Topic: AF083-193

Vulcan Wireless, Inc.

Bandwidth Efficient SATCOM Waveform Techniques

The technology developed was a compact multifunctional software defined radio hosting both MUOS and Legacy UHF waveforms on a Low Earth Orbit (LEO) satellite platform. The communications link provides low latency, anywhere on orbit data control and connectivity from the user to the space vehicle, which is not currently available to the satellite user. Vulcan Wireless is currently focusing on Machine to Machine (M2M) communications, whereas most Mobile User Objective System (MUOS) terminals are designed for voice and data and are much larger. We see multiple paths to transition to M2M applications, first is into LEO space vehicles, second unmanned aerial vehicles, and unmanned underwater vehicles. This system has been prototyped and its functionally verifiable. We transition products from conception to production for military and commercial customers.

Technology Category Alignment:

EO/IR Components for sensing, transmission and communication
RF Components for sensing, transmission and communication
Fixed Wing Vehicles (includes UAS)
High-Speed/Hypersonics
Synthesis/Analytics/Decision Tools

Contact:
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http://www.vulcanwireless.com/
SYSCOM: SPAWAR
Contract: FA9453-16-C-0423

Room: Room 4
Presenting: Apr 10th at 10:10 AM
Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=FA9453-16-C-0423

Department of the Navy SBIR/STTR Transition Program

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SPAWAR SR-2018-323

Topic # AF083-193

Bandwidth Efficient SATCOM Waveform Techniques

Vulcan Wireless, Inc.

WHO

SYSCOM: SPAWAR

Sponsoring Program: Navy PEO Space

Transition Target: Mobile User Objective System (MUOS)

TPOC:
619-553-1675

Other transition opportunities: We see multiple paths to transition to machine to machine (M2M) applications, first into Low Earth Orbit (LEO) space vehicle and then into unmanned aerial vehicles and unmanned underwater vehicles. We also have a transitioning path directly with a Vulcan Wireless produced cryptographic solution.

Notes: The figure shows Vulcan Wireless's compact multi-functional software defined radio (SDR). The dimensions are 82 x 92 x 48.8 mm.

WHAT

Operational Need and Improvement: There is a need to develop next generation of bandwidth efficient waveform(s) and/or hardware leading to increased radio frequency (RF) capacity in military Satellite Communications (SATCOM) applications. Driven by user demand for fixed and mobile satellite communications, satellite capacity requirements have grown by a factor of ten over a period of approximately twelve years. In order to continue this explosive growth in the face of limited RF spectrum, new innovations in advanced waveform processing will be required to leverage existing RF spectrum for increased SATCOM capacity.

Specifications Required: Tactical communications in polar regions and communications in denied regions is required.The goal of this project is to demonstrate a highly flexible space based CubeSat communications payload that can communicate with ground based tactical ultra high frequency (UHF) SATCOM radios, as well as crosslink to the MUOS satellite network. The ability to communicate over two radio systems requires the SDR to switch waveforms, as well as RF configurations. This capability will be built into the NSR-SDR-MUOS radio. The resulting CubeSat radio will provide dual mode communications for the CubeSat. The MUOS system will provide control of the CubeSat and data bridging and the second mode provides data bridging in the polar region for tactical UHF SATCOM users.

Technology Developed: Vulcan Wireless developed a compact multi-functional SDR hosting both MUOS and Legacy Ultra high frequency (UHF) waveforms on a LEO satellite platform. The radio has been prototyped and its functionally verifiable. This radio will be launched on a satellite and testing will be done in the pole and denied areas. Vulcan's radio provides:

- Global coverage, spread spectrum and anti-jam capability.
- Next generation UHF network that is connected to the Global Information Grid (GIG) for real time data.
- Connectivity to thousands of Legacy UHF radios deployed in the field today.
- Ability to reuse existing ground infrastructure without modification.
- Ability to be hosted on many small vehicles such as unmanned and space vehicles.
- Beyond the Line of Site (BLOS) capability.

Warfighter Value: The system provides a cost effective and enhanced global military communications links hosted on a low cost space vehicle that works in the poles and denied areas.

