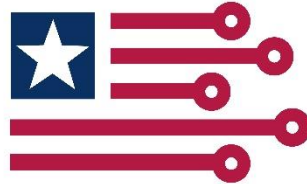


NSTC CALL FOR PROPOSALS
Executed by Natcast, the operator for NSTC

Natcast



Artificial Intelligence Driven RF Integrated Circuit Design Enablement (AIDRFIC) Call for Proposals (CFP)

Issued June 28, 2024

Funding Opportunity Number: NAT-RD-24-0001

Revision History

Date	Author	Change
June 28, 2024	R. S. Gyurcsik, Ph.D.	Initial version
July 15, 2024	Natcast staff	Updates concerning the upload of executive summaries and proposals (Sections 4.1, 4.3, and portions of Appendix A)
August 6, 2024	Natcast staff	Updated Proposal submission due date and budget workbook link
August 15, 2023	Natcast staff	Updated budget workbook and research security capabilities (8.1.7.5) page limit



NSTC CALL FOR PROPOSALS

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Artificial Intelligence Driven RF Integrated Circuit Design Enablement (AIDRFIC)

Executive Summary

Funding Opportunity Title: Artificial Intelligence Driven RF Integrated Circuit Design Enablement (AIDRFIC)

Funding Opportunity Number: NAT-RD-24-0001

Dates: Key dates are given below. Please note that all submissions are due by 5 pm EDT on the specified date. Submission of an executive summary is required for submission of a full proposal and will be used for planning the review processes. All proposers that submit a complete executive summary on time will be able to submit a full proposal.

Activity / Event	Date
Call for Proposals Released	28-Jun-24
Proposers' Day	11-Jul-24
Executive Summary Due	25-Jul-24
Question Submission Deadline	9-Aug-24
Proposals Due	23-Aug-24
Target Awards Announced	17-Oct-24
Target Project Start	2-Dec-24

Concise Description of Funding Opportunity: This NSTC research and development program will address the domestic RF IC (Radio Frequency Integrated Circuit) industry and is focused on the adaptation of Artificial Intelligence (AI) and Machine Learning (ML) technology for use in RF design. Its objective is the successful demonstration of AI-based tools used to improve design productivity for RFICs thus lowering the risk of further investment in commercialization of the technology.

Anticipated Amounts: Total program award funding up to \$30M with 3-4 awards is anticipated. Individual awards are anticipated to range from \$5M to \$10M.

Eligibility: Applicants must be NSTC members at the time of award and must be eligible to become NSTC members to submit proposals. Additional information about NSTC Membership and the process for becoming a member will be available in the coming months. The NSTC



expects to make NSTC Membership terms and fees sufficiently accessible for all expected applicants. Eligible applicants include domestic for-profit organizations, non-profit organizations, and accredited institutions of higher education. See Section 3 for additional details on eligibility.

Contract Type: Firm-Fixed Price with milestone payments

Cost Sharing Requirements: None

Public Website and Frequently Asked Questions (FAQs): <https://Natcast.org/research-and-development/AIDRFIC/>

Teaming Opportunities: Teaming is encouraged.

Contact Information: Ronald S. Gyurcsik, Ph.D.
AIDRFIC2024@natcast.org

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1 Funding Opportunity Description

1.1 Introduction

The National Semiconductor Technology Center (NSTC) consortium was established by the CHIPS Act of the U.S. government as a public-private consortium dedicated to semiconductor R&D in the United States. The NSTC will convene the U.S. government, allied and partner nations, and organizations across the semiconductor ecosystem—including academia and businesses of all kinds—to address the most challenging barriers to continued technological progress in the domestic semiconductor industry, including the need for a capable workforce. The NSTC reflects a once-in-a-generation opportunity for the U.S. to drive the pace of innovation, set standards, and re-establish global leadership in semiconductor design and manufacturing. Natcast is a new, purpose-built, non-profit entity created to operate the NSTC consortium serving as the focal point for research and engineering throughout the semiconductor ecosystem, advancing and enabling disruptive innovation to provide U.S. leadership in the industries of the future.

RF Integrated Circuits (RFICs) are key to an ever-increasing number of commercial, industrial, and defense systems. However, the productivity of RF circuit design has not kept up with the pace of productivity improvements made in digital design. The Artificial Intelligence Driven RF Integrated Circuit Design Enablement (AIDRFIC) NSTC program will address the domestic RFIC industry and is focused on the adaptation of Artificial Intelligence (AI), and Machine Learning (ML) technology for use in RF design. There are several examples from the academic and industrial research communities of AI- and ML-based tools specific to analog and RF IC design. Examples include tools for layout generation and matching network design, and a list of references are given in Section 1.9. These fledgling tools have demonstrated their potential, but they have yet to be fully integrated into a design flow.

The AIDRFIC program will fund 30-month projects to develop initial AI-based tools for RFIC design and test these tools by using them to design, fabricate, and validate a set of circuits. At a minimum, the AI-based tools should be able to perform “inverse” goal driven design to ultimately determine the appropriate circuit topology, set transistor and passive device sizing and biasing, design all matching networks, generate the layout with physical constraints, and extract to perform final verification.

Prior to the award, Natcast will provide specifications for two exemplar circuits to performers, a millimeter-wave power-amplifier circuit and a microwave power amplifier circuit. Teams will then generate or acquire a sufficient set of training circuit designs and use these to create or update AI-based tools for RFIC design. Performers will share non-proprietary designs and data from training sets with Natcast and other performer teams to develop a larger, shared training set. The resulting new or updated tools will then be used to design circuits that meet or exceed

the specifications of the provided millimeter-wave power-amplifier and microwave power amplifier exemplar circuits. After successful design of the first two circuits, Natcast will provide five additional exemplar circuit specifications from each of the same classes, and performers will produce five additional corresponding designs. Performers will be responsible for fabricating these designs on shared wafer runs using specified foundry processes. The microwave process target is the Qorvo 0.25um Gallium Nitride (GaN) process or equivalent, and the millimeter-wave target process is GlobalFoundries Silicon Germanium (SiGe) 8XP BiCMOS 130nm process or equivalent. Natcast will submit the fabricated circuits to a 3rd party for independent verification and validation to assess the performance of the updated tools. Lastly, performers will document plans to incorporate learnings from the AIDRFIC program into academic curricula or workforce training as well as plans for technology transfer and commercialization.

Proposal teams should include a broad membership capable of successfully completing the program together as defined and subsequently transitioning the technology into the commercial space. The AIDRFIC program is intended to demonstrate the capabilities of using AI in RF design, and it is not necessarily intended to fully develop new commercial Electronic Design Automation (EDA) products. A successful program will demonstrate the viability of the proposed approach on a larger scale and meet real-world needs. This will lower the potential technology risk and enable EDA companies to produce commercialized tools.

1.2 Motivation

Radio Frequency Integrated Circuits (RFICs) critical to many commercial systems provide wide-ranging functionality including low-noise and power amplification, phase shifting, mixing, switching, and filtering, to name a few. See Figure 1 for an example.

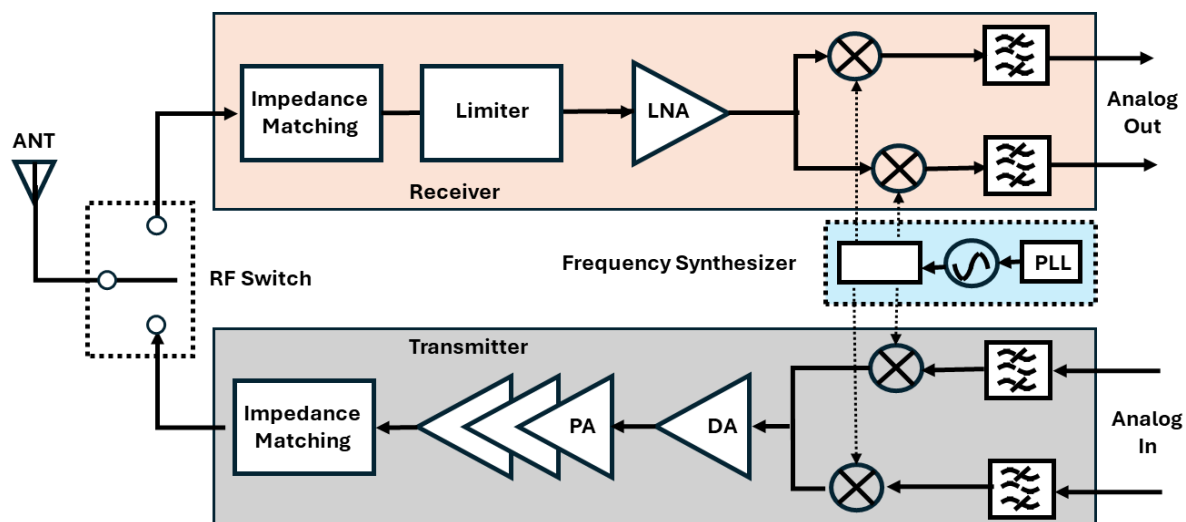


Figure 1: Example Transceiver

These building blocks form the basis of many RFICs that are used in an ever-growing broad range of commercial applications. Some example categories of commercial areas of use are listed below.

1. **Wireless communication and connectivity:** RFICs are found in many commercial applications including devices for mobile phones, Internet of Things (IoT) devices, wireless networks, home appliances and many more. The application space grows daily.
2. **Automotive radar systems:** RFICs are critical to a broad application base such as collision avoidance, adaptive cruise control, and parking assistance.
3. **Wireless sensor networks:** Flexible and scalable sensor networks utilize RFICs in many applications in automation, security, and monitoring.
4. **Satellite communication:** RFICs are used in satellite systems for tasks such as signal amplification, frequency conversion, and modulation for communication and sensing.

These challenging circuits require a designer to address a wide range of critical requirements while accounting for a diverse set of electrical, magnetic, thermal, and physical dependencies. Engineers often require several years of “apprenticing” under more experienced designers to become proficient in the art. This lengthy human-centric design process impedes the ability to successfully develop enough RFIC engineers to support US demand.

