Defense Advanced Research Projects Agency (DARPA)
DoD 23.4 Small Business Innovation Research (SBIR) Annual BAA
Proposal Submission Instructions Release 2

INTRODUCTION

DARPA's mission is to make strategic, early investments in science and technology that will have long-term positive impacts on our national security. As part of this mission, DARPA makes high-risk, high-reward investments in science and technology that have the potential to disrupt current understandings and/or approaches. The pace of discovery in both science and technology is accelerating worldwide, resulting in new fields of study and the identification of scientific areas ripe for small business utilization through the SBIR and STTR programs. Small businesses are critical for developing technology to support national security. Proposers are encouraged to consider whether the R/R&D being proposed to DoD Components also has private sector potential, either for the proposed application or as a base for other applications. The topics below focus on technical domains important to DARPA's mission pursuing innovative research concepts that fall within one of its technology offices. More information about DARPA's technical domains and research topics of interest may be found at: http://www.darpa.mil/about-us/offices.

Proposers responding to a topic in this BAA must follow all general instructions provided in the Department of Defense (DoD) SBIR Program BAA. DARPA requirements in addition to or deviating from the DoD Program BAA are provided in the instructions below.

Specific questions pertaining to the administration of the DARPA Program and these proposal preparation instructions should be directed to: DARPA Small Business Programs Office at SBIR_BAA@darpa.mil. DSIP Topic Q&A will NOT be available for these DARPA topics. Technical questions related to improving the understanding of a topic's requirements must be submitted to SBIR_BAA@darpa.mil by the deadline listed below.

The following dates apply to this DARPA Topic release:

February 16, 2023: Topics issued for pre-release
March 07, 2023: Topics open; DARPA begins accepting proposals via DSIP
March 30, 2023: Deadline for technical question submission
April 06, 2023: Deadline for receipt of proposals no later than **12:00 pm ET**

DIRECT TO PHASE II PROPOSAL GUIDELINES

Proposers should refer to the DARPA Direct to Phase II Proposal Instructions, provided in Appendix A.

Current Release Award Structure by Topic

Topic Number	Direct to Phase II				
	Tech Volume*	Base Amount	Period of Performance (PoP)	Option Amount	Option PoP
HR0011SB20234-04	35 pages	$1,400,000	18 months	$600,000	6 months
HR0011SB20234-05	35 pages	$1,200,000	24 months	$600,000	12 months
HR0011SB20234-06	35 pages	$750,000	12 months	$500,000	12 months

Technical Volume (Volume 2) – Abbreviated Standard Format (35-page)
If a proposer can provide adequate documentation to substantiate that the scientific and technical merit and feasibility described in the Phase I section of the topic has been met and describes the potential commercial applications, the Direct to Phase II (DP2) authority allows the Department of Defense (DoD) to make an award to a small business concern under Phase II of the SBIR program without regard to whether the small business concern was provided an award under Phase I of an SBIR program. This topic is accepting DP2 proposal submissions.

DP2 Feasibility Documentation shall not exceed 10 pages. DP2 Technical Proposal shall not exceed 20 pages. Phase II commercialization strategy shall not exceed 5 pages. This should be the last section of the Technical Volume and will not count against the 30-page limit.

Note: Please see Appendix A, section III (d) for complete instructions on the White Paper/Slide Deck technical volume format.

Content of the Technical Volume
Proposers should refer to the DARPA DP2 Proposal Instructions, provided in Appendix A and on the DARPA Small Business site (https://www.darpa.mil/work-with-us/for-small-businesses/participate-sbir-sttr-program).

Cost Volume (Volume 3)
Please see the chart above for award amounts listed by topic. Proposers are required to use the Direct to Phase II – Volume 3: Cost Proposal Template (Excel Spreadsheet) provided on the DARPA Small Business site (https://www.darpa.mil/work-with-us/for-small-businesses/participate-sbir-sttr-program). Subcontractors may also submit unsanitized costs using this template directly to DARPA at SBIR-BAA@darpa.mil.

Please review the updated Percentage of Work (POW) calculation details included in the DoD Program BAA. DARPA will occasionally accept deviations from the POW requirements with a letter of explanation or approval from the Funding Agreement officer.

Company Commercialization Report (CCR) (Volume 4)
Completion of the CCR as Volume 4 of the proposal submission in DSIP is required. Please refer to the DoD SBIR Program BAA for full details on this requirement. Information contained in the CCR will not be considered by DARPA during proposal evaluations.

Supporting Documents (Volume 5)
In addition to the documents required by DoD, small businesses may also submit additional documentation to support the Technical Volume (Volume 2) and the Cost Volume (Volume 3) in Volume 5.

DISCRETIONARY TECHNICAL AND BUSINESS ASSISTANCE (TABA)
DARPA does not offer TABA funding.

EVALUATION AND SELECTION
All proposals will be evaluated in accordance with the evaluation criteria listed in the DoD SBIR 2023.4 BAA. DARPA will conduct an evaluation of each conforming proposal. Proposals that do not comply with the requirements detailed in this BAA and the research objective(s) of the corresponding topic are considered non-conforming and therefore are not evaluated nor considered for award.

Using the evaluation criteria, the Government will evaluate each proposal in its entirety, documenting the strengths and weaknesses relative to each evaluation criterion, and, based on these identified strengths and weaknesses, determine the proposal's overall selectability. Proposals will not be evaluated against each other during the evaluation process, but rather evaluated on their own individual merit to determine how well the proposal meets the criteria stated in this BAA and the corresponding DARPA topic.

Awards will be made to proposers whose proposals are determined to be the most advantageous to the Government, consistent with instructions and evaluation criteria specified in the DoD SBIR 2023.4 BAA and availability of funding. Given the limited funding available for each topic released, not all proposals considered selectable will be selected for funding.

For the purposes of this proposal evaluation process, a selectable proposal is defined as follows:

Selectable: A selectable proposal is a proposal that has been evaluated by the Government against the evaluation criteria listed in the DoD SBIR 2023.4 BAA and DARPA topic, and the strengths of the overall proposal outweighs its weaknesses. Additionally, there are no accumulated weaknesses that would require extensive negotiations and/or a resubmitted proposal.

For the purposes of this proposal evaluation process, a non-selectable proposal is defined as follows:

Non-Selectable: A proposal is considered non-selectable when the proposal has been evaluated by the Government against the evaluation criteria listed in the DoD SBIR 2023.4 BAA and DARPA topic, and the strengths of the overall proposal do not outweigh its weaknesses.

Proposing firms will be notified of selection or non-selection status for a Phase I award within 90 days of the closing date of the DoD SBIR 2023.4 BAA. It is the policy of DARPA to treat all proposals as source selection information and to disclose their contents only for the purpose of evaluation. Restrictive notices notwithstanding, during the evaluation process, submissions may be handled by support contractors for administrative purposes and/or to assist with technical evaluation. All DARPA support contractors are expressly prohibited from performing DARPA-sponsored technical research and are bound by appropriate nondisclosure agreements. Input on technical aspects of the proposals may be solicited by DARPA from other Government and/or non-Government consultants/experts who are strictly bound by the appropriate non-disclosure requirements. No submissions will be returned. Upon completion of the evaluation and selection process, an electronic copy of each proposal received will be retained at DARPA.

