

NOTICE OF FUNDING OPPORTUNITY (NOFO)
Small Business Innovation Research (SBIR) Program for CHIPS for America –
CHIPS Metrology

EXECUTIVE SUMMARY

- **Federal Agency Name:** National Institute of Standards and Technology (NIST), United States Department of Commerce (DoC)
- **Funding Opportunity Title:** Small Business Innovation Research (SBIR) Program for CHIPS For America – CHIPS Metrology
- **Announcement Type:** Initial
- **Funding Opportunity Number:** 2024-SBIR-CHIPS-01
- **Assistance Listing (CFDA Number):** 11.620, Science, Technology, Business and/or Education Outreach; 11.042, CHIPS Research and Development
- **Dates:** Full Applications must be received at [Grants.gov](https://www.grants.gov) no later than 11:59 p.m. Eastern Time, June 14, 2024. Applications received after this deadline will not be reviewed or considered.

Applicants should be aware, and factor in their application submission planning, that the Grants.gov system closes periodically for routine maintenance. Applicants should visit [Grants.gov](https://www.grants.gov) for information on any scheduled closures.

NIST expects to complete its review, selection of successful applicants, and award processing by August 2024. NIST expects the earliest start date for awards under this NOFO to be September 2024.

- **Application Submission Address:** Applications must be submitted using Grants.gov. Paper applications will not be accepted.
- **Funding Opportunity Description:** The Small Business Innovation Research (SBIR) program for CHIPS for America – CHIPS Metrology is seeking applications from eligible applicants to explore the technical merit or feasibility of an innovative idea or technology with the aim of developing a viable product or service that will be introduced to the commercial microelectronics marketplace.
- **Anticipated Amounts:** NIST anticipates funding approximately twenty-four (24) awards. Of these, approximately fourteen (14) awards are anticipated to be Open

Topics awards and ten (10) Closed Topics awards (see Section I.01). These awards will have a period of performance of up to six (6) months for Phase I awards and up to (24) months for Phase II awards. A period of one month is allotted after the six (6) month Phase I award for the recipient to prepare and submit a final report.

Individual award amounts for Phase I awards may be up to \$283,500 with up to an additional \$6,500 for Technical and Business Assistance (TABAs), see section 5.12 for TABA information. Individual award amounts for Phase II awards may be up to \$1,910,000 with up to \$50,000 for Technical and Business Assistance (TABAs), see section 5.12 for TABA information.

- **Funding Instrument:** Cooperative Agreement.
- **Eligibility:** Applicants must qualify as a Small Business Concern for Research/Research and Development (R/R&D) purposes, as defined in Section 1.05 of this NOFO, at the time of award. In addition, the primary employment of the principal investigator must be with the small business at the time of the award and during the conduct of the proposed research. Primary employment means that more than one-half of the principal investigator's time is spent working with the small business. Primary employment with a small business precludes full-time employment with another organization.
- **Cost Sharing Requirements:** Non-federal cost share is not required for awards issued pursuant to this NOFO.

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1.0 PROGRAM DESCRIPTION AND FEDERAL AWARD INFORMATION

1.01 Introduction

The CHIPS Research and Development Office (CHIPS R&D), National Institute of Standards and Technology (NIST), Department of Commerce, invites small businesses to submit research applications under this Notice of Funding Opportunity (NOFO). Science and technology-based firms with strong research capabilities in any of the areas listed in Section 9.0 of this NOFO are encouraged to participate. Applications must sufficiently identify and clearly address a specific CHIPS Metrology Open Topic area that falls within one of the research areas described in Section 9.0 (see Section 9.01) or address a closed topic area in Section 9.0 (see Section 9.02).

The CHIPS and Science Act appropriated approximately \$50 billion to the Department of Commerce—\$39 billion in incentives to onshore semiconductor manufacturing and \$11 billion to advance U.S. leadership in semiconductor R&D. Within CHIPS for America, the mission of CHIPS R&D is to accelerate the development and commercial deployment of foundational semiconductor technologies by establishing, connecting, and providing access to domestic research efforts, tools, resources, workers, and facilities. CHIPS R&D aims to achieve the following goals by 2030:

- **U.S. Technology Leadership:** The United States improves its capacity to invent, develop, prototype, manufacture, and deploy the foundational semiconductor technologies of the future.
- **Accelerated Ideas to Market:** The best ideas achieve commercial scale as quickly and cost effectively as possible.
- **Robust Semiconductor Workforce:** Inventors, designers, researchers, developers, engineers, technicians, and staff sustainably meet evolving domestic government and commercial sector needs.

Metrology plays a key role in semiconductor manufacturing. As devices become more complex, smaller, and multi-layered, the ability to measure, monitor, predict, and ensure quality in manufacturing becomes much more difficult and uncertain. Today, the domestic semiconductor industry faces some of these metrology challenges with workarounds and inadequate tools, limiting production yields, impacting quality, and increasing costs. As greater demands are put on semiconductor device performance and material requirements, these challenges will continue to intensify. The metrology challenges impacting the U.S. semiconductor industry are at a critical stage and urgently need to be addressed (for more information, see the seven Grand Challenges, outlined in the [Strategic Opportunities for U.S. Semiconductor Manufacturing](#) publication).

NIST has been a crucial partner in helping the U.S. microelectronics industry in the development and manufacturing of next-generation devices. Breakthroughs in measurement science, standards, material characterization, instrumentation, testing, and manufacturing capabilities are necessary to realize the potential of emerging 3D devices and 3D heterogeneous integration. As devices become more complex, highly integrated, and smaller, ensuring performance becomes more challenging. Meeting dimensional tolerances, performance, and reliability over a range of environments becomes increasingly difficult.

Metrology, one of multiple CHIPS R&D initiatives, emphasizes measurements that are accurate, precise, and fit-for-purpose for the production of microelectronic materials, devices, circuits, and systems. This SBIR NOFO will advance key technologies defined within one of the open topic research areas described in Section 9.0 (see Section 9.01) or address a closed topic area in Section 9.0 (see Section 9.02). Through targeted investments in metrology capabilities, NIST is working to:

- Advance U.S. leadership in documentary standards development.
- Develop and deploy critically needed measurement services.
- Develop and deploy innovative manufacturing metrologies.

- Develop and deploy novel assurance and provenance technologies.
- Establish advanced metrology R&D testbeds.
- Build and sustain collaborative partnerships with industry.

NIST will be conducting this competition as a Fast-Track program for open topics. For the closed topics, the competition is available as Fast-Track Program or a Phase II program for applicants that have received and successfully completed a related SBIR Phase I from NIST or another federal agency. The Fast-Track competition is seeking scientifically meritorious applications that have expressly high potential for near-term commercialization. The NIST Fast-Track program consists of a submission and review process in which both Phase I and Phase II applications are submitted together as one application to reduce or eliminate the funding gap between phases. For the closed topics, applications for just the Phase II award will be considered from entities that have received and successfully completed a related SBIR Phase I from NIST or another federal agency.

Only FY 2024 Fast-Track applications covering both Phase I and Phase II (hereinafter referred to as “Fast-Track”) or Phase II applications should be submitted in response to this NOFO. NIST will not publish a separate Phase II NOFO to separately request Phase II applications from the Phase I awardees. Nor will NIST publish a NOFO for Phase I under the CHIPS Metrology program.

The Small Business Innovation Research (SBIR) program was originally established in 1982 by the Small Business Innovation Development Act (P.L. 97-219), codified at 15 U.S.C. § 638. It was then expanded and extended by the Small Business Research and Development (R&D) Enhancement Act of 1992 (P.L. 102-564), and received subsequent reauthorization and extensions, the most recent of which extends the SBIR program through 2025 (P.L. 117-183).

Eleven Federal agencies implement SBIR by setting aside a portion of their external research and development budget each year to fund research applications from small science and technology-based firms. The statutory purpose of the SBIR Program is to strengthen the role of innovative small business concerns (SBCs) in Federally-funded research or research and development (R/R&D). Specific program goals are to: (1) stimulate technological innovation; (2) use small business to meet Federal R/R&D needs; (3) foster and encourage participation by socially and economically disadvantaged small businesses and by women-owned small businesses in technological innovation; and (4) increase private sector commercialization of innovations derived from Federal R/R&D, thereby increasing competition, productivity, and economic growth.

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FY 2024 SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM
FOR CHIPS FOR AMERICA – CHIPS METROLOGY

NOTICE OF FUNDING OPPORTUNITY No. 2024-SBIR-CHIPS-01

April 16, 2024

The CHIPS R&D FY 2024 SBIR Program identifies and solicits applications in topics that fall within CHIPS Metrology’s research and development areas, as described in Section 9.0 of this NOFO, and allow collaboration between CHIPS R&D staff, NIST scientists and the SBIR awardees whenever possible.

For any SBIR award that requires a license to use a NIST-owned invention covered by a patent or patent application, the SBIR awardee must contact NIST’s Technology Partnerships Office for a license to use the NIST-owned invention. Such awardees will be granted a non-exclusive research license and will be given the opportunity to negotiate a non-exclusive or an exclusive commercialization license to the NIST-owned invention, in accordance with the Federal patent licensing regulations, set forth in 37 C.F.R. Part 404, and to the extent that such NIST-owned invention is available for licensing and has not otherwise been exclusively licensed to another party. It is the goal of this program to position the SBIR awardee to use and build upon such licensed NIST-owned invention with the awardee’s own innovation to develop a commercially viable product based on the NIST-owned invention.

1.02 Three-Phase Program

The SBIR statute (15 U.S.C. § 638) requires the Department of Commerce to establish a three-phase SBIR program by reserving a percentage of its extramural R&D budget to be awarded to SBCs for innovation research. SBIR policy is provided by the SBA through the [SBIR/STTR Policy Directive](#).

The funding vehicles for NIST’s SBIR program in both Phase I and Phase II are cooperative agreements. NIST’s authority to implement its SBIR programs through cooperative agreements is 15 U.S.C. § 272(b)(4). NIST’s programmatic authorities for the research areas listed in this NOFO are found at 15 U.S.C. §§ 272(b) and (c). The nature of NIST’s “substantial involvement” will generally be collaboration with the awardees in carrying out the project’s approved scope of work. Administrative requirements for grants and cooperative agreements, set forth at 2 C.F.R. Part 200, will apply to NIST SBIR awards.