The design flow of RFICs shown in Figure 2 is well understood. It consists of many steps often requiring iterations and trade-offs in specifications and partitioning. The Circuit Design, Physical Design, and System Verification parts of the RFIC flow are a time and resource intensive part of the design process, and thus, those parts of the flow would benefit from greater automation.

RF Design Flow

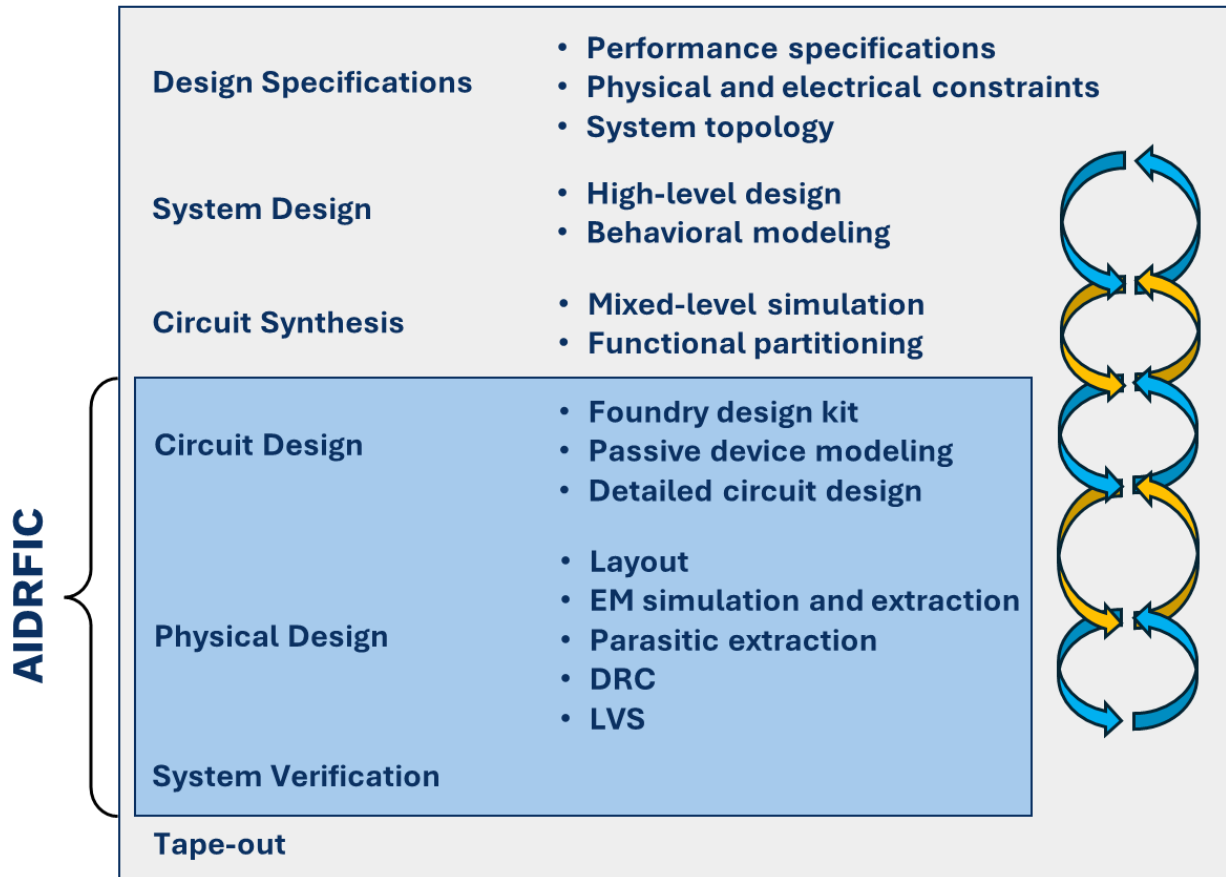


Figure 2: Typical RFIC Design Flow

Recent developments in AI algorithms and special-purpose hardware have spurred on the use of AI in a broad set of applications. AI-based tools are capable of processing large amounts of diverse data in ways that humans cannot. By excelling at pattern recognition, decision making, and optimization, AI-based systems can replicate the human mind’s learning, reasoning, and problem-solving abilities to varying degrees. AI utilizing advanced ML can often even yield novel and superior solutions compared to human-centric ones.

The emphasis of AIDRFIC is on the Circuit Design and Physical Design components of the flow for RF building blocks and corresponding System Verification of the higher-level system. AI-based tools for these components will improve the productivity of the design process, potentially allowing for greater focus on system-level partitioning and trade-offs. Ultimately, the objective of AIDRFIC is the successful demonstration of AI-based tools used to improve design productivity thus lowering the risk of further investment in commercialization of the technology.

1.3 Goals and Outcomes

Recently, promising AI-based techniques have been demonstrated for aspects of RFIC design illustrating the potential for the incorporation of AI. The overall AIDRFIC program is being established to address this opportunity. AIDRFIC will address the use of AI for RFIC design and overcome the limitations of the current human-centric approach by moving towards an approach where human designers and AI tools work together to improve productivity and produce better designs. These AI-based capabilities are intended to eventually be integrated into commercially relevant IC EDA tools and be the basis of new EDA tools and flows. To that end, the goals of the AIDRFIC program are using AI in RF IC design to:

- 1. Lower the experience barrier for performing RFIC design**
- 2. Increase RFIC design productivity**
- 3. Optimize RFIC designs**
- 4. Generate unique, non-intuitive RFIC designs**

The first two goals address the shortage of RFIC engineering talent. The first goal is critical to overcome the lengthy time to train new RFIC engineers. Improved EDA tools open greater opportunities for all to go into the field, especially given the limited number of experienced mentors to learn from. This will further benefit the development of the domestic workforce by increasing participation.

The second goal is an increase in design productivity to help overcome the shortage of experienced RFIC designers relative to need. New AI-based EDA tools will enable designers to better manage the typical set of design requirements and allow designers to meet the requirements more expeditiously.

The third goal addresses the use of AI to optimize RFIC designs. There is a complex interrelationship between the often-diverse set of requirements for RFICs. The RFIC designer typically balances the output from various EDA simulation domains in a piecemeal manner. AI-based EDA tools will help analyze the simulation results to generate a more globally optimized RFIC design and implementation, improving resulting design performance even for experienced designers.

Goal four addresses the value of AI-based ML in RFIC design to expand the design space and generate unique and non-intuitive design. Inverse design has the potential to develop new designs that meet desired specifications yet exploit design features that would not be generated by standard human-centric methods. These designs have potential to reduce the size of designs and increase efficiency.

Future efforts in AI-enabled design may expand beyond these initial four goals to enable continuous machine learning and expand knowledge space by using results mined from literature. However, these future goals are not in scope for AIDRFIC.

A successful program will demonstrate the viability of the proposed approach on a larger scale and meet real-world design needs. The successful outcome of the AIDRFIC program will be the starting point for further development and commercialization of AI-based design technology in RFIC design by EDA companies. The AIDRFIC program will de-risk further investment and provide confidence for EDA companies or start-ups with funding to commercialize the technology in support of the domestic semiconductor industry.

An additional outcome of the AIDRFIC program is increased training in RF IC design and growth of the design workforce. Incorporation of learnings and tools from AIDRFIC projects into academic curricula or other workforce training programs will promote workforce development and ensure that new designers are educated and prepared to use the latest developments in circuit design technology.

1.4 Scope

It will take a significant investment to achieve these goals, and the AIDRFIC program is just the first step. The scope of the AIDRFIC program is to develop initial AI-based tools for RFIC design and test these tools by using them to design, fabricate, and validate a set of circuits. Natcast recognizes that these tools may have limitations and the full flow may be incomplete.

Prior to the award, Natcast will provide specifications for two exemplar circuits to performers, a millimeter-wave power-amplifier circuit and a microwave power amplifier. The AI-based tools created or updated by performers will be used to design circuits that meet or exceed the specifications of the provided exemplar circuits. Additional exemplar circuit specifications in the same classes will be provided in Task 4 to further assess the capabilities of the AI-based tools.

Circuit designs will be fabricated using specified foundry processes, and participants are required to use one of the two specified SiGe or GaN processes or equivalents. The microwave process target is the Qorvo 0.25um Gallium Nitride (GaN) process or equivalent, and the millimeter-wave target process is GlobalFoundries Silicon Germanium (SiGe) 8XP BiCMOS 130nm process or equivalent. The proposer will need to gain access to the Process Design Kits (PDKs).

Natcast has budgeted separately for the independent verification and testing of the RF test circuits, and thus these costs should not be included in the proposer's budget.

Proposers must address all tasks, not a subset, and teams are expected to have a diverse enough composition to adequately perform all tasks.

Performers will conduct six tasks in each AIDFRIC project:

Task 1 – Create training set and baseline design productivity data:

- Develop or obtain the circuit designs to form a sufficient initial training set for the proposed AI tool updates. The training data can come from any combination of simulated results and/or validated test results.
- Share non-proprietary designs and data from training sets with Natcast and other performer teams receiving awards under the AIDFRIC Call for Proposals (CFP) to develop a larger, shared training set.
- Determine or document baseline design productivity data for designs in the initial training set, such as the time needed for an experienced designer to complete the designs. Baseline design productivity is set by the engineering effort needed to complete the design and layout of a representative RF amplifier circuit by an experienced design team.

Task 2 – Update tools and integrate into an AI-based RFIC design flow:

- Develop or adapt models and update tools to support RF design of SiGe and/or GaN RFICs.
- At a minimum, the AI-based tools should be able to perform “inverse” goal driven design to ultimately determine the appropriate circuit topology, set transistor and passive device sizing and biasing, design all matching networks, generate the layout with physical constraints, and extract to perform final verification.
- Demonstrate AI model or tool capability to learn through designated training and/or use.

Task 3 - Demonstrate updated tools:

- Use updated AI-based tools to design two RF circuits that meet the specifications of the exemplar millimeter-wave power-amplifier circuit and microwave power amplifier circuits provided by Natcast.
- Compare performance metrics and layout of generated designs to the exemplar circuit specifications.
- Document approach and tools used in the design process.
- Detail strengths and weaknesses of the approach and AI-based tools based on the performance of the designed RF circuits compared to the provided exemplar circuits.

