Department of the Navy SBIR/STTR Transition Program

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MCSC-PRR-4099

Topic # N181-003

USMC Ground Radio LPI/LPD Interference Mitigation Active Communication Antenna

Vulcan Wireless Inc.

WHO

SYSCOM: MARCOR

Sponsoring Program: Marine Corps Systems Command

Transition Target: Provide an end to end solution that easily integrates into a tactical radio system using a software defined radio that provides a ground radio Low Probability of Intercept/Low Probability of Detection (LPI/LPD) interference mitigation to the communication link

TPOC:

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Other transition opportunities: We see multiple paths to transition for the VAAT (Vulcan Antenna Array Transceiver). Our commercialization strategy is to use Intellectual Property (IP) core, as it is cheaper and easier. The technology developed will be directly applicable to a wide variety of wireless systems and can be readily adapted to multiple waveforms and applications.

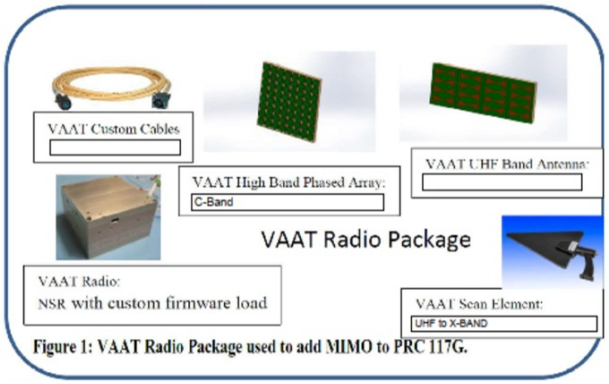

Figure 1: VAAT Radio Package used to add MIMO to PRC 117G.

Notes: The figure shows Vulcan Wireless's VAAT (Vulcan Antenna Array Transceiver) which is a radio add on. Due to limited budget, we still need to build an entire 360 coverage field of view, in a future Phase II

WHAT

Operational Need and Improvement: There is a need to develop an improved range and concealed communications in a contested area to allow for improved LPI/LPD Interference mitigation. Marine Corp Systems Command (MARCORSYSCOM) utilizes multiple communication systems in environments that require covert communications, as they are exposed to severe interference. To significantly improved the LPI/LPD (Low Probability of Intercept/Low Probability of Detection) from detection we proposed an add-on MIMO (Multiple Input Multiple Output) module that connects to the antenna port of the existing tactical radio, specifically the AN/PRC-117G. The control of the tactical radio is done via Ethernet to coordinate the tactical radio and add-on module to insure proper configuration, such as carrier frequency and waveform selection.

Specifications Required: Provide an active interference mitigation antenna that will connect to Marine Corps communications radios to include the AN/PRC-117G or other variants. The specific requirements of the Tactical Radio waveform are:

* Simulate the channel effects (multipath and fading)
* Simulate frequency impairments the channel (Doppler and frequency uncertainty)
* Simulate effects of interference
* Simulate Multiple Input Multiple Output (MIMO) beam forming for both Transmission and reception antenna patterns
* Review RF specifications of multi-element receiver (downconverter and digital sampling receiver)
* Review RF specifications for multi-element transmitter (digital converter and upconverter transmitter)

Technology Developed: Vulcan Wireless, Inc has demonstrated we can develop a light weight, low power, man portable radio add-on called VAAT (Vulcan Antenna Array Transceiver) radio package that enhances the range of the radio, which also establishes covert communications that works even when exposed to severe interference.

Warfighter Value: The system provides an enhanced and cost effective solution to military communications that is portal, light weight and low power radio, protecting and secure communications from detection in hostile areas. This can be applied to many systems throughout the military.

WHEN

Contract Number: M67854-20-C-6510 **Ending on:** October 15, 2019

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Design stand alone VAAT (Vulcan Antenna Array Transceiver)	Med	Simulated an array of prototype antenna to validate the manufacturability.	TRL-4	1st QTR FY20
Fabricate VAAT (Vulcan Antenna Array Transceiver)	Med	Lab demo of PRC-117 to VAAT system. VAAT detects and acquires remote communication signal and forms an input antenna beam for signal	TRL-6	1st QTR FY20
VAAT (Vulcan Antenna Array Transceiver) integration	Low	Antenna chamber demo with PRC-117G	TRL-7	3rd QTR FY22

HOW

Projected Business Model: Vulcan Wireless Inc's VAAT radio package was developed to take a widely used tactical communication system and make the system more robust and improve its LPI/LPD/AJ characteristics. The system is fully deployable without the need for NSA cryptographic keys, thus is unclassified. The User operates the PRC-117G with standard COMSEC procedures and methods to the VAAT. However, to avoid NSA COMSEC /INFOSEC certification requirements no data from the spectrum analyzer is stored within the VAAT unit itself. The add on VAAT radio is designed to cover a 360 degree area of coverage that will automatically scan to find remote terminal that will automate the set up and operate, with no interference in a hostile area.

Company Objectives: Vulcan Wireless Inc was awarded a Phase II contract to expand this technology in the area of LPI/LPD interference mitigation. Vulcan Wireless is looking to expand this technology with additional research and development into risk reduction, digital beam forming and control software with a 360 degree area of azimuth coverage. The value Vulcan provides is the radio hardware and add-on will increase security for the military and keep communication secure. The goal of this program is to defeat communications interference in a battlefield scenario. We are leveraging our design off the Vulcan CSR-SDR and NSR-SDR radios.

Potential Commercial Applications: It is anticipated that we will leverage our digital beam forming techniques into IP core that can be scaled for a wide variety of wireless applications that can be readily adapted to multiple waveforms and applications. We will market the IP blocks along with our existing RF hardware products. IP cores are becoming much more portable as much higher integration is being done in silicon. In the past each beam forming application used highly customized hardware making it very difficult to segment into a reusable IP core. This is no longer true with the introduction of RF SoC our IP cores will be reusable in any radio system that utilizes this core. Vulcan Wireless has commercialized Software Defined Radios for small space vehicles and this technology will enhance future radio systems.

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