1.02.01 Phase I – Feasibility Research

The purpose of Phase I is for NIST to determine the technical feasibility of the research, preliminary commercialization merit of the proposed effort, and the quality of the awardee’s performance. The application should concentrate on describing research that will significantly contribute to proving the feasibility of the proposed

Phase II research and commercialization potential, prerequisites to receiving further support in Phase II. Each Phase I award is for up to \$283,500 and up to a six (6) month period of performance. Up to an additional \$6,500 may be requested for Technical and Business Assistance (TABAs); see section 5.12 for more information about TABAs. NIST's inclusion of TABAs funds in the award will be subject to the availability of NIST funding.

1.02.02 Phase II – Research and Development

All applicants under this NOFO are also required to submit a Phase II application. In Phase II, work from Phase I that exhibits potential for commercial application is further developed. Phase II is the R&D or prototype development phase. The Phase II application must include detailed information outlining the proposed research and a detailed plan to commercialize the final product. Each NIST Phase II award is for up to \$1,910,000 and up to a 24-month period of performance. Up to \$50,000 may be requested for Technical and Business Assistance (TABAs); see section 5.12 for more information about TABAs. One year after completing the Phase II R&D activity, the awardee shall be required to report on its commercialization activities.

Applicants for the Closed Topics discussed under this NOFO that have successfully obtained and completed an SBIR Phase I for a related topic may be considered and awarded a Phase II award. Phase II applicants shall provide sufficient information in their proposal to persuade NIST that their successful SBIR Phase I completion addresses the requirements outlined in the Closed Topic area in Section 9.

1.02.03 Phase III – Commercialization

Phase III refers to work that derives from, extends, or completes an effort made under prior SBIR funding agreements, but is funded by sources other than the SBIR Program. Phase III may be for products, production, services, R/R&D, or a combination thereof.

1.02.04 Commercialization Readiness Pilot Program

15 U.S.C. § 638(gg) authorizes agencies to establish a Commercial Readiness Pilot Program (CRPP). Under a CRPP, follow-on funding (up to an additional \$100,000) may be provided to selected awardees after competition of Phase II. The funding would be used to support advancement toward Phase III and to increase the likelihood of commercialization. NIST is under no obligation to make any CRPP awards.

1.02.05 Domestic Production and Control of Intellectual Property

As set forth in 15 U.S.C. §4656(g), the Department of Commerce must develop policies for the domestic production, to the extent possible, of intellectual property resulting from R&D conducted under this NOFO. Further, 15 U.S.C. §4656(g) requires CHIPS R&D to develop domestic control requirements to protect such intellectual property from foreign adversaries. For the purposes of 15 U.S.C. §4656(g), “intellectual property” means any invention that is or may be patentable under U.S. law; and “foreign adversaries” include but are not necessarily limited to any “foreign entity of concern” and “foreign country of concern,” as those terms are defined in 15 U.S.C. §4651(7)-(8) and 15 C.F.R. §231.102, §231.104.

Consistent with the domestic production requirements, a recipient must submit a Commercial Viability and Domestic Production (CVDP) with their Phase I final report (See Section 5.02).

CHIPS R&D will include specific award terms and conditions related to intellectual property and domestic production and control, to meet the requirements of 15 U.S.C. §4656(g). At Phases I and II, the relevant terms and conditions will include, at a minimum, the following:

- I. At least one domestic entity must own or co-own any intellectual property resulting from R&D (“resulting intellectual property”) and must have full rights to enforce the applicable intellectual property rights, for no less than a period of years to be determined prior to the final awards.
- II. At the conclusion of the period of years, ownership of the resulting intellectual property may generally be sold, transferred, or assigned to a foreign entity that is not a foreign adversary.
- III. In the event a domestic entity sells, transfers, or assigns ownership of the resulting intellectual property, the entity must promptly disclose such transaction to NIST prior to such transaction.
- IV. Any owner or co-owner of the resulting intellectual property (including successors in interest) may not sell, transfer, or assign ownership of such intellectual property to a foreign adversary.
- V. Any owner of the resulting intellectual property may not license such intellectual property to a foreign adversary, subject to the following specific exceptions.
 - a. This restriction is not applicable to the following specific exceptions, provided that an owner or co-owner of any patent or patent application resulting from R&D conducted under this NOFO satisfies the notification requirement specified in V.a.iii below.

- i. This restriction is not applicable to any patent(s) or published patent application(s) (i) declared and/or determined to be essential to a technical standard and (ii) under an obligation that the owner of the patent or published patent application license such rights pursuant to the terms of a standards development organization's Intellectual Property Rights policy.
 - ii. This restriction is not applicable to any license(s) of patent(s) or published patent application(s), including cross-licenses, resulting from settling an actual case or controversy, including patent infringement or validity disputes, whether part of a formal proceeding or not.
 - iii. In the event an owner or co-owner of the patent(s) resulting from R&D conducted under this NOFO determines that any of the specific exceptions above applies and plans to license such patent(s) to a foreign adversary pursuant to the exception(s), the owner or co-owner must promptly disclose such action for NIST review.
- b. This restriction is not applicable to the sale of a product by a funding recipient (or any other lawful owner, assignee, transferee, or licensee of IP) and any accompanying implied or explicit intellectual property license relating to the use of the product that is sold.

1.03 SBIR Applicant Eligibility and Limitation

1.03.01 Applicant Qualifications

Each applicant must qualify as an SBC for R/R&D purposes, as defined in Section 1.05 of this NOFO, at the time of the award. In addition, the primary employment of the principal investigator must be with the small business at the time of the award and during the conduct of the proposed research. Primary employment means that more than one-half of the principal's investigator's time is spent working with small business. Primary employment with a small business precludes full-time employment with another organization. Occasionally, deviations from this requirement may occur, which must be approved in writing by the NIST Grants Officer after consultation with the SBIR Program Manager. Further, a small business may only replace the principal investigator on an SBIR Phase I award if the NIST Grants Officer provides prior written approval. Personnel obtained through a Professional Employer Organization or other similar personnel leasing company may be considered employees of the awardee.

The R/R&D work must be performed in the United States. Requests for an exemption must be submitted in writing at the time of application submission. Only rare and unique circumstances will be considered for an exemption. The NIST Grants Officer must approve each exemption and its terms in writing.

NIST has elected to not use the authority that would allow venture capital operating companies (VCOCs), hedge funds or private equity firms to participate in the SBIR Program. Therefore, applications in which work is performed by VCOCs will not be considered for award.

For Phase I, a minimum of two-thirds of the research and/or analytical effort must be performed by the awardee. The total cost for all consultant fees, facility leases, usage fees, and other subcontract/subaward or purchase agreements may not exceed one-third of the total award. For Phase II, a minimum of one-half of the research and/or analytical effort and usage fees, and other subcontract/subaward or purchase agreements may not exceed one-half of the total award.

Each applicant will be required to provide certain information via www.sbir.gov, as well as information required by the [SBIR/STTR Policy Directive \(see Appendices V-VI\)](#). Each SBC applying for an award is required to update the appropriate information in the SBA database on SBIR.gov for any of its existing and prior Phase II awards.

Applicants may not participate in the review of applications.

The statement of work of an SBIR award made under this NOFO cannot overlap with the statement of work of an existing NIST Cooperative Research and Development Agreement (CRADA) with the awardee. NIST will consider the issue of any potential overlap on a case-by-case basis.

1.03.02 Company Registry Requirements

SBA maintains a [Company Registry](#) to track ownership and affiliation requirements for all companies applying to the SBIR Program. **Each Phase I applicant must register in the Company Registry prior to submitting an application. The applicant must save its information from the registration in a .pdf document and append this document to the SF-424 (R&R) form as described in Section 8.02 of this NOFO.** All applicants are required to report and/or update their registration information in the SBA Company Registry prior to each SBIR application submission or if any information changes prior to an award.

1.03.03 Performance Benchmark Ratings Requirements

Performance Benchmark Requirements

Companies with multiple SBIR/STTR awards must meet minimum performance benchmark requirements to be eligible to apply for a new Phase I or Direct-to-Phase II award. The performance benchmark requirements address the extent to which an awardee progresses a project from Phase I to Phase II (i.e., Phase I to Phase II Transition Rate Benchmark) and the extent to which an awardee progresses a project from Phase II towards commercialization (i.e., Commercialization Rate Benchmark). The purpose of these benchmarks is to ensure that Phase I applicants that have won multiple prior SBIR/STTR awards are progressing towards commercialization. The benchmarks were published in the *Federal Register* for public comment and agreed upon by all 11 SBIR agencies. The Phase I to Phase II Transition Rate Benchmark was published at [78 FR 30951](#) in May 2013, and the Commercialization Rate Benchmark was published at [78 FR 59410](#) in September 2013. The SBIR and STTR Extension Act of 2022 (Public Law 117-183) amended the application of these benchmarks for more experienced firms. This NOFO reflects those statutory changes.

Phase I to Phase II Transition Rate Benchmark

The Phase I to Phase II Transition Rate Benchmark only applies when a company has received 21 or more Phase I awards during the past five fiscal years, excluding the most recently completed fiscal year. It requires the company to average a ratio of Phase II to Phase I awards of at least 0.25, meaning the company must average one Phase II for every four Phase I awards received during the measurement period.

To calculate the Phase I to Phase II Transition Rate, SBA divides the total number of SBIR and STTR Phase II awards a company received from all agencies during the past five fiscal years by the total number of SBIR and STTR Phase I awards the company received from all agencies during the past five fiscal years, excluding the most recently completed year. The Phase II period begins one year later because Phase II awards rarely occur during the same year as the Phase I.

Below is an example of the Phase I to Phase II Transition Rate Benchmark assessment for three hypothetical companies conducted in Fiscal Year 2023.

Company	Phase I Awards (2017-2021)	Phase II Awards (2018-2022)	Transition Rate Calculation (Phase II Awards / Phase I Awards)	Assessment Outcome
Company A	21	7	0.33	Pass, ratio is equal or greater than 0.25

Company B	21	3	0.14	Fail, ratio is less than 0.25.
Company C	20	3	N/A	N/A –benchmark does not apply, firm has less than 21 Phase I Awards.

Commercialization Rate Benchmark

The Commercialization Rate Benchmark only applies when a company has received 16 or more Phase II awards during the past ten fiscal years, excluding the two most recently completed fiscal years. It requires the company to average at least \$100,000 of sales and/or investments per Phase II award received during the period; or have received a number of patents equal to or greater than 15% of the number of Phase II awards received during the period. The Commercialization Rate Benchmark calculation is based on data submitted through the SBIR.gov Company Commercialization Report. SBA utilizes reported total sales or revenues—including government designated Phase III awards, total dollars invested, or the number of patents, that resulted at least in part, from work performed under Phase II awards received during the 10-year period to calculate the Commercialization Rate Benchmark. A complete guide with additional details on what should and should not be reported is available here: [Guide for completing commercialization Report SBIR Gov 09 15 20.pdf](#).

