IR Cooled and Uncooled Staring Sensor

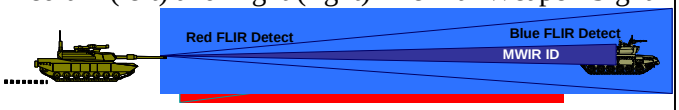
PROBLEM / OBJECTIVE

Current and future U.S. Forces require high sensitivity, cooled dual-color Mid-Wave/Long Wave Infrared (IR) Focal Plane Arrays (FPAs). These arrays allow detection of difficult or obscured targets and long-range identification beyond threat detection capabilities. In addition, manportable and small Unmanned Aerial Vehicles (UAVs) applications, that cannot accommodate such sensors due to size, weight and power constraints, require cost effective alternatives without degrading sensor performance.

This ManTech program developed and demonstrated manufacturing processes to produce staring cooled and uncooled IRFPAs and components for the Near-IR (NIR), Mid-IR (MWIR) & Long-IR (LWIR) wavebands.

Uncooled sensors, although lower performance when compared to cooled sensors, are a suitable alternative for manportable and small UAV applications.

Medium (left) and Light (right) Thermal Weapon Sight



Combat overmatch provided by Dual-Color FPAs

ACCOMPLISHMENTS / PAYOFF

Process Improvement:

Manufacturing improvements under the uncooled portion provided increased yield and throughput of 320x240 uncooled FPAs. This effort transitioned the material growth process from Thin Film Ferro-Electric (TFFE) to Vanadium Oxide (VOx) to provide better robustness and control of growth. This project also improved vacuum package design, identified low cost, low dispersion glass composition that provides a 40% cost reduction and demonstrated a one-step glass forming / lens casting process.

ManTech and detector processing also occurred under the cooled portion of this project. Material uniformity improved and yield increased by over 90% through in-situ monitoring of material growth using 2-color Molecular Beam Epitaxy (MBE). Enhanced etching techniques improved processing of 20μ detectors and enhanced interconnect techniques improved FPA hybridization yield by over 90%.

Implementation and Technology Transfer:

The uncooled portion has enabled on-going procurement for the Thermal Weapon Sight (TWS) to replace existing cooled, scanning FPAs with uncooled staring 320x240 FPAs. Multiple polymer lenses were integrated into the Cadillac Night Driver System in July1999.

The cooled portion integrated two MW/LW 640x480 FPA into two integrated dewar-cooler assemblies in 2QFY04. Integration of these assemblies into the Multi-Function Staring Sensor Suite (MFS3) is planned for 1QFY05 and will investigate both multi-spectral aided detection of cluttered/obscured targets and long-range ID while on-the-move. Fabrication processes and FPA component hardware has been transitioned to the Dual-Band FPA Manufacturing (DBFM) ManTech Objective which started in FY03. DBFM will further improve yield and increase format size to implement the technology into Future Combat Systems for both Ground and Airborne applications.

Expected Benefits:

Uncooled FPAs provide tangible system benefits to manportable thermal systems. TWS, for example, gains reductions in weight (2X), size (2.5X), power (2.5X). Small UAVs can achieve similar system benefits.

Dual-color MW/LW cooled staring FPAs provide the warfighter increased combat overmatch and survivability to "See First / Act First".

TIME LINE / MILESTONE

Start Date: October 1998
End Date: October 2004

FUNDING

Army ManTech: $11.0M
Cost Sharing:

PM-JAVELIN,NV/RSTA:	$2.0M
DUAP:	$6.0M
Industry:	$16.8M

PARTICIPANTS

Raytheon Systems Company (uncooled)
Raytheon Vision Systems (cooled)
U.S. Army RDECOM CERDEC NVESD
U.S. Army PM JAVELIN
U.S. Army PM NV/RSTA
Naval Research Laboratory
Missile Defense Agency