Department of the Navy SBIR/STTR Transition Program

Topic # N172-118
Laser Target and Analysis Board Development
Tau Technologies LLC

WHO

SYSCOM: NAVAIR

Sponsoring Program: Advanced Tactical Aircraft Protection Systems Program Office (PMA-272)

Transition Target: Large Aircraft Infrared Countermeasures (LAIRCM) System Prime Contractors, other DoD using Commands

TPOC:
(812)854-3180

Other transition opportunities: Laser Target and Analysis Board (LTAB) permits high fidelity testing of directed energy (laser) based systems in a real world environment. Potential users include the Air Force Research Laboratory (AFRL) Directed Energy Directorate, civilian users of lasers, such as optical communications systems, astronomical guide star imaging systems

Image courtesy of Tau Technologies.

Notes: Tau Technologies has been a key player in the development of high fidelity computer models of directed energy-related phenomena, supporting laser research and development. In support of the Directed Energy Test, Science & Technology program (DET S&T), Tau Technologies developed a fully polarized, anisotropic, wavelength- and temperature dependent Bidirectional Reflectance Distribution Function (BRDF) model. The BRDF is a critical component in predicting target signatures and reflected laser energy. Tau employs this model to support a wide range of active and passive applications

WHAT

Operational Need and Improvement: With many airborne laser systems now being produced and fielded such as Large Aircraft Infrared Countermeasures (LAIRCM) and DoN LAIRCM, etc., the need for low-cost, near real-time evaluation of the system parameters is rapidly becoming prevalent. There currently exist few (if any) self-sustained and rapidly deployable laser receiver target boards that merge the measurement of divergence, power, and pointing accuracy. This combination of ground-based sensor evaluation techniques is needed for use in austere environments.

Specifications Required: Airborne laser-based systems now being produced and fielded require in-situ evaluation of the laser system's performance. System must test the laser on a relevant platform (i.e. helicopter), in a relevant environment, with the ability to collect data on the target at range (> 1 km). The equipment must operate from prepared/unprepared sites. System must measure critical laser beam characteristics, recording data for immediate and post-event analysis. Laser specifications may vary from test to test, so system must be flexible in data collection methods. System must perform beam measurements at relevant ranges (1-10 km). Testing can be performed with operational and developmental lasers, from static positions and fielded platforms, in real-world conditions. System setup/teardown: < 2 hours.

Technology Developed: Tau Technologies' LTAB utilizes physics-based algorithms that can accurately analyze beam characteristics/waveforms at range, performing measurements of divergence, power, pointing accuracy and other characteristics, and is easily transportable. LTAB utilizes physical characteristics of far-field beam to provide detailed beam analysis. Simulation results confirmed high accuracy beam parameter measurements from a sparse array of discrete detectors, at very high sample rates. LTAB can detect/characterize jitter direction, cumulative power, frequencies and amplitude. LTAB analysis permits quantification/attribution of high frequency disturbances. LTAB--an adaptable design using an integrated commercial off-the-shelf (COTS) approach.

Warfighter Value: This program can save lives by providing detailed confirmation, in situ, of aircraft self-protection system functionality. The LTAB program provides a versatile system for testing laser sources used in the LAIRCM and other similar systems. The complex beam characteristics of LAIRCM systems must be tested to verify function, supporting aircraft and aircrew survival in a hostile environment.

WHEN

Contract Number: N68335-19-C-0195 **Ending on:** April 8, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Phase 1 SBIR: Concept Development	Med	Modeling and simulation of sparce array concept successful, preliminary target board design complete	3	March 2018
Phase 2 SBIR: Prototype design and build	Low	Prototype build, initial test and checkout complete	5	February 2021
Phase 2 SBIR Enhancement: Prototype Test	Low	Prototype delivery, acceptance testing (currently ongoing) at customer range	6	July 2021

HOW

Projected Business Model: Tau Technologies is actively looking to commercialize this Laser Target and Analysis Board technology, either directly to the DoD or to a prime associated with large aircraft self-defense systems that this technology can support. We also believe this technology can directly support directed energy weapons research by providing field beam measurement capability that currently does not exist. Tau Technologies has the capability to support manufacturing of medium quantities of these devices, and has established connections with contract manufacturers to support custom detector manufacturing requirements. Tau Technologies has already fielded a Phase 2 prototype, and this device has successfully completed acceptance testing at the customer's test range.

Company Objectives: Tau Technologies' world-class expertise in laser beam propagation modeling and simulation, coupled with its design and manufacturing capabilities demonstrated in the LTAB prototype, position it as a stand alone leader in directed energy-related field test systems. Tau Technologies continues to look for other laser-related programs, both in and out of DoD, that could benefit from this breakthrough technology program. This program can also provide adaptable field testing capabilities supporting future laser-related weapon system development.

Potential Commercial Applications: The capability to accurately test and characterize a laser beam, propagated through the chaotic atmosphere, is an invaluable asset to programs that provide defensive countermeasures for the warfighter. LTAB can provide large amounts of beam information, permitting validation of implementation models, verification of threat-specific features, and characterization of beam behavior as a result of aircraft maneuvering. LTAB provides a capability long missing in the directed energy research community--the ability to characterize a laser, in a realistic environment, to determine "power in the bucket", beam quality, tracking system accuracy, and atmospheric-induced beam perturbations. In the civilian research field, the LTAB concept can provide the astronomical community the ability to test and accurately characterize laser guide star systems, used with adaptive optics systems. Emerging free space optical communications could utilize LTAB capabilities to verify system performance in specific installation situations.

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