To calculate the Commercialization Rate Benchmark, SBA sums the countable commercialization resulting from the specific Phase II awards received during the 10-year period and divides that number by the total number of Phase II awards received during the 10-year period. For determining the Commercialization Rate Benchmark based on patents, SBA divides the number of patents reported from the specific Phase II awards received during the 10-year period by the total number of Phase II awards received during the period.

Below is an example of a Commercialization Rate Benchmark assessment for four hypothetical companies conducted in Fiscal Year 2023.

Company	Phase II Awards (2011-2020)	Commercialization (\$) Resulting from Phase II Awards received between 2011-2020	Patents Resulting from Phase II Awards received	Commercialization Rate (Commercialization \$ / # of Phase II Awards)	Patent Rate (# of Patents / # of Phase II Awards)	Assessment Outcome
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			between 2011-2020			
Company A	16	\$3,200,000	1	\$200,000	.06	Pass. Commercialization rate meets or exceeds a \$100,000 average. It does not matter that the patent rate is below the threshold.
Company B	20	\$1,900,000	3	\$95,000	.15	Pass. Patent rate is at least 15%. It does not matter that the commercialization rate is below the threshold.
Company C	30	\$2,500,000	3	\$83,333	.10	Fail. Both the commercialization and patent rates are below the minimums.
Company D	15	\$3,000,000	0	\$200,000	.0	N/A –benchmark does not apply, firm has less than 16 Phase II Awards.

Commercialization Reporting

SBIR and STTR awardees are required to update and maintain their organization’s Company Commercialization Report via SBIR.gov. The reporting is accessible when an authorized user (user is SAM.gov verified) accesses its SBIR.gov profile under the “My Dashboard” section. SBIR and STTR Phase II awardees are required to update its commercialization record when applying for new Phase II awards, at the conclusion of a Phase II award, and then voluntarily update the information in the database annually thereafter for a minimum period of 5 years (15 U.S.C. § 638(k)).

Increased Performance Standards for More Experienced Firms

The SBIR and STTR Extension Act of 2022 (Pub. Law 117-183) established increased performance standards for more experienced firms. **Effective as of April 1, 2023**, the statute modifies the Phase I to Phase II Transition Rate Benchmark and the Commercialization Rate Benchmark based on a higher threshold of received awards.

Increased Performance Standard for the Phase I to Phase II Transition Rate Benchmark

The Increased Performance Standard for the Phase I to Phase II Transition Rate Benchmark only applies when a company has received or receives 51 or more Phase I awards during the past five fiscal years, excluding the most recently completed fiscal year. It requires the company to average a ratio of Phase II to Phase I awards of at least 0.50, meaning they must average one Phase II for every two Phase I awards received during the measurement period.

Increased Performance Standard for the Commercialization Rate Benchmark

The Increased Performance Standard for the Commercialization Rate Benchmark establishes two additional tiers, with each tier requiring an elevated performance requirement.

Tier 1 applies when a company has received or receives 51 or more Phase II awards during the past ten fiscal years, excluding the two most recently completed fiscal years. It requires the company to average at least \$250,000 in aggregate sales and investments per Phase II award received during the period.

Tier 2 applies when a company has received or receives 101 or more Phase II awards during the past ten fiscal years, excluding the two most recently completed fiscal years. It requires the company to average at least \$450,000 in aggregate sales and investments per Phase II award received during the period.

Please note, patents cannot be used to pass the Increased Performance Standards for the Commercialization Rate Benchmark.

Increased Performance Standards Documentation Requirement

The SBIR and STTR Extension Act of 2022 requires companies subject to the increased performance standard for the Commercialization Rate Benchmark to submit to SBA supporting documentation to support reported **covered sales**. The act defines covered sales as follows (15 U.S.C. § 638(qq)(3)(B)(iii)(II)):

In this clause, the term "covered sale" means a sale by a small business concern-

- that the small business concern claims to be attributable to an SBIR or STTR award;
- for which no amount of the payment was or is made using Federal funds;
- which the small business concern uses to meet an applicable increased minimum performance standard under clause (i) [i.e., Increased Performance Standard for the Commercialization Rate Benchmark]; and
- that was or is received during the 5 fiscal years immediately preceding the fiscal year in which the small business concern uses the sale to meet the increased minimum performance standard.

Please note that government awards received as a prime or subcontractor that satisfy the definition of Phase III and result, at least in-part, from Phase II award(s) received during the measurement period are not considered covered sales because the payment was or is made using Federal funds.

Note: For the Fiscal Year 2023 assessment, SBA will provide guidance directly to firms triggering the increased performance standards with instructions for providing the covered sales documentation. SBA anticipates company commercialization reporting system modifications to allow for uploading required documentation will be complete prior to the Fiscal Year 2024 assessment.

Consequences of Failure to Meet the Benchmarks

SBA will identify, on June 1 of each year, the companies that fail to meet the Phase I to Phase II Transition Benchmark, the Commercialization Rate Benchmark, or the Increased Performance Benchmarks for More Experienced Firms.

Companies that fail to meet either the Phase I to Phase II Transition Benchmark or the Commercialization Rate Benchmark will not be eligible to submit a proposal for a Phase I (or Direct-to-Phase II) award for a period of one year, beginning from the determination date (June 1).

Companies that fail to meet either of the benchmarks under the Increased Performance Standards for more Experienced Firms may not receive more than 20 total Phase I awards and Direct-to-Phase II awards from each Federal agency during the 1-year period beginning on the date of determination (June 1).

Section 3 of the SBIR/STTR Policy Directive defines a Federal Agency as follows:

- (o) **Federal Agency.** An executive agency as defined in 5 U.S.C. § 105, and a military department as defined in 5 U.S.C. 102 (Department of the Army, Department of the Navy, Department of the Air Force), except that it does not

include any agency within the Intelligence Community as defined in Executive Order 12333, § 3.4(f), or its successor orders.

Notification

SBA will notify companies failing either of the benchmarks and the relevant officials at the participating agencies. The information on the companies will not be available to the public, but a confidential list of companies failing the benchmarks are required to be submitted to Congress.

To provide companies with advance warning, SBA notifies companies on April 1 if they are failing any of the benchmark(s). This notification also instructs companies to review the information available on SBIR.gov and to create or update its company commercialization report to ensure SBA utilizes the most complete and accurate data prior to the official assessment date. Companies identifying inaccuracies may provide feedback through the SBIR.gov helpdesk <https://www.sbir.gov/feedback>. Companies should review and provide any feedback early, to ensure modifications are able to be addressed well in advance of the June 14th deadline.

Because the performance benchmark requirements only affect a company's eligibility for new Phase I (or Direct-to-Phase II) awards, a company that fails to meet any of the required benchmarks may continue working on its current or ongoing SBIR/STTR awards and may apply for and receive new Phase II and Phase III awards.

Performance Benchmarks: General information on the Performance Benchmark requirements is available at <https://www.sbir.gov/performance-benchmarks>.

1.04 Contact with NIST

For general programmatic, electronic submission or grants questions, please contact the appropriate individual:

Subject Area	Point of Contact
Programmatic Questions	Sarah Hughes Phone: (303) 358-0937 E-mail: sarah.hughes@chips.gov or Tracey Smith Phone: (240) 309-8835 E-mail: tracey.smith@chips.gov

Electronic Application Submission through Grants.gov	Grants.gov (800) 518-4726 E-mail: support@grants.gov
Grant Rules and Regulations	Dean Iwasaki Phone: (301) 975-8449 E-mail: dean.iwasaki@nist.gov

Applicants may also contact the NIST Hollings Manufacturing Extension Partnership (MEP) for technical assistance with application preparation. More information on obtaining technical assistance from MEP Centers for application preparation can be found in Section 5.13 of this NOFO.

1.05 Definitions

(a) General Definitions

Except as specifically noted by citation or reference, all definitions below are excerpted from the [SBA SBIR/STTR Policy Directive](#).

Applicant – The organizational entity that qualifies as an SBC at all pertinent times and that submits a contract proposal or a grant application for a funding agreement under the SBIR/STTR Programs.

Awardee – The organizational entity that receives an SBIR or STTR Phase I, Phase II, or Phase III award. An “SBIR/STTR Awardee.”

Commercialization – The process of developing products, processes, technologies, or services and the production and delivery (whether by the originating party or others) of the products, processes, technologies, or services for sale to or use by the Federal government or commercial markets.

Contract, see 2 C.F.R. § 200.1 – For the purpose of Federal financial assistance, a legal instrument by which a recipient or subrecipient purchases property or services needed to carry out the project or program under a Federal award. For additional information on subrecipient and contractor determinations, see 2 C.F.R. [§ 200.331](#).

Cooperative Agreement, see 31 CFR §§ 6302 and 6305 – A legal instrument of financial assistance between a Federal awarding agency and a recipient or a pass-through entity and a subrecipient that is consistent with 31 U.S.C. §§ [6302](#), [6305](#):

- (1) Is used to enter into a relationship the principal purpose of which is to transfer anything of value to carry out a public purpose of support or stimulation authorized by a law of the United States (see [31 U.S.C. § 6101\(3\)](#)); and not to acquire property or services for the Federal Government or pass-through entity's direct benefit or use;
- (2) Is distinguished from a grant in that it provides for substantial involvement of the Federal awarding agency in carrying out the activity contemplated by the Federal award.

Covered Individual, see 15 U.S.C. § 638(e)(15) – An individual who—

- (1) contributes in a substantive, meaningful way to the scientific development or execution of a research and development project proposed to be carried out with a research and development award from a Federal research agency; and
- (2) is designated as a covered individual by the Federal research agency concerned.

Essentially Equivalent Work – Work that is substantially the same research, which is proposed for funding in more than one contract proposal or grant application submitted to the same Federal agency, or submitted to two or more different Federal agencies for review and funding consideration; or work where a specific research objective and the research design for accomplishing the objective are the same or closely related to another proposal or award, regardless of the funding source.

Federally Funded Award – A Phase I, Phase II (including a Phase II award under subsection (cc)), or Phase III SBIR or STTR award made using a funding agreement.

Foreign Affiliation, see 15 U.S.C. § 638(e)(16) – A funded or unfunded academic, professional, or institutional appointment or position with a foreign government or government-owned entity, whether full-time, part-time, or voluntary (including adjunct, visiting, or honorary).