Task 4 – Refine AI-based tools, benchmark results, and validate performance

- Refine AI-based tools to address gaps or inefficiencies identified in Task 3.

- Share results and lessons learned with other performer teams to identify additional potential improvements.
- Use AI-based design tools to design up to 5 additional RF circuits using a single process to meet the specifications of additional Natcast-provided exemplar circuits.
- Submit designs for inclusion on a shared wafer run using the specified foundry processes.
- Benchmark the performance of generated designs and tools.
- Note: Natcast will perform independent verification of design performance prior to fabrication and the RF test of fabricated wafers.
- Note: Performers are expected to align their schedules with available shared wafer runs or use a dedicated foundry run.

Task 5 – Develop a plan to integrate the AI-based tools or approaches into academic curriculum or other workforce training:

- Identify learnings from the AIDRFIC project most relevant to academic curriculum or a workforce training program.
- Identify classes or training programs and integrate learnings or tools from the AIDRFIC projects into the curriculum.

Task 6 – Develop a plan to commercialize the AIDRFIC technology in the United States:

- Publish or patent the results of the AIDRFIC project, as appropriate.
- Develop a technology transition plan to commercialize the technology and make it available to support the domestic semiconductor industry. The plan should include a model of the productivity gains for experienced and inexperienced designers.
- Document expected commercial, economic, and national security benefits to the United States.

Strong proposals will demonstrate plans and capabilities to perform these six tasks and achieve the stated goals and outcomes of the AIDRFIC program. Proposals should also describe:

- A prioritized list of tools or EDA functions where the proposer will use AI to provide value to the RFIC designer,
- Proposed changes in the RFIC design flow to accommodate the proposed tool capabilities,
- Size and composition of the required training set for developing the proposed AI-enhanced design tools and a plan for developing or obtaining the required training set,
- Plans to develop, adapt, or use either new or existing AI models, and
- Baseline design productivity metrics and data to measure the performance of AI-enhanced design tools or a plan to obtain this data in the performance of the project.

1.5 Program Structure

This effort will be funded for a period of thirty months. As shown in Figure 3, both **Tasks 1 and 2** will start at the same time. **Task 1** is expected to be completed by month three of the award; **Task 2** by month fifteen, and **Task 3** by month eighteen. **Tasks 4, 5 and 6** are expected to start in month eighteen and be completed by the end of the award. Each participant will receive the same design specifications, and target process technologies. Each participant will need to obtain access to the necessary Process Design Kits (PDKs) from the foundry. **Tasks 5 and 6** are independent of other tasks, and teams may choose to start them earlier in the program.

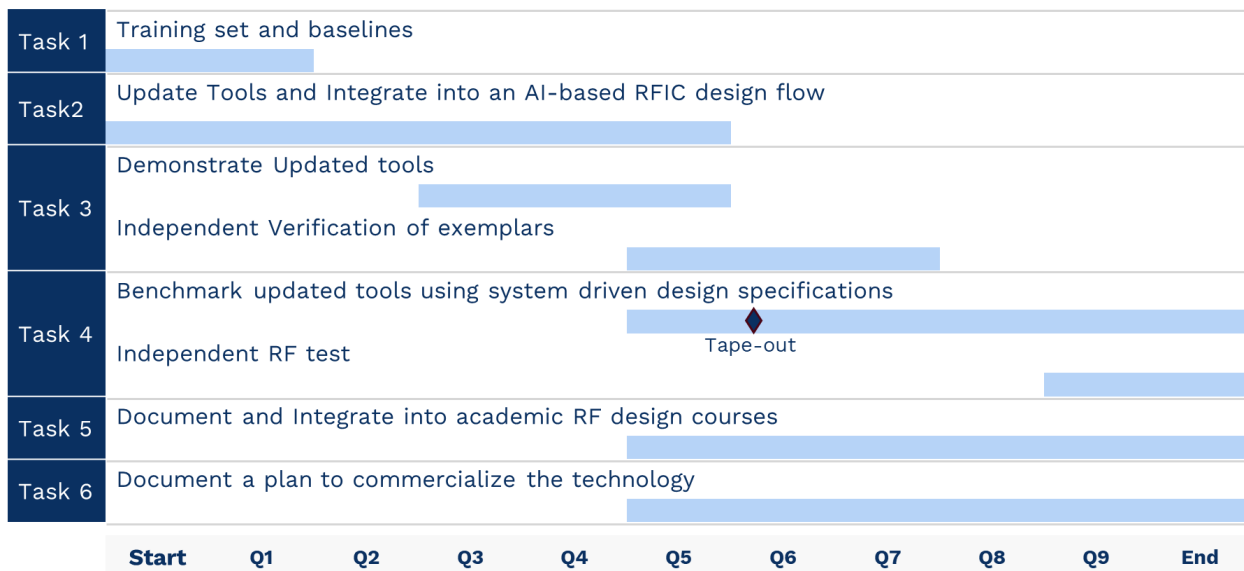


Figure 3: Task Gant Chart

Natcast and its technical reviewers will evaluate each team’s performance prior to the completion of **Task 3** based on the results for the two designed circuits. Natcast may terminate awards after **Task 3** should results not meet the design specification objectives.

It is anticipated that this effort will be led by teams including combinations of university researchers, RF-focused start-ups, commercial and defense companies; SiGe or GaN foundries; established and start-up EDA tool companies; and US government funded labs. Teams may include unfunded collaborators. Please note that the team should contain members able to utilize the outcomes of the effort to initiate commercialization of EDA tools.

1.6 Schedule and Milestones

The thirty-month AIDRFIC program planned schedule is shown in Figure 4. In addition to the kickoff meeting there will be several in-person reviews. Subcontracting performers are expected to attend in person and should budget accordingly. The in-person reviews are

scheduled for the end of Months 6, 12, 18 and 24, and the final review will be held during Month 30. There will be monthly update meetings for all other months.

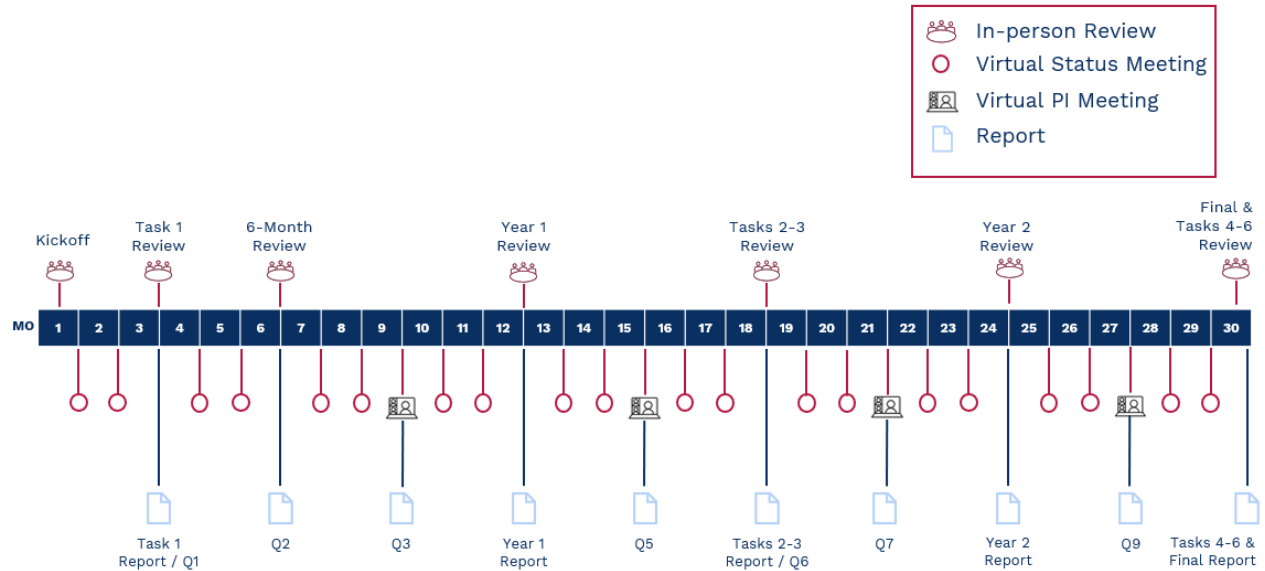


Figure 4: AIDRFIC Schedule and Milestones

A December 2024 project start date is targeted. The program kickoff, interim review, final review, and monthly status meetings represent an opportunity to interact with Natcast on the work, specifics of the technical approaches, and any technical or programmatic items of concern. In addition, one or more technical workshops open to all performers may be held during the program in which performers may provide further insights on future technical paths and challenges that must be addressed. Performer teams are encouraged to share and interact with other teams. Monthly progress teleconferences will be scheduled with the Natcast team to review technical progress and identify risks to completing the analysis.

1.7 Deliverables

The list of deliverables is shown in Figure 5. These include all presentation material from all review and status meetings; kickoff, quarterly, task, annual and final written reports; and schematic and DRC-clean layout of all designs for all the designed circuits. The results for Tasks 1 are to be included in the Quarter 1 report, the outcome of Tasks 2 and 3 are to be included in the Quarter 6 report, and Tasks 4, 5 and 6 results are to be included in the final report. Please note that all deliverables will be available to NSTC members and government agencies and possibly others pursuant to the proposer’s Intellectual Property Management Plan. Natcast must also have access to the enhanced tools for the purpose of further evaluation.

Deliverable	Comments
Reports	Quarterly Reports Annual Reports Final Report Task 1 Report - Combined with the Q1 Report Task 2 & 3 Reports - Combined with the Q6 Report Task 4, 5 & 6 Reports - Combined with the Final Report
Presentation Material	From all reviews and status meetings
EDA databases	Non-proprietary training set of circuits 2 Initial exemplars 5-10 final exemplars
EDA Tools developed under this program	Executable code licensed to Natcast and made available to NSTC membership for research and non-commercial purposes only as per Section 2.5.
Developed Curriculum	All relevant course material and documentation for use by NSTC membership.

Figure 5: Program Deliverables

In connection with the reporting obligations described in Section 6.3, the performer will provide to Natcast quarterly written reports that include a description of newly developed IP, including patentable inventions, software, and research results, as well as any utilization activities of such IP.

