Topic: N142-100

EOSPACE Inc.

Ruggedized, Ultra-Compact, High Dynamic Range, Dual-Output Wideband Electro-Optic Modulator

Coaxial cables are heavy, bulky, and require regular replacement on airborne platforms due to mechanical fatigue from the harsh environment. High dynamic range fiber optic links utilizing dual output Lithium Niobate modulators can provide a >10x reduction in size and weight as well as immunity to electromagnetic interference (EMI). EOSPACE's dual output modulator operates from DC to >40GHz with extremely high reliability and is capable of operating at temperatures from -55C to +200C to support Radar, Electronic Warfare and Communication systems in harsh airborne environments. For more than 20 years, EOSPACE has developed a wide variety of Lithium Niobate modulators designed for high performance DoD and aerospace applications. Our goal is to transition this technology into DoD airborne platforms to reduce SWaP and increase reliability.

Technology Category Alignment:

RF Components for sensing, transmission and communication
Air Platforms
Networks and Communications
Distributed/Coordinated/Net-Enabled Systems
Radio Frequency (RF) (non-EW)

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SYSCOM: NAVAIR
Contract: N68335-16-C-0068
Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N68335-16-C-0068

Department of the Navy SBIR/STTR Transition Program

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NAVAIR JSF17-822

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EOSPACE Inc

WHO

SYSCOM: NAVAIR

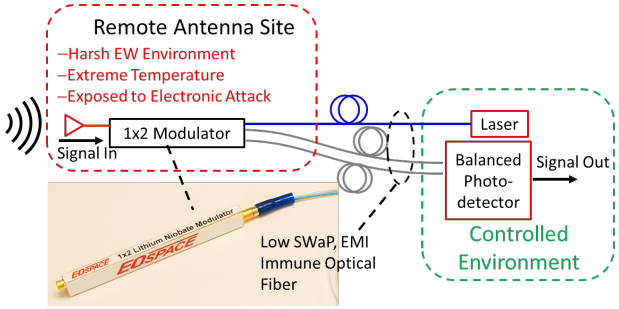
Sponsoring Program: JSF-MS

Transition Target: F-35 Joint Strike Fighter

TPOC:
(301)342-9115

Other transition opportunities: F-16, F-22, E-2C/D, MH-60 and UAVs such as the K-Max UAV/UCAV, Desert Hawk III and micro UAVs.

Notes: Sensors on airborne platforms may be located at wingtips or other extreme locations.



Fiber optic links can transport Radar and electronic warfare signals from these harsh EW environments (Electromagnetic Interference (EMI) and high power microwave (HPM) attack) with wide temperature variations to a controlled environment in the heart of the airplane for processing.

WHAT

Operational Need and Improvement: Airborne communication, Radar and electronic warfare (EW) systems require ever increasing bandwidth and reductions in size, weight, and power (SWaP). In addition, sensitive electronics are vulnerable to Electromagnetic Interference (EMI), and high-power microwave (HPM) attack. The technology we are developing is a dual output Lithium Niobate modulator, the key component in high dynamic range fiber optic links to replace the heavy and bulky coaxial cables that are used to transport signals on Navy air platforms. Replacing the coax cables used in onboard RF applications with RF/analog fiber optic links will not only provide dramatic 10x SWaP reduction but also immunity to EMI and HPM.

Specifications Required: Modulator bandwidth up to 40 GHz is required with compatibility with emerging systems to 100 GHz. A fourfold reduction in SWaP as compared to current electro-optic modulators without any degradation in device performance. Uncooled operation over a temperature range of -40 to +100 degrees Celsius. Compatible with high power DFB lasers >200 mW. Ruggedized packaging with a volume of ~2.5 cubic centimeters that is compatible with Navy air platform vibration, humidity, thermal shock, mechanical shock, and temperature cycling.

Technology Developed: An ultra-compact dual output Lithium Niobate (LiNbO3) modulator compatible with high dynamic range analog fiber optic links with balanced detection. The modulator is the key component of a fiber optic link that can replace the heavy and bulky coaxial cables that are used to transport Radar and EW signals on Navy air platforms. Airborne communication and EW systems require ever increasing bandwidth and reductions in size, weight, and power (SWaP). In addition, sensitive electronics are vulnerable to EMI, and HPM attack.

Warfighter Value: This technology provides a dramatic 10x weight reduction compared to coaxial cables reducing aircraft payload and providing immunity to EMI. The technology is broadband from DC to >40GHz providing a solution for a wide variety of military systems operating at different frequencies from Radar and Electronic Warfare to Communications that require reduced SWaP or immunity to EMI.

WHEN

Contract Number: N68335-16-C-0068 **Ending on:** November 15, 2018

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Device function demonstrated in prototype housing (Phase II Base)	N/A	Key specs met	4	June 2017
Device function demonstrated in ruggedized housing (Phase II Base)	Low	Specs met in new ruggedized housing	4	October 2017
Device passes MIL-STD environmental screening (Phase II Option)	Med	Specs unchanged after environmental screening	5	March 2018
RF Photonic link demonstration (Phase II Option)	Med	Key RF Photonic link specs met	6	June 2018
Delivery to Prime Contractor for testing (Phase II Option)	Med	Specs met in relevant/operational environment	6-7	September 2018

HOW

Projected Business Model: EOSPACE has manufactured high performance Lithium Niobate phase, intensity, and polarization modulators for Defense/Aerospace applications for more than twenty years. The technology developed under this SBIR will be rapidly transitioned to our commercial product line to drive down the cost for DoD customers.

Company Objectives: EOSPACE has a broad portfolio of high reliability Lithium Niobate optical integrated circuits (ICs). Our optical ICs can be optimized for a variety of extreme operational conditions including: extended temperature range operation from -55C to >+200C, extremely high RF frequency to >110 GHz, high optical power to >2 Watts, and high optical extinction ratio >70 dB. We will work with DoD and Aerospace customers to meet the most stringent environmental and performance requirements for fiber optic links.

Potential Commercial Applications: High dynamic range analog fiber optic links. Fiber optic transceivers, Telecommunication links, Antenna remoting.

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