Foreign Entity of Concern, The term “foreign entity of concern” has the meaning given to it under 15 U.S.C. § 4651(8) and 15 C.F.R. § 231.104 (see 88 Fed. Reg. 65,600, 65,616 (Sept. 25, 2023)). This meaning includes any foreign person or entity that is “owned by, controlled by, or subject to the jurisdiction or direction of a government of a foreign country” that is a covered nation under 10 U.S.C. § 4872(d) (i.e., China, Iran, North Korea, and Russia), where:

- The person or entity is a citizen, national, or resident of a foreign country listed in 10 U.S.C. § 4872(d) and is located in a foreign country listed in 10 U.S.C. § 4872(d);
- The person or entity is organized under the laws of or has its principal place of business in a foreign country listed in 10 U.S.C. § 4872(d);
- At least 25 percent of the person or entity’s outstanding voting interest, board seats, or equity interest is held directly or indirectly by the government of a foreign country listed in 10 U.S.C. § 4872(d); or
- At least 25 percent of the person or entity’s outstanding voting interest, board seats, or equity interest is held directly or indirectly by any combination of the persons or entities who fall within subsections (1)-(3).

Foreign Country of Concern, see 15 U.S.C. § 638(e)(17) – The term “foreign country of concern” has the meaning given to it under 15 U.S.C. § 4651(7) and 15 C.F.R. § 231.102 (see 88 Fed. Reg. 65,600, 65,615 (Sept. 25, 2023)). Those provisions provide that a “foreign country of concern” means “a country that is a covered nation” under 10 U.S.C. §4872(d) (i.e., China, Iran, North Korea, and Russia) and “any country that the Secretary [of Commerce], in consultation with the Secretary of Defense, the Secretary of State, and the Director of National Intelligence, determines to be engaged in conduct that is detrimental to the national security or foreign policy of the United States.”

Funding Agreement – Any contract, grant, or cooperative agreement entered into between any Federal agency and any SBC for the performance of experimental, developmental, or research work, including products or services, funded in whole or in part by the Federal Government.

Joint Venture – [See 13 C.F.R. § 121.103\(h\)](#).

Malign Foreign Talent Recruitment Program, see 15 U.S.C. § 638(e)(18), citing 42 U.S.C. § 19237 – Is –

- (1) Any program, position, or activity that includes compensation in the form of cash, in-kind compensation, including research funding, promised future

compensation, complimentary foreign travel, things of non de minimis value, honorific titles, career advancement opportunities, or other types of remuneration or consideration directly provided by a foreign country at any level (national, provincial, or local) or their designee, or an entity based in, funded by, or affiliated with a foreign country, whether or not directly sponsored by the foreign country, to the targeted individual, whether directly or indirectly stated in the arrangement, contract, or other documentation at issue, in exchange for the individual—

- (i) engaging in the unauthorized transfer of intellectual property, materials, data products, or other nonpublic information owned by a United States entity or developed with a Federal research and development award to the government of a foreign country or an entity based in, funded by, or affiliated with a foreign country regardless of whether that government or entity provided support for the development of the intellectual property, materials, or data products;
- (ii) being required to recruit trainees or researchers to enroll in such program, position, or activity;
- (iii) establishing a laboratory or company, accepting a faculty position, or undertaking any other employment or appointment in a foreign country or with an entity based in, funded by, or affiliated with a foreign country if such activities are in violation of the standard terms and conditions of a Federal research and development award;
- (iv) being unable to terminate the foreign talent recruitment program contract or agreement except in extraordinary circumstances;
- (v) through funding or effort related to the foreign talent recruitment program, being limited in the capacity to carry out a research and development award or required to engage in work that would result in substantial overlap or duplication with a Federal research and development award;
- (vi) being required to apply for and successfully receive funding from the sponsoring foreign government's funding agencies with the sponsoring foreign organization as the recipient;
- (vii) being required to omit acknowledgment of the recipient institution with which the individual is affiliated, or the Federal research agency sponsoring the research and development award, contrary to the institutional policies or standard terms and conditions of the Federal research and development award;
- (viii) being required to not disclose to the Federal research agency or employing institution the participation of such individual in such program, position, or activity; or
- (ix) having a conflict of interest or conflict of commitment contrary to the

standard terms and conditions of the Federal research and development award; and

- (2) a program that is sponsored by—
- (i) a foreign country of concern or an entity based in a foreign country of concern, whether or not directly sponsored by the foreign country of concern;
 - (ii) an academic institution on the list developed under section 1286(c)(8) of the John S. McCain National Defense Authorization Act for Fiscal Year 2019 (10 U.S.C. 2358 note; Public Law 115-232); or
 - (iii) a foreign talent recruitment program on the list developed under section 1286(c)(9) of the John S. McCain National Defense Authorization Act for Fiscal Year 2019 (10 U.S.C. § 2358 note; Public Law 115-232).

Research or Research and Development (R/R&D) – Any activity that is:

- (1) a systematic study directed toward greater knowledge or understanding of the subject studied;
- (2) a systematic study directed specifically toward applying knowledge and innovation to meet a recognized but unmet need; or
- (3) a systematic application of knowledge and innovation toward the production of useful materials, devices, and systems or methods, including design, development, and improvement of prototypes and new processes to meet specific requirements.

Small Business Concern (SBC) – A concern that meets the SBIR/STTR program eligibility requirements set forth in 13 C.F.R. § 121.702, “What size and eligibility standards are applicable to the SBIR and STTR programs?” (available at https://www.ecfr.gov/cgi-bin/text-idx?SID=3ccaf429aac93292cdf7afdc1689514e&mc=true&node=se13.1.121_1702&rqn=dv8).

Socially and Economically Disadvantaged SBC (SDB) – See [13 C.F.R. Part 124](#), Subpart B.

Socially and Economically Disadvantaged Individual – See [13 C.F.R. §§ 124.103](#) and [124.104](#).

Subaward, 2 CFR § 200.1 – An award provided by a pass-through entity to a

subrecipient for the subrecipient to carry out part of a Federal award received by the pass-through entity. It does not include payments to a contractor or payments to an individual that is a beneficiary of a Federal program. A subaward may be provided through any form of legal agreement, including an agreement that the pass-through entity considers a contract.

Women-Owned Small Business (WOSB) – An SBC that is at least 51% owned by one or more women, or in the case of any publicly owned business, at least 51% of the stock is owned by women, and women control the management and daily business operations.

(b) Definitions related to rights in data developed under the SBIR program. These definitions are also included in Section 5.04.02 of this NOFO.

All definitions below are excerpted from the [SBA SBIR/STTR Policy Directive](#).

Computer Database – A collection of data recorded in a form capable of being processed by a computer. The term does not include Computer Software.

Computer Programs – A set of instructions, rules, or routines recorded in a form that is capable of causing a computer to perform a specific operation or series of operations.

Computer Software -- Computer programs, source code, source code listings, object code listings, design details, algorithms, processes, flow charts, formulae, and related material that would enable the software to be reproduced, recreated, or recompiled. Computer Software does not include Computer Databases or Computer Software Documentation.

Computer Software Documentation - Owner's manuals, user's manuals, installation instructions, operating instructions, and other similar items, regardless of storage medium, that explain the capabilities of the Computer Software or provide instructions for using the software.

Data - All recorded information, regardless of the form or method of recording or the media on which it may be recorded. The term does not include information incidental to contract or grant administration, such as financial, administrative, cost or pricing or management information.

Form, Fit, and Function Data – Data relating to items, components, or processes that are

sufficient to enable physical and functional interchangeability, and data identifying source, size, configuration, mating and attachment characteristics, functional characteristics, and performance requirements. For Computer Software it means data identifying source, functional characteristics, and performance requirements, but specifically excludes the source code, algorithms, processes, formulas, and flow charts of the software.

Government Purpose – Any activity in which the United States Government is a party, including cooperative agreements with international or multi-national defense organizations or sales or transfers by the United States Government to foreign governments or international organizations. Government Purposes include competitive procurement, but do not include the rights to use, modify, reproduce, release, perform, display, or disclose Technical Data or Computer Software for commercial purposes or authorize others to do so.

Operations, Maintenance, Installation, or Training Purposes (OMIT) Data – Data that is necessary for operation, maintenance, installation, or training purposes (but not including detailed manufacturing or process data).

SBIR/STTR Computer Software Rights – The Federal Government’s rights during the SBIR/STTR Protection Period in specific types of SBIR/STTR Data that are Computer Software.

(1) The Federal Government may use, modify, reproduce, release, perform, display, or disclose SBIR/STTR Data that are Computer Software within the Government. The Federal Government may exercise SBIR/STTR Computer Software Rights within the Government for:

(i) Use in Federal Government computers;

(ii) Modification, adaptation, or combination with other Computer Software, provided that the Data incorporated into any derivative software are subject to the rights in § 3(ee) of the SBIR/STTR Policy Directive and that the derivative software is marked as containing SBIR/STTR Data;

(iii) Archive or backup; or

(iv) Distribution of a computer program to another Federal agency, without further permission of the Awardee, if the Awardee is notified of the distribution and the identity of the recipient prior to the distribution, and a copy of the SBIR/STTR Computer Software Rights included in the Funding Agreement is provided to the recipient.

- (2) The Federal Government shall not release, disclose, or permit access to SBIR/STTR Data that is Computer Software for commercial, manufacturing, or procurement purposes without the written permission of the Awardee. The Federal Government shall not release, disclose, or permit access to SBIR/STTR Data outside the Government without the written permission of the Awardee unless:
- (i) The non-Governmental entity has entered into a non-disclosure agreement with the Government that complies with the terms for such agreements outlined in § 8 of the SBIR/STTR Policy Directive; and
 - (ii) The release or disclosure is—
 - (A) To a Federal Government support service contractor or their subcontractor for purposes of supporting Government internal use or activities, including evaluation, diagnosis and correction of deficiencies, and adaptation, combination, or integration with other Computer Software provided that SBIR/STTR Data incorporated into any derivative software are subject to the rights in § 3(ee) of the SBIR/STTR Policy Directive; or
 - (B) Necessary to support certain narrowly-tailored essential Government activities for which law or regulation permits access of a non-Government entity to a contractors' data developed exclusively at private expense, non-SBIR/STTR Data, such as for emergency repair and overhaul.

SBIR/STTR Data - All Data developed or generated in the performance of an SBIR or STTR award, including Technical Data and Computer Software developed or generated in the performance of an SBIR or STTR award. The term does not include information incidental to contract or grant administration, such as financial, administrative, cost or pricing or management information.

