DMEA
STTR 20.A PROPOSAL SUBMISSION INSTRUCTIONS

INTRODUCTION

The Defense Microelectronics Activity (DMEA) SBIR/STTR Program is implemented, administrated, and managed by the DMEA Office of Small Business Programs (OSBP). If you have any questions regarding the administration of the DMEA SBIR/STTR Program, please contact the DMEA SBIR/STTR Program Manager (PM), Mr. Greg Davis, at smbus@dmea.osd.mil.

For general inquiries or problems with electronic submission, contact the DOD SBIR/STTR Help Desk at 703-214-1333 between 9:00 am to 5:00 pm ET. For questions about the topic during the pre-release period (10 December 2019 through 13 January 2020), contact the Technical Point of Contact (TPOC) listed under each topic on the https://www.dodsbirsttr.mil/submissions/ website prior to the Open phase of the DoD STTR Program Broad Agency Announcement (BAA) FY 20.A. The SBIR/STTR Interactive Topic Information System (SITIS) will be open to questions during pre-release and close to new questions two weeks prior to the announcement close date.. Information regarding the DMEA mission and programs can be found at http://www.dmea.osd.mil.

PHASE I GUIDELINES

DMEA intends for Phase I to be only an examination of the merit of the concept or technology that still involves technical risk, with a cost not exceeding $167,500.

A list of the topics currently eligible for proposal submission is included in this section followed by full topic descriptions. These are the only topics for which proposals will be accepted at this time. The topics are directly linked to DMEA's core research and development requirements.
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Please ensure that your e-mail address listed in your proposal is current and accurate. DMEA cannot be responsible for notification to companies that change their mailing address, e-mail address, or company official after proposal submission.

PHASE I PROPOSAL SUBMISSION

Read the DOD STTR Program BAA FY 20.A for detailed instructions on proposal format and program requirements. When you prepare your proposal submission, keep in mind that Phase I should address the feasibility of a solution to the topic. Only UNCLASSIFIED proposals will be entertained.

The technical period of performance for the Phase I effort should be no more than six (6) months. DMEA will evaluate and select Phase I proposals using the evaluation criteria contained in Section 6.0 of the DOD STTR Program BAA FY 20.A Preface Instructions. Due to limited funding, DMEA reserves the right to limit awards under any topic, and only proposals considered to be of superior quality will be funded.

DMEA does not accept Phase I proposals exceeding $167,500. DMEA will conduct a price analysis to determine whether cost proposals, including quantities and prices, are fair and reasonable. Contractors should expect that cost proposals will be negotiated.
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If you plan to employ NON-U.S. citizens in the performance of a DMEA STTR contract, please identify these individuals in your proposal as specified in Section 5.4.c(8) of the DOD STTR Program BAA FY 20.A.

It is mandatory that the ENTIRE Technical Volume, DOD Proposal Cover Sheet, and Cost Volume are submitted electronically through the DOD SBIR/STTR website at https://www.dodsbirsttr.mil/submissions/. The DOD proposal submission site submission will lead you through the process for submitting your technical proposal and all of the sections electronically. Each of these documents is submitted separately through the website. If you have any questions or problems with the electronic proposal submission, contact the DOD SBIR/STTR Help Desk at 703-214-1333 or email dodsbirsupport@reisystems.com

Your proposal submission must be submitted via the submission site on or before the 8:00 a.m. ET deadline on 12 February 2020.

Proposal submissions that are not complete or that are received after the closing date and time will not be considered for award.

PHASE II GUIDELINES

Phase II is the prototype/demonstration of the technology that was found feasible in Phase I. DMEA encourages, but does not require, partnership and outside investment as part of discussions with DMEA sponsors for potential Phase II efforts.

Phase II proposals may be submitted for an amount not to exceed $1,100,000. The technical period of performance for the Phase II effort should be no more than twenty-four (24) months.

PHASE II PROPOSAL SUBMISSION

Phase I awardees may submit a Phase II proposal without invitation not later than sixty (60) calendar days following the end of the Phase I contract. The Phase II proposal submission instructions are identified in the Phase I contract, Part I – The Schedule, Section H, Special contract requirements, "STTR Phase II Proposal Submission Instructions."

All Phase II proposals must have a complete electronic submission. Complete electronic submission includes the submission of Cover Sheet, Cost Volume, the entire Technical Volume, and any appendices via the DOD submission site (https://www.dodsbirsttr.mil/submissions/). The DOD proposal submission site will lead you through the process for submitting your technical volume and all of the sections electronically. Each of these documents is submitted separately through the website. Your proposal must be submitted via the submission site on or before the DMEA-specified deadline or it will not be considered for award.

