Topic: N151-018

EOSPACE Inc.

Integrated Laser and 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. For more than 20 years, EOSPACE has developed a wide variety of Lithium Niobate modulators designed for high performance DoD and aerospace applications. We are now integrating this rugged modulator with a high performance laser to create an ultra-compact fiber optic transmitter to reduce SWaP and increase reliability on DoD airborne platforms.

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: N68335-17-C-0096
Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N68335-17-C-0096

Department of the Navy SBIR/STTR Transition Program

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NAVAIR JSF17-822

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Integrated Laser and Modulator
EOSPACE Inc

WHO

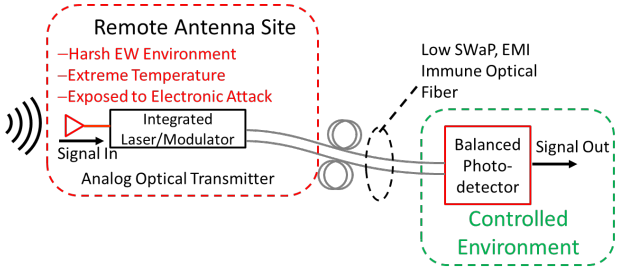
SYSCOM: NAVAIR

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 environments 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 an ultra-compact fiber optic transmitter consisting of an integrated laser and Lithium Niobate (LiNbO3) modulator 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: Integrated laser and intensity modulators operating at 1.55 micron with a minimum linewidth requirement of less than 200 kHz, and relative intensity noise of < -169 dBc/Hz from DC to at least 20 GHz. The intensity modulator bandwidth should be at least 20 GHz with 25 mW output power when biased at quadrature. The integrated package dimensions should be less than 1x1x15 cubic centimeters.

Technology Developed: An ultra-compact fiber optic transmitter consisting of an integrated laser and Lithium Niobate (LiNbO3) modulator to 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. By integrating the laser and modulator components together in a single package we will reduce the sensitivity of the fiber optic link to aircraft vibrations.

WHEN

Contract Number: N68335-17-C-0096 **Ending on:** October 20, 2019

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Individual component demonstration (Phase II Base)	Med	Key specs met by individual components	3	March 2018
Chip integration (Phase II Option)	Med	Specs met for combined components	4	September 2018
Integrated ultra-compact transmitter packaging (Phase II Option)	High	Packaged components meet specs	4	June 2019
Environmental testing of ultra-compact transmitter (Phase II Option)	High	Meets specs after environmental testing	5	August 2019

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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