Proposal titles, abstracts, anticipated benefits, and keywords of proposals that are selected for contract award will undergo a DARPA Policy and Security Review. Proposal titles, abstracts, anticipated benefits, and keywords are subject to revision and/or redaction by DARPA. Final approved versions of proposal titles, abstracts, anticipated benefits, and keywords may appear on the DoD SBIR/STTR awards website and/or the SBA's SBIR/STTR award website (https://www.sbir.gov/sbirsearch/award/all).

Refer to the DoD SBIR 2023.4 Program BAA for procedures to protest the Announcement.
As further prescribed in FAR 33.106(b), FAR 52.233-3, Protests regarding the selection decision should be submitted to:

DARPA
Contracts Management Office (CMO)
675 N. Randolph Street
Arlington, VA 22203
E-mail: scott.ulrey@darpa.mil and sbir@darpa.mil

AWARD AND CONTRACT INFORMATION

1. General Award Information

Multiple awards are anticipated. DARPA may award FAR-based government contracts (Firm- Fixed Price or Cost-Plus Reimbursement) or Other Transactions for Prototypes agreement (under the authority of 10 U.S.C. § 4022) subject to approval of the Contracting Officer. The amount of resources made available for each topic issued under this BAA will depend on the quality of the proposals received and the availability of funds.

Majority Ownership in Part. Proposers that are more than 50% owned by multiple venture capital operating companies (VCOC), hedge funds (HF), private equity firms (PEF), or any combination of these as set forth in 13 C.F.R. § 121.702, are eligible to submit proposals in response to DARPA topics advertised within this BAA.

For proposers that are a member of this ownership class the following must be satisfied for proposals to be accepted and evaluated:

a. Prior to submitting a proposal, firms must register with the SBA Company Registry Database.
b. The proposer within its submission must submit the Majority-Owned VCOC, HF, and PEF Certification. A copy of the SBIR VC Certification can be found on https://www.darpa.mil/work-with-us/for-small-businesses/participate-sbir-sttr-program, under SBIR/STTR BAA Forms. Include the SBIR VC Certification in the Supporting Documents (Volume 5).
c. Should a proposer become a member of this ownership class after submitting its proposal and prior to any receipt of a funding agreement, the proposer must immediately notify the Contracting Officer, register in the appropriate SBA database, and submit the required certification which can be found under SBIR/STTR BAA Forms and Templates on https://www.darpa.mil/work-with-us/for-small-businesses/participate-sbir-sttr-program.

The Government reserves the right to select for negotiation all, some, one, or none of the proposals received in response to this announcement and to make awards with or without communications with proposers. Additionally, the Government reserves the right to award all, some, one, or none of the options on the contract(s)/agreement(s) of the performers based on available funding and technical performance. If warranted, portions of resulting awards may be segregated into pre-priced options. Additionally, DARPA reserves the right to accept proposals in their entirety or to select only portions of proposals for award. In the event that DARPA desires to award only portions of a proposal, negotiations may be opened with that proposer. The Government reserves the right to fund proposals in phases with options for continued work, as applicable.

The Government reserves the right to request any additional, necessary documentation once it makes the award instrument determination. The Government reserves the right to remove a proposal from award consideration should the parties fail to reach agreement on award terms, conditions, and price within a reasonable time, and/or the proposer fails to provide requested additional information within three business days.

In all cases, the Government Contracting Officer reserves the right to select award instrument type, regardless of instrument type proposed, and to negotiate all instrument terms and conditions with selectees. DARPA will apply publication or other restrictions, as necessary, if it determines that the research resulting from the proposed effort will present a high likelihood of disclosing performance characteristics of military systems or manufacturing technologies that are unique and critical to defense. Any award resulting from such a determination will include a requirement for DARPA permission before

publishing any information or results on the program. For more information on publication restrictions, see the DoD SBIR 2023.4 BAA.

Because of the desire to streamline the award negotiation and program execution process, proposals identified for negotiation will result in negotiating a type of instrument for award that is in the best interest of the Government. In the case of an OT for Prototype agreement under DARPA's authority to award OTs for prototype projects, 10 U.S.C. § 4022, use of an OT provides significant opportunities for flexible execution to assist in meeting DARPA's aggressive SBIR/STTR program goals.

All proposers that wish to consider an OT award should carefully read the following:

The flexibility of the OT award instrument is beneficial to the program because the Performer will be able to apply its best practices as required to carry out the research project that may be outside of the Federal Acquisition Regulation (FAR) process-driven requirements. Streamlined practices will be used, such as milestone-driven performance, intended to reduce time and effort on award administration tasks and permit performers to focus on the research effort and rapid prototyping. Because of this ability, OTs provide the Agreements Officer the flexibility to create an award instrument that contains terms and conditions that promote commercial transition, reduce some administratively burdensome acquisition regulations, and meet SBIR/STTR program goals.

Proposers must only propose an OT agreement with fixed payable milestones. Fixed payable milestones are fixed payments based on successful completion of the milestone accomplishments agreed to in the milestone plan. Refer to the Other Transactions for Prototypes Fact Sheet and Other Transaction for Prototype Agreement, available at https://www.darpa.mil/work-with-us/for-small-businesses/participate-sbir-sttr-program. Specific milestones will be based upon the research objectives detailed in the topic.

Please see https://www.darpa.mil/work-with-us/for-small-businesses/participate-sbir-sttr-program for more information on OTs.

2. Transition and Commercialization Support Program (TCSP)

DARPA will provide services to Phase II or DP2 awardees upon contract execution through the Transition and Commercialization Support Program (TCSP) at no cost to awardees. The TCSP goal is to maximize the potential for SBIR/STTR companies to move their technology beyond Phase II and into other research and development programs for further maturity or into solutions or products for DoD acquisition programs, other Federal programs, and/or the commercial market. Please visit https://www.darpa.mil/work-with-us/for-small-businesses/commercialization-continued for more information on DARPA TCSP.

3. Embedded Entrepreneurship Initiative

Awardees of SBIR funding pursuant to this BAA may be eligible to participate in the DARPA Embedded Entrepreneurship Initiative (EEI) during the Period of Performance. Invitation to participate in EEI is at the sole discretion of the Government based on evaluation of technical and commercial factors and subject to program balance and the availability of funding. EEI is a limited scope program offered by DARPA, at DARPA's discretion, to a small subset of awardees. The goal of DARPA's EEI is to increase the likelihood that DARPA-funded technologies take root in the U.S. and provide new capabilities for national defense. EEI supports DARPA's mission "to make pivotal investments in breakthrough technologies and capabilities for national security" by accelerating the transition of innovations out of the lab and into new capabilities for the Department of Defense (DoD). EEI investment supports development of a robust and deliberate Go-to-Market strategy for selling technology product to the government and commercial markets and positions DARPA awardees to attract U.S. investment. The following is for informational and planning purposes only and does not constitute solicitation of proposals to the EEI.

There are three elements to DARPA's EEI: (1) A Senior Commercialization Advisor (SCA) from DARPA who works with the Program Manager (PM) to examine the business case for the awardee's technology and uses commercial methodologies to identify steps toward achieving a successful transition of technology to the government and commercial markets; (2) Connections to potential industry and investor partners via EEI's Investor Working Groups; and (3) Additional funding on an awardee's contract for the awardee to hire an embedded entrepreneur to achieve specific milestones in a Go-to-Market strategy for transitioning the technology to products that serve both defense and commercial markets. This embedded entrepreneur's qualifications should include business experience within the target industries of interest, experience in commercializing early stage technology, and the ability to communicate and interact with technical and non-technical stakeholders. Funding for EEI is typically no more than $250,000 per awardee over the duration of the award. An awardee may apportion EEI funding to hire more than one embedded entrepreneur, if achieving the milestones requires different expertise that can be obtained without exceeding the awardee's total EEI funding. The EEI effort is intended to be conducted concurrent with the research program without extending the period of performance.