SBIR/STTR Data Rights - The Federal Government's license rights in properly marked SBIR/STTR Data during the SBIR/STTR Protection Period are as follows: SBIR/STTR Technical Data Rights in SBIR/STTR Data that are Technical Data or any other type of Data other than Computer Software; and SBIR/STTR Computer Software Rights in SBIR/STTR Data that is Computer Software. Upon expiration of the protection period for SBIR/STTR Data, the Federal Government has a royalty free license to use, and to authorize others to use on its behalf, these data for Government Purposes, and is

relieved of all disclosure prohibitions and assumes no liability for unauthorized use of these data by third parties. The Federal Government receives Unlimited Rights in Form Fit, and Function Data, OMIT Data, and all unmarked SBIR/STTR Data.

SBIR/STTR Protection Period - The period of time during which the Federal Government is obligated to protect SBIR/STTR Data against unauthorized use and disclosure in accordance with SBIR/STTR Data Rights. The SBIR/STTR Protection Period begins at award of an SBIR/STTR Funding Agreement and ends not less than twenty years from that date (See § 8(b)(4) of the SBIR/STTR Policy Directive).

SBIR/STTR Technical Data Rights - The Federal Government's rights during the SBIR/STTR Protection Period in SBIR/STTR Data that are Technical Data or any other type of Data other than Computer Software.

- (1) The Federal Government may, use, modify, reproduce, perform, display, release, or disclose SBIR/STTR Data that are Technical Data within the Government; however, the Government shall not use, release, or disclose the data for procurement, manufacturing, or commercial purposes; or release or disclose the SBIR/STTR Data outside the Government except as permitted by paragraph (2) below or by written permission of the Awardee.
- (2) SBIR/STTR Data that are Technical Data may be released outside the Federal Government without any additional written permission of the Awardee only if the non-Governmental entity or foreign government has entered into a non-disclosure agreement with the Federal Government that complies with the terms for such agreements outlined in § 8 of the SBIR/STTR Policy Directive and the release is:
 - (i) Necessary to support certain narrowly tailored essential Government activities for which law or regulation permits access of a non-Government entity to a contractors' data developed exclusively at private expense, non-SBIR/STTR Data, such as for emergency repair and overhaul;
 - (ii) To a Government support services contractor in the performance of a Government support services contract for internal Government use or activities, including evaluation, diagnosis, or modification, provided that SBIR/STTR Technical Data incorporated into any derivative Data are subject to the rights in § 3(ii) of the SBIR/STTR Policy Directive, and the release is not for commercial purposes or manufacture;

- (iii) To a foreign government for purposes of information and evaluation if required to serve the interests of the U.S. Government; or
- (iv) To non-Government entities or individuals for purposes of evaluation.

Technical Data - Recorded information, regardless of the form or method of the recording, of a scientific or technical nature (including Computer Software Documentation and Computer Databases). The term does not include Computer Software or financial, administrative, cost or pricing, or management information, or other data incidental to contract or grant administration. The term includes recorded Data of a scientific or technical nature that is included in Computer Databases.

Unlimited Rights - The Government's rights to access, use, modify, prepare derivative works, reproduce, release, perform, display, disclose, or distribute Data in whole or in part, in any manner and for any purpose whatsoever, and to have or authorize others to do so.

1.06 Fraud, Waste and Abuse

As defined in section 9(f) of the SBIR/STTR Policy Directive, fraud includes any false representation about a material fact or any intentional deception designed to deprive the United States unlawfully of something of value or to secure from the United States a benefit, privilege, allowance, or consideration to which an individual or business is not entitled. Waste includes extravagant, careless, or needless expenditure of Government funds, or the consumption of Government property, that results from deficient practices, systems, controls, or decisions. Abuse includes any intentional or improper use of Government resources, such as misuse of rank, position, or authority or resources.

Examples of fraud, waste, and abuse relating to the SBIR/STTR Program include, but are not limited to:

- (i) misrepresentations or material, factual omissions to obtain, or otherwise receive funding under, an SBIR/STTR award;
- (ii) misrepresentations of the use of funds expended, work done, results achieved, or compliance with program requirements under an SBIR/STTR award;
- (iii) misuse or conversion of SBIR/STTR award funds, including any use of award funds while not in full compliance with SBIR/STTR Program requirements, or failure to pay taxes due on misused or converted SBIR/STTR award funds;

- (iv) fabrication, falsification, or plagiarism in applying for, carrying out, or reporting results from an SBIR/STTR award;
- (v) failure to comply with applicable federal costs principles governing an award;
- (vi) extravagant, careless, or needless spending;
- (vii) self-dealing, such as making a sub-award to an entity in which the Principal Investigator (PI) has a financial interest;
- (viii) acceptance by agency personnel of bribes or gifts in exchange for grant or contract awards or other conflicts of interest that prevents the Government from getting the best value; and
- (ix) lack of monitoring, or follow-up if questions arise, by agency personnel to ensure that awardee meets all required eligibility requirements, provides all required certifications, performs in accordance with the terms and conditions of the award, and performs all work proposed in the application.

Report any allegations of fraud, waste and abuse using the online Department of Commerce Office of the Inspector General [Online Complaint Form](#). Contact information for the Office of Inspector General is available at: <https://www.oig.doc.gov/pages/Contact-Us.aspx>. Please do not include Personally Identifiable Information (PII) through the website. PII is considered to be items containing Social Security numbers, dates of birth, credit card and passport numbers, or other personally identifying information that could adversely affect an individual. Should you desire to provide this information, it is strongly recommended that you contact the Hotline by telephone at the number listed below.

Phone:

Toll Free 800-424-5197

Mail:

Office of Inspector General Hotline
HCHB 7709
1401 Constitution Avenue, N.W.
Washington, DC 20230

1.07 Other Information

1.07.01 Personal and Business Information

The applicant acknowledges and understands that information and data contained in applications for financial assistance, as well as information and data contained in financial, performance, and other reports submitted by applicants, may be used by the Department of Commerce in conducting reviews and evaluations of its financial assistance programs. For this purpose, applicant information and data may be accessed, reviewed, and evaluated by Department of Commerce employees, other Federal employees, and also by Federal agents and contractors, and/or by non-Federal personnel, all of whom enter into appropriate conflict of interest and confidentiality agreements covering the use of such information. As may be provided in the terms and conditions of a specific financial assistance award, applicants are expected to support program reviews and evaluations by submitting required financial and performance information and data in an accurate and timely manner and by cooperating with Department of Commerce and external program evaluators. In accordance with 2 C.F.R. § 200.303(e), applicants are reminded that they must take reasonable measures to safeguard protected personally identifiable information and other confidential or sensitive personal or business information created or obtained in connection with a Department of Commerce financial assistance award.

In addition, Department of Commerce regulations implementing the Freedom of Information Act (FOIA), 5 U.S.C. § 552, are found at 15 C.F.R. Part 4, Public Information. These regulations set forth rules for the Department regarding making requested materials, information, and records publicly available under the FOIA. Applications submitted in response to this Notice of Funding Opportunity may be subject to requests for release under the Act. In the event that an application contains information or data that the applicant deems to be confidential commercial information that should be exempt from disclosure under FOIA, that information should be identified, bracketed, and marked as Privileged, Confidential, Commercial or Financial Information. In accordance with 15 C.F.R. § 4.9, the Department of Commerce will protect from disclosure confidential business information contained in financial assistance applications and other documentation provided by applicants to the extent permitted by law.

2.0 CERTIFICATIONS, CURRENT AND PENDING SUPPORT FORM, RESEARCH SECURITY REVIEW, AND RESEARCH INVOLVING HUMANS OR ANIMALS

2.01 Due Diligence Certification and Current and Pending Support Form

[The SBIR and STTR Extension Act of 2022 \(the Act\)](#), Pub. L. 117-183, requires that all

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FY 2024 SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM
FOR CHIPS FOR AMERICA – CHIPS METROLOGY

NOTICE OF FUNDING OPPORTUNITY No. 2024-SBIR-CHIPS-01

April 16, 2024

agencies funding SBIR awards, including NIST, establish a due diligence program to assess security risks presented by small business concerns seeking a federally funded SBIR award. Specifically, NIST must assess the “cybersecurity practices, patent analysis, employee analysis, and foreign ownership of a small business concern seeking an award, including any financial ties and obligations (which shall include surety, equity, and debt obligations) of the small business concern and [its] employees . . . to a foreign country, foreign person, or foreign entity. . . ”. [15 U.S.C. § 638\(vv\)\(2\)](#). NIST is prohibited from funding awards to businesses with specified relationships and commitments described in [15 U.S.C. § 638\(g\)\(15\)\(A\)](#) to foreign countries of concern that are determined to fall into one of the categories listed in [15 U.S.C. § 638\(g\)\(15\)\(B\)](#).

As a result of these statutory requirements, all applicants must complete a certification that discloses the ownership, financial ties, technology licensing or intellectual sales, and other affiliations, as specified in [15 U.S.C. § 638\(g\)\(13\)](#), to the People’s Republic of China, the Democratic People’s Republic of Korea, the Russian Federation, the Islamic Republic of Iran, and/or any other country determined to be a country of concern by the Secretary of State of concern prior to award, and as required during the life of the funding agreement. The Required Disclosures of Foreign Affiliations or Relationships to Foreign Countries is available in Appendix C of this NOFO.

A related requirement is for each “covered individual” to complete a Current and Pending Support Form (see 8.01.14). 15 U.S.C. § 638(e)(15) defines the term “covered individual” as “an individual (A) who contributes to a substantive, meaningful way to the scientific development or execution of a research and development project proposed to be carried out with a research and development award from a Federal research agency; and (B) is designated as a covered individual by the Federal research agency concerned.”

Covered individuals include the principal investigator, co-investigators, and associate investigators and any individual listed by the applicant as a “key individual” under Sections 3.04.02.(6) or as a “Senior/Key Person” in Section 8.01.8(a) of this NOFO or for whom a resume or CV is provided under section 8.01.7. Personnel who participate only through isolated tasks that are incidental to the research (for example, setting up equipment or performing administrative functions), and those individuals who support research by executing discrete tasks as directed are not covered individuals.

In identifying the key individuals for the Technical Content required under Section 3.04.02, the applicant must provide a brief description (title or one-sentence summary) of the role to be served by each.

[2.02 Prohibition Against Awards to a Foreign Entity of Concern](#)

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Pursuant to 15 U.S.C. § 4657, none of the funds awarded under this NOFO may be provided to a foreign entity of concern, as defined in 15 U.S.C. § 4651 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. Foreign entities of concern are also ineligible to participate in an award under this NOFO as unfunded collaborators.