WHEN

Contract Number: FA9453-16-C-0423 **Ending on:** April 24, 2018

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Enviromental testing NSR-SDR-MUOS	Low	Radio passed qualification testing	TRL-6	May 2016
Design dual radio hardware upgrade	Med	Radio fully assembled and presented in Critical Design Review (CDR) to SPAWAR	TRL-6	February 2018
Fabricate dual Radio NSR-SDR-MUOS	Med	Integrated, passed verification and operational testing	TR-6	April 2018

HOW

Projected Business Model: Vulcan Wireless's radio is scheduled to go up into a satellite, where it will be tested in the polar and denied area regions. However, to get permission to operate on the MUOS network we will need to get National Security Agency (NSA) Communications Security (COMSEC) certification. Vulcan Wireless intends to manufacturer the radio hardware, but needs a partner to provide Type 1 cryptographic subsystem and Vulcan completes the system certification / qualification.

Company Objectives: Vulcan Wireless is looking to expand this technology in the area of cryptographic subsystem. The value chain would be Vulcan provides the radio hardware, partner provides the Type-1 cryptographic solution to complete this project with Vulcan Wireless completing the system certification/qualifications.

Potential Commercial Applications: With the radios flexible architecture multiple commercial applications can be for small satellites, unmanned aerial vehicles (UAVs), unmanned underwater vehicles (UUVs) and aircraft applications.

Contact: Kevin Lynaugh, President
klynaugh@vulcanwireless.com 760-473-7656

Topic: N142-118

HYPRES, Inc.

Wideband RF Digitizer with Integrated Filter

HYPRES, Inc. (HYPRES) – a superconducting electronics company – offers design, development, fabrication, testing and packaging services for their digital Radio Frequency (RF) product-lines. This Phase II effort develops Co-Site Interference Mitigation for Wideband Receivers. HYPRES Advanced Digital Receiver (ADR) enables full spectrum monitoring and maximizes signal reception for military satellite communication, signal intelligence, radar, electronic warfare systems and tactical data links, providing improved surveillance capabilities, detection of smaller targets, and superior range. Direct RF digitizing eliminates front-end analog components reducing size, weight, and power by 50%. A world leader in advanced digital RF superconductor technology development and production, HYPRES seeks program office and prime contractor support, and equity investors to transition ADR systems for DoD applications and commercial markets.

Technology Category Alignment:

RF Components for sensing, transmission and communication
Networks and Communications
Broadband/Multispectral Components and Systems

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(321) 427-5293
https://www.hypres.com/
SYSCOM: ONR
Contract: N00014-17-C-2001

Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N00014-17-C-2001

Department of the Navy SBIR/STTR Transition Program

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ONR Approval #43-4388-18

Topic # N142-118
Wideband RF Digitizer with Integrated Filter
HYPRES, Inc.

WHO

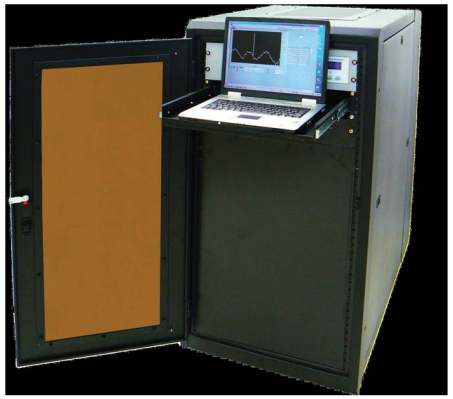
SYSCOM: ONR

Sponsoring Program: SPAWAR PMW 120, PMW 150, PMW/A 170, PMW 770

Transition Target: Shipboard Signals Exploitation Equipment next generation, Navy Multi-band SATCOM Terminal

TPOC:
Dr. Deborah Van Vechten
deborah.vanvechten@navy.mil

Other transition opportunities: Multi-functional Information Distribution System (MIDS) Link 16, Magnetic Resonance Imaging (MRI) systems for Traumatic Brain Injury



Modular, Multi-Function Digital-RF Receiver

WHAT

Operational Need and Improvement: Naval radio frequency (RF) systems have a requirement to improve spectrum utilization by implementing high speed broadband analog to digital converters. Although great strides were made with the third generation Modular, Multi-Function Digital-RF Receiver systems in the hands of government labs, attention is now focused on the fourth generation, first delivered in 2018. The ability to simultaneously capture a wide range of signals of interest is now primarily limited by the immaturity of integration of the data output into appropriate backend DSP.

