride (GaN) microwave power amplifier technology is also being explored to meet future BMD radar performance requirements. This effort will demonstrate a microwave power amplifier using GaN substrate grown by vapor phase epitaxy as the wide-band gap material. High performance X-band power amplifiers will provide as much as three to four times the current capability to future radar and missile seekers. The transistor design chosen offers the advantages of high mobility and high carrier concentration, high versatility, high breakdown voltage and high gain, proper engineering of channel composition using alloy layers, and low susceptibility to micro-pipe defects.

The low-cost of Silicon Germanium (SiGe) Monolithic Microwave Integrated Circuits (MMICs) contributes to the development of low-cost scalable phased array panels for MDA applications. The SiGe T/R chip will develop SiGe devices suitable for scalable phased array applications. SiGe devices can be an order of magnitude less expensive than GaAs, and will provide single-MMIC transmit/receive devices with equal or better overall efficiency, and Low Noise Amplifier (LNA) power handling performance than comparable GaAs devices.

The Next Generation Radar Demonstrator will be used to validate low power density technology and advanced processing techniques and open system architecture as the way forward for future Ballistic Missile Defense System radars.

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