

SOCOM244-P009: Open Topic for Autonomous Precision Timing in Contested/Congested RF Environments

ADDITIONAL INFORMATION

N/A

TECHNOLOGY AREAS:

Air Platform | Electronics | Ground Sea | Information Systems | Sensors

MODERNIZATION PRIORITIES:

Advanced Computing and Software | Advanced Materials | Human-Machine Interfaces | Integrated Network Systems-of-Systems | Integrated Sensing and Cyber | Microelectronics | Space Technology

KEYWORDS:

Alt-PNT; commercial PNT services; prototypes; hosted payloads; hosting payloads; resilient PNT; GPS resilience; "PNT as a service"; commercial PNT; alternate timing distribution; Alternate PNT; compact atomic clocks; assured PNT

OBJECTIVE:

The objective of this SBIR Open Topic is to develop applied research towards the development of an independent, autonomous precision timing source, such as an Atomic Clock, to enable precision timing in Radio Frequency (RF) contested and congested environments.

ITAR:

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), 22 CFR Parts 120-130, which controls the export and import of defense-related material and services, including export of sensitive technical data, or the Export Administration Regulation (EAR), 15 CFR Parts 730-774, which controls dual use items. Offerors must disclose any proposed use of foreign nationals (FNs), their country(ies) of origin, the type of visa or work permit possessed, and the statement of work (SOW) tasks intended for accomplishment by the FN(s) in accordance with section 3.5 of the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

DESCRIPTION:

Existing systems depend on the Global Positioning System (GPS) for positioning, navigation, and timing (PNT) services. In environments where GPS is unavailable, RF communication systems relying on precision timing are impacted. The proposed technology should address how autonomous precision timing sources can integrate into current systems and mobility platforms, including chip-scale, modular, and fixed-based timing sources. The aim is to provide a reliable autonomous precision timing source to support mission success in contested and congested environments.

PROGRAM OFFICE: Tactical Information Systems (TIS)

Technology Areas of Interest:

1. Mobility Applications: Technology for "advantaged" user applications
2. Disadvantaged Applications: Timing update technology for ground users
3. Enterprise Timing: Source and distribution technology

Performance Requirements:

- General:

- o Interface Requirements: Ethernet, RS-232, 1 Pulse per Second (PPS) output, 1 Have Quick Timing output, L1/L2 SAASM GPS Input.
- o Objective Requirement: Maintain a drift of 1 microsecond in 24 hours.

- o Threshold Requirement: Maintain a drift of 1 microsecond in 4 hours.

- Mobility Platform:

- o Size: Approximately 150 cubic inches (in³)
 - o Weight: Less than 5 pounds (lbs.)
 - o Power: Must operate on 28DC
 - o Application: Intended for aircraft, vehicular, and maritime subsystems.

- Dismounted:

- o Size: Approximately 20 in³
 - o Weight: Less than 1 lb.
 - o Power: Runs on a rechargeable battery
 - o Application: Intended for handheld and manpack radios, small unmanned aerial systems (sUAS), etc.

PHASE I:

Conduct a feasibility study to assess what is in the art of the possible that satisfies the requirements specified in the above paragraphs entitled "Objective" and "Description."

The objective of this USSOCOM Phase I SBIR effort is to conduct and document the results of a thorough feasibility study ("Technology Readiness Level 3") to investigate what is in the art of the possible within the given trade space that will satisfy a needed technology. The feasibility study should investigate all options that meet or exceed the minimum performance parameters specified in this write up. It should also address the risks and potential payoffs of the innovative technology options that are investigated and recommend the option that best achieves the objective of this technology pursuit. The funds obligated on the resulting Phase I SBIR contracts are to be used for the sole purpose of conducting a thorough feasibility study using scientific experiments and laboratory studies as necessary. Operational prototypes will not be developed with USSOCOM SBIR funds during Phase I feasibility studies. Operational prototypes developed with other than SBIR funds that are provided at the end of Phase I feasibility studies will not be considered in deciding what firm(s) will be selected for Phase II.

PHASE II:

Develop, install, and demonstrate a prototype system based on the most feasible solution identified in Phase I. The focus will be on an atomic clock for precision timing with a Next Generation Tactical Communications and/or MTUAS system.

PHASE III DUAL USE APPLICATIONS:

The developed system could have broad applications in military environments requiring independent timing for RF communications and navigation systems. Potential uses range from airborne platforms to small ground tactical systems.

REFERENCES:

1. PNT Advisory Board (PNTAB) <https://gps.gov>
2. Protect, Toughen, Augment (PTA) <https://www.gps.gov/governance/advisory/subcommittees/#pta>
3. Babcock-Chi, Jade, Trapani, Lucca, Akos, Dennis, "Timekeeping with a Chip Scale Atomic Clock in GPS Denied Environments," Proceedings of the 2023 International Technical Meeting of The Institute of Navigation, Long Beach, California, January 2023, pp. 34-52.
<https://www.ion.org/publications/abstract.cfm?articleID=18589>
4. Joint Navigation Conference (JNC), June 2023

TOPIC POINT OF CONTACT (TPOC):

None