

**Defense Microelectronics Activity (DMEA)
2024.A Small Business Technology Transfer (STTR)
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). Proposers responding to a topic in this BAA must follow all general instructions provided in the Department of Defense (DoD) STTR Program BAA. DMEA requirements in addition to or deviating from the DoD Program BAA are provided in the instructions below.

Proposers are encouraged to thoroughly review the DoD Program BAA and register for the DSIP Listserv to remain apprised of important programmatic and contractual changes.

- The DoD Program BAA is located at: <https://www.defensesbirstr.mil/SBIR-STTR/Opportunities/#announcements>. Be sure to select the tab for the appropriate BAA cycle.
- Register for the DSIP Listserv at: <https://www.dodsbirstr.mil/submissions/login>.

Specific questions pertaining to the administration of the DMEA SBIR/STTR Program and these proposal preparation instructions should be directed to: DMEA Acting SBIR/STTR Program Manager (PM), Mr. Tien Dang, at osd.mcclellan-park.dmea.list.smbus@mail.mil.

PHASE I PROPOSAL GUIDELINES

The Defense SBIR/STTR Innovation Portal (DSIP) is the official portal for DoD SBIR/STTR proposal submission. Proposers are required to submit proposals via DSIP; proposals submitted by any other means will be disregarded. Detailed instructions regarding registration and proposal submission via DSIP are provided in the DoD STTR Program BAA.

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 \$197,283.00. The technical period of performance for the Phase I effort should be no more than six (6) months.

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.

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.

PROPOSAL VOLUMES:**Proposal Cover Sheet (Volume 1)**

Required per the DoD STTR Program BAA.

Technical Volume (Volume 2)

The technical volume is not to exceed twenty (20) pages and must follow the formatting requirements provided in the DoD STTR Program BAA. Technical volumes exceeding twenty (20) pages will be deemed non-compliant and will not be evaluated.

Content of the Technical Volume

Read the DoD STTR Program BAA 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 accepted.

DMEA will evaluate and select Phase I proposals using the evaluation criteria contained in Section 6.0 of the DoD STTR Program BAA. 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.

Cost Volume (Volume 3)

The Phase I Base amount must not exceed \$197,283.00. 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. Costs must be separated and clearly identified on the Proposal Cover Sheet (Volume 1) and in Volume 3.

The on-line cost volume for Phase I 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 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 leased 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.

Please review the updated Percentage of Work (POW) calculation details included in the DoD Program BAA. Deviations from the POW requirements are not permitted.

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 STTR Program BAA for full details on this requirement. Information contained in the CCR will be considered by DMEA during proposal evaluations.

Supporting Documents (Volume 5)

All proposing small business concerns are REQUIRED to submit the following documents to Volume 5:

1. Contractor Certification Regarding Provision of Prohibition on Contracting for Certain Telecommunications and Video Surveillance Services or Equipment
2. Disclosures of Foreign Affiliations or Relationships to Foreign Countries
3. Disclosure of Funding Sources

Please refer to the DoD Program BAA for more information.

PHASE II PROPOSAL GUIDELINES

Phase II proposals may only be submitted by Phase I awardees. 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.

The Technical Volume is not to exceed forty (40) pages and consists of a single PDF file with your firm name, topic number, and proposal number in the header of each page. All documentation should use no smaller than 10-point font on standard 8.5" X 11" paper with one-inch margins and not be in two-column format. Do not include blank pages.

Phase II proposals may be submitted for an amount not to exceed \$1,315,219.00. The technical period of performance for the Phase II effort shall be no more than twenty-four (24) months.

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 per the Proposal Volumes area listed in Phase I. Your proposal must be submitted via the submission site on or before the DMEA-specified deadline or it will not be considered for award.

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. Any extension to that time period will be requested by the Contracting Officer.

A Phase II contractor may receive up to one additional, Sequential Phase II award for continued work on a project. The additional, Sequential Phase II award has the same guideline amounts and limits as an initial Phase II award. Sequential, Phase II proposals shall be initiated by the Government Technical Point of Contact for the initial Phase II effort and must be approved by the Acting DMEA SBIR/STTR Program Manager in advance.

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 \$657,610.00 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 (TAB A)

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

EVALUATION AND SELECTION

All proposals will be evaluated in accordance with the evaluation criteria listed in the DoD STTR Program BAA.

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 BAA.

Refer to the DoD STTR Program BAA for procedures to protest the Announcement.

As further prescribed in FAR 33.106(b), FAR 52.233-3, Protests after Award should be submitted to:

DMEA Acting SBIR/STTR Program Manager (PM):

- Name: Mr. Tien Dang
- Email: osd.mcclellan-park.dmea.list.smbus@mail.mil

DMEA STTR 24.A Topic Index

DMEA24A-001 Monolithic SDR SoC for SATCOM

DMEA24A-001 TITLE: Monolithic SDR SoC for SATCOM

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

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

OBJECTIVE: Development of a monolithic Radio Frequency (RF) System-on-Chip (SoC) Software Defined Radio (SDR) Integrated Circuit (IC) transceiver for satellite communications (SATCOM) meeting specific defense needs and supportive of global navigation satellite system (GNSS), internet-of-things (IoT) edge-computing, and artificial intelligence (AI) processing technologies and applications.

