

Department of the Navy SBIR/STTR Transition Program

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ONR Approval # 43-2262-16

Topic # N141-065

High-Speed Reconfigurable SIGINT (HiReS) System for Large Time Bandwidth Product

EpiSys Science, Inc.

WHO

SYSCOM: ONR

Sponsoring Program: Office of Naval Research (ONR) Division 312, RF Surveillance and Signal Processing Program

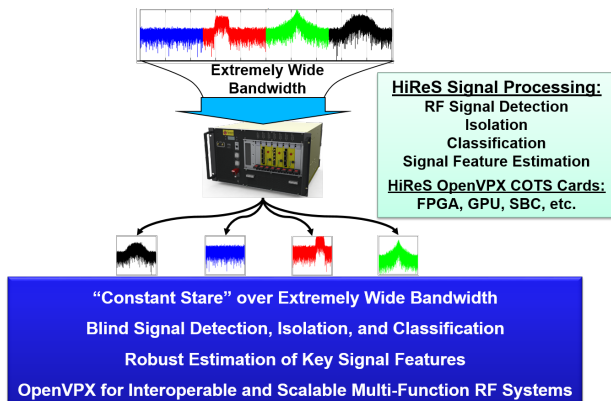
Transition Target: Ship's Signal Exploitation Equipment (SSEE) Increment F, Surface Electronic Warfare Improvement Program (SEWIP), AN/BLQ-10 Submarine Electronic Warfare System, AN/BLQ-10 Virginia Class Electronic Support Measures (ESM) System

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Other transition opportunities:

National Security Agency (NSA)
 Electronic Surveillance
 Central Intelligence Agency (In-Q-Tel)



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WHAT

Operational Need and Improvement: New solutions are needed to provide warfighters with significantly higher levels of Radio Frequency (RF) situational awareness while meeting size, weight, and power (SWaP), and cost requirements imposed by emerging multi-function RF systems.

- Specifications Required:**
1. To continuously process extremely wide bandwidth (e.g., several hundreds of MHz) and detect/classify a large number of signals simultaneously that exhibit a wide variety of behaviors and patterns.
 2. To accurately estimate and visualize key features of the detected signals, including hard-to-find radar pulses.
 3. To implement and operate using commercial-off-the-shelf (COTS) hardware components.
 4. To meet the interoperability requirements with the Department of Defense (DoD) standards such as OpenVPX multi-function RF system specifications.

- Technology Developed:**
1. Novel signal processing techniques to detect and classify a wide range of RF signals with low signal-to-noise ratios, large bandwidth, and extremely short duration.
 2. Robust estimation techniques for capturing key features of detected RF signals without a priori knowledge.
 3. Optimal distribution of complex computations across heterogeneous COTS Digital Signal Processing (DSP) devices (FPGA, GPU, CPU, etc.), significantly reducing hardware cost and SWaP.

Warfighter Value: "Never miss a signal!" HiReS enables warfighters to maintain significantly improved RF situational awareness because it: (i) eliminates "scanning"; (ii) estimates signal types and parameters with much higher accuracy; (iii) detects hard-to-find signals such as radar pulses and weak signals; (iv) visualizes both instantaneous and temporal signal behaviors; (v) significantly reduces costs by utilizing COTS products; and (vi) complies with OpenVPX standard for seamless interoperability with emerging multi-function RF systems.

WHEN

Contract Number: N00014-15-C-5173 **Ending on:** March 31, 2018

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Algorithm Development	High	Successful signal classification ratio	3	June 2016
Prototype Implementation	Med	Real-time operation of individual components in target hardware environment	4	September 2016
Integrated system based on target hardware	Med	Real-time operation of integrated system in target hardware environment	5	March 2017
Integration with customer hardware platform	Med	Real-time operation with desired performance	6-7	September 2017
Testing and demonstration of fielded system	Low	Real-time operation with desired performance	8-9	March 2018

HOW

Projected Business Model: Model 1: Make and sell HiReS subsystems based on OpenVPX hardware modules to the prime contractor providing full SIGINT and Multi-Function RF System solutions to the government. The prime contractor may require us to customize the HiReS system to meet particular requirements of the government customers.

Model 2: Sell a complete stand-alone HiReS system directly to the government. EpiSys Science can produce and deliver a complete system within 6 months upon receiving the order.

Company Objectives: The short-term objective of EpiSys Science is to further advance the signal sensing and classification technologies over extremely wideband spectrum, while building the sustainable business for selling both stand-alone HiReS solutions (to the government) as well we subsystems (to the prime contractors). Its long-term goal is to become the industry leader in SIGINT, RF Sensor, Software Defined Radios, and Multi-Function RF systems. In addition, EpiSys Science is expanding its R&D and business areas to include AI-based autonomous systems such as drone swarms with self-piloting technologies.

Potential Commercial Applications: The demand for spectrum by commercial wireless services is increasing dramatically. Meeting this explosive demand growth is a daunting challenging since spectrum is a finite resource. One area of breakthrough to meet such demands is to "dynamically" grant access to those who are willing to participate in the dynamic spectrum access (DSA) paradigm. Core enablers for this DSA include such technologies as robust RF sensing, signal detection, and classification, all of which must be present in the form of low-cost, low-power cognitive radios. The innovations being brought by HiReS technologies are natural foundations for commercially viable cognitive radios. EpiSys Science is advancing the state-of-the-art HiReS technologies to bring them to mobile devices.

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