Department of the Navy SBIR/STTR Transition Program

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Topic # N181-075
Navy-Electronic Battle Damage Indicator (eBDI) Tool for Non-Kinetic High-Power Radio-Frequency (RF) Engagements
Voss Scientific, LLC

WHO

SYSCOM: ONR

Sponsoring Program: Office of Naval Research, Code 35

Transition Target: DOD Directed Energy and Counter Directed Energy Programs

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Other Transition Opportunities: High Power Radio Frequency/ High Power Microwave (HPRF/HPM) field testing.
HPRF/HPM target system characterization.
HPRF/HPM attack detection and geolocation.
Target installation measurement and hardening.

Notes: Photo of the ADAM Gen I during anechoic chamber testing at Voss Scientific. Gen I package is 30 inches tall, 18 inches wide, and 18 inches deep. A large modular package was used for initial development of generation I, to allow testing, evaluation, and optimization of varying options for subsystems, electronics, custom RF sensors, and batteries.

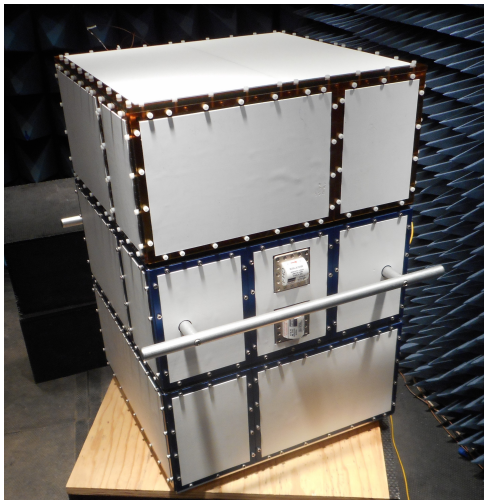

Image of Autonomous Damage Assesment Module (ADAM) Gen I, courtesy of Voss Scientific, LLC

WHAT

Operational Need and Improvement: Currently, evaluations of HPRF/HPM sources and other non-kinetic counter-electronic systems are impeded by a limited ability to accurately assess the level of electronic battle damage inflicted. This is because, in a non-kinetic engagement, there is no observable physical damage after the engagement. This lack of physical evidence requires alternative means to assess these electronic targets.

Specifications Required: What is needed is an Electronic Battle Damage Indicator (eBDI) which is compact, able to discern the target signals in the presence of background noise, have sufficient flexibility to measure a variety of targets, and provide rapid feedback of the effectiveness of the attack. In addition, it must be capable of surviving HPRF/HPM exposure and able to measure the output produced by the attacking source to validate the engagement. Likely sources are:
Wideband HPRF/HPM source detection 100-1000 MHz, pulse width 2 – 200 ns
Narrowband HPRF/HPM source detection 500 MHz – 5 GHz, pulse widths, 1 ns - 5 µs

Target measurement range of unintended emissions: 0.2 – 12 GHz

Technology Developed: The Autonomous Damage Assessment Module (ADAM) will measure and store RF emissions from a targeted facility, record critical parameters of an HPRF/HPM engagement source, measure target RF emissions after the HPRF engagement, determine if significant changes in the RF signature have occurred, and finally, transmit the results to a Remote Control Unit (RCU) within seconds-to-minutes after an engagement. The next generation of the ADAM module will be sufficiently compact, lightweight and inexpensive that its deployment is exceptionally straightforward and its utilization can be on a one-time, even disposable, basis.

Warfighter Value: ADAM provides post HPRF/HPM attack assessment of the target electronic systems to aid the warfighter in situational awareness and decision making after an engagement.

WHEN

Contract Number: N68335-19-C-0445 **Ending on:** Feb 16, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Proof of conept demonstration	N/A	Measured target signals at relevant range	3	1st QTR FY19
Demonstration of RF data link at 20 km	N/A	Measured full data transfer rate at 20 km equivalent range	5	1st QTR FY21
High power test of receiver system	N/A	No degradation of receiver system after HPRF exposure	5	3rd QTR FY21
Demonstration of temperature tolerance	N/A	Operation of system at temperatures to 130°F ambient	6	3rd QTR FY22
Field demonstration of brassboard system	N/A	Detected target effects during directed energy demonstration	7	1st QTR FY22
If option is fully funded, demonstration of compact system	Medium	Achieve similar performance as Gen I in a compact man portable package	8	4th QTR FY23

HOW

Projected Business Model: Voss Scientific will continue the development of the ADAM system and can meet initial low volume production requirements. We can also deploy and operate the ADAM as a part of Government or prime contractor sponsored directed energy source development / demonstrations. We have identified paths to reduce the SWaP of the existing system and move toward a design which can be covertly deployed if desired. As demand increases a manufacturing partner will be sought to ensure cost effective and timely delivery of high quality products.

Company Objectives: Voss Scientific is committed to the development of the ADAM technology and is seeking opportunities to support HPRF/HPM tests to enhance the ongoing development. At this time there is sufficient unfunded ceiling on the existing Phase II contract to assemble a more compact and covert version of the ADAM and deploy it in a future demonstration.

We are also interested in developing alternative uses of the technology, such as an inexpensive HPRF/HPM attack detection system.

Potential Commercial Applications: As directed energy capabilities become more common, both government and commercial sites can easily be targeted. A mass produced, low cost, ADAM system could be broadly deployed as an advanced warning system and damage assessment tool for HPRF/HPM attacks at a broad range of government and commercial infrastructure sites and data centers. In addition to early detection and identification of the nature of the attack, multiple devices deployed at a single installation will also provide geolocation of the source of the attack. In addition, the capability to detect low level signals can be used to design and evaluate electromagnetic hardening solutions to protect from these types of attacks.

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