

Topic: N112-089

## Forward Photonics LLC

### Ultra-High Brightness Mid-Infrared Laser Beam Fiber Combiner for Infrared Counter-Measures Applications

Forward Photonics is developing a 100 W laser in the mid-wave infrared with integrated cooling system. This power level represents an order of magnitude increase in power over what is available commercially. This is enabled by the proprietary wavelength beam combination (WBC) technology that allows for the combination of a number of individual quantum cascade lasers into a single high brightness output beam. The intended Navy application is infrared countermeasures (IRCM) for both fixed wing and rotary wing aircraft, as well as ship-based. The goal is for the laser system to be integrated into an IRCM platform with a prime contractor partner with multi-platform uses. Forward Photonics specializes in high brightness direct diode laser systems for electronic warfare, including IRCM and direct energy weapons.

### Technology Category Alignment:

EO/IR Components for sensing, transmission and communication

Broadband/Multispectral Components and Systems

Survivability

High Energy Lasers (HEL)

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**SYSCOM:** NAVAIR

**Contract:** N68335-17-C-0147

 Corporate Brochure: [https://navystp.com/vtm/open\\_file?type=brochure&id=N68335-17-C-0147](https://navystp.com/vtm/open_file?type=brochure&id=N68335-17-C-0147)

Department of the Navy SBIR/STTR Transition Program

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NAVAIR 2018-741

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WHO

SYSCOM: NAVAIR

Sponsoring Program: PEO(T)

Transition Target: Direct Infrared Countermeasures (DIRCM)

TPOC: (904)790-5916

Other transition opportunities: Tactical Aircraft Directable Infrared Countermeasures (TADIRCM)

Notes: 100 W Medium Wavelength Infrared (MWIR) Laser Concept Design

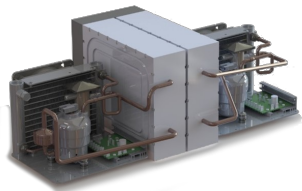


Image Provided by Forward Photonics LLC, 2018

WHAT

**Operational Need and Improvement:** There is a present need for an inexhaustible infrared (IR) countermeasure system for defeating IR heat-sinking missiles for a number of Direct Infrared Countermeasures (DIRCM) systems. A 100 W MWIR system with integrated cooling and fiber coupling supports multiple needs across the forces. With such high power and with the fiber coupling, only one laser will be required per craft and routed to multiple jam heads throughout the aircraft, representing a significant cost savings.

**Specifications Required:** >= 100 W Output in the Mid-Infrared

Laser Modulate-able

Integrated Water Free Cooling System

Fiber Coupling

Hardened for environmental and vibrational operation

**Technology Developed:** Forward Photonics will use its proprietary Wavelength Beam Combination (WBC) to expand its current mid-infrared lasers based on quantum cascade lasers (QCLs) to reach power levels of 100 W or more. In addition to this unprecedented power level Forward Photonics has developed an integrated high capacity cooling system that eliminates the need for recirculating water in these high power systems, as water is not a flight qualifiable coolant. Additionally Forward Photonics is developing MWIR fiber components that will allow for the high output power to be coupled into an optical fiber. Current MWIR optical fibers can only handle < 1 W of output power.

**Warfighter Value:** 100 W output in this wavelength regime represents well over an order of magnitude power improvement on what is commercially available currently. Additionally laser IRCM systems provide significantly greater jam/signal ratio over currently fielded countermeasure systems. Forward Photonics' laser provides greater engagement range, greater target specificity, has an inexhaustible capacity and could provide cost savings due to its integrated fiber coupling over other lasers systems.

WHEN

Contract Number: N68335-17-C-0147 Ending on: December 20, 2018

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Cooling System Designed	Low	Integrated with laser system with adequate cooling	4	July 2018
Fiber Coupling	Med	Able to handle output power with minimal reflection loss	4	September 2018
Laser Assembled	Low	100 W Output Power with High Beam Quality	5	November 2018

HOW

**Projected Business Model:** Our goal is to design and manufacture the lasers, which will be used by Prime contractors in their laser propagation systems.

**Company Objectives:** Forward Photonics is looking to expand awareness of the utility of WBC lasers for defense and commercial uses. Such lasers offer high brightness output, an order of magnitude or higher brightness that can be achieved with non WBC direct diode systems. Direct diode systems offer some of the highest efficiency, lowest cost lasers available. Forward Photonics is eager to speak with laser integrators for both defense and commercial laser systems for defense platforms and materials processing.

**Potential Commercial Applications:** Potential commercial applications for MWIR high brightness WBC lasers are numerous and include , spectroscopy, advanced materials processing of plastics, glass, and carbon fiber composites.

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