Department of the Navy SBIR/STTR Transition Program

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NAVSEA #2022-0346

Topic # N19A-T009
3-Band PicoSecond High Energy Compact (SWaP) Laser System for Marine Wave Boundary Layer Atmospheric Characterization Instrument Development
TIPD, L.L.C.

WHO

SYSCOM: NAVSEA

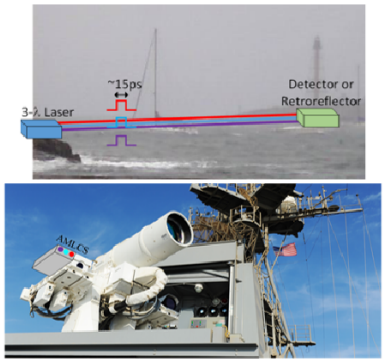
Sponsoring Program: NAVSEA

Transition Target: PMA-299 MH-60R/S, PMA-264 ASW

TPOC: (401) 832-6887

Other Transition Opportunities: TIPD's initial end customer would be the Navy (through PMA-272) or the Air Force. TIPD has working relationships with Lockheed Martin (Business Development) and Northrup Grumman (Unmanned Systems). TIPD is using the existing points-of-contact to identify groups working the laser systems. TIPD's initial products would either be prototype systems delivered to PMA-272 or alpha versions delivered to either Lockheed Martin or Northrup Grumman. Lockheed-Martin, Northrup Grumman, Raytheon, and Boeing all have the technical capabilities to design and manufacture high peak and average power pulse laser systems. The large defense contractor could also be potential collaborators in the development program.

Notes:



(left) System schematic showing AMLCS 3-band laser and detection system in test configuration, (right) Conceptual schematic of AMLCS system integrated with HEL system

WHAT

Operational Need and Improvement: Gaining a deeper theoretical and experimental understanding of maritime turbulence and laser light propagation in the marine boundary is required to optimize the performance of critical communication channels and high energy lasers. Increased understanding of beam propagation through the turbulent flows of the marine layer will help the US Navy improve the performance of optical beam directors, adaptive optics, and other turbulence mitigating techniques and improve the safety and security of the warfighters. Recent investigations have shown that there is a complex interaction between the turbulent structures in the ocean and atmospheric mixing layers. The lack of tools capable of providing the required millimeter-level spatial resolution hampers researcher's attempts to study the boundary layer.

Specifications Required: 3 co-linear wavelengths: UV, Visible, and IR
Linewidth: Transform limited, Pulse duration: ~ps, Repetition rate: ~kHz, Energy per pulse in each band: ~few mJ, Total average power per band: high

Technology Developed: The 3-Band Picosecond High Energy Compact (SWaP) Laser System for Marine Wave Boundary Layer Atmospheric Characterization Instrument Development is a three color laser system that can be used to map the marine layer with the higher accuracy.

Warfighter Value: TIPD's Advanced Marine Layer Characterization Source (AMLCS) employs a three-wavelength pulsed laser that can be used to study the marine layer and enable several new avenues of research by providing high power pulses in the Deep Ultraviolet (DUV), the visible, and the near-IR (NIR). Additionally, this laser system can be used for many maritime mission tasks such as target marking, detection, and designation.

WHEN

Contract Number: N68335-21-C-0133 **Ending on:** Dec 20, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Demonstrate 100W IR laser with 5 kHz repetion rate	Medium	Successfully completed	4	3rd QTR FY22
Final Design Review	Medium	Successful simulations	3	4th QTR FY22
Provide test data and deliver the AMLCS system to the Navy	Medium	On-going	6	2nd QTR FY24

HOW

Projected Business Model: Spin the 3-ban laser to system with lower SAWP-C. Develop the unit for testing in a Naval environment. License intellectual property and designs to Prime Contractors to be integrated in one of their already deployed systems.

Company Objectives: Our objective is the integration of novel state of the art technology onto several Naval platforms and to be used to increase warfighter readiness and success during tactical and ISR operations. The demonstration of the value of our advanced technology by enabling mission success. Another objective is to team with multi-disciplinary experts, subcontract, and license our intellectual property.

Potential Commercial Applications: The development of high average power ultrashort pulse lasers is important for many critical industrial and DOD applications such as material processing, sensing, IR counter-measure, and directed energy. Laser development experienced tremendous growth in the past two decades because of the recent revolutionary advances in fiber-based technologies. Fiber lasers are transitioning from instruments for research laboratories into key technologies for different industries for a wide range of applications including material processing, biomedical imaging and precision measurements.

Contact: Dr. Adoum Mahamat, Vice-President
adoum@tipdllc.com (520) 622-0804