2.03 Cyber Security Education and Training Requirements for Phase I and Phase II Awardees.

As is stated above in Section 2.01 of this NOFO, the Act requires that each due diligence program assess security risks presented by small business concerns seeking a federally funded award, as follows:

(A) assess, using a risk-based approach as appropriate, the cybersecurity practices, patent analysis, employee analysis, and foreign ownership of a small business concern seeking an award, including the financial ties and obligations (which shall include surety, equity, and debt obligations) of the small business concern and employees of the small business concern to a foreign country, foreign person, or foreign entity; and

(B) assess awards and proposals or applications, as applicable, using a risk-based approach as appropriate, including through the use of open-source analysis and analytical tools, for the nondisclosures of information required under (g)(13).

To meet the requirements of Sections (A) and (B) of the Act, Phase I and Phase II awardees receiving SBIR awards from NIST will be required to complete the following due diligence education and training activities.

2.03.01 Phase I Cybersecurity Activities

- a. Training Videos on Mitigation Techniques. The NIST SBIR Program Office will require Phase I awardees to watch the Department of Defense's [Cyber Attacks, the Insider Threat](#) and the Defense Counterintelligence and Security Agency's [Cybersecurity Awareness](#). Both videos outline mitigation techniques for cyber-attacks and guidelines to help ensure that employees and the workplace are following proper cyber security mitigation practices. Individual(s) who manage the IT system(s) of the small business should watch these videos. The NIST SBIR homepage will be updated to include these links.

- b. Cybersecurity Awareness Training. NIST also will require Phase I awardees to attend [Cybersecurity Awareness Training](#) hosted by the Defense Counterintelligence and Security Agency's Center for Development of Security Excellence. This informative training is part of the Office of the Director of National Intelligence's (ODNI's) Safeguarding Science Toolkit and has a printable guide. The certificate generated at the completion of the training shall be submitted to the NIST SBIR Program Office no later than 30 days after receipt of award.

2.03.02 Phase II Cybersecurity Activities

- a. NIST Phase II awards are focused on the implementation of the proof-of-concept and development of a prototype. Phase II work must be completed within twenty-four months and is typically funded up to \$1,910,000. Due to the increased complexity of this work, Phase II awards are considered higher risk than Phase I, and, therefore, Phase II awardees will be required to complete the cybersecurity training listed below.
- b. Phase II awardees shall complete the three part [Cyber Training Series](#) within 90 days of receiving the notification of recommendation of award for Phase II. This series is part of the [Safeguarding Science](#) initiative, which also is sponsored by the ODNI and recommended by the Federal Bureau of Investigation (FBI). The series has three interactive modules presenting cyber information, with each module followed by a brief quiz pertaining to the content presented. Following each quiz, the participant attending the training shall take a screenshot of the quiz results and send to the NIST SBIR Program Office for confirmation of completion.

2.04 Due Diligence/Research Security Review and Risk Determination

The NIST Research Security Team will conduct a research security review and a risk determination of applications likely to be selected for award. During the review of the application, NIST will use [NIST IR 8484](#) as the basis for reviewing and assessing research security risks. In conducting this review, NIST will review available information, (e.g., the Due Diligence Certification (Appendix C), the Technical Content, the Current and Pending Support Form and Resume or CV).

2.05 Funding Agreement Certification

Awardees will be required to certify size, ownership and other SBIR Program requirements at the time of award and during the funding agreement life cycle, using the SBIR Funding Agreement Certification and SBIR Funding Agreement Certification – Life-Cycle Certification, which are provided in Appendix B of this NOFO.

2.06 Research Activities Involving Human Subjects and Human Tissue, and/or Data or Recordings Including Software Testing

This section summarizes the requirements for applications that potentially involve research involving human subjects. Additional information that describes the NIST review process for such applications and provides details regarding the documentation required is available here: <https://www.nist.gov/oaam/nist-notice-funding-opportunity-requirements-human-subjects-and-live-vertebrate-animal>. Both this summary and the additional information provided at the link will be incorporated into any award made under this NOFO.

Any application that includes research activities involving human subjects, human tissue/cells, or data or recordings from or about human subjects, including software testing, must satisfy the requirements of the Common Rule for the Protection of Human Subjects (Common Rule), codified for the Department of Commerce at [15 C.F.R. Part 27](#).¹ Research activities involving human subjects that fall within one or more of the classes of vulnerable subjects found in [45 C.F.R. Part 46](#), Subparts [B](#), [C](#) and [D](#) must satisfy the requirements of the applicable subpart(s). In addition, any such application that includes research activities on these subjects must comply with all applicable statutory requirements imposed upon the Department of Health and Human Services (DHHS) and other Federal agencies, all regulations, policies and guidance adopted by DHHS, the [Food and Drug Administration \(FDA\)](#), and other Federal agencies on these topics, and all Executive Orders and Presidential statements of policy on applicable topics. The [website of the Office of Human Research Protection](#) (OHRP) in the DHHS contains the applicable regulatory, policy and guidance and (includes links to [FDA](#), but may not include all applicable FDA regulations and policies.

If the application is accepted for [or awarded] funding, organizations that have an Institutional Review Board (IRB) are required to follow the procedures of their organization for approval of exempt and non-exempt research activities that involve human subjects. The IRB must be currently registered with OHRP that is linked to the engaged organization. Organizations that do not have an IRB must demonstrate the ability to expeditiously contract with a commercial IRB to conduct a review of the

¹ NIST uses the Common Rule definitions for research and human subjects research contained in 15 C.F.R. § 27.102.

proposed activities. Also, all engaged organizations must possess a currently valid Federalwide Assurance (FWA) on file from OHRP. The NIST IRB is unable to serve as the IRB for financial assistance recipients.

The NIST Research Protections Office (RPO) reserves the right to conduct an administrative review of all applications that potentially include research involving human subjects and were approved by an authorized non-NIST institutional entity (an IRB or entity analogous to the NIST RPO) under 15 C.F.R. [§ 27.112](#) (Review by Institution). Conducting an “administrative review” means that the NIST RPO will review and verify the performing institution’s determinations made under the Common Rule and all documentation that support such determinations.

All applications involving human subjects research must clearly indicate, by separable task, all research activities believed to be exempt or non-exempt research involving human subjects, the expected institution(s) where the research activities involving human subjects may be conducted, and the institution(s) expected to be engaged in the research activities. Some documents may be requested for a pre-review during the proposal review process; however, the Grants Officer may allow final versions of certain required documents to be produced at an appropriate designated time post-award. If an award is issued, no research activities involving live vertebrate animals shall be initiated or costs incurred for those activities under the award until the NIST Grants Officer issues written approval. In addition, all re-approvals, amendments, modifications, changes, annual reports, and closure will be reviewed by NIST.

This summary and the information provided here <https://www.nist.gov/oaam/nist-notice-funding-opportunity-requirements-human-subjects-and-live-vertebrate-animal> reflect the existing NIST policy and requirements for Research Involving Human Subjects. Should the policy be revised prior to award, a clause reflecting the policy current at time of award may be incorporated into the award. If the policy is revised after award, a clause reflecting the updated policy may be incorporated into the award.

For more information regarding research projects involving human subjects, contact Anne Andrews, Director, NIST Research Protections Office (e-mail: anne.andrews@nist.gov; phone: (301) 975-5445).

2.07 Research Activities Involving Live Vertebrate Animals or Pre-Existing Cell Lines/Tissues From Vertebrate Animals

This section summarizes the requirements for applications that potentially involve research involving live vertebrate animals or pre-existing cell lines or tissues from vertebrate animals. Additional information that describes the NIST review process for

such applications and provides details regarding the documentation required is available here: <https://www.nist.gov/oaam/nist-notice-funding-opportunity-requirements-human-subjects-and-live-vertebrate-animal>. Both this summary and the additional information provided at the link will be incorporated into any award made under this NOFO.

Any application that proposes research activities involving live vertebrate animals that are to be cared for, euthanized, or used by award recipients to accomplish research goals, teaching, or testing must meet the requirements of the Animal Welfare Act (AWA) ([7 U.S.C. § 2131](#) et seq.), and the AWA final rules (9 C.F.R. Parts [1](#), [2](#), and [3](#)), and if appropriate, the Good Laboratory Practice for Nonclinical Laboratory Studies ([21 C.F.R. Part 58](#)). In addition, such research activities should be in compliance with the [“U.S. Government Principles for Utilization and Care of Vertebrate Animals Used in Testing, Research, and Training”](#) (Principles).

NIST reserves the right to conduct an administrative review of all applications that potentially include research activities that involve live vertebrate animals, or custom samples from, or field studies with live vertebrate animals. Conducting an “administrative review” means that the NIST RPO will review and verify the performing institution’s determinations made under the applicable legal and policy requirements and all documentation that support such determinations. Some documents may be requested for a pre-review during the proposal review process; however, the Grants Officer may allow final versions of certain required documents to be produced at an appropriate designated time post-award. If an award is issued, no research activities involving live vertebrate animals shall be initiated or costs incurred for those activities under the award until the NIST Grants Officer issues written approval. In addition, all re-approvals, amendments, modifications, changes, annual reports, and closure will be reviewed by NIST.

The applicant should clearly indicate in the application, by separable task, all research activities believed to include research involving live vertebrate animals and the institution(s) where the research activities involving live vertebrate animals may be conducted. In addition, the applicant should indicate any activity/task that involves an excluded or custom collection from vertebrate animals, or a field study with animals.

This summary and the information provided here <https://www.nist.gov/oaam/nist-notice-funding-opportunity-requirements-human-subjects-and-live-vertebrate-animal> reflect the existing NIST policy for Research Involving Live Vertebrate Animals. Should the policy be revised prior to award, a clause reflecting the policy current at time of award may be incorporated into the award. If the policy is revised after award, a clause reflecting the updated policy may be incorporated into the award.

For more information regarding research projects involving live vertebrate animals, contact Anne Andrews, Director, NIST Research Protections Office (e-mail: anne.andrews@nist.gov; phone: 301- 975-5445).

[2.08 Certifications Regarding Federal Felony and Federal Criminal Tax Convictions, Unpaid Federal Tax Assessments and Delinquent Federal Tax Returns](#)

In accordance with Federal appropriations law, an authorized representative of the selected applicant(s) may be required to provide certain pre-award certifications regarding federal felony and federal criminal tax convictions, unpaid federal tax assessments, and delinquent federal tax returns.

3.0 APPLICATION PREPARATION INSTRUCTIONS AND REQUIREMENTS

[3.01 Open Topics – Fast-Track Application Requirements: Phase I and Phase II](#)

Only FY 2024 Fast-Track applications covering both Phase I and Phase II (hereinafter referred to as “Fast-Track”) should be submitted in response to this NOFO. NIST will not be publishing a separate Phase II NOFO to separately request Phase II applications from those selected for Phase I awardees.