Specifications Required: This phase II is part of the program plan to develop a wideband receiver for applications such as electronic warfare. The objective of this Phase II is to integrate ADCs together with an analog filter/multiplexer as an integrated Nb technology single chip. If more capability is required, the system can be scaled up by combining chips into a multi-chip module (MCM).

Technology Developed: Technology developed utilizing the HYPRES advanced digital RF receiver (ADR) will eliminate many components,enhance toleration of co-located high power transmitters and enable dominance of the RF spectrum for naval multi-function RF applications, such as communications, Electronic Warfare (EW), Intelligence, Surveillance, and Reconnaissance (ISR) and Radar.

Warfighter Value: These Modular, Multi-Function Digital-RF Receiver systems maximize signal reception for communication, ISR and EW systems, enabling full broadband spectrum monitoring and precise emitter identification (ID) in a smaller form factor. Direct digitization at RF eliminates traditional analog RF components such as mixers, LO and many filters. High sensitivity allows many LNA to be eliminated. Digital reception allows many signals having different bandwidths and potentially overlapping frequency content to be collected from a single data stream and a single antenna. All these benefits reduce the size, weight, and power of full spectrum access systems by as much as 50 percent while simultaneously allowing facile real time adaptation.

WHEN

Contract Number: N00014-17-C-2001 **Ending on:** March 16, 2019

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Design and develop a multi ADC chip and a digital RF receiver concept	N/A	Test and evaluate a set of ADC chips per test plan, Completed	3	1st QTR FY18
Develop Cryocooled Testbed for Receiver chip	N/A	Demonstrate an MCM based, working ADC. Demonstrate a digital receiver with multiple coherently clocked ADC.	3	2nd QTR FY18
Design and develop Nb analog filter	N/A	Test analog filter chips per test plan. First development cycle completed. Second cycled started.	3	2nd QTR FY18
Option 1-Develop receiver MCM	High	Test system on a single, integrated chip per test plan.	4	2nd QTR FY20
Option 2-Build Digital RF Receiver with Filter ADC SoC MCM	High	Test and demonstrate the concept of a channelizing Digital RF Receiver	6	1st QTR FY20

HOW

Projected Business Model: The output of this Phase II will result in a product that will be incorporated into the HYPRES digital RF receiver product family which in turn will be inserted into military systems directly and through other DoD prime contractors. HYPRES has worked with L-3 Communications, Argon ST, and ViaSat on digital-RF receiver projects in the past.

Company Objectives: HYPRES seeks program office support for completion of development, test and evaluation, and transition to Ship's Signals Exploitation Equipment (SSEE) and Navy Multiband Terminal (NMT) as examples of relevant programs of record. HYPRES also seeks relationships with prime contractors, DoD program offices and equity investors for transition to major communications, EW, ISR and radar acquisition programs, and to the commercial market.

Potential Commercial Applications: HYPRES has identified commercial applications in MRI systems (ONR/OSD SBIR phasel/phase II contracts), avionics equipment and commercial SATCOM.

Contact: Michael DeZego, Director, Business Development
mdezego@hypres.com 321-427-5293

Topic: N151-076

Teqnovations LLC

Modular, Polarization-Preserving, 40-200 GHz, Active, Electronically Steered Array (AESA) Focal-Plane + Reflector Antenna for Next-Generation, Space-borne Radiometer
Teqnovations' ultra-wide-bandwidth, timed-array active, electronically steered array (AESA) antennas enable next-generation SIGINT, radar, and data communications systems operating between 8 GHz and 200 GHz. True-time-delay beam steering enables transmitting and/or receiving RF signals in a 5:1 frequency range without squint or RF pulse distortion. Low SWaP-C, timed-array antennas enhance performance of systems on ships, planes, drones, satellites, and the ground. Teqnovations continues to develop its patented, low-SWaP-C, timed-array antenna technology for multiple governmental and commercial applications. Teqnovations has prototyped novel, ultra-wide-bandwidth true-time-delay units (TDUs) and conceptually designed a complete, modular Ka-band SATCOM antenna system to include an integrated receiver. Teqnovations is looking for Defense customers with un-met needs to support development and prime contractors to integrate our technology into advanced systems.

