Department of the Navy SBIR/STTR Transition Program

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Topic # N11A-T011

Monolithic Beam-Combined Mid-Infrared Laser Array

Pendar Technologies (formerly EOS Photonics)

WHO

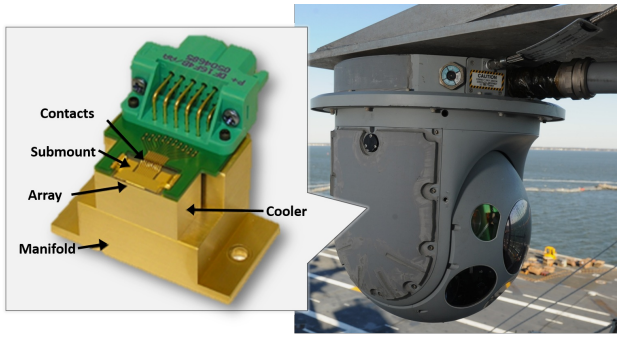
SYSCOM: NAVAIR

Sponsoring Program: PMA272

Transition Target: Infrared Countermeasure (IRCM)

TPOC:
(760) 939-0239

Other transition opportunities: Mid-wave and long-wave infrared (MWIR, LWIR) lasers coupled to imaging systems for military, law enforcement, and civilian applications including; target acquisition, situational awareness (infrared scene illumination), industrial process control, remote sensing, obstacle avoidance, and selective etching, cutting, and marking of materials.



Left - 2015 Copyright Eos Photonics (Now Pendar) & MIT LL; Right - 130220-N-PO203-026 (Feb. 20, 2013) ONR-sponsored Situational Awareness System (SAWS), USS Dwight D. Eisenhower (CVN 69) (U.S. Navy photo by John F. Williams/Released)

Notes: On August 1, 2015 Eos Photonics merged with Pendar Medical to form Pendar Technologies. The merger carries with it the resources, experience, and mandate to commercialize breakthrough highest power infrared lasers.

WHAT

Operational Need and Improvement: This advance is aimed at the the realization of a monolithic high power laser source based on a beam-combined Quantum Cascade Laser (QCL) array. The benefits of this program include lower production costs, higher power on target, improved reliability, and simple integration.

Specifications Required: A monolithically beam-combined QCL array that can be operated in continuous wave with a combined continuous wave (CW) output power exceeding 15 Watts and with excellent beam quality (M^2<1.5). This represent a 5 fold increase in the power achievable with the current state-of-the-art source based on single emitter.

Technology Developed: The work performed includes the development of high power QCL arrays reaching tens of Watts and of a monolithic spectral beam combining solution to dramatically simplify the optics necessary to integrate the laser source in an actual system. This lead to the development of a unique ion implantation process to lower the optical losses of the monolithic beam combiner.

Warfighter Value: Increasingly sophisticated man-portable heat-seeking weapons may advance to the point of defeating today's countermeasures technology based on infrared lasers. Our technology provides a means to increase the power for these systems, thereby increasing their effectiveness in protecting low-flying aircraft such as gunships and cargo planes.

WHEN

Contract Number: N68335-13-C-0197 **Ending on:** December 15, 2015

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Custom high power electronics	Low	Specs: Electronics capable of driving laser bars with 32 laser elements, starting TRL: 0	4	December 2015
Custom thermal solution for high power laser bars	Med	Specs: Thermal management solution based on impingement cooler technology, starting TRL:0	4	December 2015
High power laser bars	Med	Specs: MWIR high power quantum cascade laser bars reaching tens of Watts, starting TRL: 0	4	December 2015
Monolithic spectral beam combining solution	High	Specs: Monolithic spectral beam combining solution, starting TRL: 0	3	December 2015

HOW

Projected Business Model: There are aspects of the countermeasures technology chain that drive Pendar toward collaborative supply relationship with one or more Primes. Pendar alone cannot furnish a fully integrated IRCM system, including all steering and electronics. Pendar is actively transitioning laser prototypes emerging from this STTR into next generation systems.

Company Objectives: Pendar Technologies is a privately held product development company focused on bringing breakthrough portable analysis tools and specialized laser systems to market. With experts in innovative spectroscopy and data science, the company has a pipeline of products in development.The combined company brings a full spectrum of technologies as well as expertise and experience bringing portable, high-value opto-mechanical devices to market.

We serve our men and women in uniform in three ways: By using high powered QCLs discussed here for IRCM, by commercializing eyesafe infrared explosives detection systems, and by supplying hardened field medicine equipment.

Potential Commercial Applications: Condensed phase chemical standoff detection, gas phase analysis, cutting/etching or polymeric materials, and others. To varying degrees, each requires high power, high efficiency, independent modulation, high beam quality, and scalability.

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