

# NAVY Transition Assistance Program

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## NEED & CUSTOMER REQUIREMENT

**Need:** The current Active Denial System (ADS) requires the use of a superconducting magnet. These are expensive, difficult to transport, operate, and maintain in the field. A source with output power exceeding 30kW utilizing permanent magnets is desired.

**Value to the Warfighter:** The updated technology will allow instant operation without time requirement to cool the magnet to superconducting temperatures, offering instantaneous non-lethal protection for the Warfighter in many situations such as protection of vessels entering harbors and crowd control.

**Operational Gap:** Current superconducting magnet requires 12-14 hours to reach operational temperature before the system can be activated. The alternative is to keep the system powered up continuously, which significantly increases cost and requires additional personnel.

**Customer Specifications:** Requirement is > 35% power efficiency for the RF source (gyrotron). The source must be capable of producing > 50 kW for several seconds at 95 GHz using permanent magnets. In addition, improvements in weight, cost, reliability, and cool-down time of the current ADS are sought without increasing other constraints on the system such as prime power.

**Technology Description:** The RF source is a gyrotron which converts electrical power to RF power. The challenge is to utilize a higher order harmonic of the operating mode to lower the magnetic field requirement to that achievable by a permanent, rare earth magnet. Higher harmonic operation results in lower circuit efficiency, so an energy recovery capability is required to achieve the total efficiency. The RF source under development is a gyrotron operating at the third harmonic of the TE02 mode with a depressed collector.

## TECHNOLOGY DEVELOPMENT MILESTONES (SBIR/STTR)

Milestone	TRL	Risk	Measure of Success	TRL Date
Gyrtron Design	3	Moderate	Simulation of specified performance	June 2008
Magnet Design	3	High	Simulated achievement of field profile	October 2008
Magnet Assembly	4	High	Achievement of measured field profile	May 2009
Gyrotron Assembly	4	Low	Sealed device ready for test	December 2009
Gyrotron Test	5	High	Production of required power level at specified efficiency	March 2010

**Open contract:** N00024-08-C-4112 ending 1/15/2010

N06-129 - Calabazas Creek Research, Inc.

3rd Harmonic W-Band Permanent Magnet Gyrotron

## SPONSORSHIP of original SBIR/STTR Topic

**SYSCOM:** NAVSEA

**Transition Target:** Joint Non-Lethal Weapons Program - The Active Denial System

**Original Sponsoring Program:** Not Specified

**TPOC Phone Number:**  
(812) 854-4804

**Note:**

- A parallel program is funded by the U.S. Air Force out of Kirtland AFB, NM (FA9451-07-C-0010). The TPOC Phone Number is (505) 846-5261.

- The Joint Non-Lethal Weapons Program is sponsoring a transition program led by the Air Armament Center at Eglin AFB to establish a formal program of record.



## TECHNOLOGY TRANSITION OPPORTUNITIES (PHASE III)

**Other Potential Applications:**

- U.S. Army - High Mobility Multipurpose Wheeled Vehicle (HMMWV), Mine Resistant Armored Personnel (MRAP) vehicles
- U.S. Air Force - security protection purposes
- Border Patrol
- U.S. Embassy protection (Diplomatic Security)

**Business Model:**

We intend to license the technology to Communications & Power Industries, Inc. (CPI) to produce the gyrotron. CPI is currently the only commercial producer of gyrotrons in the U.S. They currently produce the gyrotron for the Raytheon Active Denial System.

**Objective:**

We are seeking to develop relationships with a prime contractor, such as Raytheon or L3 Communications Titan, capable of developing the power supply and cooling system for the gyrotron, as well as the control electronics and antenna system.