Affordable Software Defined Radio Components for the Joint Tactical Radio System (JTRS)

PROBLEM / OBJECTIVE

Future Army communications systems will rely on embedded Software Defined Radio (SDR) components to provide network connectivity and seamless communications between combat vehicles and Soldier systems with assured interoperability. The JTRS HMS acquisition program will develop and acquire Small Form Fit (SFF) configurations for embedded SDR network communications and reuse across JTRS Vehicular, Man-Pack, and Hand-Held configurations. Commercial SDR technology is not suitable to satisfy these requirements.

ACCOMPLISHMENTS / PAYOFF

This Army Technology Objective for Manufacturing (ATO-M) delivered five components to reduce the Size, Weight and Power – Cost for the core transceiver of the JTRS Handheld, Man pack and Small Form Fit (HMS) radio. Each ATO-M part has been fully tested and verified to be in total compliance with JTRS HMS specifications. The parts were transitioned during September 2009 and will each be fully MRL 7 qualified with low rates of production quantities.

Process Improvement:

Gallium Nitride (GaN) Microwave Monolithic Integrated Circuit (MMIC) Power Amplifier (PA) - The PA provides a 96% reduction in size and weight and a 85% reduction in cost over the baseline design. The GaN fabrication process was fully automated and the wafer size increased to vastly enhance yield and reliability.

Barium Strontium Titinate (BST) tunable RF SINCGARS filter - The components provided a 50% reduction in size and weight over the baseline design. The BST fabrication process was fully automated and to vastly enhance yield and reliability.

Silicon Germanium RF Integrated Circuit (RFIC) - The chipset replaces over 300 discrete components with 2 fully packaged, assembled and tested chips. Collaborating with Trusted Access Program Office (TAPO) to leverage the secure foundry line and capabilities providing a manufacturing cost savings of approximately $750K. The chips provide an 72% reduction in size and weight, the manufacturing plan offers 85% reduction in cost over the baseline design.

Silicon Carbide (SiC) MMIC RF switch - The switches provide a 90% reduction in size and weight, 90% reduction in power and a 40% reduction in cost over the baseline design. The SiC fabrication process was fully automated and the wafer size increased to vastly enhance yield and reliability.

Chip Scale Packaging for the baseband processor - Delivered stackable DRAM, FPGA, microprocessor, and flash packages at an MRL 5 and a System-in-a-Package (SiP) fully representative of the JTRS HMS discrete baseband processor also at an MRL 5.

Return on Investment is estimated at 15.7 to 1 with a cost benefit of $447M.

JTRS HMS Small Form Fit (SFF) Family

Expected Benefits and Warfighter Payoff:

- Improves mobility and transportability by significantly reducing the size and weight of embedded JTRS network communications for future communications systems.
- Enhances operational availability of sensor-to-shooter network connectivity.
- Provides interoperability across systems.
- Delivers low power and affordable SDR components.

TIME LINE / MILESTONE

Start Date:	October 2004
End Date:	November 2009
Army ManTech:	$31.5 M
PM-HMS:	$1.75 M

PARTICIPANTS

RDECOM Communications Electronics Research Development and Engineering Center (CERDEC) IBM Design Services, Hittite Microwave, Cree Agile RF, Tessera