Topic: N092-119

NP Photonics, Inc.

Broadband High Power Mid-IR Supercontinuum Source

Our company is developing a mid-IR supercontinuum fiber laser with high-brightness multi-band output for various applications including stand-off mid-IR spectroscopy. We are also developing a new, tellurite-based mid-IR transport fiber to provide broader mid-IR range and improved mechanical properties over existing chalcogenide and fluoride transmission fibers. These technologies are initially intended for fixed and rotary wing Navy and Marine Corps platforms. With over 10 years of specialty non-silica glass fiber and laser experience, our company has successfully demonstrated mid-IR transmission past 5 µm in our tellurite fiber, and we have demonstrated an ultra-short pulse mid-IR fiber laser based on our germanate fiber. Our expectation is to supply these technologies to a prime contractor requiring multi-band mid-IR coverage currently unavailable in existing technologies.

Technology Category Alignment:

EO/IR Components for sensing, transmission and communication
Broadband/Multispectral Components and Systems
Distributed/Coordinated/Net-Enabled Systems
High Energy Lasers (HEL)

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SYSCOM: NAVSEA
Contract: N00024-16-C-4526
Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N00024-16-C-4526

Department of the Navy SBIR/STTR Transition Program

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NAVSEA #17-526

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WHO

SYSCOM: NAVSEA

Sponsoring Program: PEO Integrated Warfare Systems (IWS)

Transition Target: IWS 2DE Directed Energy Weapons

TPOC:
(812)854-3686

Other transition opportunities: Applicable to stand-off mid-infrared (IR) spectroscopy systems with high-brightness multi-band mid-IR coverage by prime DoD contractors building deployable systems. Tactical aircraft protection systems will benefit from this technology as well.

Notes: The Ticonderoga-class guided-missile cruiser USS Cowpens (CG 63) fires Standard Missiles (SM) 2 at an airborne drone during a live-fire weapons shoot.



U.S. Navy photo #120920-N-TX154-336 by Mass Communication Specialist 3rd Class Paul Kelly

WHAT

Operational Need and Improvement: Current anti-missile technology includes spectrally enhanced Infrared (IR) flares and in-band IR lasers that direct a beam into the IR-seeking sensor of incoming missile threats. First and second generation IR-seeking missiles search for a very specific IR band. Next generation IR-seeking missiles need the ability to seek in multiple IR bands. Improved lasers are needed to counter fourth and fifth generation anti-aircraft missiles, saving lives and aircraft from this highly effective and deployed weaponry. There is a need for a system that may jam IR missiles with reduced size, weight and power (SWAP). Also needed is a system with a reduced time for pointing and having increased reliability and reduced drag on the aircraft platform.

Specifications Required: Develop an all-fiber based supercontinuum laser with the capability to propagate a multi-spectral laser beam with >10 Watts of time-averaged power.

Technology Developed: NP Photonics is developing an all-fiber supercontinuum laser covering the mid-IR. An all-fiber approach, based on highly nonlinear tellurite fiber, to generate a high power (multi-watt), single mode beam (M2 < 2) with extremely wide (1um-5um) and simultaneous wavelength coverage has significant advantages in terms of reliability (no moving parts or alignment), room temperature operation, size, weight, and power efficiency.

Warfighter Value: Multi-spectral supercontinuum lasers and their ability to greatly expand the photonic bandwidths and increased data rates will be vital to all fiber optic networks that serve communications, sensing, defense, computers, space.

WHEN

Contract Number: N00024-16-C-4526 **Ending on:** August 16, 2018

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Tellurite Fiber Fabrication	Low	Single mode nonlinear fibers, core diameters 2.5um, 7um, 10um	3	November 2017
Tellurite mid-IR Transport Fiber	Med	Single mode transport fiber, core diameter 15 um, NA ~ 0.07	4	December 2017
Mid-IR High Transmission Tellurite Fiber	Med	Low Loss (< 0.5 dB/m) Mid IR Fiber	5	January 2018
High Power Wide Band Mid-IR Laser Source	Med	> 5 W Mid IR (2 um -5 um) Fiber-based Laser Source	5	March 2018
High Power Wide Band Mid-IR Laser Source	Med	> 10W Mid IR (2 um -5 um) Fiber-based Laser Source	5	August 2018

HOW

Projected Business Model: NP Photonics intends to develop this new supercontinuum laser and new mid-IR transport fiber and supply to, or partner with, a larger DoD contractor to integrate these technologies. While NP Photonics does not expect to develop a fully deployed system, we would be a merchant supplier of the mid-IR supercontinuum laser to a prime DoD contractor.

Company Objectives: NP Photonics seeks to identify and build relationships with larger DoD contractors that are developing next-generation fiber optic systems that serve communications and other defense programs.

Potential Commercial Applications: Along with creating a mid-IR supercontinuum laser, this development effort is creating a new tellurite-based mid-IR Transport Fiber for mid-IR optical power distribution and aggregation over 2m - 10m lengths. This mid-IR Transport Fiber would greatly simplify transmission of mid-IR light within DoD vehicles, including mobile land, air and sea vehicles, compared to transmission via discrete optics or even existing mid-IR fiber technologies such as chalcogenide or fluoride-based fibers.

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