Department of the Navy SBIR/STTR Transition Program

STATEMENT A. Approved for public release; distribution is unlimited. ONR Approval # 43-1256-16

Topic # N12A-T014

Reworkable Epoxy Bonding for Superconductor Multi-chip Modules

HYPRES. Inc.

WHO

SYSCOM: ONR

Sponsoring Program: Intelligence Advanced Research Projects Agency (IARPA) Cyrogenic Computing Capability Program (FY14 start)

Transition Target: Ship's Signals Exploitation Equipment (SSEE) Increment G

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Other transition opportunities: Multifunctional Information Distribution System (MIDS) Link 16, Magnetic Resonance Imaging (MRI) systems for Traumatic Brain Injury (TBI)

HYPRES Advanced Digital Receiver 48 in x 19 in x 22 in

WHAT

Operational Need and Improvement: Naval radio frequency (RF) systems have a requirement to improve spectrum utilization by implementing high speed broadband analog to digital converters. Although great strides have been made with the third generation superconductor, advanced digital RF receiver (ADR) systems in terms of functionality, these systems have to be easily upgraded or maintained by being able to facilitate replacement of the multi-chip-module (MCM).

Specifications Required: The primary objectives of Phase II are to (1) refine the process of die attachment and detachment to enable selection of known good die by repeatedly using a qualified test-vehicle carrier, and (2) develop a new process for selective detachment of one out of multiple flipped chips, cleaning, and attachment of a replacement chip.

Technology Developed: Utilizing this ADR will eliminate many components, enhance toleration of co-located high power transmitters and enable dominance of the RF spectrum for naval multi-function RF applications, such as communications, Electronic Warfare (EW), Signals Intelligence (SIGINT) and radar.

Warfighter Value: These ADRs maximize signal reception for communication, SIGINT and EW systems, enabling full broadband spectrum monitoring and precise emitter identification (ID) in a smaller form factor. Directly digitizing at RF reduces the size, weight and power of traditional analog systems by 50 percent thus eliminating traditional RF front end components thereby offering significant cost savings.

WHEN

Contract Number: N00014-14-C-0077 **Ending on:** June 30, 2016

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Establish a reworkable die attachment process	Low	Testing on cryogenic test bed	3	February 2015
Selective detachment and replacement of chips in a MCM	Low	Perform electrical and thermal testing	3	June 2015
Initiate development of an MCM for multi-input synchronous ADC	Med	These chips will serve as diagnostics for the die attachment	4	July 2015
Develop an MCM for testing interchip interconnects	Med	Perform high-speed electrical testing to ascertain the quality of MCM bonding.	4	December 2015

HOW

Projected Business Model: The output of this Phase II will result in a product that will be incorporated into the HYPRES digital RF receiver product family which in turn will be inserted into military systems directly and through other DoD prime contractors. HYPRES has worked with L-3 Communications, Argon ST, and ViaSat on digital-RF receiver projects in the past.

Company Objectives: HYPRES seeks program office support for completion of development, test and evaluation, and transition to Ship's Signals Exploitation Equipment (SSEE) and Navy Multiband Terminal (NMT). HYPRES also seek relationships with prime contractors, DoD program offices and equity investors for transition to major communications, EW, SIGINT and radar acquisition programs, and to the commercial market.

Potential Commercial Applications: The results of this Phase II will have a significant impact in the next generation of superconductor advanced digital-RF receivers for Navy EW/SIGINT data collection systems, advanced satellite communication and tactical data links. HYPRES has an on going Phase II with the Navy/OSD applying the advanced digital receiver technology for magnetic resonance imaging (MRI) systems that will be significantly smaller than current MRI's in use today.

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