DESCRIPTION: There are few commercially available, monolithic, SDR-SoCs on the market [1][2], and those that exist, though highly capable, can be cost prohibitive and are not optimized for low size, weight, and power (SWaP) DoD applications, such as small handheld devices where ultra-low power and reduced form-factor are major design considerations. Furthermore, a review of prior awarded SBIR/STTR topics demonstrates that defense specific needs for low SWaP SDR devices have routinely been met through a modular approach of integrating commercial-of-the-shelf (COTS) devices [3]. However, further SWaP optimization can only be achieved through higher levels of SoC integration with efficient architecture execution in supportive modern semiconductor technologies that include sufficient intellectual property (IP) offerings. Though SDR construction varies, the typical SDR architecture consists of a RF frontend, a field programmable gate array (FPGA) for baseband signal processing, and microprocessor or microcontroller for SDR control and power management. While continued advances in analog-to-digital (ADC) converter and digital-to-analog converter (DAC) designs have fueled RF SoC frontend innovations, such as direct-sampling of RF signals [4][5], and with the availability of processor core IP more commonplace in modern technology nodes, FPGA fabrics may not be most effective for on-chip baseband signal processing. While FPGAs are capable of meeting the high performance and reconfigurability requirements of SDRs, this comes at the expense of area and power dissipation due to their inherent structure. Furthermore, the powerup and reconfiguration latencies of FPGAs can be an issue in applications where wakeup time and agile tuning are required. To address these issues, taking advantage of advances in semiconductor scaling, application specific baseband processing, typically accomplished by the FPGA, may be more efficiently accomplished through on chip digital signal processing (DSP) techniques.

PHASE I: The purpose of the Phase I effort is to: determine the feasibility (cost, schedule, and performance) related to the development of the SDR-SoC; identify technological issues (availability of IP, etc.) to be addressed through innovations; and, develop a Phase II proposal for development activities toward the realization of the SDR-SoC from design to qualification, with the goal of meeting the following performance specifications:

1. General:
 - a. Off-state leakage current: $< 10 \mu\text{A}$
 - b. Sleep conditions must be specified along with projected sleep current.
 - c. Active power management with ability to shutdown/sleep system components.
 - d. Peak Power Dissipation: $< 1 \text{ W}$
 - e. Chip area: 5mm x 5mm

2. RF Frontend:
 - a. Transceiver tuning range: 100 MHz to 6 GHz
 - b. At least 1 Tx and 1 Rx channel
 - c. 40MHz Bandwidth
 - d. Anti-aliasing filters
 - e. 14 bit DAC, 14 bit ADC or better
3. DSP Engine:
 - a. Programmable DSP module floating point, 64 MACs running at 500MHz or better.
4. Processor Core:
 - a. ARM Cortex9 or better or RISC-V core with support for bootable Linux OS, external storage, UART, USB, I2C, SPI, network interfaces.

Furthermore, due to national security considerations the use of a DMEA accredited Trusted Supplier for Foundry Services is preferred, but not required, when considering feasibility options. Phase-I feasibility study should also be inclusive of programming software for the DSP module and front end, and supported Linux distribution(s).

PHASE II: The purpose of the Phase II effort is to: execute on the Phase I proposed developmental activities and innovations needed to advance the SDR-SoC concept; demonstrate working silicon; and develop a Phase III product commercialization plan, including potential non-DoD customers. Phase II outcomes will result in the design for fabrication, fabrication, package, assembly, test, qualification, and delivery of functional prototypes, including supporting design development and user-required software, data, and documentation, of either the fully functional monolithic SDR-SoC or necessary IP block(s) required to advance the monolithic SDR-SoC concept.

PHASE III DUAL USE APPLICATIONS: The objective of Phase III effort is to pursue commercialization objectives resulting from the Phase II developments. Other Phase III activities may include follow-on non-SBIR/STTR funded R&D (ATSP, OTA) or production contracts for developed products intended for use by the DoD.

REFERENCES:

1. Xilinx, <https://www.xilinx.com/products/silicon-devices/soc/rfsoc.html>: August, 2023.
2. Analog Devices, <https://www.analog.com/en/product-category/rf-agile-sdr-transceivers.html>: August, 2023.
3. DoD SBIR/STTR Program, SBIR/STTR Award Data search, <https://www.sbir.gov/sbirsearch/award/all>; search keywords: SDR, SDR + Low SWaP, SDR + SATCOM: August, 2023.
4. A. M. A. Ali et al., "A 12-b 18-GS/s RF Sampling ADC With an Integrated Wideband Track-and-Hold Amplifier and Background Calibration," in IEEE Journal of Solid-State Circuits, vol. 55, no. 12, pp. 3210-3224, Dec. 2020, doi: 10.1109/JSSC.2020.3023882.
5. L. Fang, X. Wen, T. Fu and P. Gui, "A 12-Bit 1 GS/s RF Sampling Pipeline-SAR ADC With Harmonic Injecting Cross-Coupled Pair Achieving 7.5 fJ/Conv-Step," in IEEE Transactions on Circuits and Systems I: Regular Papers, vol. 69, no. 8, pp. 3225-3236, Aug. 2022, doi: 10.1109/TCSI.2022.3169508.

KEYWORDS: Software Defined Radio (SDR); System on Chip (SoC); Satellite Communications (SATCOM); Integrated Circuit (IC); Internet of Things (IoT); edge computing; Artificial Intelligence (AI); Global navigation satellite system (GNSS).