1.8 Metrics

A successful demonstration of AI-based tools to improve design productivity will lower the risk of additional investment in the technology’s commercialization. In addition to furthering progress towards the goals of the AIDRFIC program, a successful project will demonstrate advancement by meeting or exceeding specified metrics. Success metrics for the AIDRFIC program are divided into four key areas:

- Productivity – demonstrating the capacity for AI-based tools to increase designer productivity
- Performance – demonstrating that circuits designed with AI-based tools meet or exceed exemplar circuit specifications
- Workforce development – demonstrating incorporation of AIDRFIC learnings into curriculum
- Commercialization – demonstrating a viable path towards commercialization for technology developed in the AIDRFIC program

As previously described, the baseline data for calculating these metrics will be provided by performers and/or developed in the performance of the first tasks of the AIDRFIC program. The baseline for productivity data is the design time needed for an experienced designer to complete a comparable design. An experienced designer is defined as someone with ten or more years of RF IC design experience.

Target metrics are shown in Figure 6. Strong proposals should demonstrate a team’s plans and capabilities to meet or exceed the metrics stated below. Proposals may also describe additional metrics and data by which the team will demonstrate success and achievement of the goals of the AIDRFIC program.

Productivity Metrics	Relative to Baseline from Task 1		
	Threshold	Goal	Stretch
AI-based tools relative to only using standard tools/flow (Task 3)	50%	25%	10%
Design time for an inexperienced (<10 years) RF designer using AI-enabled tools relative to design time for an experienced designer using standard tools/flow (Task 3)	120%	100%	80%
Performance Metrics			
Demonstration of AI-enabled tools to meet specifications of initial exemplar circuits (Task 3)	1 of 2	2 of 2	2 of 2
Number of designed circuits that achieve intended functionality of the additional exemplar circuits (Task 4)	5 from one process	5 from one process	10 from 2 processes
Specifications that meet or exceed specifications of the additional exemplar circuits (Task 4)	No specifications >10% deficient	Meets all specifications	Some exceed specification by >10%
Layout area of the five additional exemplar circuits compared to traditional design (Task 4)	1x	0.9x	0.75x
Workforce & Commercialization Metrics			
Integration of AIDRFIC learnings into curriculum (Task 5)	Materials developed	Active class or training	Students taught
Development and implementation of a commercialization plan (Task 6)	Plan developed	Initial discussions	Active licensing or tech transfer

Figure 6: Metrics

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Y. Li, Y. Lin, M. Madhusudan, A. Sharma, W. Xu, S. S. Sapatnekar, R. Harjani, and J. Hu, "A Customized Graph Neural Network Model for Guiding Analog IC Placement," *Proceedings of the IEEE/ACM International Conference on Computer-Aided Design*, 2020.

Y. Wen, J. Dean, B. A. Floyd and P. D. Franzon, "High Dimensional Optimization for Electronic Design," *2022 ACM/IEEE 4th Workshop on Machine Learning for CAD (MLCAD)*, UT, USA, 2022, pp. 153-157.

2 Award Information

2.1 General Award Information

Natcast anticipates 3-4 awards within a program budget of up to \$30M. The number of awards will depend on the proposed budgets and the availability of funds. Awards will be made to proposers whose proposals best address all evaluation criteria and selection factors.

2.2 Terms and Conditions

By submitting a proposal, proposers affirm that they have read, understood, and agreed to the terms and conditions contained in the CFP.

Natcast is not obligated to make an award, or award the full amount of available funds, as a result of the CFP process or the receipt of proposals in response to this CFP. Natcast's internal CFP process is flexible and may include, for example, requesting additional documentation from proposers, modifying the proposed budgets or scope of work for individual awards, or conducting further discussions with proposers as a part of the process.

Funds will only be made available after entering into a binding award agreement. Natcast may remove proposers from award consideration if the parties fail to reach agreement on award terms within a reasonable time or the proposer fails to provide requested additional information in a timely manner.

As a part of the CFP process, proposals and related information submitted under the CFP may be used, excerpted, copied, reproduced, and/or distributed to Natcast employees, contractors, consultants, and external reviewers as well as the Department of Commerce or other Federal agencies and their contractors or consultants for the purposes of conducting the competition under this CFP. Persons requiring access will be subject to appropriate non-disclosure and conflict of interest requirements.

Any parts of a proposal shared with Federal agencies may be subject to requests under the Freedom of Information Act (5 U.S.C. § 552). Proposers are encouraged to mark as confidential any part of a proposal they believe is confidential, such as trade secrets or privileged or confidential commercial or financial information.

By submitting a proposal in response to this CFP, proposers represent and warrant that they have the authority to submit a proposal and grant the rights set forth in the CFP on behalf of their organization.

2.3 Fundamental Research

Proposers are required to identify and provide an explanation for whether the proposed research is Fundamental Research or non-Fundamental Research. 'Fundamental research' means basic and applied research in science and engineering, the results of which ordinarily are

published and shared broadly within the scientific community, as distinguished from proprietary research and from industrial development, design, production, and product utilization, the results of which ordinarily are restricted for proprietary or national security reasons.

Natcast reserves the right to make a final determination and may impose award terms and conditions based on the distinction. In particular, non-fundamental research shall be subject to a pre-publication review.

Proposers should also be aware that the content of a Research Security Plan may depend in part on whether the proposal concerns fundamental or non-fundamental research. Wherever feasible, proposers shall (subject to concurrence by Natcast) consider basic or applied research conducted on campus at a university as fundamental research. Natcast affirms the ability of the applicant and members of the project team to publish and broadly disseminate the results of such fundamental research.

2.4 Research Security

2.4.1 Research Security Review and Risk Determination

Proposers are required to undergo a Research Security Review by NIST in order to be considered for award. The provided Project Narrative Template details the information that proposers must supply for this review, which comprises a brief summary of proposer's current capabilities related to Research Security as well as resumes/CVs and current and pending support forms for all covered individuals. The resulting research security risk determination may be used as a selection factor. Furthermore, Natcast may require that applicants mitigate identified risks as an aspect of award negotiation.

Proposers must provide (as a Project Narrative appendix as specified in Appendix A) a brief summary (at most one page) of proposer's current capabilities related to Research Security that addresses cybersecurity, foreign travel, research security training, and export control to protect against adversarial exfiltration. Each proposer also must attest that, if preliminarily selected for an award, the proposer has the capacity and intends to develop a Research Security Plan prior to receipt of the award demonstrating that NSTC-funded research and associated data products will be protected.

2.4.2 Research Security Plan

As an aspect of award negotiation, selected proposers may be asked to improve their research security practices or plans. It is essential that proposers be prepared to strengthen their research security protocols as part of the award process and/or over the course of the period of performance.

If and when selected for award negotiation, proposers must submit a detailed description of their current Research Security Plan or (if none) describe a plan to protect Natcast-funded research and associated data products; this plan must include an implementation timeline. The description must identify a member of proposer’s leadership team to serve as the point of contact responsible for coordinating with Natcast on research security issues. The description must further describe the applicant’s existing or proposed internal processes or procedures to address cybersecurity, foreign talent recruitment programs, conflicts of commitment, conflicts of interest, research security training, and research integrity. The description must also address research security considerations involving subcontractors, if any. Appendix D contains a Research Security Plan questionnaire that will be requested if and when a proposal is selected for award negotiation. Award terms will specify that within ninety (90) days of award, proposers must show progress on implementing the Plan as applicable.

2.5 Intellectual Property and Data Rights

“IP” means all intellectual property rights, including without limitation copyrights, works of authorship, graphics, designs, patents, inventions, ideas, information, methods, improvement, processes, trademarks, names, logos, trade secrets, rights in software, database rights, rights in data and any other proprietary rights.

2.5.1 Award agreement IP terms

The award agreement will include terms and conditions related to intellectual property and data. Certain of these terms and conditions are specifically required by Natcast’s obligations to the Department of Commerce; others are intended to fulfill the NSTC mission of furthering research and engineering throughout the semiconductor ecosystem. This Project is the first that Natcast is funding and coincides with the launch of the NSTC and the development of policies to be adopted by the NSTC including with respect to intellectual property. The terms below apply only to this Project; future projects may be accompanied by different terms with respect to IP.

The following commitments will be required of all performers. A performer is responsible for ensuring each member of its team and their respective affiliated organizations comply with the IP terms of the award agreement.

- Ownership of IP: The performer or, as applicable, the Project team member responsible for development, will own all intellectual property and data developed by such performer or team member under the Project.
- Disclosure of Background IP: The performer will be required to disclose to Natcast any pre-existing IP (which may include patents, proprietary information, etc.) that will be used in completing the Project.
- Government License: The U.S. Government will have a nonexclusive, nontransferable, royalty-free, fully paid-up, worldwide, perpetual license to practice all inventions that

are or may be patentable developed by the performer in the course of performing the Project, for research and non-commercial purposes.

- Government Data Rights: The U.S. Government will have the right to use, duplicate, or disclose all information contained in the performer’s quarterly reports, in whole or in part, and in any manner, for U.S. Government purposes, and to have or permit others to do so for U.S. Government purposes, except to the extent such reports contain proprietary information of the performer.
- Domestic Control Restrictions: The performer will comply with domestic control requirements adopted by Natcast or the Department of Commerce pursuant to the CHIPS Act, including (a) the owner of the developed inventions that are or may be patentable must be either a state, local or tribal government or a US entity with its primary place of business in the US; (b) that domestic entity—and any successor in interest—may not sell, transfer, or assign ownership of any developed inventions that are or may be patentable to a foreign adversary (“foreign adversary” includes any “foreign entity of concern” and “foreign country of concern” as defined in 15 C.F.R. § 231.102, § 231.104); (c) that domestic entity may not grant a license to a foreign adversary with some limited exceptions; and (d) that domestic entity may only assign ownership of the developed inventions that are or may be patentable to a foreign entity (that is not a foreign adversary) after the expiration of a specified period of years; the specific period of years will be determined prior to award. While a uniform term of years will be included in all award agreements, performers will have an opportunity to discuss the term of years prior to award.
- Natcast Rights in Developed IP: The performer will grant to Natcast a perpetual, non-exclusive, royalty-free, sublicensable (including to future NSTC Members) license to newly developed IP for research and non-commercial purposes. This license will include, for example, newly developed software; project tools related to developed software, performance data demonstrating results, and other ancillary information related to developed software; patentable inventions; and the deliverables identified in Section 1.7.

