Dual Band Focal Plane Array Manufacturing

PROBLEM / OBJECTIVE

In order for 3rd Gen Sensor Systems to support Future Combat Systems (FCS) requirements, they must provide rapid wide area search while on-the-move, multi-spectral aided target detection against difficult/obscure targets with detection and identification of threat targets beyond the enemy's detection capability. Affordable large format (1280x720), small pixel (20 um), dual band (MWIR & LWIR) 3rd Gen Focal Plane Arrays (FPAs) are key to enabling this objective capability sensor systems of FCS. However, these FPAs could not be affordably produced using the existing methods.

ACCOMPLISHMENTS / PAYOFF

Process Improvement:

To improve the yield and reduce the cost of large format, small pixel, dual band FPAs, this program optimized the Molecular Beam Epitaxy (MBE) growth process; improved photolithography, etching, contact metallization and interconnect processes for small pixel fabrication; increased the size of detector substrate wafers, improved the substrate surface finish, and reduced precipitates and other defects in the substrate material. The MBE growth process was optimized using in-situ monitoring during growth to reduce defects and material compositional changes and to increase the maximum size wafer on which a defect free epilayer can be grown. Enhanced etch processes were developed to reduce material damage, improved etch uniformity, and reduced the stress induced within the thin film epitaxial layers after etching. The boule size grown for substrate material was increased, while precipitates were reduced, and the wafer surface polishing processes enhanced to reduce damage.

Implementation and Technology Transfer:

The 3rd Gen FPAs have been transitioned to PM NV/RSTA and has been demonstrated on LRAS3 system. The FPAs will also be implemented into production (e.g., mini LRAS3 and ICDA system FCS applications). For FCS there will be no implementation cost other than for the acquisition of the sensors. Dual Band Focal Plane Arrays will also be implemented through system production for Apache through phased retrofit as part of planned block upgrades. For Apache, this sensor is a planned program upgrade to these systems to improve their lethality and survivability.

Expected Benefits and Warfighter Impact:

The ManTech program reduced the cost of focal plane arrays from $705,000 to $17,000 and from $1,605,000 to $60,000 for large format focal plane arrays. Additionally, the program has enabled the weight of the infrared sensor system to be reduced from 120lbs. to less than 40lbs. This technology will benefit platforms that utilize the Long Range Advanced Scout Surveillance Suite, Stryker, FCS, Apache and Armed Reconnaissance Helicopter. The successful completion of this program has enabled the development of improved operational capability, allowing the Warfighter to see first, understand first, act first and finish decisively.

TIME LINE / MILESTONE

Start Date: October 2003
End Date: December 2006

FUNDING

Army ManTech:	$49.2M
Army 3rd Gen IR Tech ATO	$1.4M
Industry Cost Share:	$19.5M

PARTICIPANTS

U.S. Army RDECOM CERDEC-NVESD
Raytheon Vision Systems (RVS)
Rockwell Scientific Company (RSC)