EEI Application Process:
After receiving an award under the solicitation, awardees interested in being considered for EEI should notify their DARPA Program Manager (PM) during the period of performance. Timing of such notification should ideally allow sufficient time for DARPA and the awardee to review the awardee's initial transition plan, identify milestones to achieve under EEI, modify the award, and conduct the work required to achieve such milestones within the original award period of performance. These steps may take 9-18 months to complete, depending on the technology. If the DARPA PM determines that EEI could be of benefit to transition the technology to product(s) the Government needs, the PM will refer the performer to DARPA Commercial Strategy.

DARPA Commercial Strategy will then contact the performer, assess fitness for EEI, and in consultation with the DARPA technical office, determine whether to invite the performer to participate in the EEI. Factors that are considered in determining fitness for EEI include DoD/Government need for the technology; competitive approaches to enable a similar capability or product; risks and impact of the Government's being unable to access the technology from a sustainable source; Government and commercial markets for the technology; cost and affordability; manufacturability and scalability; supply chain requirements and barriers; regulatory requirements and timelines; Intellectual Property and Government Use Rights, and available funding.

Invitation to participate in EEI is at the sole discretion of DARPA and subject to program balance and the availability of funding. EEI participants' awards may be subsequently modified bilaterally to amend the Statement of Work to add negotiated EEI tasks, provide funding, and specify a milestone schedule which will include measurable steps necessary to build, refine, and execute a Go-to-Market technology transition plan aimed at delivering new capabilities for national defense. Milestone examples are available at: https://www.darpa.mil/work-with-us/contract-management.

Awardees under this solicitation are eligible to be considered for participation in EEI, but selection for award under this solicitation does not imply or guarantee participation in EEI.

For more information please refer to the EEI website https://eei.darpa.mil/.

4. DARPA Toolbox Initiative

DARPA Toolbox is an Agency-wide effort to provide open licensing opportunities with commercial technology vendors to the researchers behind DARPA programs. DARPA Toolbox provides easy, low-cost, scalable access to state-of-the-art tools and intellectual property (IP) under predictable legal terms

and streamlined acquisition procedures. The goal is to reduce performer reliance on low-quality, low-cost tools and IP that increase execution risks and complicate post-DARPA transitions.

Through this initiative, DARPA performers are granted access to select vendor tools and technologies throughout the life of their contractual relationship with the Agency. The Toolbox suppliers bring to the table proven technologies commonly used in state-of-the art commercial microelectronics or system design methodologies.

DARPA Toolbox program information and a full list of participating suppliers can be found at https://www.darpa.mil/work-with-us/darpa-toolbox-initiative. If there are tool or technologies of interest, contact the Supplier POC listed for the product, referencing the DARPA Toolbox Initiative. The Supplier POC will provide advice on products and pricing information. Include any non-production pricing quotes in your proposal. Products and pricing are between you and the suppliers – *do not* contact DARPA directly.

ADDITIONAL INFORMATION

DARPA intends to use electronic mail for all correspondence regarding these topics. Questions related to the technical aspect of the research objectives and awards specifically related to a topic should be emailed to SBIR_BAA@darpa.mil. Please reference the topic number in the subject line. All questions must be in English and must include the name, email address, and the telephone number of a point of contact.

DARPA will attempt to answer questions in a timely manner; however, questions submitted within seven (7) calendar days of the proposal due date listed herein may not be answered. DARPA will post a consolidated Frequently Asked Questions (FAQ) document. To access the posting please visit: http://www.darpa.mil/work-with-us/opportunities. Under the topic number summary, there will be a link to the FAQ. The FAQ will be updated on an ongoing basis until one week prior to the proposal due date.

Technical support for the Defense SBIR/STTR Innovation Portal (DSIP) is available Monday through Friday, 9:00 a.m. – 5:00 p.m. ET. Requests for technical support must be emailed to DoDSBIRSupport@reisystems.com with a copy to SBIR_BAA@darpa.mil.

DARPA SBIR 23.4 Topic Index
Release 2

HR0011SB20234-04	Super-resolution Thermal Metrology for High Power Density Devices
HR0011SB20234-05	Wearables at the Edge to Augment Readiness (WEAR)
HR0011SB20234-06	Exploiting Sparsity in Python (ESPy)

HR0011SB20234-04 TITLE: Super-resolution Thermal Metrology for High Power Density Devices

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Microelectronics

OBJECTIVE: This topic seeks to develop a super-resolution thermal metrology tool to enable accurate characterization of semiconductor materials and devices, and wide bandgap and ultra-wide bandgap materials and devices, in particular, at nanometer length scale.

DESCRIPTION: Radar and communication systems are ubiquitous in both military and commercial applications. In these platforms, system performance can be improved by increasing the radio frequency (RF) output power of the transmitter power amplifier (PA), which is directly proportional to the output power density of the PA transistor. However, the operating output power densities achieved in today's wide bandgap transistors are thermally limited to values substantially below theoretical electronic limits. The government has an interest in developing technologies to overcome these thermal limitations and realize robust, high-power density transistors that operate near their fundamental electronic limit of RF output power, with a focus on achieving high power density through reduction in transistor thermal resistance [1]. Success requires metrology that can accurately measure thermal resistance and interfacial thermal resistance of a variety of material and device structures. Furthermore, these measurements are required to verify that performer high-power transistors meet program metrics.

Existing thermal metrology tools often use pump-probe laser-based techniques, such as time-domain thermoreflectance (TDTR), frequency-domain thermoreflectance (FDTR), and recent variants such as steady state thermoreflectance (SSTR)[2] . While these techniques are useful for the measurement of thermal resistance in thin films and interfaces, they are are limited in spatial resolution [2,3], and cannot measure thermal resistance and thermal resistance gradients in submicron devices. The ability to measure thermal resistance beyond the surface film (i.e., in the buried channel layer of a heterojunction device) and also characterize at both nanoscale and microscale dimensions, is critical to the development of high power density devices. The purpose of this direct to Phase II (DP2) SBIR topic is to develop a super-resolution thermal metrology tool that enables accurate characterization of the thermal resistance of semiconductor materials, heterostructures and devices, particularly wide bandgap and ultra-wide bandgap materials and devices at nanometer length scale. The tool must be capable of measuring both epilayers and operating devices with a thermal resolution less than 0.25 ^{o}C, thermal precision of 1 ^{o}C, spatial resolution below 50 nm, accuracy above 90%, and reproducibility and repeatability less than 2%. Specific measurement capabilities include thermal resistance, thermal boundary resistance of interfaces, and temperature of an operating device and, in particular, buried channel layers. The device-scale measurements must characterize both the surface and cross-section of a multi-finger, submicron GaN high-electron-mobility transistor (HEMT) and an ultra-wide bandgap AlGaN HEMT. In addition, a comprehensive validation plan should be provided. For example, the plan should include device-relevant material structures, such as GaN transistor layers, that are compared to other thermal measurement techniques for verification of results. The plan may also incorporate National Institute of Standards and Technology (NIST) standards. The final Phase II base deliverable will be a laboratory demonstration of the thermal metrology tool, along with a plan for construction of tool and delivery to a U.S. government organization. The Phase II option of this topic will address the development of this thermal metrology tool into an automated, turnkey system that will be delivered to a U.S. government laboratory. The deliverables of the Phase II option will include both the tool, calibration standards, and any necessary software for demonstrating material and device thermal characterization. Finally, on-site support will be required to ensure proper installation and operation at the U.S. government organization.