In addition to the above, the award agreement may contain additional obligations on behalf of the performer with respect to IP. Proposers should respond to the specific questions posed in connection with the IP Rights Management Plan (as described in the Project Narrative Template).

2.5.2 Intellectual Property Management Plan

Proposers must submit an Intellectual Property Management Plan (see the Project Narrative Template), wherein, proposers should clearly identify (1) any pre-existing IP (which may include patents, proprietary information, etc.) that will be used in completing the project, and (2) IP that may be developed with Natcast funding.

Proposers should describe how the proposed management and ownership of IP will ensure domestic control of CHIPS funded intellectual property, including to protect such intellectual property from foreign adversaries.

Section 2.5.1 describes the minimum IP award terms for the AIDRFIC program, and the Intellectual Property Management Plan must affirm proposer’s intent to commit to the required IP terms, including a commitment to license foreground intellectual property rights (in patentable inventions, data rights, copyrights, know-how, etc.) to Natcast on a perpetual, fully-paid-up, royalty-free, sublicensable basis for research and non-commercial purposes. Beyond these baseline requirements, the Intellectual Property Management Plan is an opportunity to propose any additional IP terms, if applicable, that would benefit the NSTC and its membership. It is not a requirement to propose additional terms related to management or ownership of IP, and the lack of any additional IP terms will not disqualify a proposal from consideration. However, potential benefits to the NSTC membership will be considered as an evaluation factor, as described in Section 5.1. Examples of additional IP provisions that proposer may offer to provide additional benefits to NSTC Members may include reasonable and non-discriminatory commercial licensing of foreground and/or background IP and/or willingness to provide exclusive rights in specific fields of use. As needed, include any proposed restrictive conditions on such plans, such as restrictions on commercial use by competitors. Natcast appreciates proposals that find an effective balance between the commercial interests of the proposer, the value received in R&D funding, NSTC Member engagement, and rights and benefits returned to NSTC Members.

2.6 Commercial Viability and Domestic Production

A Commercial Viability and Domestic Production (CVDP) plan is not required for submission of proposals in response to the AIDRFIC CFP.

Consistent with promoting a robust, sustainable domestic capacity for semiconductor R&D, prototyping, and production, and the CHIPS Act domestic production requirements (15 U.S.C. §4656(g)), CHIPS R&D requires applicants to develop plans to commercialize and domestically produce intellectual property resulting from CHIPS-funded microelectronics research and development. For the purposes of 15 USC § 4656(g), “production” includes the manufacture, integration, assembly, testing, and packaging of semiconductor substrates and substrate materials. As intellectual property resulting from this funding opportunity is expected to be used primarily for the creation of software, this definition of “production” is not relevant to the proposed activities, and a Commercial Viability and Domestic Production (CVDP) plan is not required for submission of proposals. However, Task 6 of this funding opportunity involves creating a plan to commercialize research results and is expected to result in similar information to a CVDP as required in other CHIPS R&D funding opportunities.

3 Eligibility Information

The recipient of an Award must be an NSTC Member at the time of Award.

NSTC Members may not be foreign entities of concern or foreign countries of concern, as those terms are defined in 15 C.F.R. 231.104 and 231.102, respectively. Individuals and unincorporated sole proprietors are not eligible to receive funding or for NSTC membership. Moreover, as also required by this CFP, recipients must undergo a Research Security Review (see 2.3.1) and be prepared to implement a Research Security Plan (see 2.3.2).

Additional information about NSTC Membership and the process for becoming a member will be available in the coming months. The NSTC expects to make NSTC Membership terms and fees sufficiently accessible for all expected applicants

3.1 Federal Entities

Federal Entities (e.g., Federal departments and agencies, military services educational institutions, etc.) are eligible to participate in funding opportunities as team members or contractors, to the extent allowed by law and subject to applicable direct competition limitations. Federal Entities must clearly demonstrate that the work is not otherwise available from the private sector and provide written documentation citing the specific statutory authority and contractual authority, if relevant, establishing their ability to receive Federal award funds and compete with industry. Applicants must identify the Federal entity in the Project Plan and provide documentation attached to the required letter of commitment establishing that the Federal entity is able to participate in the proposed work.

Federally Funded Research and Development Centers (FFRDCs) may participate in awards as subrecipients or contractors, to the extent allowed by law, based on the unique and specific needs of the project. Applicants must identify the FFRDC(s) in the Project Plan and provide documentation attached to the required letter of commitment establishing that FFRDC subrecipients and contractors are able to participate in the proposed work, including:

- Documentation demonstrating that the proposed work does not compete with the private sector; and
- Documentation from the FFRDC's sponsoring institution citing the FFRDC's eligibility to participate in competitive Government funding opportunities; the FFRDC's compliance with the sponsor agreement; and confirmation from the sponsoring agency that they can receive Federal funds from Natcast.

3.2 Eligible Use of Funds

Eligible uses may include, but not be limited to, basic and applied research, demonstration, prototyping, preparation of commercial viability and domestic production information, industry

stakeholder engagement, design work, information collection, acquisition of software or hardware, manufacturing costs, associated program travel, data analysis, audit costs.

Use of funds for travel costs must be consistent with Natcast's applicable travel expense policy.

Applicants may also propose to expend limited funds to protect innovations or content developed under the funding opportunity, such as fees for patent or copyright protection or to enhance research security.

3.3 Organizational Conflict of Interest

Proposers are asked to identify any potential organizational conflicts of interest that may arise in the context of this CFP, and (if applicable) potential strategies that Natcast should consider in mitigating those conflicts

3.4 Cost Sharing

Cost sharing is encouraged but not required for this effort. In that light it is neither an evaluation nor selection criterion.

3.5 Foreign Collaboration and Overseas Activities

Foreign organizations (e.g., for profit companies, educational institutions, and other non-profits) and foreign individuals can participate in research funded by Natcast R&D on an unfunded basis, subject to certain limitations such as a research security review, to ensure the protection of CHIPS R&D-funded intellectual property from foreign adversaries.

To protect national security and the resiliency of supply chains, however, foreign entities of concern may not receive Natcast R&D funds or participate in NSTC R&D programs. Foreign entities of concern include entities owned by, controlled by, or subject to the jurisdiction or direction of the governments of China, Russia, North Korea, or Iran. Complete definitions of foreign entity of concern and foreign country of concern are found at 15 CFR part 231.

Foreign organizations may participate as members of a project team, as subrecipients or contractors, subject to Natcast approval. The applicant must provide Natcast with a written justification demonstrating that the foreign entity's involvement is essential to advancing project objectives, such as by offering access to unique facilities, IP, or expertise that is otherwise not readily available in the United States. Natcast will only approve work outside of the United States if it is in the best interest of CHIPS R&D and the United States, including the domestic economy generally, U.S. national security, U.S. industry, and U.S. manufacturing competitiveness. Natcast's determination regarding the performance of project tasks outside the United States will be based on information provided by the applicant and by other Federal agencies.

For purposes of this Announcement a foreign organization refers to:

1. A public or private organization located in a country other than the United States and its territories that is subject to the laws of the country in which it is located, irrespective of the citizenship of project staff or place of performance;
2. A private nongovernmental organization located in a country other than the United States that solicits and receives cash contributions from the general public;
3. A charitable organization located in a country other than the United States that is nonprofit and tax exempt under the laws of its country of domicile and operation, and is not a university, college, accredited degree-granting institution of education, private foundation, hospital, organization engaged exclusively in research, or scientific activities, church, synagogue, mosque or other similar entities organized primarily for religious purposes; or
4. An organization located in a country other than the United States not recognized as a foreign public entity.

4 Proposal and Submission Information

4.1 Proposal Submission Process

Natcast will follow a five-step process for making the AIDRFIC award:

Step 1: Executive Summary submitted as a required indication of interest. Feedback will not be provided however full proposals will not be accepted unless the Executive Summary has been received by the date specified.

Step 2: Full Proposal (Executive Summary submission required for full proposal submission)

Step 3: Full Proposal evaluation

Step 4: Research Security Review and Research Security Plan

Step 5: Negotiation and Award

The executive summary (Step 1) and eventually the full proposal (Step 2) must be uploaded to a secure web site <https://natcast.secure-platform.com/rnd/>. It is also possible to navigate to this site from the AIDRFIC home page, <https://natcast.org/research-and-development/aidrfic>. See Appendix Section 8.1.2 for the required contents of the executive summary, which is to be uploaded on July 25 and which should be included with updates (if any) as a subsection of the Project Narrative in the full proposal.

4.2 Dates

Key dates are given below. Please note that all submissions are due by 5pm EDT on the specified date.

Activity / Event	Date
Call for Proposals Released	28-Jun-24
Proposers' Day	11-Jul-24
Executive Summary Due	25-Jul-24
Question Submission Deadline	9-Aug-24
Proposals Due	23-Aug-24
Target Awards Announced	17-Oct-24
Target Project Start	2-Dec-24

4.3 Proposal Form and Content

Proposals are required to adhere to a Project Narrative structure. Page limits and policy requirements are explained in the template.

Proposals must contain the following:

Executive Summary (Due 7/25/2024)

Project Narrative (Due 8/23/2024)

- See the below Appendix A for detailed requirements and suggestions.
- Cover Sheet
- Executive Summary (*may included content updated from initial submission*)
- Goals and Impact
- Management Plan
- Technical Plan
- Intellectual Property Rights Management Plan
- Appendices
 - Bibliographic list of references
 - Table of funded participants and unfunded collaborators
 - Budget volume (*Optional prose appendix, to be supplemented by an excel-format Budget Workbook uploaded separately*).
 - Research security capabilities
 - Resumes/CVs
 - Current and pending support forms
 - Letters of commitment

Budget Workbook (excel-format budget Workbook, also Due 8/23/2024, uploaded separately from the Project Narrative). An optional (but highly recommended) budget template will be made available for the convenience of proposers at within the AIDRFIC application portal <https://natcast.secure-platform.com/rnd>.