Technology Category Alignment:

RF Components for sensing, transmission and communication

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SYSCOM: ONR
Contract: N68335-17-C-0058

Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N68335-17-C-0058

Department of the Navy SBIR/STTR Transition Program

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ONR Approval #43-4388-18

Topic # N151-076

Modular, Polarization-Preserving, 40-200 GHz, Active, Electronically Steered Array (AESA) Focal-Plane + Reflector Antenna for Next-Generation, Space-borne Radiometer

WHO

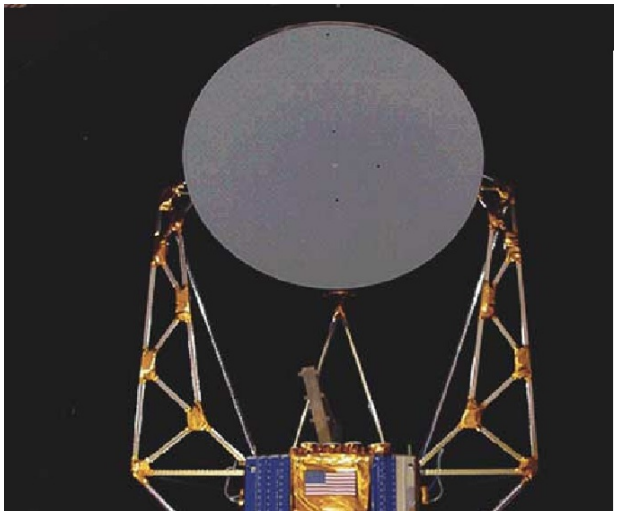
SYSCOM: ONR

Sponsoring Program: Office of Naval Research: Code 3.1 Electronics Sensors and Network Research

Transition Target: Navy capital ships and satellite data communications

TPOC:
Dr. Deborah VanVechten
deborah.vanvechten@navy.mil

Other transition opportunities: Teqnovations' capabilities are applicable across a wide range of Army, Navy, Marine Corps, and Air Force WindSat satellites, as well as the commercial SatCom and wireless data transmission community.



Courtesy U.S. Navy

WHAT

Operational Need and Improvement: Teqnovations' modular, polarization-preserving 40 - 200 GHz active, electronically steered array (AESA) antenna is targeted for integration into next-generation WindSat satellites. Teqnovations' AESA technology enables WindSat's to customize earth scan location and resolution to precise image wind vectors in critical geographic areas. Application of higher frequencies minimizes interference from lower frequency operations. Modular, AESA configured into planar, timed-array antennas or focal-plane arrays support the design of a wide range of antenna shapes and sizes, including quasi-conformal arrays. Planar, ultra-wideband modular antenna (PUMA) technology supports the acquisition of 40 - 200 GHz polarimetric radiometer data. True-time-delay (TTD), RF liquid-crystal (LC) -based time delayers form beams across the entire frequency band. Multiple antenna beams can be formed entirely in the RF domain, entirely in the digital domain, or hybrid domains via sub-arrays.

Specifications Required: A high gain, low noise figure, rad-hard, dual polarization, electronically steered, multi-beam antenna array for the 40-200 GHz frequency range using a scalable subarray design.

Technology Developed: Teqnovations' ultra-wide-bandwidth, timed-array active, electronically steered array (AESA) antennas enable next-generation intelligence, surveillance, and reconnaissance (ISR), radar, and data communications systems operating between 1 GHz and 200 GHz. True-time-delay beam steering enables transmitting and/or receiving RF signals in a 5:1 frequency range without squint or RF pulse distortion. Low SWaP-C, timed- array antennas enhance the performance of systems on ships, planes, drones, satellites, and the ground.

