Transmitted Isotropic Generated Equivalent Radiation (TIGER)

Statement of Work (SOW)

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Statement of Work (SOW)

Transmitted Isotropic Generated Equivalent Radiation (TIGER)

1. Introduction

This Statement of Work (SOW) describes the research and development to be provided to the Space Systems Development Department (SSDD) of the Naval Center for Space Technology (NCST) located at the Naval Research Laboratory (NRL) in Washington, D.C.

1.1. Background

The NCST is the designated lead laboratory for Navy space programs. NCST has the mission to "preserve and enhance a strong space technology base and provide expert capabilities in the development and acquisition of space and related systems." The Space Systems Development Department (SSDD), a department within NCST, is chartered to develop space and related terrestrial systems, aerospace systems, and tactical communications systems, and to actively pursue emerging technologies advancing space, aerospace, and tactical communications systems. In recent years, the SSDD has developed Command, Control, Communication, Computing, and Intelligence (C4I) projects for the Department of Defense (DoD) and other U.S. Government agencies. These projects leverage NRL's experience and expertise in satellite communications, terrestrial ground data systems, network integration and management, ruggedized tactical communications systems, Radio Frequency (RF) systems and antenna integration, and vehicle integration.

1.2. Scope

The effort required under this action is for Transmitted Isotropic Generated Equivalent Radiation. This acquisition will be to continue the next phase of research for the performance of research and implementation of prototyped development in signal generation techniques across the radio frequency spectrum employing high levels of power. The Awardee will refine and implement the techniques, hardware, and software based upon the prototypes developed and evaluated in the previous contract. These signal generation techniques will be employed for atmospheric research and spacecraft and/or aircraft calibration. This effort may require access to SCI programs. The Awardee will continue the research signal generation techniques across the frequency spectrum, with various signal parameters which will include, but may not be limited to, pulse-widths, pulse repetition

intervals, and EIRPs. These pulses will be turned into RF energy that will be transmitted in very narrow beams at extremely high power levels from a large (greater than 55 foot) custom-designed apertures designed by the Navy to precisely target centimeter-sized components. There will be no allowance for signal spillage either to another component on the targeted vehicle or to other vehicles in proximity to the target. The Awardee will also research, design and develop, and modify associated software and hardware combinations needed to generate the most efficient signals for use with the Navy's space and airborne assets.

2. General Requirements

The Naval Research Laboratory (NRL) Requirements for On-Site Awardees (ROSC) dated 8 December 2008 provides general instructions for Awardees conducting business at/on NRL property. Compliance with specific paragraphs of the NRL ROSC cited in the Section 2 - General Requirement and Section 4 - Special Requirements is mandatory, other requirements in the NRL ROSC are provided for information purposes only.

2.1.Location and Hours of Work

Accomplishment of the results contained in this PWS requires work primarily at the Naval Research Laboratory facilities, 4555 Overlook Ave, SW, Washington, DC 20375-5320 or NRL field sites in the National Capital area for normal workdays. Meetings at various sites in CONUS may also be required. Meetings at various sites in CONUS/OCONUS may also be required. Normal workdays are Monday through Friday except US Federal Holidays. NRL workers typically work eight (8) hours per day, 40 hours per week. Flextime workers start not earlier than 0600 and not later than 0900. Core hours of work are from 0900 to 1500 daily. All employees are expected to be available during core hours. Additional information on work hours is provided in Section 1. (c), NRL HOURS OF OPERATION AND HOLIDAY SCHEDULE, in the NRL ROSC.

2.2.Travel / Temporary Duty (TDY)

Travel to other government facilities or Awardee facilities may be required for conduct of experimental research or attendance at government reviews or scientific meetings and seminars. If applicable, Badges and/or car passes may be required at certain locations.

The Awardee shall coordinate all travel requirements (including plans, agenda, itinerary and dates) for review with the Government and is on a strictly cost reimbursable basis.

The Awardee shall bill costs for travel in accordance with FAR 31.205-46 Travel Costs (subject to local policy & procedures).

3. Performance Requirements

In the last phase of the research, the Awardee focused on high precision, picosecond accuracy from one large aperture. In this phase, the main focus will be on time and frequency stability, more precision and phasing the large apertures to be one source. The awardee will take that research and modify it to obtain femtosecond accuracy, phase stability across multiple apertures, highly precise timing from clock sources that provide time and frequency stability to 3 parts per trillion.

3.1 The Awardee shall perform Research and Development that will result in highly precise (femtosecond accuracy) generated pulses that will be transmitted from large apertures (over 55 ft) that are phased to one source.

3.2 The Awardee shall turn generated pulses into RF energy to be transmitted from large custom-designed apertures of at least 55 feet phased together in support of atmospheric research and satellite calibration. This energy will be collected and analyzed by DoD spacecraft and aircraft for space research.

3.3 The Awardee shall generate highly precise pulses in a beam forming configuration to be transmitted from smaller apertures (>55').

3.4 The Awardee shall precisely target narrow-beam high-power generated RF signals to centimeter-sized targets to assure zero percent signal spillage to other vehicles in proximity to the target.

3.5 The Awardee shall analyze requirements, generate corresponding design documents, attend and participate in design reviews and provide cost analysis for the work being performed.

3.6 The Awardee shall perform Research and Development as well as implementation of prototypes on associated hardware and software including, but not limited to the Antenna Control Unit, Digital Pulse Generator, Acquisition Signal Processor, Near Field Imaging Tower Implementation, and Signal Source Unit.