For full instructions and requirements of the Executive Summary, Project Narrative contents, and Budget Volume contents, see the annotated outline in the below Appendix A 8.1.

4.4 Teaming

It is expected that teams for this effort will comprise of some or all of the following: university researchers, RF-focused start-ups, commercial and defense companies; Si/SiGe and compound semiconductor foundries; established and start-up EDA tool companies and/or US government funded labs.

Teams should be comprised of one lead proposer (the “Performer”) with funded team members who would become sub-awardees and/or unfunded collaborators. Funded and unfunded collaborators must meet eligibility requirements and should submit a teaming letter with the project proposal or white paper. Full proposals should include a sub-awardee budget in addition to letters of commitment.

4.5 Frequently asked questions

Proposers can submit questions via email prior to August 9 by submitting questions to AIDRFIC2024@natcast.org. Abstracted answers will be shared publicly via FAQ posted at <https://natcast.org/research-and-development/AIDRFIC>.

5 Proposal Review Information

5.1 Evaluation Criteria

Proposals to this solicitation will be evaluated according to the following criteria, listed in priority order:

- ❖ **Overall Scientific and Technical Merit:** This criterion addresses the quality, innovativeness, and feasibility of the project proposal and the potential for meeting the objectives of the funding opportunity. Reviewers will consider the extent to which:
 - The proposed activities are innovative, original, or potentially transformative;
 - The proposal demonstrates knowledge of the current state of the art in relevant fields and the feasibility of the proposed technologies to be advanced, including gaps, constraints, and significant challenges that must be addressed; and
 - The plans for Project-Level Technical Targets represent a significant advance relative to the state of the art globally.

- ❖ **Relevance to economic and national security:** This criterion addresses relevance of the proposal to enhancing U.S. economic or national security competitiveness. Reviewers will consider the extent to which the project is likely to:
 - Advance domestic semiconductor development capabilities;
 - Generate substantial economic benefits to the Nation that extend beyond the direct return to participants in the program; and
 - Support the development of semiconductors necessary to U.S. national security systems, other government systems, or critical infrastructure.

- ❖ **Transition and Impact Strategy:** This criterion addresses the project's potential for supporting the commercialization and domestic production of funded semiconductor innovations, as well as beneficial impacts to workforce development and the broader domestic research, development, and innovation ecosystem. Reviewers will consider the extent to which the proposal provides:
 - A reasonable approach for transitioning the proposed technology to commercial deployment; and
 - Outlines an education and workforce development plan appropriate to developing a workforce relevant to domestic semiconductor manufacturing capabilities.
 - The evaluation may also consider the applicant's history of transitioning (or plans to transition) technologies to foreign governments or to companies that are foreign owned, controlled, or influenced.

- ❖ **Benefit to NSTC membership:** This criterion addresses the intellectual property aspects of proposal as well as factors related to the dissemination of IP. Reviewers will consider the extent to which the IP terms the proposer will make rights in data, inventions, and copyrightable material available to the membership. Illustrative elements of a proposal could be the offer of research purpose rights to the membership, non-exclusive royalty-free commercial rights, reasonable and nondiscriminatory licensing to any member, patentable concepts scoped within the NSTC membership, most favored nation terms on background IP, the embodiment of Natcast-funded research in testbeds available to the membership at reasonable cost, etc. Reviewers will consider:
 - The extent to which any proposed additional IP benefits are commensurate with the benefit of Natcast funding and the availability of NSTC infrastructure and support as it evolves
 - The extent to which the proposed IP terms maximize the potential for commercializing Natcast-funded inventions, datasets, and copyrightable materials
 - Plans, if any, for making the NSTC membership aware of the emerging knowledge and enabling its use

- ❖ **Project Management:** This criterion addresses the degree to which proposers demonstrate that they have the appropriate personnel and access to required equipment and facilities. Reviewers will consider the extent to which the proposal:
 - Identifies key staff, leadership, and technical experts with qualifications and experience appropriate to the proposed work, including prior experience and results in efforts similar in nature, purpose, or scope of proposed activities; and

- ❖ **Cost Realism:** This criterion addresses the cost proposal. Reviewers will consider the extent to which the proposal costs are both:
 - Necessary to achieve the project objectives
 - Sufficient to achieve the project objectives.

5.2 Selection Criteria

Natcast will select a portfolio of proposals based on a broad range of criteria including:

- **Merit Review.** Results of the merit reviewers' evaluations, including narrative evaluations (if applicable), and the Reviewers' adjectival ratings (if applicable).
- **Relevance to Program and Mission.** Alignment with the objectives of the funding opportunity as well as the objectives and priorities of NSTC and the mission, goals, and priorities of the NSTC R&D program, which may include considerations related to research security, domestic production, and domestic control of intellectual property.

- **Funding.** The availability of funding.
- **Diversity of Projects and Participants.** The degree to which the selected portfolio of proposed teams and project provides for a diversity of proposed project topics or approaches, regional diversity of participants, and institutional diversity (including small and medium enterprises, universities, nonprofit research organizations, etc.) in the overall NSTC projects portfolio.
- **Funding duplication.** Selection will strive to avoid funding duplicative projects
- **Benefit to NSTC membership.** The extent to which IP plans and other factors benefit the NSTC membership.
- **Research Security Risk.** Natcast may consider the results of a Research Security Review in its selection.

5.3 Review of Proposals

The review process involves evaluation of each conforming and eligible proposal on its individual merits, followed by a selection process that considers a range of broader criteria that are comparative and/or additive of the merit evaluation as Natcast determines which set of proposals best meets the program objectives.

Natcast may, at its discretion, review a substantially complete proposal if any gaps in information can be rectified easily during the review or award process.

6 Award Administration Information

6.1 Notification of Submission Status

Natcast intends to publicly announce awards no later than thirty (30) days after all awards under this CFP are executed. Announcements may occur earlier, such as once award negotiations have sufficiently progressed that all material terms are agreed to and both parties give consent to announce the Award, provided that such announcements reflect that a final, binding Award has not yet been made.

Proposers will be notified by email if and when a determination has been made to enter award negotiations.

Unsuccessful proposers will also be notified by email and will have the opportunity to receive a debriefing after the funding opportunity is officially closed. Applicants must request within ten (10) business days of the email notification to receive a debrief from Natcast. Natcast will then work with the unsuccessful applicant in arranging a date and time of the debrief.

6.2 Policy Requirements

6.2.1 Documentation Retention

Performers must keep and retain records of all data generated through funded research which includes but is not limited to technical data, specifications, software, and mask works. In addition, performers must keep and retain all financial records, supporting documents, statistical records, and other materials related to the award.

These requirements apply for three (3) years following Natcast's final payment.

6.2.2 Tangible Property

The acquisition of certain tangible personal property, including equipment and supplies, must comply with the requirements of 2 C.F.R. §§ 200.313 and 314. Performers will also be required to record appropriate notices of record to indicate that personal property has been acquired or improved with federal funds and that use and disposition conditions apply to the property, in accordance with 2 C.F.R. § 200.316. For purposes of this CFP, these requirements apply to tangible personal property (including information technology systems), including equipment and supplies, having a useful life of more than one year and a per-unit acquisition cost which equals or exceeds the lesser of the capitalization level established by the acquiring entity for financial statement purposes, or \$10,000.

Performers may not use Award funds to acquire real property or to engage in construction.

6.2.3 Accounting Standards

Award agreements will require that Performers maintain proper GAAP accounting of all federal funds provided under the Award, including the use of funds for approved research and development purposes as well as maintain commitment to any cost-sharing, if applicable.

6.3 Reporting

The number and types of reports will be specified in the award agreement but will include at a minimum quarterly technical and financial status reports and a final project report.

- **Technical Reports:** These reports should provide Natcast Program Managers with information on the progress of supported projects and the way funds are being used. Technical reports may request the types of information described in the illustrative Technical Report Template found in Appendix C.
- **Financial Status Reports:** Performers report financial information regarding their award using their standard reporting format or as specified in the award instrument.
- **Final Project Report:** This is the last report of the project and should be written specifically for the most recently completed budget period. It should address progress in all activities of the project in its final year, including any activities intended to address the Broader Impacts criterion that are not intrinsic to the research. Illustrative contents of this report are outlined in Appendix D.

In addition, performers are required to submit publication citation information, links to publicly available data, and other public outputs as soon as they become available.

6.3.1 Meeting and Travel Requirements

Please refer to Section 1 “Funding Opportunity Description” for travel expectations. Proposers should anticipate travel costs accordingly.

6.4 Federal Requirements

Awards made under this CFP are made from federal funds Natcast receives under an “other transaction agreement” (OTA) with the Department of Commerce. These funds are not generally subject to the Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards, 2 C.F.R. Part 200, or the Federal Acquisition Regulation. They are subject to requirements imposed via the OTA. The OTA requires that awards under this CFP include terms addressing the following:

- A prohibition on federal funds going to any foreign entities of concern or foreign countries of concern, as those terms are defined in 15 C.F.R. 231.104 and 231.102, respectively, or to any other entity debarred, suspended or otherwise prohibited from receiving federal funds;
- Compliance with export control laws;

- Compliance with Title VI of the Civil Rights Act, Title IX of the Education Amendments, and other non-discrimination laws that prohibit discrimination on the basis race, color, national origin, handicap, age, religion, veteran status, or sex;
- Maintaining effective internal controls;
- Maintaining a System for Award Management (SAM) and ensuring that it is current, accurate, and complete;
- Providing access to records for examination, audit, investigation, or inspection by the Department of Commerce, a third party retained by the Department of Commerce, the Department of Commerce Office of Inspector General, or the Comptroller General. This requirement continues to apply for three (3) years after the final award payment, unless otherwise required by law;

A certification to the best of its knowledge and belief that no Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on its behalf in connection with the making of an award under this CFP.

- For award funded travel, adherence to the Fly America Act at 49 U.S.C. § 40118, economy class travel 41 C.F.R. § 301-10.103, and GSA per diem and hotel rates (<https://www.gsa.gov/travel/plan-book/per-diem-rates>) as outlined in Natcast's travel policy.