PHASE I: This topic is soliciting Direct to Phase II (DP2) proposals only. This DP2 SBIR requires documentation of existing thermal metrology capabilities and a proposed plan with supporting analysis showing that achieving 50 nm spatial resolution with high precision and accuracy is feasible. The

documentation must include measured data, including thermal resistance, from existing thermal metrology techniques demonstrating less than 2 µm spatial resolution and the ability to resolve interfaces beyond the surface film. In addition, validation data from the existing thermal metrology tool should be provided.

PHASE II: The proposed plan must describe the path towards a successful final DP2 SBIR deliverable which meets the requirements listed below. This DP2 SBIR will have an 18-month duration in which the super-resolution thermal metrology tool will be designed, developed, validated, and tested for performance goals. The requirements of the thermal metrology tool are:

1. Capable of measuring thermal resistance, thermal boundary resistance, and temperature of operating multi-finger, submicron GaN HEMT and ultra-wide bandgap AlGaN HEMT with the following specifications:
    a. Spatial resolution < 50 nm
    b. Thermal resolution < 0.25 ^{o}C
    c. Thermal precision: 1 ^{o}C
    d. Accuracy > 90%
    e. Reproducibility and repeatability < 2%

2. Tool validation using a comparison of measured results of device relevant structures to other thermal metrology techniques. In addition, validation may use available NIST standards.

Phase II (base) fixed milestones include:

- Month 1: Detailed report on super-resolution thermal metrology tool design, including documentation of path towards achieving in-situ device testing and meeting DP2 SBIR goals.
- Month 3: Report on progress towards final design and demonstration of thermal metrology tool.
- Month 6: Report on progress towards final design and demonstration of thermal metrology tool.
- Month 9: Report on progress towards final design and demonstration of thermal metrology tool.
- Month 12: Initial prototype demonstration of super-resolution thermal metrology tool. Detailed report should include validation data as well as thermal resistance, temperature, and thermal resolution of the surface and cross-section of GaN and AlGaN transistors with less than 100 nm spatial resolution. Documentation should also describe the path towards the final DF2 SBIR deliverable.
- Month 15: Detailed report on progress towards final design and demonstration of the thermal metrology tool, including validation data and transistor thermal characterization.
- Month 18: Final demonstration of a prototype thermal metrology tool that meets requirements listed above. Detailed data report containing final validation measurements and thermal characterization of surface and cross-section of GaN and AlGaN transistors with less than 50 nm spatial resolution. Plan for construction of tool and delivery to a U.S. government organization.

Phase II (option) This DP2 SBIR will have a 6-month option in which the super-resolution thermal metrology tool demonstrated in Phase II will be developed into a turn-key, push-button, automated system. A Phase II option final report will detail the successful demonstration of a fully-automated measurement of the thermal resistance, thermal boundary resistance, temperature, and thermal resolution of an operating multi-finger, submicron GaN HEMT and ultra-wide bandgap AlGaN HEMT. The DP2 option will also include:

1. Delivery of prototype automated, turnkey thermal metrology tool to a designated U.S. government organization.
2. Support for installation and operation at the U.S. government laboratory.
3. Demonstration of thermal characterization of GaN HEMT and ultra-wide bandgap AlGaN HEMT on-site at the U.S. government organization.

Phase II (option) fixed milestones include:

- Month 1: Detailed report on automated, push-button thermal metrology tool design and path toward achieving DP2 Option goals. Coordinate with the designated U.S. government organization to provide a preliminary plan for delivery and installation.
- Month 3: Report on thermal metrology tool development progress.
- Month 6: Delivery of final prototype thermal metrology tool, including calibration standards and any necessary software for demonstrating material and device thermal characterization. Detailed report containing final validation measurements and thermal characterization of surface and cross-section of GaN and AlGaN transistors with less than 50 nm spatial resolution.

PHASE III DUAL USE APPLICATIONS: This SBIR will enable a commercially available, automated thermal metrology tool for use by academia, semiconductor foundries (commercial and defense), and material vendors. Specifically, this technology will provide high resolution thermal metrology so that transistor developers can accurately characterize the thermal resistance and temperature of a wide variety of films, material structures, devices, and packages. This thermal characterization data can be incorporated into device modeling and design, enabling devices with higher power density and improved robustness for a wide range of defense and commercial radar and communication applications.

REFERENCES:

[1] DARPA Broad Agency Announcement, Technologies for Heat Removal in Electronics at the Device Scale (THREADS), Microsystems Technology Office, HR001123S0013, November 18, 2022.
[2] Olson, David, et al., "Spatially resolved thermoreflectance techniques for thermal conductivity measurements from the nanoscale to the mesoscale", Journal of Applied Physics 126, 2019.
[3] Yuan, Chao, et al., “A review of thermoreflectance techniques for characterizing wide bandgap semiconductors’ thermal properties and devices’ temperatures,” Journal of Applied Physics 132, 2022.

KEYWORDS: Microelectronics, thermal metrology, thermoreflectance, thermal resistance, temperature, transistor, wide bandgap, ultra-wide bandgap

HR0011SB20234-05 TITLE: Wearables at the Edge to Augment Readiness (WEAR)

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced Materials, Microelectronics

OBJECTIVE: The objective of the Wearables at the Edge to Augment Readiness (WEAR) SBIR topic is to develop a secure and lightweight framework for real-time analysis of sensory data from wearables to monitor warfighter health and readiness at the edge.

DESCRIPTION: Wearable technology is now fundamental to all areas of the human ecosystem. The term wearable technology refers to small electronic and mobile devices, or computers with wireless communications capability that are incorporated into gadgets, accessories, or clothes, which can be worn on the human body [1]; for the purposes of this SBIR topic, it does not apply to invasive versions such as micro-chips or smart tattoos. Wearable technology can provide invaluable physiological and environmental data that can potentially be used to assess a warfighters' physical/mental wellness and readiness.

Modern edge devices, like smartphones and smart watches, are equipped with an ever-increasing set of sensors, such as accelerometers, magnetometers, gyroscopes, etc., that can continuously record users' movements and motion [2]. The observed patterns can be an effective tool for seamless Human Activity Recognition which is the process of identifying and labeling human activities by applying Artificial Intelligence (AI)/Machine Learning (ML) to sensor data generated by smart devices both in isolation and in combination [3, 4].

However, smartphone and wearable sensor signals are typically noisy and can lack context/causality due to inaccurate timestamps when the device sleeps, goes into low-power mode, or experiences high resource utilization. Thus, it can be challenging to fuse any of the various raw sensor data to achieve positive or negative assessment in wellness areas such as personal healthcare, injuries, fall detection, as well as monitoring functional/behavioral health. For instance, sensor data can be processed into feature data related to sleep or different physical activities that potentially correlate to effects on an individual's health [5, 6].

The objective of WEAR is to develop a secure and lightweight framework for real-time analysis of sensory data from wearables to monitor warfighter health and readiness at the edge. Importantly, WEAR will achieve this goal while consuming less than 5% of the wearable battery over 10 days, assuming an initial full battery charge. The battery consumption metric is of particular interest to WEAR as warfighters at the edge (e.g., expeditionary forces deployed to remote locations or Special Operations Forces units) may not be able to recharge wearable batteries due to mission constraints limiting access to power sources for re-charging. Equally important is the need for all processing to occur at the edge because of security concerns [8]. Existing commercial efforts require cloud and off-premises server resources to analyze sensor data.

