Department of the Navy SBIR/STTR Transition Program

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ONR Approval # 43-2203-16

Topic # N132-129

A Variable Pulse Width, Voltage, and Repetition Frequency IGBT-based High Power Radio Frequency Source Driver

Eagle Harbor Technologies, Inc.

WHO

SYSCOM: ONR

Sponsoring Program: ONR Code 35

Transition Target: Directed Energy Systems

TPOC:
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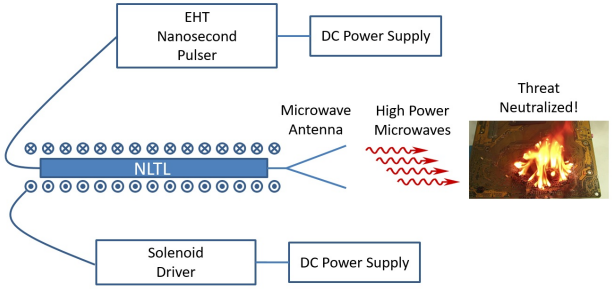
Other transition opportunities: Pulse power systems for high power microwave generation, decontamination systems, pulse radar systems, electronic warfare, plasma processing systems, power systems for UV light generation, advanced power supplies for high current applications



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Notes: The EHT HPRF source driver is the leading component to a fully solid state high power microwave solution for directed energy weapons

WHAT

Operational Need and Improvement: A variety of high power radio frequency (HPRF) sources have been developed. These HPRF sources have the potential to enable Directed Energy (DE) systems for U.S. Navy including small vessel mounted and man-portable systems. Substantial progress has been made to reduce the size, weight, and power utilization of the HPRF source itself. For HPRF DE systems to become viable and fielded the new pulsed power drivers must be developed that are as compact as the RF sources they support.

Specifications Required: What is needed is a compact pulsed power driver for HPRF sources capable of 10's of kHz repetition rates, a prime power requirement of 5-25 kW with a volume of less than a half cubic meter, weighing less than 100 pounds, with an output power of 10's of megawatts for a pulse of peak amplitude of 40-50 kV and pulse-width of 5-500 ns.

Technology Developed: Eagle Harbor has produced several prototype configurations, which were built and tested to demonstrate a pathway forward to meeting the full Navy specifications for a deploy-able system. EHT has proposed to build a modular pulser system including control systems, enclosures, and thermal management systems will be required for both the prototype and deliverable units for field testing prior to deployment. EHT has demonstrated a working prototype for the high power switching system which meets the requirements for high power microwave generation.

Warfighter Value: Technologies for advanced communication, surveillance systems and remote control including drone based technology is easily obtainable at low cost. These technologies allow for advanced and difficult to defeat systems which can be used by the enemy without expending large resources. In many cases, including autonomous drones and IEDs these systems can be difficult to defeat with conventional weapons. Directed Energy (DE) systems including high power microwave systems can be utilized to disrupt or destroy the complex electronics associated with these systems. New DE systems can decrease the cost of defensive systems as they use electrical power which can be very low cost per use. The pulsed driver under development will enable high power DE systems which will significantly increase our ability to defeat these threats.

WHEN

Contract Number: N00014-15-C-0025 **Ending on:** November 3, 2016

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Design and Build a Modular Prototype High Power Solid State Driver	Low	Prototype complete	4	November 2015
Test and Characterize Prototype for Failure Modes and Robustness	Med	Demonstrate system robustness in laboratory	5	January 2016
Build and Test System for NLTL and High Power Microwave Production	Med	Demonstrate full system operation with microwave production	6	June 2016
Configure and Build Final Deliverable Prototype Units for Field Testing	Med	Prototype units complete for field testing during option period	6	November 2016

HOW

Projected Business Model: Eagle Harbor Technologies (EHT), Inc. is a research and development company dedicated to producing innovative solutions to technological problems in pulse power applications, nanosecond pulsers, low-temperature plasma physics, fusion energy research, plasma diagnostics, and pulsed plasma sources for laboratory and materials science applications. The technology is designed for mobile platforms including trucks, small boats, and small aircraft. The application is to produce directed energy as a method to effect or to destroy enemy electronic systems. The ultimate goal is to integrate and transition the technology into naval platforms as part of a full directed energy system. The technology will most likely be integrated into systems produced by prime contractors. EHT expects that after prototype development of the technology licensing of the technology for production will occur. EHT will maintain its business for in custom and research applications and will support the license with continued technology development.

Company Objectives: EHT objective for the FST event are to meet with relevant program managers and end users for the technology for further development into additional application areas. The high power fast pulser developed for high power microwave applications in this Phase II prgram has a wide range of other DOD relevant applications including the production of plasma which can be utilized for surface treatment of materials, sterilization for medical applications, UV light sources and high power lasers, phased RADAR systems and enhanced combustion.

Potential Commercial Applications: The purpose of the Phase II program are to develop the technologies for use in directed energy systems. There are several commercial applications which can utilize the technology including rapid high voltage capacitor charging applications. Several prime contractors require similar technologies and have procured commercial systems from EHT. Additionally, there are multiple non-defense applications including systems used for academic research, medical devices, UV light sources and efficient combustion systems.

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