

Department of the Navy SBIR/STTR Transition Program

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NAVAIR JSF16-1029

Topic # N101-030

Lossless Non-Blocking Single-Mode Fiber Optic Wavelength Router

EM Photonics, Incorporated

WHO

SYSCOM: NAVAIR

Sponsoring Program: Joint Strike Fighter (JSF) F-35

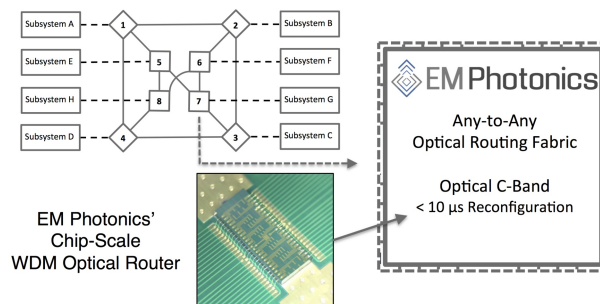
Transition Target: JSF F-35

TPOC:

(301)342-9115

Other transition opportunities: EA-18G Growler Airborne Electronic Attack Aircraft
MQ-8B/C Fire Scout
MQ-4C Triton UAS
Consolidated Afloat Network Enterprise Services (CANES)

Notes: EM Photonics' wavelength division multiplexing (WDM) optical router utilizes silicon photonics to create an ultra-compact optical switch matrix. The technology offers an added benefit of supplying multiple methods of signal routing, such as point-to-point optical links, channel broadcasting and wavelength filtering.



WHAT

Operational Need and Improvement: The technology developed addresses the requirement of networking many subsystems utilizing a WDM-enabled communication network on the JSF platform. Low-latency and high-bandwidth communication between subsystems, peripheral sensors and antennas are vital to mission functionality, with the enabling technology focusing on reduced Size, Weight and Power (SWaP) metrics for implementation on the JSF and other avionic platforms.

Specifications Required: Desirable features are to have a fiber-based optical router with packaging compactness no greater than 500 in³, packaging ruggedness per MIL-STD- 810F, minimal power consumption no greater than 100 Watts, re-configurability, transparency, predictable latency, resilience, scalability, reliability via integration, and built-in testing in the harsh avionics environment.

Technology Developed: EM Photonics' router technology provides the means to have many systems in a network communicate optically; sending photons of information to each other at the speed of light without needing an interposing slow-electronic "middle-man" router. The router is designed with high-performance and high-extinction ratio optical switches that are utilized in a unique matrix for the interconnection of WDM communication signals within the optical C-Band. EM Photonics' technology routes incident optical signals between ports without leaving the optical domain, creating a point-to-point optical pathway that is non-blocking and bi-directional.

Warfighter Value: EM Photonics' optical router creates a reconfigurable point-to-point optical communication link, where many streams of data can be transmitted along the same fiber, creating single-fiber links with data rates that are orders of magnitude greater than their electronic counterparts. The developed technology enables the use of optical fibers on aircrafts to rid the infrastructure of long and heavy copper cables, reducing the size and weight of an aircraft and signal losses or distortions, while improving upon its tolerance of electromagnetic interference. The optical link is transparent and bi-directional, providing a protocol-independent optical communication, adaptable for increased system lifetimes.

WHEN

Contract Number: N68335-15-C-0111 **Ending on:** August 5, 2017

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Bench-top demonstration of 8-port optical cross-connect (OXC)	N/A	Demonstration of reconfigurable optical point-to-point link	4	April 2016
8-port polarization independent OXC	Low	Polarization dependent loss (PDL) Measurement	4	January 2017
Single Mode Fiber (SMF)-coupled 32-port packaged OXC	Med	Optical link demonstration between interconnected fibers	5	August 2017
Harsh environmental testing	Med	Performance test and result of environmental test	5	January 2018

HOW

Projected Business Model: The ultimate goal is to transition and license this technology to prime contractors or their suppliers for fabrication and to integrate it onto deployed platforms for high performance network communication. EM Photonics would be able to supply technical support and design modifications for additional hardware capabilities.

Company Objectives: EM Photonics is seeking prime contractors and their suppliers for the fabrication of the developed technology and design assistance for the integration into their desired platform. EM Photonics is also seeking opportunities within DoD and other Federal agencies that are interested in upgrading existing ground-based local area network (LAN) infrastructures with state-of-the-art fiber-based optical communication capabilities.

Potential Commercial Applications: The developed technology is also highly beneficial to commercial avionic platforms, the telecommunication industry for fiber-based optical communication, and high performance LAN environments for increased reliability.

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