These requirements and others will be specified in award terms. Performers will be subject to sub-recipient monitoring throughout the life of the award, which will include steps to ensure that performers comply with applicable requirements.

6.5 Payment Terms

The AIDRFIC program plans to operate with fixed-price awards, using the following payment structure:

Initial Payment: Upon signing of the award, an initial payment of 15% of the total award value will be made to the proposer or sub awardee.

Milestone Payments: Payments will be made upon the completion of predefined milestones. These milestones and their associated payments will be clearly defined in the contract or agreement.

Final Payment: A final payment constituting 20% of the total contract value will be made upon the acceptance of the final report by Natcast.

All payments, including milestone and final payments, will be subject to the approval of the designated Program Manager (PM) following Natcast’s approval process flows.

7 Other Information

7.1 Contacts

Questions should be directed to the following:

Subject Area	Point of Contact
Programmatic and Technical Questions:	Ronald S. Gyurcsik, Ph.D. Email: AIRFRIC2024@natcast.org
Award management:	Jill Bennett Email: AIDRFIC2024@natcast.org
Technical assistance with award submission:	Ronald S. Gyurcsik, Ph.D. Email: AIDRFIC2024@natcast.org

8 Appendices

8.1 Appendix A: Project Narrative Outline (Maximum 35 pages excluding appendices)

This outline describes the required structure of a proposal. Instructions are included in italics and may be deleted.

Proposal Formatting requirements

- *Font: Use one of the following fonts:*
 - a. *Arial (not Arial Narrow) a font size of 10 points or larger;*
 - b. *Times New Roma Calibri, or Aptos, at a font size of 11 points or larger; or*
 - c. *Computer Modern family of fonts at a font size of 11 points or larger.*
- *Line spacing: Single*
- *Margins: One (1) inch top, bottom, left, and right*
- *Page layout: Portrait orientation*
- *Page limit: Project proposals should not exceed 35 pages*
- *Paper size: 8.5" by 11" with 1" margins*
- *Application language: English*
- *Typed document: All applications must be typed.*

8.1.1 Cover Sheet

- 8.1.1.1 Funding opportunity name and reference number (if applicable)
- 8.1.1.2 Relevant technical areas
- 8.1.1.3 Name of the applicant
- 8.1.1.4 Name of the project director(s)/principal investigator(s)
- 8.1.1.5 Any major subrecipients and contractors
- 8.1.1.6 Project title
- 8.1.1.7 Point of Contact for the applicant, to include name, address, telephone number, and business e-mail address
- 8.1.1.8 Total funds requests and total proposed cost-share (if applicable)
- 8.1.1.9 Any statement regarding confidentiality, including proprietary or sensitive business information, if applicable

8.1.2 Executive Summary (Maximum 5 pages)

The initially submitted Executive Summary may be updated in the full Project Narrative. Proposers should provide a concise summary/abstract of the proposed effort including information around:

- 8.1.2.1 The name of the proposer(s)
- 8.1.2.2 The name(s) of other collaborators (if applicable)
- 8.1.2.3 The application title
- 8.1.2.4 Project objectives
- 8.1.2.5 Methods to be employed
- 8.1.2.6 The potential impact of the proposed project (i.e. benefits, outcomes)

8.1.3 Goals and Impact

Proposers should clearly describe what they are trying to achieve and the difference it will make (qualitatively and quantitatively) if successful. In particular, they should provide a clear problem statement and well-defined project outcomes, explaining how both are relevant to the goals and the objectives of the funding opportunity and contribute to economic and national security, as expressed in the evaluation criteria.

8.1.4 Management Plan

Proposers should provide a summary of expertise of the team, including any subcontractors, and key personnel who will be doing the work. A Principal Investigator (PI) for the project must be identified, along with a clear description of the team's organization, including an organization chart that includes, as applicable: the programmatic relationship of team members; the unique capabilities of team members; the task responsibilities of team members, the teaming strategy

among the team members; and key personnel with the amount of effort to be expended by each person during each year. Proposers should also provide a detailed plan for coordination, including explicit guidelines for interaction among collaborators/subcontractors of the proposed effort, risk management approaches, and descriptions of any formal teaming agreements that are required to execute the proposed research.

8.1.5 Technical Plan

Proposers should outline and address technical challenges inherent in the approach and possible solutions for overcoming potential problems. This section should provide appropriate measurable milestones (quantitative if possible) at intermediate stages of the proposed research to demonstrate progress, and a plan for achieving the milestones. The technical plan should demonstrate a deep understanding of the technical challenges and present a credible (even if risky) plan to achieve the proposal's stated goal and discuss mitigation of technical risk.

8.1.5.1 Fundamental Research Declaration

Proposers should identify which of the proposed research activities, if any, the applicant believes NSTC should consider as fundamental research and the rationale for that determination. For any proposed fundamental research, proposers should identify the involved project team member.

8.1.5.2 Proposed International Collaborations

If an international collaboration is required for the project, proposers must provide a written justification demonstrating:

- *that the foreign partner's involvement is essential to advancing program objectives, such as by offering access to unique facilities, IP, or expertise that is otherwise not readily available in the United States;*
- *the adequacy of any agreements and protocols between the applicant and foreign partner regarding IP protection and data protection;*
- *the partnership does not jeopardize the soundness of the project's proposed pathway to domestic production;*
- *as applicable, the foreign partner will comply with any necessary nondisclosure agreements, security regulations, export control laws, audit requirements, and other governing statutes, regulations, and policies;*
- *the foreign partner is not based in a foreign country of concern as defined at 15 U.S.C. §4651(7) and implemented by the final rule entitled Preventing the Improper Use of CHIPS Act Funding, 88 FR 65600 (Sept. 25, 2023), codified at 15 C.F.R. §231.104; and 6. the foreign partner agrees to be subject to a national security review by CHIPS R&D AND workforce, which may include a risk assessment of IP leakage, if appropriate.*

8.1.6 Intellectual Property Rights Management Plan.

In this section proposers should:

Clearly identify (1) any pre-existing IP (which may include patents, proprietary information, etc.) that will be used in completing the project, and (2) IP that may be developed with Natcast funding.

Describe how the proposed management and ownership of IP will ensure domestic control of CHIPS funded intellectual property, including to protect such intellectual property from foreign adversaries.

Section 2.5.1 describes the minimum IP award terms for the AIDRFIC program, and the Intellectual Property Management Plan must affirm proposer's intent to commit to the required IP terms, including a commitment to license foreground intellectual property rights (in patentable inventions, data rights, copyrights, know-how, etc.) to Natcast on a perpetual, fully-paid-up, royalty-free, sublicensable basis for research and non-commercial purposes. Beyond these baseline requirements, the Intellectual Property Management Plan is an opportunity to propose any additional IP terms, if applicable, that would benefit the NSTC and its membership. It is not a requirement to propose additional terms related to management or ownership of IP, and the lack of any additional IP terms will not disqualify a proposal from consideration. However, potential benefits to the NSTC membership will be considered as an evaluation factor, as described in Section 5.1. Examples of additional IP provisions that proposer may offer to provide additional benefits to NSTC Members may include reasonable and non-discriminatory commercial licensing of foreground and/or background IP and/or willingness to provide exclusive rights in specific fields of use. As needed, include any proposed restrictive conditions on such plans, such as restrictions on commercial use by competitors. Natcast appreciates proposals that find an effective balance between the commercial interests of the proposer, the value received in R&D funding, NSTC Member engagement, and rights and benefits returned to NSTC Members.

8.1.7 Appendices

8.1.7.1 Table of Abbreviations and Acronyms.

An alphabetical list of all abbreviations, acronyms, and their meanings.

8.1.7.2 Bibliographic List of References

A complete bibliographic listing of all references used within the application.

8.1.7.3 Table of Funded Participants and Unfunded Collaborators

A table that identifies all organizations that will participate in and collaborate with the awarded team, known at the time of the application submission. The table should consist of an

alphabetically ordered list, by organization, of all team members, funded and unfunded, including any known contractors.

8.1.7.4 Budget volume

8.1.7.4.1 BUDGET WORKBOOK (TO BE UPLOADED SEPARATELY AS EXCEL SPREADSHEET)

It is highly recommended that all applicants' cost proposals/budget requests be submitted using the Natcast approved budget workbook available within the application portal at <https://natcast.secure-platform.com/rnd>. In preparing the Budget Workbook, applicants must provide a concise narrative explanation to support the budget request, explained in detail below.

8.1.7.4.2 BUDGET NARRATIVE AND JUSTIFICATION

Justifications for expenditures should be outlined in detail on each tab of the Budget Workbook, where applicable (e.g. far right column marked "Justifications / Basis of Estimate.") All information must align with the amounts being requested for that individual line item and funding levels must be consistent with the project scope and allowable costs.

Direct Labor: The budget justification for all staff/personnel should include the following: Job title, commitment of effort on the proposed project in terms of average number of hours per week or percentage of time, salary rate, total personnel charges for each identified position on the proposed project, description of the role of the individual on the proposed project and the work to be performed.

Fringe Benefits: Fringe benefits for each position should be identified separately from direct labor and based on rates determined by your organizational policy. The items included in the fringe benefit rate (e.g., health insurance, dental, life, FICA, etc.) This should not be charged under another cost category.

Equipment: Equipment is defined as an item of property that has an acquisition cost of \$5,000 or more (unless the organization has established lower levels) and an expected service life of more than one year. The budget justification should list each piece of equipment, the cost, and a description of how it will be used and why it is necessary for the successful completion of the proposed project. Please note that any general use equipment (computers, etc.) charged directly to the award should be allocated to the award according to expected usage on the project.

Travel: For all travel costs, the budget justification for travel should include the destination; number of people traveling; duration; estimated transportation, lodging and per diem rates; and a description of how the travel is directly related to the proposed project. For travel that is yet to be determined, please provide the best estimates based on prior experience.

Other Direct Costs: For costs such as supplies, printing, and publications. This can include fewer common items that do not have a specific heading within the budget template. Please list the item, cost, and the breakdown of the total costs by quantity or unit of cost. Include and explanation of the necessity of the cost for the completion of the proposed project.