Warfighter Value: Teqnovation's capability:
- Extends antenna bandwidth and improves radar range resolution
- Enables diverse data communications operation over a wide range of frequencies
- Enables higher frequency, broad-bandwidth persistent ISR
- Enables wider-bandwidth, higher-frequency radiometry, Raises operational range frequency range
- Lower Size, weight, Power, and Costs (SWaP-C)
- Flexible, modular antenna construction – tailorable antenna shape and size

WHEN

Contract Number: N68335-17-C-0058 **Ending on:** March 25, 2019

Milestone	Risk Level	Measure of Success	Ending TRL	Date
PUMA array and antenna architecture	Med	System Specification and Test Criteria Established	TRL-3	2nd QTR FY18
Designed a build-able version of a one beam, dual-polarity PUMA array	Med	Targeted Transmission Rates/Fidelity	TRL-3	1st QTR FY19
Test TDUs for radiation tolerance (total ionizing dose)	Med	200 - 600 krad	TRL-4	3rd QTR FY19
Build and test a one beam, dual-polarity PUMA array	Med	VSWR and polarization isolation goals achieved	TRL-4	4th QTR FY19

HOW

Projected Business Model: Teqnovations proposes to develop a modular, polarization-preserving 40-200 GHz active, electronically steered array (AESA) antenna for the next generation of WindSat satellites. The new WindSat's higher frequencies will minimize interference from operations at lower frequencies. Modular, AESA tiles can be configured into planar, timed-array antennas or into the focal-plane arrays for use with a reflector. The scalable AESA tile design supports a wide range of antenna shapes and sizes, including quasi-conformal arrays. Planar, ultra-wideband modular antenna (PUMA) technology was developed to acquire polarimetric radiometer data in the 40-200 GHz band. Where, true-time-delay (TTD), RF liquid-crystal (LC) -based time delayers form beams across the entire frequency band. Multiple antenna beams are formed entirely in the RF domain, entirely in the digital domain, or in a hybrid of the two domains with sub-arrays. Teqnovations has designed a laboratory version of an AESA with four, dual (V + H) beams. Teqnovations has plans to build hardware to prove its technology. Then develop a complete antenna system or team with a prime for complete antenna development to manufacturer, sell, or license complete antenna systems or antenna modules.

Company Objectives: Teqnovations plans to continue development of its patented, low-SWaP-C, timed-array antenna technology for multiple governmental and commercial applications. Under the Phase II SBIR Teqnovation has prototyped novel, ultra-wide-bandwidth true-time-delay units (TDUs) and conceptually designed a complete, modular Ka-band SATCOM antenna system to include an integrated receiver. Teqnovations is looking for Defense customers with un-met needs to support the development and prime contractors to integrate our technology into advanced systems.

Potential Commercial Applications: Commercial collision avoidance radar applications operating in the 60 GHz range to 94 GHz range is being developed quickly. Short-range communications, such as WiFi hotspots, leverage for portions of the spectrum with large atmospheric attenuation regions with large physical separation. Specific regions within the Commercial SatCom and wireless data transmission community requiring high data rate information and reliable connectivity.

Contact: Tom Linnenbrink, Principal and CEO
toml@teqnovations.com 719-235-7327

Topic: N152-123

Metamagnetics, Inc.

Ferrite-Based Frequency Selective Limiter and Signal-to-Noise Enhancer for Interference Protection and Prevention in UHF SATCOM

RF environments are increasingly more complex causing distress for system designers across the warfighter to create a robust RF interference mitigation solution. Metamagnetics' Auto-tune Filter has created a small chip that can mitigate any number of interferers quickly and effectively without the need of complex processing systems. This enables a variety of platforms to easily install a robust, low SWAP solution for cosite and jamming problems. Potential systems include radios, GPS, EW and radars. Metamagnetics, an advance magnetic material design firm, has enhanced the device's baseline material and performed higher level testing in systems along with transitioning another version of the technology to a Navy EW system. Metamagnetics is looking to partner with primes for system transition along with government entities to help fund development.