PHASE I: This topic is soliciting Direct to Phase 2 (DP2) proposals only. Phase I feasibility will be demonstrated through evidence of: a completed proof of concept/principal or basic prototype system; definition and characterization of framework properties/technology capabilities desirable for both Department of Defense (DoD)/government and civilian/commercial use; and capability/performance comparisons with existing state-of-the-art technologies/methodologies (competing approaches). Entities interested in submitting a DP2 proposal must provide documentation to substantiate that the scientific/technical merit and feasibility described above has been achieved and also describe the potential commercial applications. DP2 Phase I feasibility documentation should include:

- technical reports describing results and conclusions of existing work, particularly regarding the commercial opportunity or DoD insertion opportunity, risks/mitigations, and technology assessments;
- presentation materials and/or white papers;
- technical papers;
- test and measurement data;
- prototype designs/models;
- performance projections, goals, or results in different use cases; and,
- documentation of related topics such as how the proposed WEAR solution can enable accurate and reliable analysis of sensory data at the edge.

This collection of material will verify mastery of the required content for DP2 consideration. DP2 proposers must also demonstrate knowledge, skills, and abilities in AI/ML, data analytics, edge technologies, software development/engineering, and mobile security/privacy. For detailed information on DP2 requirements and eligibility, please refer to the DoD Broad Agency Announcement and the DARPA Instructions for this topic.

PHASE II: The Personal Health Determinations (WEAR) SBIR topic seeks to develop a secure and lightweight framework that can perform real-time analysis of sensory data from wearables to monitor warfighter operational health and readiness at the edge, while consuming less than 5% of the wearable battery over 10 days, assuming an initial full battery charge (i.e., WEAR component overhead can be no more than 5% of the wearable battery over 10 days).

One potential direction to achieve this goal is to leverage advances in low-power sensing at the chipset level present in modern mobile and wearable devices, including but not limited to “always-on sensing.” The primary interest is in commercial-off-the-shelf hardware paired with novel sensor drivers and algorithms developed to operate at low power. A secondary objective is to offer modular application programming interfaces (APIs) to access sensor data and edge ML models/algorithms that can fit into the resource-constrained environments of commercial wearables. The end goal is the capability to monitor and accurately assess warfighter operational health and readiness by using the sensory information on the edge devices without transporting information outside of the wearable or smartphone devices. Any custom hardware or sensors are out of scope for this solicitation.

DP2 proposals should:

- describe a proposed framework design/architecture to achieve the above stated goals;
- present a plan for maturation of the framework to a demonstrable prototype system; and
- detail a test plan, complete with proposed metrics and scope, for verification and validation of the prototype system performance.

Phase II will culminate in a prototype system demonstration using one or more compelling use cases consistent with commercial opportunities and/or insertion into a DARPA program (e.g., Warfighter Analytics using Smartphones for Health (WASH [7]), which seeks to use data collected from cellphone sensors to enable novel algorithms that conduct passive, continuous, real-time assessment of the warfighter).

The Phase II Option period will further mature the technology for insertion into a DoD/Intelligence Community (IC) Acquisition Program, another Federal agency; or commercialization into the private sector.

The below schedule of milestones and deliverables is provided to establish expectations and desired results/end products for the Phase II and Phase II Option period efforts.

Schedule/Milestones/Deliverables: Proposers will execute the research and development (R&D) plan as described in the proposal, including the below:

- Month 1: Phase I Kickoff briefing (with annotated slides) to the DARPA Program Manager (PM) including: any updates to the proposed plan and technical approach, risks/mitigations, schedule (inclusive of dependencies) with planned capability milestones and deliverables, proposed metrics, and plan for prototype demonstration/validation.
- Months 4, 7, 10: Quarterly technical progress reports detailing technical progress to date, tasks accomplished, risks/mitigations, a technical plan for the remainder of Phase II (while this would normally report progress against the plan detailed in the proposal or presented at the Kickoff briefing, it is understood that scientific discoveries, competition, and regulatory changes may all have impacts on the planned work and DARPA must be made aware of any revisions that result), planned activities, trip summaries, and any potential issues or problem areas that require the attention of the DARPA PM.
- Month 12: Interim technical progress briefing (with annotated slides) to the DARPA PM detailing progress made (including quantitative assessment of capabilities developed to date), tasks accomplished, risks/mitigations, planned activities, technical plan for the second half of Phase II, the demonstration/verification plan for the end of Phase II, trip summaries, and any potential issues or problem areas that require the attention of the DARPA PM.
- Month 15, 18, 21: Quarterly technical progress reports detailing technical progress made, tasks accomplished, risks/mitigations, a technical plan for the remainder of Phase II (with necessary updates as in the parenthetical remark for Months 4, 7, and 10), planned activities, trip summaries, and any potential issues or problem areas that require the attention of the DARPA PM.
- Month 24: Final technical progress briefing (with annotated slides) to the DARPA PM. Final architecture with documented details; a demonstration of the ability to perform real-time analysis of sensory data at the edge while consuming less than 5% of the wearable battery over 10 days; documented APIs; and any other necessary documentation (including, at a minimum, user manuals and a detailed system design document; and the commercialization plan).
- Month 30 (Phase II Option period): Interim report of matured prototype performance against existing state-of-the-art technologies, documenting key technical gaps towards productization.
- Month 36 (Phase II Option period): Final Phase II Option period technical progress briefing (with annotated slides) to the DARPA PM including prototype performance against existing state-of-the-art technologies, including quantitative metrics for battery consumption and assessment of monitoring/assessment capabilities to support determinations of warfighter health status.

PHASE III DUAL USE APPLICATIONS: Phase III Dual use applications (Commercial DoD/Military): WEAR has potential applicability across DoD and commercial entities. For DoD, WEAR is extremely well-suited for continuous, low-cost, opportunistic monitoring of warfighter health in the field, where specialized equipment and medical experts are not necessarily available. WEAR has the same applicability for the commercial sector and has the potential to provide doctors and physicians with invaluable historical patient health data that can be correlated to their activities, environment, and physiological responses.

Phase III refers to work that derives from, extends, or completes an effort made under prior SBIR funding agreements, but is funded by sources other than the SBIR Program. The Phase III work will be oriented towards transition and commercialization of the developed WEAR technologies. The proposer is required to obtain funding from either the private sector, a non-SBIR Government source, or both, to develop the prototype into a viable product or non-R&D service for sale in military or private sector markets. Primary WEAR support will be to national efforts to explore the ability to collect and fuse sensor data and apply ML algorithms at the edge to that data in a manner that does not drain device battery. Results of

WEAR are intended to improve healthcare monitoring and assessment at the edge, across government and industry.

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KEYWORDS: Wearable Technology, Health Monitoring, Health Assessment, Data Analytics, Edge Technology, Activity Recognition, Machine Learning

HR0011SB20234-06 TITLE: Exploiting Sparsity in Python (ESPy)

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced Computing and Software

OBJECTIVE: Extend the scientific Python programming ecosystem to incorporate a rich set of matrix and tensor operations supported by a compilation system capable of automatic efficient code generation for execution on a range of run-time hardware architectures, including hardware with features that optimize or accelerate operations on sparse data.

