

Topic: N131-052

Research Associates of Syracuse

Development of Algorithms for Characterizing Interleaved Emitter Pulse Trains with Complex Modulations

RAS is developing techniques to process data from non-contiguous pulse clusters resulting from periodic sampling (spectral, spatial, temporal) of the signal environment to improve Emitter Identification (EID). The resulting system will have improved EID with reductions in the size of candidate emitter lists and ambiguities, thereby improving situational awareness. The system utilizes classical EW parameters augmented with calculated Specific Emitter Features and measurement of IMOP characteristics to enhance real-time pulse processing and clustering of RF-agile and PW/PRF-agile emitters, Cluster-to-Track Correlation, Specific Emitter Tracking, and EID. This low-cost technology identifies RF emitters using scanning receivers that obtain the same performance levels as wideband receivers while reducing operating and maintenance costs. It enhances performance in identifying complex emitters within dense electromagnetic environments, resulting in improved ship survivability.

Technology Category Alignment:

Preemptive/Proactive Effects

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SYSCOM: NAVSEA

Contract: N00024-15-C-4017

 Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N00024-15-C-4017

Department of the Navy SBIR/STTR Transition Program

Statement A: Approved for Release. Distribution is unlimited.

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Development of Algorithms for Characterizing Interleaved Emitter Pulse Trains with Complex Modulations [CHIP]

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WHO

SYSCOM: NAVSEA

Sponsoring Program: OPNAV N86

Transition Target: The primary military application to be addressed is the NAVSEA Naval Surface Warfare Command (NSWC) AN/SLQ-32 Surface Electronic Warfare (EW) Improvement Program (SEWIP) Block II.

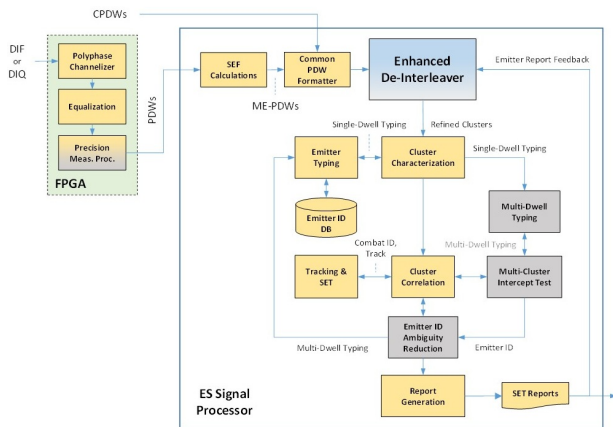
TPOC:

(812) 854-4804

Other transition opportunities:

Other NAVY candidates include the PMS-435 AN/BLQ-10 (V) EW Modernization for both Virginia and Ohio class submarines (Next Generation ES system). Another possibility for transition is upgrading the SPAWAR PMW-180 Ships Signals Exploitation Equipment (SSEE).

Notes: After a successful Phase II, RAS plans to contract with Navy program offices to support additional performance testing, to integrate CHIP technology with other systems of interest, and to qualify these systems. In addition, RAS will leverage established working relationships with several other small and large businesses to investigate other potential applications.



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WHAT

Operational Need and Improvement: More accurate characterization of signals having complex modulations resulting in improved Emitter Identification (EID) with fewer ambiguities and lower operating and maintenance costs.

Specifications Required: Detect, measure, and characterize emitters through automatic selection of Specific Emitter Features on pulses from non-contiguous pulse clusters resulting in improved EID. To achieve this improved performance, the following internal performance requirements have been established:

- Precision Pulse Measurement: IMOP Type/SEF
- Confusion matrix of IMOP Type Performance: >90% / 95% (Thres / Obj) over all types at +20 dB SNR
- Emitter Typing: >90% / 95% (Thresh / Obj), utilizing PRI Typing, RF-Agile Typing, and Scan Typing over multiple dwells

Technology Developed: Improvements to pulse clustering, de-interleaving, and Emitter Typing software modules to process data from non-contiguous pulse clusters received from Electronic Support (ES) acquisition scanning receivers sampling the signal environment (spectrally, spatially, and temporally). Provide an approach to detect, mitigate and better utilize pulses with multi-path.

Warfighter Value: Automatic, timely reporting of emitters with fewer ambiguities improves situational awareness and helps ensure safe passage of friendly assets and tactical superiority at reduced cost.

WHEN

Contract Number: N00024-15-C-4017 **Ending on:** February 2, 2017

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Characterization Testing	Low	Individual modules provide expected performance standalone and when integrated into the EDM	5	November 2016
CHIP EDM Demonstration at RAS Facility	Low	Improved emitter characterization and ID using real, representative emitter scenarios / PDWs	5	January 2017
Concept Demonstration 1 (Forward-fit) at Lockheed Martin	Med	Improved emitter characterization and ID in forward-fit environment	6	September 2017
Concept Demonstration 2 (Back-fit) at Crane	Med	Improved emitter characterization and ID in back-fit environment	6	September 2018

HOW

Projected Business Model: RAS would be the prime for software application program interfaces and serve as a subcontractor for integration services for forward-fit, back-fit, and legacy system options.

Company Objectives: License firmware / software to system integrators and serve as a subcontractor to integrate these components into larger systems. RAS seeks additional funding to conduct formal integration and testing with new production SEWIP II systems, upgrade existing SEWIP II systems, and perform sea trials.

Potential Commercial Applications: Potential applications in the private sector include wireless waveform characterization, sustaining operation in the presence of fading and /or multipath, fidelity assessment and classification, and passive tracking of RF devices.

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