Technology Category Alignment:

RF Components for sensing, transmission and communication
Networks and Communications
Advanced Electronic Protection Techniques and Technology
Distributed/Coordinated/Net-Enabled Systems
Radio Frequency (RF) (non-EW)

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http://www.mtmgx.com
SYSCOM: SPAWAR
Contract: N68335-17-C-0252

Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N68335-17-C-0252

Department of the Navy SBIR/STTR Transition Program

DISTRIBUTION STATEMENT A. Approved for public release. Distribution is unlimited.
SPAWAR SR-2018-317

Topic # N152-123

Ferrite-Based Frequency Selective Limiter and Signal-to-Noise Enhancer for Interference Protection and Prevention in UHF SATCOM

Metamagnetics, Inc.

WHO

SYSCOM: SPAWAR

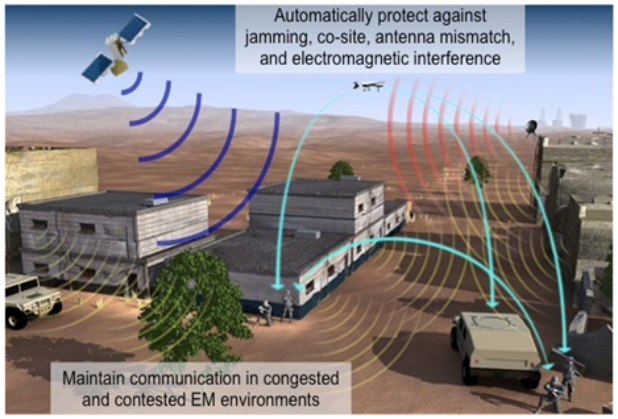
Sponsoring Program: Navy Communications Satellite Programs, PEO Space Systems, PMW 146

Transition Target: Next-generation Mobile User Objective System (MUOS)

TPOC:
(619)972-3963

Other transition opportunities: Unmanned Aerial Vehicles (UAVs), tactical radios, MIDS, Link 16, EA-18G Growler, F/A-18 Super Hornet

Notes: This FSL technology enables a canceller technology that strongly rejects interferes (>60 dB) while minimally affecting signals of interest.



*adapted from www.shadowspear.com

WHAT

Operational Need and Improvement: SATCOM links are subject to electromagnetic interference from both friendly and foe sources, such as co-located transmitters, enemy jamming, and electronic attack. Robust SATCOM links are required for maintaining communications and situational awareness in theater for both ground-based users and space-based platforms.

Specifications Required: SPAWAR is seeking technologies that improve a satellites resiliency to electromagnetic interference and improve the purity of signals beamed back to earth.

Technology Developed: Metamagnetics has developed frequency selective limiter (FSL) and signal-to-noise enhancer (SNE) technologies at UHF-band that automatically discriminate signals based on power level and only apply either limiting or enhancement to signals above threshold. The unique analog signal processing ability of these component technologies enable enhanced receiver functionality with improved dynamic range and resiliency.

Warfighter Value: Enable continuous reception of signals-of-interest and maintain communications links in electromagnetically congested and contested environments.

WHEN

Contract Number: N68335-17-C-0252 **Ending on:** November 23, 2018

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Demonstrate UHF-band FSL	Med	Measure FSL functionality at UHF-band	TRL 4	May 2018
Demonstrate UHF-band SNE	Med	Measure SNE functionality at UHF-band	TRL 4	September 2018
Deliver FSL and SNE to SPAWAR	Med	Deliver functional components to SPAWAR	TRL 4	October 2018

HOW

Projected Business Model: Metamagnetics will manufacture the Auto-tune Filter internally but will look to sell into channels via
1) The primes and their systems through a direct salesforce and manufacturer's reps
2) A distribution model through RF subsystem manufacturers

Company Objectives: Immediate goals are to establish a list of potential military systems. MUOS receivers and Link 16 communications would be the nearest term opportunities. Next would be to identified the primes making these systems. Long term, Metamagnetics will work with the primes and the PEOs to identify and solve gaps where the technology needs aid to transition.

Potential Commercial Applications: 5G macro cell stations, personal and commercial drone datalinks, satellite communications, hand held radios, and marine radar

Contact: Michael Hunnewell, Director of Business Development
mhunnewell@mtmgx.com 7815620756

Topic: N122-146

SA Photonics, Inc.