DESCRIPTION: Of the nearly 44 zettabytes of data humans have gathered to date, most of it is collected, processed and stored as multi-dimensional arrays or tensors. From the earliest computer and the first FORTRAN compiler, we have perfected how to store and compute dense tensor data. However, a large portion of the data, either obtained from nature or generated by humans, is sparse. The Python programming environment is increasingly the tool of choice for scientific processing, but it has poor support for sparsity; current practice is to ignore the sparsity and treat the data as dense, incurring unnecessary overhead, or to transform the data into unnatural dense formats, making the programs much more complicated. Capitalizing on sparsity can greatly increase the efficiency of scientific computations, but the challenge is that there are a large number of sparse data formats, each of which takes advantage of particular features of the data; the algorithms that operate on these different data formats are then specialized to exploit the advantages of the specific data formats. An additional challenge is that there are a variety of hardware accelerators for matrix and tensor computations, ranging from features in conventional CPUs and GPUs to new hardware capabilities that have been developed to accelerate computations on sparse data. Dealing with this complexity is a challenge that is not within the reach of most programmers. The objective of this effort is to make the processing of sparse data as accessible and efficient as working with dense data. Specifically, to make the Python APIs for array processing (in NumPy, SciPy, PyTorch, and scikit-learn used by 10s of millions of people) work seamlessly with sparse data. ESPy will build on the current Python scientific library approach (e.g. NumPy and SciPy), to minimize source code changes and encourage community take-up, and add sparsity awareness and the ability to target multiple hardware architectures, including at least one architecture with features aimed at accelerating computation on sparse data. A framework or domain-specific language approach can be used to encapsulate the Python application, or the Python environment can be extended with an array/tensor algebra compiler; the selected approach should require minimal source-code changes. A compilation intermediate representation should be devised or adapted that incorporates sparse semantics, such as degree of sparsity and data formatting, and that can be efficiently targeted at multiple run-time hardware architectures. Data formatting transformations should be minimized.

PHASE I: This topic is soliciting Direct to Phase II (DP2) proposals only. Selected performers will have an established and documented background and experience with most or all of the following: the design and implementation of Python-based libraries, frameworks, domain-specific-languages, compilers, compilation intermediate representations, code generation and optimization, and a range of target computer architectures including CPUs, GPUs, and hardware accelerators. Performers should also be able to document familiarity with sparse and dense tensor algebra, including comprehensive coverage of the many sparse and dense data structures and formats.

PHASE II: The goal of ESPy is to establish an efficient and easy-to-use sparse tensor algebra capability in the Python scientific ecosystem. The facility can be based on a library approach, or use a domain-specific language or a framework to facilitate the capability, as long as there are minimal code changes for the Python programmer. There are a multitude of sparse object data structures and formats, and ESPy should support as many of these as possible, and be capable of extension to additional sparse data formats as needed or required. ESPy should also support multiple target architectures including at least one architecture implementation with features that can be exploited to accelerate sparse vector or matrix

processing. ESPy's support of tensor algebra shall be more than just addition and multiplication by providing a rich set of operators and functions, such as convolutions and semi-rings. Expected Phase II metrics:

- At least 100X faster performance on a sparse array- and tensor-processing benchmark vs generic Python processing using scientific libraries with <5% lines of code changed
- Benchmark composition to be proposed and implemented by the proposer with DARPA's agreement
- Two or more target hardware architectures in Phase II (base)
- Three or more target architectures, including at least one with hardware support for sparse data processing, in Phase II (option)

Schedule/Milestones/Deliverables

- Month 1: Kick-Off meeting; technical approach report that outlines the Python user interface (library/framework/DSL), intermediate representation, and target architecture code generation strategy; proposed tensor-processing benchmark review
- Month 3: PI meeting with PowerPoint presentations of accomplishments since the previous review and plans for the next period
- Month 6: PI meeting with PowerPoint presentations of accomplishments since the previous review and plans for the next period; demonstrations of work so far
- Month 9: PI review, including final design review, demonstration plans, and projected metrics achievements
- Month 12: Final PI review and final report, including quantitative metrics regarding performance and usability (percentage code changes need); demonstrate support for multiple sparse data formats; demonstrate support for multiple target architectures; proposal for Phase II option including additional target architecture and demonstration application (based on transition party requirements); the final report shall also document any scientific advances that have been achieved under the program (A brief statement of claims supplemented by publication material will meet this requirement); delivery of software executables, source code (if applicable), and documentation (publishing as open source is acceptable as delivery)

Phase II Option Phase II option activities should include the addition of a target architecture and a real-world demonstration in collaboration with a transition partner.

Schedule/Milestones/Deliverables

- Month 1: Kick-Off meeting; technical approach report outlining demonstration application based on transition partner requirements and additional target architecture(s)
- Month 3: PI meeting with PowerPoint presentations of accomplishments since the previous review and plans for the next period
- Month 6: PI meeting with PowerPoint presentations of accomplishments since the previous review and plans for the next period; demonstrations of work so far
- Month 9: PI review, including final design review, demonstration plans, and projected metrics
- Month 12: Final review/report including demonstration with transition partner and demonstration of additional target architecture; delivery of software executables, source code (if applicable), and documentation (publishing as open source is acceptable as delivery)

PHASE III DUAL USE APPLICATIONS: Sparse arrays are used extensively in commercial, scientific, and DoD/Military applications, such as social media, financial transactions, network traffic analysis, partial differential equations, optimizations, and Machine Learning applications. A likely pathway forward for the developers is to publish the software as open-source, thereby encouraging uptake and recruiting additional developers, and then to offer support and consulting services based on intimate understanding of the ESPy design and implementation.

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KEYWORDS: Sparse; Dense; Python; Array; Matrix; Tensor

APPENDIX A: DARPA DIRECT TO PHASE II (DP2) PROPOSAL INSTRUCTIONS

I. Introduction

A complete proposal submission consists of:

Volume 1: Proposal Cover Sheet
Volume 2: Technical Volume (feasibility documentation and technical proposal)
Volume 3: Cost Volume
Volume 4: Company Commercialization Report
Volume 5: Supporting Documents
Volume 6: Fraud, Waste and Abuse Training

The Defense SBIR/STTR Innovation Portal (DSIP) provides a structure for building the proposal volumes and submitting a consolidated proposal package. If this is your first time submitting an SBIR or STTR proposal using DSIP, please review detailed training guides at https://www.dodsbirsttr.mil/submissions/learning-support/training-materials. It is the responsibility of the proposing firm to ensure that a complete proposal package is certified and submitted by the close date listed in the topic to which they are responding.

To assist in proposal development, templates for Volume 2: Technical Volume and Volume 3: Cost Volume have been provided as attachments to the announcement posted at https://www.dodsbirsttr.mil/submissions/login Use of these templates is mandatory.

NOTE: All proposers are required to submit Volume 4: Company Commercialization Report (CCR).

II. Proprietary Information

Proposers that include in their proposals data that they do not want disclosed to the public for any purpose, or used by the Government except for evaluation purposes, shall follow instructions in section 4.5 regarding marking propriety proposal information.

III. DP2 Proposal Instructions

a. Proposal Cover Sheet (Volume 1)

The Cover Sheet must include a brief technical abstract of no more than 3000 characters that describes the proposed R&D project with a discussion of anticipated benefits and potential commercial applications. Do not include proprietary or classified information in the Proposal Cover Sheet. If your proposal is selected for award, the technical abstract and discussion of anticipated benefits may be publicly released.

b. Format of Technical Volume (Volume 2) – standard format

1. The Technical Volume must include two parts, PART ONE: Feasibility Documentation and PART TWO: Technical Proposal.

2. Type of file: The Technical Volume must be a single Portable Document Format (PDF) file, including graphics. Perform a virus check before uploading the Technical Volume file. If a virus is detected, it may cause rejection of the proposal. Do not lock or encrypt the uploaded file. Do not include or embed active graphics such as videos, moving pictures, or other similar media in the document.