Both the Phase I and Phase II portions of the application, to be described in a single Technical Proposal narrative as given below, must sufficiently identify and clearly address a specific CHIPS Metrology Open Topic area that falls within one of the research areas described in Section 9.0. The research must be directed towards development of a commercial product or service in the CHIPS Metrology research and development areas, emphasizing measurements that are accurate, precise, and fit-for-purpose for the production of microelectronic materials, devices, circuits, and systems. The application must be self-contained and written with all the care and thoroughness of a scientific paper submitted for publication. It should indicate a thorough knowledge of the current status of research area addressed by the application. Each application should be checked carefully by the applicant to ensure inclusion of all essential material needed for a complete evaluation (see Sections 4.02 and 8.01).

The application must serve as the basis for technological innovation and lead to a new metrology commercial product, process, or service for the microelectronics industry that benefits the public.

NIST reserves the right to not submit an application for merit review if NIST determines that the application fails to comply with the administrative procedures as outlined in the

applicable Screening Criteria in Section 4.02 or is missing any of the required forms and documents listed in Section 8.01.

3.02 Closed Topics – Fast-Track or Phase II Application Requirements

Applicants for the Closed Topics (discussed in Section 2) with prior SBIR Phase I awards may submit a FY 2024 Phase II application in response to this NOFO. Or, FY 2024 Fast-Track applications covering both Phase I and Phase II (hereinafter referred to as “Fast-Track”) should be submitted in response to the Closed Topics in this NOFO. To reiterate, only applicants with related, successfully completed Phase I awards are eligible to submit a Phase II application to the Closed Topics. All other applicants should submit a Fast-Track application to the Closed Topics. NIST will not be publishing a separate Phase II NOFO to separately request Phase II applications from those selected for Phase I awards for the Closed Topics.

Fast-Track applications submitted in response to this NOFO must address requirements for both Phase I and Phase II. NIST will not publish a separate Phase II NOFO for this competition.

For either the Phase II application or the Fast-Track application, the proposal narrative, as described below must sufficiently identify and clearly address a specific CHIPS Metrology Closed Topic area in Section 9.2. The research must be directed towards development of a commercial product or service in the CHIPS Metrology research and development areas, emphasizing measurements that are accurate, precise, and fit-for-purpose for the production of microelectronic materials, devices, circuits, and systems. The application must be self-contained and written with all the care and thoroughness of a scientific paper submitted for publication. It should also demonstrate how their previous, successful completion of a Phase I award relates to the Phase I requirements addressed in the Closed Topic area. Each application should be checked carefully by the applicant to ensure inclusion of all essential material needed for a complete evaluation (see Sections 4.02 and 8.01).

The application must serve as the basis for technological innovation and lead to a new metrology commercial product, process, or service for the microelectronics industry that benefits the public.

NIST reserves the right to not submit an application for merit review if NIST determines that the application fails to comply with the administrative procedures as outlined in the applicable Screening Criteria in Section 4.02 or is missing any of the required forms and documents listed in Section 8.01.

3.03 SBA Data Collection Requirement

All applicants are required to provide certain information for inclusion into SBA's SBIR.gov database by completing the Company Commercialization Report (CCR). The CCR allows applicants to report funding outcomes resulting from prior SBIR and STTR awards. SBIR and STTR awardees are required by the SBIR Policy Directive to update and maintain their organization's CCR at www.SBIR.gov.

Each Phase II awardee is required to update appropriate information on the award in the database upon completion of the last program objective under the funding agreement and is requested to voluntarily update the information in the database annually thereafter for a minimum period of 5 years.

Applicants shall complete the CCR by logging into their company's existing account or register for a new account at www.SBIR.gov. Instructions for applicants to complete and include the CCR with its application are listed below.

1. Log into www.SBIR.gov.
2. Use the Login/Register prompt at the top of the home page to login to your existing account or to register and create a new account.
3. Navigate to My Dashboard > My Documents to view or print the information currently contained in the Company Registry Commercialization Report.
4. Create or update the commercialization record from the company dashboard by scrolling to the "My Commercialization" section and clicking the create/update Commercialization tab under "Current Report Version." Please refer to the "Instructions" and "Guide" documents contained in this section of the Dashboard for details on completing and updating the CCR. Ensure the report is certified and submitted.
5. Click the "Company Commercialization Report" PDF under the My Documents section of the dashboard to download a PDF of the CCR.
6. Submit your CCR along with the proposal documents listed in Section 8.01 Required Fast- Track Forms and Documents, of this NOFO.

3.04 Technical Proposal Application

A complete application must include a Technical Proposal (described below) and all other forms and documents listed in Section 8.01. An applicant may not submit multiple applications – **applications are limited to one proposal per SBC.**

The Technical Proposal, both the Cover Sheet and Technical Content, is **limited to 15 pages**. The only exception to the 15-page limit is for applicants covered by the provision

for Prior SBIR Phase II Awards (Section 3.04.02 (15)). Additional pages beyond the 15-page limit will not be considered in the evaluation process. Pages should be of standard size (8 1/2" x 11"; 21.6 cm x 27.9 cm) with margins of 2.5 cm and type at least 10-point font. All units of measurement should be presented in metric units.

The Technical Proposal portion of the application requires the following:

- (a) Cover Sheet (3.04.01) pages 1 and 2, and**
- (b) Technical Content (3.04.02) pages 3 through 15.**

The listing of all forms and documents needed to complete the application is given in Section 8.01 of this NOFO. The additional required forms and documents in Section 8.01 are not included in the 15-page count.

See Section 6.0 for information on the submission of applications in response to this NOFO.

3.04.01 Cover Sheet

A completed Cover Sheet (see Appendix A of this NOFO) is a required part of the Technical Proposal. The Cover Sheet is counted as pages 1 and 2 of the Technical Proposal.

If an applicant checks 'Yes' on #11, the applicant's contact information will be provided to the NIST Hollings Manufacturing Extension Partnership (MEP). Such applicants may be contacted by your local MEP Center to explore a wide range of services and initiatives to help identify potential opportunities to accelerate and strengthen growth and competitiveness in the global marketplace for small and medium-sized manufacturers, including business-related support services that could potentially benefit the applicant's proposed project.

The applicant must provide in the space available on the Cover Sheet an abstract (limited to 200 words) and summary of potential commercial application of the research results (limited to 100 words). Each applicant's abstract and summary of potential commercial applications will be provided to the SBA and should not contain proprietary information. Each awardee's abstract and summary of potential commercial applications will be published on the [NIST SBIR website](#) and www.sbir.gov.

3.04.02 Technical Content

Beginning on page 3 of the Technical Proposal, include the following items with headings as shown:

(1) **NIST CHIPS Metrology Program Area.** The first paragraph of the proposal must describe a research project that addresses either one of the path forward elements associated in the seven grand challenges (open topics) or one of the 10 closed topics identified in Section 9.0.

(2) **Identification and Significance of the Problem or Opportunity.** Make a clear statement of the specific research problem or opportunity addressed, its innovativeness, commercial potential, and why the research is important.

(3) **Phase I & II Technical Objectives and Preliminary Data.**

(a) Phase I Technical Objectives:

State the specific objectives of the Phase I effort, including the technical questions it will try to answer, to determine the feasibility of the proposed approach. Phase I objectives should specify clear, appropriate, measurable goals (milestones) to be achieved in Phase I prior to initiating Phase II. As appropriate, provide preliminary data that clearly support the technical and commercial feasibility.

If applying for a Phase II from this NOFO after a successful completion of a previous SBIR Phase I from NIST or another federal agency, or consideration for Phase II, submit the final technical report from NIST or another federal agency. Additionally, indicate if considering applying for a Phase II from another agency.

(b) Phase II Technical Objectives: State the specific objectives of the Phase II effort, including the technical questions it will try to answer, to determine the potential for commercial success of the proposed approach.

(4) **Phase I & II Work Plan.**

(a) Phase I Work Plan: Include a detailed description of the Phase I feasibility research plan. The plan should indicate what will be done, where it will be done, and how the research will be carried out. The method(s) planned to achieve each objective or task should be discussed in detail.

(b) Phase II Work Plan: Following the Phase I Work Plan, include a detailed description of the Phase II Work Plan. The plan should indicate what will be done, where it will be done, and how the research will be carried out. The method(s) planned to achieve each objective or task should be discussed in detail.

(5) **Related R/R&D.** Describe significant R/R&D that is directly related to the

application, including any conducted by the principal investigator or by the proposing SBC. Describe how it relates to the proposed effort and describe any planned coordination with outside sources. The applicant must persuade evaluators of his or her awareness of key, recent R/R&D conducted by others in the specific topic area.

- (6) **Key Individuals and Bibliography of Related Work.** Identify key individuals involved in Phase I, including a brief description of what each will contribute, their related education, experience, and publications. Where vitae are extensive, summaries that focus on the most relevant experience and publications are desired and may be necessary to meet application size limitations.
- (7) **Relationship with Future R/R&D.** Discuss the significance of the Phase I effort in providing a foundation for the Phase II R/R&D effort. Also state the anticipated commercial results of the proposed approach.
- (8) **Facilities and Equipment.** A description, availability, and location of instrumentation and physical facilities proposed for Phase I should be provided.
- (9) **Consultants, Contracts, and Subawards.** The purpose of this section is to show that any third-party research assistance would materially benefit the proposed effort and that arrangements for such assistance are in place at the time of the application submission.

For Phase I, a minimum of two-thirds of the research and/or analytical effort must be performed by the awardee. Outside involvement in the project is encouraged where it strengthens the conduct of the research. Outside involvement is not a requirement of this program and is limited to no more than one-third of the research and/or analytical effort in Phase I. The total cost for all consultant fees, facility leases, usage fees, and other subcontract/subaward or purchase agreements may not exceed one-third of the total award.

No individual or entity may serve as consultant, contractor, or subrecipient if they have been the recipient of any NIST information related to the research area that is not generally available to the public.

The applicant must also include Letters of Commitment from any participating consultants, subrecipients, or subcontractors. The Letters of Commitment are separate from the Technical Proposal and do not count against the page limit. See Section 8.01.16.

- (10) **Potential Commercial Application.** A primary SBIR program goal is to provide

opportunities for small businesses to convert research into technological innovation in the private sector. All proposed research should have a commercial outcome. Describe in detail the commercial potential of the proposed research, how commercialization would be pursued and potentially used by the private sector and/or the Federal Government. Include any optional letters of support and relevant supporting material such as references to journal articles, literature, or government publications. Provide any indicators of commercial potential and address the following:

- (a) Market opportunity – Describe the current and anticipated target market, the size of the market, and include a brief profile of the potential customer(s).
- (b) Technology and competition – Describe the competitive landscape, the value proposition and competitive advantage of the product or service enabled by the proposed innovation. Also include the critical milestones and pathway for commercial deployment of the proposed product or service.
- (c) Finances – Describe your strategy for financing the innovation beyond the SBIR award. Describe the existence of any outside, non-SBIR funding or partnering commitments including any Phase II funding commitments from private sector or non-SBIR funding sources and/or the existence of Phase III follow-on commitments for the subject research.
- (d) Benefits - Describe the anticipated commercial benefits of the resulting product or service.
- (e) Experience - Describe your record of commercializing SBIR or another research. Include any additional indicators of the commercial potential of the idea.

