Department of the Navy SBIR/STTR Transition Program

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Topic # A16-123
Miniaturization of high average power, high peak power, wide bandwidth antennas
ASR Corporation

WHO

SYSCOM: ONR

Sponsoring Program: ONR

Transition Target: Future airborne Navy high power microwave (HPM) source applications.

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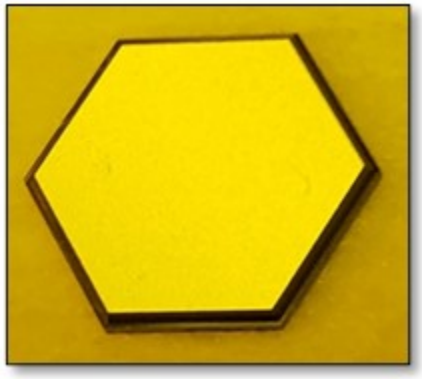
Other Transition Opportunities: Commercial range finding and ultra-wideband (UWB) communication applications.



Courtesy of Semiconductor Power Technology

Notes: High power microwave (HPM) weapons refer to a class of offensive weapons that generate a microwave signal that can disrupt near-by electrical systems. This signal can be either narrow band or wideband in nature. Generally, narrow band sources are larger and heavier, but can disrupt target systems at greater ranges than wideband sources. Conversely, wideband sources generally have a shorter range of effectiveness but are lighter and smaller than narrow band sources. When the source can be located close to the target, wide band sources can be very cost effective and compact. The drift step recovery diode (DSRD) developed here can form the basis of a wideband HPM source.

WHAT

Operational Need and Improvement: High power microwave (HPM) sources have been developed to disrupt electrical systems at a distance. The drift step recovery diode (DSRD) is an opening electrical switch and can enable the use of inductive energy storage systems to drive HPM sources more efficiently than closing switches. Coupled with compact antennas, HPM sources based on DSRDs may allow the development of more compact sources than would otherwise be available with closing switches. Combined, these two technologies may enable HPM sources in smaller systems.

Specifications Required: DSRDs with greater than 800V per diode and less than 2 ns switching time into a standard test circuit load. Compact wideband antennas with a range of 100 MHz - 1 GHz and voltage handling of 26kV.

Technology Developed: Team member Semiconductor Power Technology has developed a Gen 2 DSRD fabrication process that allows operation at 638 kV and less than 1.6 ns rise time per diode. Team member UMKC has developed an 8+ kV micro-patch antenna with 1 GHz center frequency and 22% bandwidth.

Warfighter Value: increased range to effect for improved warfighter safety. This is important to the warfighter because of the increased standoff distance for a given effect.

WHEN

Contract Number: N68335-19-C-0255 **Ending on:** Dec 22, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Gen 2 Switches Drive Antenna Loads	Low	Meet integration target	5	4th QTR FY23

HOW

Projected Business Model: Develop a relationship with a major prime to fabricate DSRDs that can make use of inductive energy storage and compact antennas in directed energy weapons of interest to the DoD.

Company Objectives: Develop a wide range of customers to support with innovative inductive energy storage systems and compact antennas.

Potential Commercial Applications: The increased efficiency associated with inductive energy storage coupled with compact antennas can enable a variety of range finding applications. This may include automotive applications, ground penetrating radar and any other application where an opening is beneficial.

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