3. Length: The length of each part of the technical volume (Feasibility Documentation and Technical Proposal) will be specified by the corresponding topic. The Government will not consider pages in excess of the page count limitations.

4. Layout: Number all pages of your proposal consecutively. Font size should not be smaller than 10-point on standard 8-1/2" x 11" paper with one-inch margins. The header on each page of the Technical Volume should contain your company name, topic number, and proposal number assigned by DSIP when the Cover Sheet was created. The header may be included in the one-inch margin.

c. C

ontent of the Technical Volume (Volume 2) – Standard Format

PART ONE: Feasibility Documentation

1. Provide documentation to substantiate that the scientific and technical merit and feasibility described in the Phase I section of the topic has been met and describe the potential commercial applications. To be eligible, proposers must demonstrate that the feasibility requirements outlined in the topic have been met, and achieved outside of the SBIR program. Documentation should include all relevant information including, but not limited to: technical reports, test data, prototype designs/models, and performance goals/results.
2. Maximum page length for feasibility documentation will be specified by the topic. If you have references, include a reference list or works cited list as the last page of the feasibility documentation. This will count towards the page limit.
3. Work submitted within the feasibility documentation must have been substantially performed by the proposer and/or the PI.
4. If technology in the feasibility documentation is subject to Intellectual Property (IP), the proposer must either own the IP, or must have obtained license rights to such technology prior to proposal submission, to enable it and its subcontractors to legally carry out the proposed work. Documentation of IP ownership or license rights shall be included in the Technical Volume of the proposal.
5. Include a one-page summary on Commercialization Potential addressing the following:
   i. Does the company contain marketing expertise and, if not, how will that expertise be brought into the company?
   ii. ii. Describe the potential for commercial (Government or private sector) application and the benefits expected to accrue from this commercialization.

DO NOT INCLUDE marketing material. Marketing material will NOT be evaluated.

PART TWO: Standard Technical Proposal (applies to both 65 and 35-page volumes)

1. Significance of the Problem. Define the specific technical problem or opportunity addressed and its importance.
2. Phase II Technical Objectives. Enumerate the specific objectives of the Phase II work, and describe the technical approach and methods to be used in meeting these objectives.
3. Phase II Statement of Work. The statement of work should provide an explicit, detailed description of the Phase II approach, indicate what is planned, how and where the work will be carried out, a schedule of major events and the final product to be delivered. The methods planned to achieve each objective or task should be discussed explicitly and in detail. This section should be a substantial portion of the total proposal.
   a. Human/Animal Use: Proposers proposing research involving human and/or animal use are encouraged to separate these tasks in the technical proposal and cost proposal in order to avoid potential delay of contract award.

b. Phase II Option Statement of Work (if applicable, specified in the corresponding TOPIC). The statement of work should provide an explicit, detailed description of the activities planned during the Phase II Option, if exercised. Include how and where the work will be carried out, a schedule of major events and the final product to be delivered. The methods planned to achieve each objective or task should be discussed explicitly and in detail.

4. Related Work. Describe significant activities directly related to the proposed effort, including any conducted by the PI, the proposer, consultants or others. Describe how these activities interface with the proposed project and discuss any planned coordination with outside sources. The proposal must persuade reviewers of the proposer's awareness of the state of the art in the specific topic. Describe previous work not directly related to the proposed effort but similar. Provide the following: (1) short description, (2) client for which work was performed (including individual to be contacted and phone number) and (3) date of completion.

5. Relationship with Future Research or Research and Development.
   i. State the anticipated results of the proposed approach if the project is successful.
   ii. Discuss the significance of the Phase II effort in providing a foundation for Phase III research and development or commercialization effort.

6. Key Personnel. Identify key personnel who will be involved in the Phase II effort including information on directly related education and experience. A concise resume of the PI, including a list of relevant publications (if any), must be included. All resumes count toward the page limitation. Identify any foreign nationals you expect to be involved on this project.

7. Foreign Citizens. Identify any foreign citizens or individuals holding dual citizenship expected to be involved on this project as a direct employee, subcontractor, or consultant. For these individuals, please specify their country of origin, the type of visa or work permit under which they are performing and an explanation of their anticipated level of involvement on this project. Refer to section 3.2 of this BAA for more information. Supplemental information provided in response to this paragraph will be protected in accordance with the Privacy Act (5 U.S.C. 552a), if applicable, and the Freedom of Information Act (5 U.S.C. 552(b)(6)).

8. Facilities/Equipment. Describe available instrumentation and physical facilities necessary to carry out the Phase II effort. Items of equipment to be purchased (as detailed in the cost proposal) shall be justified under this section. Also state whether or not the facilities where the proposed work will be performed meet environmental laws and regulations of federal, state (name) and local Governments for, but not limited to, the following groupings: airborne emissions, waterborne effluents, external radiation levels, outdoor noise, solid and bulk waste disposal practices and handling and storage of toxic and hazardous materials.

9. Subcontractors/Consultants. Involvement of a university or other subcontractors or consultants in the project may be appropriate. If such involvement is intended, it should be identified and described according to the Cost Breakdown Guidance. Please refer to section 3 of this BAA for detailed eligibility requirements as it pertains to the use of subcontractors/consultants.

10. Prior, Current or Pending Support of Similar Proposals or Awards. If a proposal submitted in response to this topic is substantially the same as another proposal that was funded, is now being funded, or is pending with another Federal Agency, or another or the same DoD Component, you must reveal this on the Proposal Cover Sheet and provide the following information:
    a. Name and address of the Federal Agency(s) or DoD Component to which a proposal was submitted, will be submitted, or from which an award is expected or has been received.

b. Date of proposal submission or date of award.
c. Title of proposal.
d. Name and title of the PI for each proposal submitted or award received.
e. Title, number, and date of BAA(s) or solicitation(s) under which the proposal was submitted, will be submitted, or under which award is expected or has been received.
f. If award was received, state contract number.
g. Specify the applicable topics for each proposal submitted or award received.

Note: If this does not apply, state in the proposal "No prior, current, or pending support for proposed work."

11. Transition and Commercialization Strategy. DARPA is equally interested in dual use commercialization of SBIR/STTR projects that result in products sold to the U.S. military, the private sector market, or both. DARPA expects explicit discussion of key activities to achieve this result in the transition and commercialization strategy part of the proposal. The Technical Volume of each Direct to Phase II proposal must include a transition and commercialization strategy section. The Phase II transition and commercialization strategy shall not exceed 5 pages, and will NOT count against the proposal page limit.

    Information contained in the commercialization strategy section will be used to determine suitability for participation in EEI. Selection for participation in EEI will be made independently following selection for SBIR/STTR award. Please refer to section 3 of the Instructions for more information on the DARPA EEI and additional proposal requirements.