The technical period of performance for the Phase II effort should be no more than twenty-four (24) months. DMEA will evaluate Phase II proposals based on the Phase II evaluation criteria listed in Section 8.0 of DOD STTR Program BAA FY 20.A Preface. DMEA does not have an established page limit for Phase II submissions. Please reference the DOD SBIR Submission site FAQs for more information on generating Phase II proposals. Due to limited funding, DMEA's ability to award any Phase II, regardless of proposal quality or merit, is subject to availability of funds. Please ensure that your proposal is valid for 120 days after submission, and any extension to that time period will be requested by the contracting officer.

Any follow-on Phase II proposal (i.e., a second Phase II subsequent to the initial Phase II effort) shall be initiated by the Government Technical Point of Contact for the initial Phase II effort and must be approved by the DMEA SBIR/STTR Program Manager in advance.

COST VOLUME GUIDELINES

The on-line cost volume for Phase I and Phase II proposal submissions must be at a level of detail that would enable DMEA personnel to determine the purpose, necessity, and reasonability of each cost element. Provide sufficient information (a. through h. below) on how funds will be used if the contract is awarded. Include the itemized cost volume information (a. through h. below) as an appendix in your technical proposal. The itemized cost volume information (a. through h. below) will not count against the 20-page limit on Phase I proposal submissions.

a. Special Tooling and Test Equipment and Material: The inclusion of equipment and materials will be carefully reviewed relative to need and appropriateness of the work proposed. The purchase of special tooling and test equipment must, in the opinion of the Contracting Officer, be advantageous to the government and relate directly to the specific effort. They may include such items as innovative instrumentation and/or automatic test equipment. Title to property furnished by the Government or acquired with Government funds will be vested with the DOD Component; unless it is determined that transfer of the title to the contractor would be more cost effective than recovery of the equipment by the DOD Component.
b. Direct Cost Materials: Justify costs for materials, parts, and supplies with an itemized list containing types, quantities, price, and where appropriate, purposes.
c. Other Direct Costs: This category of costs includes specialized services such as machining or milling, special testing or analysis, costs incurred in obtaining temporary use of specialized equipment. Proposals, which include teased hardware, must provide an adequate lease *versus* purchase justification or rationale.
d. Direct Labor: Identify key personnel by name if possible or by labor category if specific names are not available. The number of hours, labor overhead and/or fringe benefits and actual hourly rates for each individual are also necessary.
e. Travel: Travel costs must relate to the needs of the project. Break out travel cost by trip, with the number of travelers, airfare, and per diem. Indicate the destination, duration, and purpose of each trip.
f. Cost Sharing: Cost sharing is permitted. However, cost sharing is not required, nor will it be an evaluation factor in the consideration of a proposal.
g. Subcontracts: Involvement of university or other consultants in the planning and /or research stages of the project may be appropriate. If the offeror intends such involvement, describe the involvement in detail and include information in the cost proposal. The proposed total of all consultant fees, facility leases, or usage fees and other subcontract or purchase agreements may not exceed one-third of the total contract price or cost, unless otherwise approved in writing by the Contracting Officer. Support subcontract costs with copies of the subcontract agreements. The supporting agreement documents must adequately describe the work to be performed (i.e., Cost Volume). At the very least, a statement of work with a corresponding detailed cost volume for each planned subcontract must be provided.
h. Consultants: Provide a separate agreement letter for each consultant. The letter should briefly state what service or assistance will be provided, the number of hours required, and the hourly rate.

DMEA STTR PHASE II ENHANCEMENT PROGRAM

To encourage transition of STTR into DOD systems, DMEA has a Phase II Enhancement policy. DMEA's Phase II Enhancement program requirements include: up to one-year extension of existing Phase II, and up to $550,000 matching STTR funds. Applications are subject to review of the statement of work, the transition plan, and the availability of funding. DMEA will generally provide the additional Phase II Enhancement funds by modifying the Phase II contract.

DISCRETIONARY TECHNICAL AND BUSINESS ASSISTANCE (TABA)

DMEA does not provide Discretionary Technical and Business Assistance (TABA).

PHASE I PROPOSAL SUBMISSION CHECKLIST:

All of the following criteria must be met or your proposal will be REJECTED.

_____1. Your Technical Volume, the DOD Cover Sheet, and the Cost Volume have been submitted electronically through the DOD submission site by 8:00 pm ET on 12 February 2020.