Contractual (i.e., Contracts or Consultants): Each contract or consultant should be treated as a separate item. Identify the cost (daily rate x period) or fixed fee and describe the services to be provided and the necessity of contract to the successful performance of the proposed project. Contracts are for obtaining goods and services for the use on the project and creating a procurement relationship with the contractor.

Subaward (i.e., subrecipient): Each subaward should be treated as a separate item. Identify the entity, cost, and describe the scope of work to be provided by the recipient and the necessity of the subaward to the successful performance of the proposed project. A subaward is for the purpose of carrying out a portion of an Award and creates a Federal financial assistance relationship with the subrecipient.

Indirect/Overhead Rates: Commonly referred to as F&A, Overhead, Indirect Costs (IDC), are defined as costs incurred by the applicant organization that cannot otherwise be directly assigned or attributed to a specific project. The justification should include a cost calculation that reflects the applicable indirect cost rate.

8.1.7.4.3 PROPOSED MILESTONE PAYMENTS

Applicants must articulate proposed programmatic milestones tied to their use of funds. Milestones will be used to negotiate payments and payment schedules with Natcast, if selected. Applicants may include proposed milestones to stand up programs, such as an initial advance payment. Milestones should represent significant operational achievements or deliverables -- such as hiring of key personnel, contracting with necessary partners, or payments for completion of training curriculum – and major performance outcomes, such as completion of cohort training, enrollment of participants into jobs, or similar activities in alignment with the proposed scope, as described in their application.

8.1.7.4.4 TABLE OF COST SHARE AND CONTRIBUTORS

Where voluntary, committed cost share is offered, a table with details about all contributing sources of cost share, both cash and in-kind, including the rationale for selection of the contribution and the merits and risks associated with each known and anticipated contribution.

8.1.7.4.5 LEVERAGED RESOURCES

Applicants are not required to provide cost sharing or matching funds. Including such funds is not one of the application screening criteria and applications that include any form of cost sharing or match will not receive additional consideration during the review process. Instead,

Natcast considers any resources contributed to the project beyond the funds provided by the agency as leveraged resources. Applicants are strongly encouraged to leverage additional funds to support the project but leveraged resources are not required. Leveraged resources can come from a variety of sources, including, but not limited to, employers, industry associations, labor organizations, community-based organizations, education and training providers, philanthropic organizations, and/or state, and local government programs.

8.1.7.5 Research Security Capabilities (Limit to 3 pages)

All proposers must describe their research security capabilities and be prepared to develop or improve their research security plans if and when selected for award.

8.1.7.5.1 (INSERT ORGANIZATION NAME) RESEARCH SECURITY CAPABILITIES

Does the organization have an existing research security program (y/n)?

If yes, by submitting this proposal, the proposer acknowledges that depending on an assessment by NIST, it may be asked to improve the described program as a condition of award.

If no, by submitting this proposal, the proposer acknowledges that, if preliminarily selected for an award, the proposer has the capacity and intends to develop a robust Research Security Plan prior to receipt of the award demonstrating that Natcast-funded research and associated data products will be protected. The proposer also acknowledges that progress on implementing such a plan within 90 days of award.

8.1.7.5.2 ORGANIZATIONAL LEADERSHIP

Identify the organization's leadership.

- Name of organization
- Names and positions of organization's leadership
- Point of contact

8.1.7.5.3 ORGANIZATIONAL POLICY

Attach the existing research security policy.

8.1.7.5.4 SCOPE OF PROGRAM

Describe the research security scope

8.1.7.5.5 RESEARCH SECURITY TEAM

If implemented, provide the research security team membership.

- Name, position, and e-mail contact
- Roles and responsibilities of team members

8.1.7.5.6 TECHNOLOGY AND INTELLECTUAL PROPERTY ASSESSMENT

If implemented, attach an existing critical asset list that contains a minimum list of technologies and intellectual property that are pertinent to a funding application that are at risk from foreign adversaries.

8.1.7.5.7 FOREIGN TRAVEL

Does the organization monitor foreign travel and, if so, how?

8.1.7.5.8 COMMUNICATION AND TRAINING

If implemented, describe the current communication and training strategy. Please include type of training provided.

8.1.7.5.9 TECHNOLOGY CONTROL PLANS

For an organization with existing TCPs, please attach.

8.1.7.5.10 REVIEWS, RISK DETERMINATION, AND MITIGATION

If implemented, identify a research security review methodology and provide a timeline.

8.1.7.5.11 ACCEPTANCE AND IMPLEMENTATION

If a research security plan or program is in development and presently incomplete, outline a proposed implementation timeline for the organization.

8.1.7.6 Resumes or CVs:

Submit for all key personnel, limited to two pages each, highlighting experience relevant to the proposed work.

8.1.7.7 Current and Pending Support Forms

All “covered individuals” must enumerate current and pending support using the [NIST’s standard form, found at <https://www.nist.gov/system/files/documents/2024/05/02/NIST%20Current%20and%20Pending%20Support%20Form%20-%205.1.24%20FINAL.pdf>](https://www.nist.gov/system/files/documents/2024/05/02/NIST%20Current%20and%20Pending%20Support%20Form%20-%205.1.24%20FINAL.pdf). A covered individual is defined as a person who contributes in a substantive, meaningful way to the scientific development or execution of a research and development project proposed.

8.1.7.8 Letters of commitment

Each partner organization and/or subgrantee cited by the lead applicant as providing services to support the program model and lead applicant must submit a Letter of Commitment.

Letters of Commitment must address the level of participation, qualifications of the personnel who will be actively involved, and how successful completion of this project would positively impact their profession or community. Letters must be signed by an individual with authority to legally bind the organization to its commitment.

Letters of Commitment must also specify any voluntary committed cost-share, including the specific services and/or products to be used in the project.

8.2 Appendix B: Research Security Plan Questionnaire

The information in this questionnaire is needed only at award negotiation time

8.2.1 (Insert Organization Name) Research Security Plan

8.2.1.1 Organizational leadership

Identify the organization's leadership.

- Name of organization
- Names and positions of organization's leadership
- Point of contact

8.2.1.2 Organizational Policy

Attach the existing research security policy or the intent to develop such policy. For an organization needing to create a research security policy, please provide a timeline.

8.2.1.3 Scope of Program

Provide the research security scope or the intent to develop such scope. For an organization needing to create a research security scope, please provide a timeline.

8.2.1.4 Research security team

Provide the research security team membership.

- Name, position, and e-mail contact
- Roles and responsibilities of team members

For an organization needing to create a research security team, please provide a timeline.

8.2.1.5 Technology and intellectual property assessment

Attach an existing critical asset list that contains a minimum list of technologies and intellectual property that are pertinent to a funding application that are at risk from foreign adversaries.

For an organization needing to create a critical asset list, please provide a timeline.

8.2.1.6 Communication and training

Describe the current communication and training strategy. Please include type of training provided.

For an organization needing to create a communication and training strategy, please provide proposed communication strategy, a proposed training scope, and a timeline.

8.2.1.7 Technology Control Plans

For an organization with existing TCPs, please attach.

For an organization without an existing TCP, please identify the intended solution and timeline.

8.2.1.8 Reviews, Risk Determination, and Mitigation

Identify a research security review methodology and provide a timeline.

8.2.1.9 Acceptance and Implementation

Outline a proposed research security program implementation timeline for the organization.

8.3 Appendix C: Illustrative Technical Report Template

8.3.1 Outcomes

8.3.1.1 Major Goals and Objectives:

8.3.1.2 Accomplishments in the current period

8.3.1.3 Plans for the Next Reporting Period

8.3.2 Outputs

8.3.2.1 Publications, Conference Papers, and Presentations

- *List any publications, conference papers, and presentations produced during the reporting period.*

8.3.2.2 Website(s) or Other Internet Site(s)

- *Provide details of any websites or other internet sites developed as part of the project.*

8.3.2.3 Technologies or Techniques

- *Describe any new technologies or techniques that were developed.*

8.3.2.4 Inventions, Patent Applications, and/or Licenses

- *List any inventions, patent applications, and/or licenses that resulted from the project.*

8.3.2.5 Other Products

- *Detail any other products such as data or databases, physical collections, audio or video products, software, models, educational aids or curricula, instruments or equipment, research material, interventions (e.g., clinical or educational), or new business creation.*

8.3.3 Risks/Problems/Changes

8.3.3.1 Risks and Risk Mitigation

- *Consider maintaining a running list of significant uncertainties and their perceived impact on the project. Consider a risk matrix covering technical, managerial, and other uncertainties (market, external dependencies) versus impact on the project outcome (low, medium, high) depending on resolution. As progress is made, new risks/uncertainties may appear and others may be settled.*
- *If not already accounted in the project plan, identify any actual or anticipated problems or delays and the actions or plans to resolve them.*

8.3.3.2 Changes in Approach

- *Describe any changes in approach to mitigate newly discovered risks or problems, and the reasons for these changes.*

8.3.3.3 Impact on Expenditures and Timeline

- *Discuss any changes that have a significant impact on the timeline or budget and expenditures and the reason.*

8.4 Appendix D: Illustrative Final Report Template

8.4.1 Introduction

- *Overview of the project and its objectives*

8.4.2 Project Outcomes or Findings

- *Detailed Description of the project's outcomes or findings*
- *Intellectual merit and broader impacts*

8.4.3 Publications and Outputs

- *List of publications, patents, presentation, articles, or disclosures of Research Results*

8.4.4 Impact Analysis

- *Comparison of the project's impact to the expected outcomes*

8.4.5 Lessons Learned and Recommendations

- *Insight and recommendation for future NSTC R&D Programs*

8.4.6 Transition plans and commercialization

- *Discuss how to advance the economic goals of the NSTC*

8.4.7 Deliverables and Research Byproducts

- *Descriptions, instructions, and artifacts associated with project deliverables and research byproducts, potentially including but not limited to:*
 - *Datasets*
 - *Source code*
 - *Object code*
 - *Curriculum and labs*
 - *Copyrighted materials*
 - *Prototypes (mask sets etc)*

8.4.8 Expected Publication of Results

- *Information on the expected publications of results and other relevant details for NSTC members*

8.4.9 Citations and Links

- *Citations, links to publicly accessible data and other public outputs*