    The transition and commercialization strategy should include the following elements:

    a. A summary of transition and commercialization activities conducted during Phase I, and the Technology Readiness Level (TRL) achieved. Discuss the market, competitive landscape, potential stakeholders and end-users, and how the preliminary transition and commercialization path or paths may evolve during the Phase II project. Describe key proposed technical milestones during Phase II that will advance the technology towards product such as: prototype development, laboratory and systems testing, integration, testing in operational environment, and demonstrations.
    b. Problem or Need Statement. Briefly describe what you know of the problem, need, or requirement, and its significance relevant to a Department of Defense application and/or a private sector application that the SBIR/STTR project results would address. Is there a broader societal need you are trying to address? Please describe.
    c. Description of Product(s) and/or System Application(s). Identify the commercial product(s) and/or DoD system(s), or system(s) under development, or potential new system(s). Identify the potential DoD end- users, Federal customers, and/or private sector customers who would likely use the technology.
    d. Business Model(s)/Procurement Mechanism(s). Discuss your current business model hypothesis for bringing the technology to market. Describe plans to license, partner, or self-produce your product. How do you plan to generate revenue? Describe the resources you expect will be needed to implement your business models. Discuss your plan and expected timeline to secure these resources. Understanding DARPA’s goal of creating and sustaining a U.S. military advantage, describe how you intend to develop your product and supply chains to enable this differentiation.
    e. Target Market. Describe the market and addressable market for the innovation. Describe the customer sets you propose to target, their size, their growth rate, and the key reasons they would consider procuring the technology. Discuss the business economics and market drivers in the target industry. Describe competing technologies existent today on

the market as well as those being developed in the lab. How has the market opportunity been validated? Describe the competition. How do you expect the competitive landscape may change by the time your product/service enters the market?

f. Funding Requirements. Describe your company's funding history. How much external financing have you raised? Describe your plans for future funding sources (internal, loan, angel, venture capital, etc.).
g. Transition and Commercialization Risks. Describe the major technology, market and team risks associated with achieving successful transition of the DARPA funded technology. DARPA is not afraid to take risks but we want to ensure that our awardees clearly understand the risks in front of them. What are the key risks in bringing your innovation to market? What are actions you plan to undertake to mitigate these risks?
h. Expertise/Qualifications of Team/Company Readiness. Describe the expertise and qualifications of your management, marketing/business development and technical team that will support the transition of the technology from the prototype to the commercial market and into government operational environments. Has this team previously taken similar products/services to market? If the present team does not have this needed expertise, how do you intend to obtain it? What is the financial history and health of your company (e.g., availability of cash, profitability, revenue growth, etc.)?
i. Anticipated Transition and Commercialization Results. Include a schedule showing the anticipated quantitative transition and commercialization results from the Phase II project at one year after the start of Phase II, at the completion of Phase II, and after the completion of Phase II (i.e., amount of additional investment, sales revenue, etc.). After Phase II award, the company is required to report actual sales and investment data in its Company Commercialization Report at least annually.

Advocacy Letters (OPTIONAL)* Feedback received from potential Commercial and/or DoD customers and other end-users regarding their interest in the technology to support their capability gaps. Advocacy letters that are faxed or e-mailed separately will NOT be accepted.

Letters of Intent/Commitment (OPTIONAL)* Relationships established, feedback received, support and commitment for the technology with one or more of the following: Commercial customer, DoD PM/PEO, a Defense Prime, or vendor/supplier to the Primes and/or other vendors/suppliers identified as having a potential role in the integration of the technology into fielded systems/products or those under development. Letters of Intent/Commitment that are faxed or e- mailed separately will NOT be accepted.

*Advocacy Letters and Letters of Intent/Commitment are optional, and should ONLY be submitted to substantiate any transition or commercialization claims made in the commercialization strategy. Please DO NOT submit these letters just for the sake of including them in your proposal. These letters DO NOT count against any page limit.

In accordance with section 3-209 of DOD 5500.7-R, Joint Ethics Regulation, letters from government personnel will NOT be considered during the evaluation process.

d. Format of Cost Volume (Volume 3)

Proposers are required to use the Direct to Phase II – Volume 3: Cost Proposal Template (Excel Spreadsheet) provided as an attachment to this announcement. The Cost Volume (and supporting documentation) DOES NOT count toward the page limit of the Technical Volume.

e. Content of the Cost Volume (Volume 3)

Some items in the Cost Breakdown Guidance below may not apply to the proposed project. If such is the case, there is no need to provide information on each and every item.

ALL proposed costs should be accompanied by documentation to substantiate how the cost was derived. For example, if you proposed travel cost to attend a project-related meeting or conference, and used a travel website to compare flight costs, include a screen shot of the comparison. Similarly, if you proposed to purchase materials or equipment, and used the internet to search for the best source, include your market research for those items. You do not necessarily have to propose the cheapest item or supplier, but you should explain your decision to choose one item or supplier over another. It's important to provide enough information to allow contracting personnel to understand how the proposer plans to use the requested funds. If selected for award, failure to include the documentation with your proposal will delay contract negotiation, and the proposer will be asked to submit the necessary documentation to the Contracting Officer to substantiate costs (e.g., cost estimates for equipment, materials, and consultants or subcontractors). It is important to respond as quickly as possible to the Contracting Officer's request for documentation.

Cost Breakdown Guidance:

1. List all key personnel by name as well as by number of hours dedicated to the project as direct labor. Special tooling and test equipment and material cost may be included. The inclusion of equipment and material will be carefully reviewed relative to need and appropriateness for 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 should be related directly to the specific topic. These 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 DARPA; unless it is determined that transfer of title to the contractor would be more cost effective than recovery of the equipment by the DARPA.
2. Cost for travel funds must be justified and related to the needs of the project.
3. Cost sharing is permitted for proposals under this announcement; however, cost sharing is not required nor will it be an evaluation factor in the consideration of a proposal.
4. All subcontractor costs and consultant costs must be detailed at the same level as prime contractor costs in regard to labor, travel, equipment, etc. Provide detailed substantiation of subcontractor costs in your cost proposal. Enter this information in the Explanatory Material section of the on-line cost proposal form. The Supporting Documents Volume (Volume 5) may be used if additional space is needed.

For more information about cost proposals and accounting standards, see the DCAA publication titled "Audit Process Overview – Information for Contractors" available at: http://www.dcaa.mil.

f. Company Commercialization Report (Volume 4)

The Company Commercialization Report (CCR) allows companies to report funding outcomes resulting from prior SBIR and STTR awards. The Company Commercialization Report (CCR) is required for Phase I and Direct to Phase II proposals. Please refer to the DoD STTR Program BAA for full details on this requirement. Information contained in the CCR will not be considered by DARPA during proposal evaluations.

g. Supporting Documents (Volume 5)

In addition to required DoD documentation and certifications, small businesses may also submit additional documentation to support the Technical Volume (Volume 2) and the Cost Volume (Volume 3) in Volume 5.

h. Fraud Waste and Abuse (Volume 6)

The Fraud, Waste and Abuse (FWA) training is required for Phase I and Direct to Phase II proposals. FWA training provides information on what represents FWA in the SBIR/STTR program, the most common mistakes that lead to FWA, as well as the penalties and ways to prevent FWA in your firm. This training material must be thoroughly reviewed once per year. Plan ahead and leave ample time to complete this training based on the proposal submission deadline. Knowingly and willfully making any false, fictitious, or fraudulent statements or representations may be a felony under the Federal Criminal False Statement Act (18 U.S.C. Sec 1001), punishable by a fine of up to $10,000, up to five years in prison, or both. Understanding the indicators and types of fraud, waste, and abuse that can occur is critical for the SBIR/STTR awardees' role in preventing the loss of research dollars.