Department of the Navy SBIR/STTR Transition Program

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NAVSEA #2022-0364

Topic # N20A-T015
Compact and Efficient Magnetron Source for Continuous Wave Microwave Power Generation
Calabazas Creek Research, Inc.

WHO

SYSCOM: NAVSEA

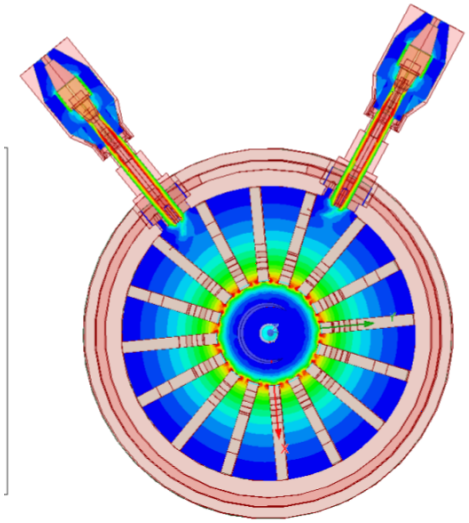
Sponsoring Program: Naval Sea Systems Command

Transition Target: Advanced Radar Illuminators

TPOC: (703) 696-5054

Other Transition Opportunities: radio beacons, target emulators, which mimic threat, and simple “fire and forget” jammers.

Notes:



Model of magnetron circuit with varactor diodes for frequency and phase control

WHAT

Operational Need and Improvement: The Navy needs a novel magnetron source for high power CW microwave generation at S-band frequencies. The source must be compact, efficient, and affordable. The source must be capable of fast tuning across a narrow band with a locked frequency response sufficient to support a data transmission. The program is integrating varactor diodes into the magnetron circuit to provide fast control of output frequency and phase. Also developing hardware and software for the control system.

Specifications Required: Minimum output power of 5 kW (CW)
2.45 GHz operation in Industrial-Scientific-Medical band to leverage industrial microwave heating equipment
Fast tuning over at least 5 MHz
Support 2 MB/sec data transmission rate using simple frequency shift keying
Use only forced air-cooling

Technology Developed: Integrating varactor diodes into magnetron circuit to modify capacitance for frequency and phase control
Developing hardware and software for feedback control system

Warfighter Value: New RF source with reduced size, weight, and power requirements

WHEN

Contract Number: N68335-22-C-0116 **Ending on:** Nov 25, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Software for phase-locking feedback loop	Low	Bench test	6	1st QTR FY23
Modulate magnetron cavity to achieve locking	High	Calculations and tests with commercial varactor diodes	6	1st QTR FY23
Demonstrate 5 MHz frequency shift in customized magnetron	Medium	Test magnetron with HV function generator driving varactor	5	2nd QTR FY23
Develop locking circuitry	Low	Test circuitry with magnetron	5	3rd QTR FY23
Demonstrate phase locked magnetron	Medium	Assemble system and test	6	1st QTR FY24

HOW

Projected Business Model: CCR will team with magnetron manufacture Communications & Power Industries, LLC (CPI) to produce the system. CPI will manufacture magnetrons with varactor inputs, and CCR will assemble and package the electronics and software.

Company Objectives: Goal is to team with a major prime manufacture requiring this source in an RF system. The prime would develop the complete system package, including RF source, power supplies, transmitter, and overall control system for deployment in a Navy vehicle or system.

Potential Commercial Applications: There are limited commercial applications. Precise frequency and phase control are not required for commercial radar or heating applications, and the output power is likely below that required for accelerator applications.

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