Department of the Navy SBIR/STTR Transition Program

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NAVAIR 2019-759

Topic # N152-081
GATED PH II - Synthesis and Realization of Broadband Magnetic Flux Channel Antennas
Metamagnetics, Inc.

WHO

SYSCOM: NAVAIR

Sponsoring Program: Carrier Unmanned Aviation program office (PMA-268)

Transition Target: MQ-25 Stingray

TPOC:
(301)342-0096

Photo courtesy of U.S. Navy

Other transition opportunities: Class 1, 2, and 3 unmanned aerial vehicles (UAVs), along with unmanned underwater vehicles (UUVs) and satellites Systems with size, weight and power (SWAP) concern. Any satellite or aircraft communications systems that are size, weight and power (SWAP) sensitive or desire reduction in visual signature.

Notes: The low profile, wide bandwidth, VHF/UHF conformal magnetic flux antenna does not require a backplane. So, it can be mounted directly to the surface of the aircraft with minimal impact on the aerodynamics of the airplane. Concept is scalable for other frequency bands.U.S. Navy photo by Mass Communication Specialist 3rd Class Sabrina Fine/Released) 130210-N-NB538-195.

WHAT

Operational Need and Improvement: The Navy is interested in extending the capabilities of magnetic-current radiators by constructing frequency-independent geometries. Additionally, small antennas and high-power antennas are being sought.

Specifications Required: A new Very high frequency (VHF) / Ultra high frequency (UHF) antenna with reduced size, which allows mounting on the outer surfaces of drones and small satellites is needed.The designs must have a azimuthal omnidirectional gain over the 350 - 700 Mhz frequency range, and usable gain over a wider bandwidth. The design must be scalable for other frequency ranges as well.

Technology Developed: Metamagnetics has developed a linear magnetic flux VHF/ UHF antenna that leverages the high permittivity and permeability of ferrite to significantly reduce the physical size. The operating frequency range depends more on the length than the height of the antenna, thus reducing the wind drag from the antenna.

Warfighter Value: The wide operational bandwidth of this antenna can potentially take the place of multiple antennas. Adjacent non-magnetic metal structures do not affect the magnetic flux antenna performance and allows the antenna to be mounted flat against the exterior surface of the airplane or satellite while providing omnidirectional coverage in azimuth. Also, the antenna can be shaped to follow the contour of the outer surface of the aircraft to minimize wind drag.

WHEN

Contract Number: N68335-17-C-0317 **Ending on:** March 12, 2020

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Phase I Computer simulation of circular antenna	N/A	Gain patterns show promise	1	February 2016
Phase II Base Design	N/A	Ferrite core antenna breadboard measurements show gain in UHF band	4	July 2018
Phase II Option Linear design simulation	N/A	Much smaller, simpler design	2	June 2019
Phase II Option Preliminary Linear Antenna testing	N/A	Gain > -10 dBi, Bandwidth > 1/2 octive	4	October 2019
Phase II Option Linear Antenna Design refinement	N/A	Smaller, Lighter, and better gain	3	December 2019
Phase II Option Refined Linear Antenna testing	N/A	Gain > -5 dBi, Bandwidth > 1 octive	5	February 2020

HOW

Projected Business Model: Metamagnetics has in-house machining and assembly capabilities. Testing will be done either in-house or at a local test range. We will manufacture the antennas in small to medium volume.

Company Objectives: • Find program office interested in capability
• Define frequency of interest for communications
• Define rough prototype
• Deliver model or hardware prototype
• Evaluate results
• Tweak product for final prototype
• Test fly product

Potential Commercial Applications: None at this time.

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