Novel CubeSat Payloads for Naval Space Missions

SkyLight™ is a cost-saving and performance-improving free space optical (FSO) communication system being developed for PEO Space. It has extremely low size, weight and power (SWaP) to allow its use on nanosatellites, namely the CubeSat platform. The device allows small (3U) satellites to communicate with the ground via infrared FSO techniques. SkyLight™ operates with high data speeds at high altitudes (LEO) through varying weather, allowing for significantly enhanced global communications. The company, which specializes in the development of advanced photonics systems to solve demanding problems for military and commercial customers, envisions its own small-scale production as well as teaming with well-known primes, as it has on past product developments.

Technology Category Alignment:

EO/IR Components for sensing, transmission and communication
Satellite Communications (SATCOM)
Networks and Communications
Trust Foundations
Electro-Optical/Infrared (EO/IR)

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http://www.saphotonics.com/
SYSCOM: SPAWAR
Contract: N68335-17-C-0533

Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N68335-17-C-0533

Department of the Navy SBIR/STTR Transition Program

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SPAWAR SR-2018-313

Topic # N122-146

Novel CubeSat Payloads for Naval Space Missions

SA Photonics, Inc.

WHO

SYSCOM: SPAWAR

Sponsoring Program: Program Executive Office for Space Systems (PEO Space Systems)

Transition Target:

TPOC:
(619)553-1020

Other transition opportunities: This free space optical (FSO) technology is not limited to Navy space applications. In addition to space programs with other departments, SA Photonics is also pursuing uses with unmanned aerial vehicles (UAVs), littoral naval applications, and various ground communication systems.

WHAT

Operational Need and Improvement: Small satellites, including cubesats, require a high data rate communication capability that is resilient to RF interference and jamming, is LPI/LPD and has extremely low SWaP. SA Photonics' SkyLight free-space optical communications system provides these capabilities and is suitable for both crosslink and space-to-ground applications.

Specifications Required: SkyLight is design to support a crosslink experiment between two 6U cubesats with a threshold requirement of providing 25 Mbps at 100 km link distance, with an objective to support 100 Mbps at distances up to 1000 km.

Technology Developed: SkyLight is a fully integrated FSO communication system that includes modem, all optical sources and receivers, optical amplifiers, closed loop beam tracking control system, autonomous acquisition, and built-in beam steering system. The integrated beam steering provides +/- 50 degree two-axis beam steering allowing for communications without requiring satellite body pointing.

Warfighter Value: SA Photonics' SkyLight FSO system provides high data rate secure and resilient communications between small satellites as well as space-to-ground and space-to-air applications. The low SWaP of skylight will enable use on small platforms such as small UAVs and man-portable ground terminals. This new capability provides communications without RF emissions, allowing use during EMCON conditions. Additionally, the optical communications is immune to RF interference and jamming, and highly tolerant to optical jamming.

WHEN

Contract Number: N68335-17-C-0533 **Ending on:** February 27, 2019

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Critical Design Review	N/A	Detailed Design Complete	5	April 2018
System Integration	Med	Functional integration test complete	6/7	December 2018
Qual Testing Complete	Med	GEVS Qual Testing	8	February 2019
Satellite Integration	Low	Successful integration tests		June 2019
Launch	Low			September 2019
On-orbit testing	Med	Exceed threshold requirements	9	November 2019

HOW

Projected Business Model: SA Photonics intends to undergo production of the SkyLight engineering model, qual units, and flight terminals using our in-house manufacturing capability. The company has a history of successful small-scale production for commercialized SBIR products. For larger quantity manufacturing, we would work with our contract-manufacturing partner currently used for our commercial terrestrial FSO system manufacturing.

Company Objectives: The SkyLight system is positioned to be a cost-saving and performance-improving communication system not just for U.S. Navy satellite communications, but military communications across the DoD. As a result, we are excited to present the product to a range of program offices at the FST, as well as a number of prime contractors, specifically those who work with satellite communications.

Potential Commercial Applications: Applications include the military space and UAV sectors, as well as commercial satellites. With commercial satellites, there is a market for free space optical links for crosslink and ground links. Additional commercial applications include high altitude platforms (drones, aerostats), as well as small aircraft and UAVs. The SWaP benefits are equally beneficial to the commercial market as the military.

Contact: Dave Pechner, CTO
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