_____2. The Phase I proposal does not exceed $167,500

DMEA STTR 20.A Topic Index

DMEA STTR 20.A Topic Descriptions

20A-001 TITLE: Correlation between Nano-scale Material Properties and Macro-scale Electrical Properties of Radiation Hardened Materials

TECHNOLOGY AREA(S): Electronics, Materials/Processes, Nuclear Technology, Sensors, Space Platforms

RESEARCH & TECHNOLOGY AREA(S):

ADVANCED CAPABILITIES:

ACQUISITION & SUSTAINMENT AOR:

OBJECTIVE: Develop and validate predictive electronic device behavioral models by systematically correlating nano-scale material properties (e.g. through quantitative electron microscopy techniques) with macro-scale electrical properties determined via device electrical testing.

DESCRIPTION: Radiation hardening, the process of making electronic components resistant to damage from ionizing radiation, has been a critical process for various applications ranging from the design of satellites and military aircraft to nuclear reactors. Therefore, to maintain the reliability of Department of Defense (DOD) microelectronics systems, it is essential to systematically make electronic components radiation hardened. There are various sources of ionization radiation such as Van Allen radiation belts, cosmic rays, solar winds, and nuclear reactors. [1] And, there are three main radiation metrics: i) total ionizing dose (TID), ii) displacement dose damage (DDD), and iii) single-event effects (SEE). TID is caused by the creation of electron-hole pairs, which are generated by photons, electrons, or protons. The TID is a primary issue for dielectric layers in complementary metal oxide semiconductor (CMOS) devices, which can lead to threshold voltage (Vth) shifts. [2] DDD occurs when atoms are displaced in the crystal lattice by protons, neutrons, or alpha particles leading to variation in the electrical properties of devices. The impact of single events (SEE) are typically more subtle because they occur when highly-charged particles cause ionization within a device and cause bits to flip. Because of the soft-error nature of these events, characterization of these processes requires careful characterization. [3]

Utilization of the advanced industrial technologies in the military and space missions have gained traction in the past years. Current, leading non-volatile technologies (e.g., flash) are susceptible to ionization effects. Therefore, to understand the abnormalities associated with the electrical properties of failed devices, it is important to characterize the fundamental mechanisms of failures. Transmission Electron Microscopy (TEM) along with spectroscopy techniques such as Electron Energy Loss Spectroscopy (EELS) and Energy Dispersive X-ray Spectroscopy (EDXS) enables defect characterization with atomic spatial and energy resolution, respectively. [4] Systematic defect characterization with a TEM and correlation to macro-scale electrical properties provides a critical avenue to design radiation hardened electronic components efficiently. Hence, the performer is expected to evaluate and develop predictive models to quantitatively correlate nano-scale behavior (defects) to macro-scale electrical properties.

PHASE I: Perform a feasibility study for evaluating and developing methods to build predictive models to enable better design of radiation hardened electronic components. Conduct research on various techniques, such as artificial intelligent (AI) and machine learning, to build models from experimental data. The proposed technique or method should be capable of predicting electronic component electrical properties based on input from material characterization data and potentially material characteristics based on input from electrical properties. It is expected that the performer chooses a specific materials system to conduct the feasibility study. The proposed technique must adhere to the following concepts:

1) High resolution imaging and spectroscopy for physical material characterization
2) Electrical testing data to inspect electrical properties
3) Modeling based techniques, such as AI and machine learning

PHASE II: Phase II will result in building, testing and delivering a technique of the predictive model developed in phase I. Technique demonstration should include multiple testing data encompassing both material characteristics and electrical properties. Additionally, it is expected that at a minimum testing data is provided from two different material systems. Furthermore, as part of technique demonstration, all the programming and mathematical justifications should be delivered.

PHASE III DUAL USE APPLICATIONS: Phase III will result in the expansion of the technique in Phase II into a tested pre-production technology, which entails a method to predict an electronic component electrical behavior based on nano-scale material characteristics. This system can be utilized for evaluating failures of electronic components sensitive to radiation effects both in commercial and government sectors.

REFERENCES:

1. [1] Kelli, Mars (11 June 2018). "Why Space Radiation Matters". National Aeronautics and Space Administration. Retrieved 27 September 2019.

2. [2] Y. Gonzalez-Velo, et al., “Review of Radiation Effects on ReRAM Devices and Technology,” Semiconductor Science and Technology, 32, p. 44, 2017.

3. [3] G.C. Messenger, M. Ash, “Single Event Phenomena, Springer Science & Business Media,” 1997.

4. [4] D. B. Williams, and C. B. Carter. Transmission Electron Microscopy: A Textbook for Materials Science. 1996.

5. [5] D. Gorissen, et al., “A Software Framework for Automated Behavioral Modeling of Electronic Devices,” IEEE Microwave Magazine, 13, 2012.

KEYWORDS: Radiation Hardening, TEM, Modeling, Electrical Testing, Machine Learning, AI, Electronic Devices