3.7 The Awardee shall perform HW and SW development and implementation of prototyped items, which shall include, but may not be limited to: analysis and design of instrument control systems which are used for satellite and/or aircraft calibration, and production of procedures, surveys and analyses pertaining to the existing and future performance of RF systems under formulation, associated with calibration of current and proposed satellite architectures.

3.8 The Awardee shall plan, recommend, and with COR review and approval, implement specific approaches to system implementation.

3.9 The Awardee shall develop software and hardware that does not affect the axial ratio. Tilt, and pointing restrictions currently levied on the antenna.

3.10 The Awardee shall perform Research and Development on pulse-generating algorithms.

3.10.1 The Awardee shall produce pulse-generating algorithms that will be loaded into Navy custom designed equipment.

3.10.2 The Awardee shall develop highly precise and repeatable RF signals for tailored, precision calibration and testing of spacecraft and aircraft.

3.10.3 The Awardee shall develop algorithms to support RF signal transmissions across the RF spectrum, from DC to light, at various power levels up to and including 1,000 MW.

3.11 The Awardee shall design and implement hardware and software solutions to generate highly precise pulses with femtoseconds accuracy that are transmitted by large antenna (greater than 55 ft and greater) that are phased to appear as one source, which may include the design and development of custom boxes, the use of COTS boxes, or a combination of both. The Awardee shall measure temperature changes and other environmental effects on the power and frequency generated by large apertures (55 ft and greater).

3.12 Shall recalibrate apertures and / or antenna systems due to temperature / environmental fluctuations.

3.13 Shall measure the precise signals against possible noise pollution or noise distractors.

3.14 The Awardee shall determine corrected effective isotropic radiated power (EIRP), tile angle, axial ration, boresight, and gain.

3.15 The Awardee shall apply the findings from the research to increase the efficiency for the pulses generated.

4. Special Requirements

This section describes the special requirements for this effort. The following sub-sections provide details of various considerations on this effort.

4.1.Security

All Contractor personnel who require NRL base access or access to NRL unclassified material and/or unclassified systems shall possess a favorably completed DoD National Agency Check with Law and Credit (NACLC). Contractors who require access to Secret material must have, at a minimum, a favorably completed DoD National Agency Check with Law and Credit (NACLC) and final DoD granted Secret security clearance the time of proposal submission, and those who require access to Top Secret/SCI material must have, at a minimum, a favorably completed DoD National Agency Check with Law and Credit (NACLC) and final DoD granted Top Secret security clearance with the eligibility of SCI at the time of proposal submission. The Contractor shall ensure that all classified material is handled in accordance with the issued DD 254, the National Security Program Operating Manual (NISPOM) (DoD 5220.22M) and all NRL and applicable Security Program Guides/Directives.

Contractor personnel performing any function designated as a component of the Cyber Security Work Force (CSWF), and/or having privileged user access to NRL information systems will require background investigations and security clearances commensurate with the access level and security classification of the system being accessed as specified in DON 5239.2M (2009). System Administrators with privileged access may work in the

computing, network and/or enclave environments. System Administrators with privileged access shall meet the training and certification requirements for IAT level I at the computing environment (CE), IAT level II at the network environment (NE), and IAT level III for the enclave environment as specified in DON 5239.2M (2009). The initiation of an SSBI is required for all System Administrators with privileged access serving in these positions.

All contractors (including subcontractors) identified in the Statement of Work shall supplement their current security practices by requiring any personnel involved in executing the contract to complete Government-sponsored and administered Operations Security (OPSEC) training, OPSE-1301.

4.2.Transition

The Awardee must follow the transition plan submitted as part of the Awardee's Management Plan and keep the Government fully informed of status throughout the transition period.

This plan shall describe the Awardee's transition in to service at the beginning of the contract, and how work would be transitioned to a different Awardee or contract vehicle at the end of the contract. It shall include a staffing and training plan for new personnel. The Awardee shall plan for the transfer of work control and information, addressing any security issues, the transfer and accountability of GFE, inspections and acceptance, and delineating the method for processing and assigning tasks during the phase-in/phase-out periods. The plan shall address how the Awardee will implement adequate measures to coordinate communications with the incumbent Awardee and NRL staff in order to ensure uninterrupted workflow and minimal mission impact during the transition process.

5. Deliverables

The Awardee shall provide deliverables with the schedule and format as described in section 3.0 of this contract and outlined in the CDRL's listed below.

Identifier	Name	Description
A001	Monthly Cost and Performance Report	Due the 15th of every month; Indicates the progress of the Awardee's work on assigned tasks, and the status of the program. Reports costs, and informs of existing or potential problem areas.
A002	Technical Reports, Documentation and Deliverables	Provides summary report of all technical work accomplished during the period of performance.
A003	Monthly Technical and Program Progress Reports	Due the 15th of every month; provides technical progress report summarizing problems and areas of concern and/or potential deviations in the Awardee plan.
A004	Final Report	Provides fully documented results of studies or analysis performed in Awardee format and content per DD 1423.
A005	Contractor On-site Labor Report	Monthly labor report due at NRL no later than five (5) days after the end of each reporting month.

6. Acronyms

HW: Hardware

NCST: Naval Center for Space Technology

OCI: Organizational Conflict of Interest

PI: Principal Investigator

R&D: Research and Development

SAP: Special Access Programs

SSDD: Space Systems Development Department

STD: Standards

S&T: Science and Technology

SW: Software

TDM: Technical Directive Memoranda