Awardees will need to submit a Commercial Viability and Domestic Production (CVDP) plan with their Phase I final report but do not need to include this information in the initial application.

- (11) **Cooperative Research and Development Agreements (CRADAs).** State if the applicant is a former or current CRADA partner with NIST, or with any other Federal agency, naming the agency, title of the CRADA, and any relationship with the proposed work. The statement of work of an SBIR award awarded under this NOFO cannot overlap with the statement of work of an existing CRADA with any federal agency, including NIST, with the awardee. NIST will consider whether there is any overlap on a case-by-case basis.

- (12) **Guest Researcher.** State if the applicant, any of the applicant's employees, or any of its consultants, contractors, or subrecipients or their employees is a domestic or foreign guest researcher at NIST (see <http://www.nist.gov/tpo/collaborations/guestresearchers.cfm>), naming the sponsoring NIST laboratory.
- (13) **Cost Sharing.** Cost sharing is not required and is not considered during the evaluation process for Phase I applications.
- (14) **Similar Applications or Awards. WARNING --** While it is permissible to submit identical applications or applications containing a significant amount of essentially equivalent work for consideration under numerous Federal program funding announcements, **it is unlawful to enter into a funding agreement requiring essentially equivalent work to an SBIR award (see 15 U.S.C. § 638(bb)(3)).** If there is any question concerning this, it must be disclosed to the soliciting agency or agencies before award.

If an application submitted in response to this NOFO is substantially the same as another application that has been funded, is now being funded, or is pending with another Federal Agency, the applicant must provide the following information:

- (a) Name and addresses of agencies to which and application was submitted or from which an award was received.
- (b) Date of application submission or date of award.
- (c) Title, number, and date of NOFO(s) under which an application was submitted or award received.
- (d) Specific applicable research topic(s) for each application submitted or award received.
- (e) Title of research projects for each application submitted or award received.
- (f) Name and title of principal investigator or project manager for each application submitted or award received.

If no equivalent application is under consideration or award for equivalent work received, a statement to that effect **must** be included in this section of the technical content area of the application.

- (15) **Prior SBIR Phase II Awards.** If the SBC has received more than 15 Phase II awards in the prior 5 fiscal years, the SBC must submit the following information in its Phase I application: name of the awarding agency; date of award; funding agreement number; amount of award; topic, subtopic, or research area title; follow-on agreement amount; source and date of commitment; and current commercialization status for each Phase II award. This required information will not be counted toward the 15-page Technical Proposal limitation.

4.0 METHOD OF SELECTION AND EVALUATION CRITERIA

4.01 Introduction

All applications will be evaluated and judged on a competitive basis. Applications will be initially screened to determine eligibility, completeness, and responsiveness to this NOFO (see Sections 4.02 and 8.01). Applications passing the initial screening will be evaluated in accordance with the evaluation criteria (see Section 4.03). Each application will be judged on its own merit.

NIST is under no obligation to fund any application or any specific number of applications in a given topic. NIST may elect to fund several or none of the applications for the same research area. If an application is submitted that requires a license to use a NIST-owned invention covered by a patent or patent application and such NIST-owned invention has become unavailable for licensing prior to the close of this NOFO in the field of use relevant to the application, NIST has the sole discretion to deem the application ineligible.

4.02 Fast-Track or Phase II Screening Criteria

Please carefully read the entire NOFO and review the following Screening Criteria to ensure that your application meets NIST requirements. Applications that do not clearly satisfy all nine (9) of the screening criteria will be eliminated from the review and selection process and not receive further consideration. However, NIST, in its sole discretion, may continue the review process for an application that is missing minor non-substantive information, the absence of which may easily be rectified.

The screening criteria are:

- (1) The application must be received by NIST before the deadline specified in Section 6.01.

- (2) The proposing firm must qualify as eligible according to the criteria provided in Section 1.03.
- (3) The Fast Track or Phase II application must include all required forms and documents listed in Section 8.01:
- i) SF-424 (R&R), Application for Federal Assistance
 - ii) Research and Related Budget (Total Fed + Non-Fed)
 - iii) CD-511, Certification Regarding Lobbying
 - iv) Research and Related Other Project Information
 - v) SF-LLL – Disclosure of Lobbying Activities (if applicable)
 - vi) Technical Content – see Section 3.04
 - a. Cover Sheet – see Section 3.04.01
 - b. Technical Proposal – see Section 3.04.02
 - vii) Resume(s) or CV(s) – see Section 8.01.7
 - viii) Budget Narrative and Justification – see Section 8.01.8
 - ix) Indirect Cost Rate Agreement – see Section 8.01.9
 - x) SBA Company Registry Form – see Section 8.01.10
 - xi) Data Management Plan -see Section 8.01.11
 - xii) Subaward Budget Form - see Section 8.01.12
 - xiii) Research and Related Personal Data – see Section 8.01.13
 - xiv) Current and Pending Support Form – see Section 8.01.14
 - xv) Compliance with SBIR Program Requirements, Applicant Fraud Awareness Training – Certificate of Training Completion – see Section 8.01.15
 - xvi) Letters of Commitment – see Section 8.01.16
 - xvii) Company Commercialization Report (CCR) – see Section 8.01.17
 - xviii) Appendix C. Required Disclosures or Relationships to Foreign Countries – see Section 8.01.18
- (4) The Technical Content must not exceed 15 pages including optional letters of support.
- (5) The application must be submitted under one of open topics or closed topics in Section 9 of this NOFO, Applicants’ proposals must clearly address either option selected.

(6) Budget:

- (a) Individual award amounts for Phase I awards may be up to \$283,500 with up to an additional \$6,500 for Technical and Business Assistance (TABAs), see section 5.12 for TABA information. For Phase I, a minimum of two-thirds of the research and/or analytical effort must be performed by the awardee. The total cost for all consultant fees, facility leases, usage fees, and other subcontract/subaward or purchase agreements may not exceed one-third of the total award (Section 1.03).
- (b) Individual award amounts for Phase 2 awards may be up to \$1,910,000 with up to \$50,000 for Technical and Business Assistance (TABAs). For Phase II, a minimum of one-half of the research and/or analytical effort and usage fees, and other subcontract/subaward or purchase agreements may not exceed one-half of the total award.

(7) Duration:

- (a) The feasibility research duration for the Phase I project must not exceed 6 months. A period of one (1) month is allotted after the six (6) month Phase I R&D duration for the awardee to prepare and submit the Phase I final report and Commercial Viability and Domestic Production plan.
- (b) The duration of R/R&D for the Phase II project must not exceed 24 months.
- (c) If an application is submitted that requires a license to use a NIST-owned invention covered by a patent or patent application, the relevant NIST-owned invention must be available for licensing prior to the close of this NOFO in the field of use relevant to the application.

- (8) The application must include the applicant's discussion regarding commercialization within the 15-page technical proposal (Sections 3.04.02(3) and 3.04.02.(10)); a separate Commercial Viability and Domestic Production plan is not required as part of the application.

4.03 Evaluation Criteria

Fast Track or Phase II applications that satisfy the screening criteria in Section 4.02 will proceed to a scored merit review process.

Merit Review. The applications will be evaluated by at least three (3) reviewers composed of NIST staff or non-federal personnel in accordance with the following

weighted criteria for a maximum of 100 points. Reviewers may discuss the applications with each other, but scores will be determined on an individual basis, not as a consensus. The reviewers will evaluate:

- (1) The degree to which the proposed technical approach is comprehensive, feasible, and demonstrates a clear understanding of the research area. (20 points)
- (2) The appropriateness of the qualifications and extent of the experience of the proposed principal/key investigators, supporting staff, and consultants as they relate to accomplishing the proposed research effort. In addition, reviewers will evaluate, as applicable, the extent to which the applicant has access to the facilities and equipment necessary to complete the proposed research. (5 points)
- (3) The likelihood that the proposed research program will lead to a successful product or service with a viable pathway for commercial deployment as described in the applicant's commercialization discussion. (30 points)
- (4) The magnitude of the anticipated commercial benefits of the resulting product or service. (25 points)
- (5) The extent to which the proposed commercial product or service enhances U.S. economic or national security competitiveness, advances CHIPS R&D mission and goals (see Section 1.01) and relates to the goals of the CHIPS Metrology program and its mission available at <https://www.nist.gov/chips/research-development-programs/metrology-program> (20 points)

4.04 Award Selections

Final selection decisions will be made by the Selecting Official, the Director of the CHIPS Metrology Program, or designee.

The Selecting Official shall select awards in rank order unless a selection out of rank order is justified based upon any of the following factors:

- (1) Diversity across CHIPS Metrology open and closed topics;

- (2) Proposed projects that include SBIR high priority areas of manufacturing and energy efficiency research;
- (3) Proposed projects that include participation by women and socially and economically disadvantaged SBCs, and SBCs from HUBZones or underserved-states;
- (4) Applicants that have received fewer than 20 SBIR awards in the past;
- (5) Possible duplication of other federally-funded research; and
- (6) Availability of funding.

NIST may select some, all, or none of the applications, or part(s) of any particular application. Prior to issuing an award, NIST may ask for supplemental information and may negotiate the scope and amount of the award. The final approval of selected applications and issuance of awards will be by the NIST Grants Officer. The award decisions of the NIST Grants Officer are final.

4.04.01 Federal Awarding Agency Review of Risk Posed by Applicants

After applications are proposed for funding by the Selecting Official, the NIST Grants Management Division (GMD) performs pre-award risk assessments in accordance with 2 C.F.R. § 200.206, which may include a review of the financial stability of an applicant, the quality of the applicant's management systems, the history of performance, and/or the applicant's ability to effectively implement statutory, regulatory, or other requirements imposed on non-Federal entities.

Review of applications, selection of successful applicants, and award processing is expected to be completed by August. The earliest start date for awards under this NOFO is expected to be September.

In addition, prior to making an award where the total Federal share is expected to exceed the simplified acquisition threshold (currently \$250,000), NIST GMD will review and consider the publicly available information about that applicant in the System for Award Management (SAM.gov). An applicant may, at its discretion, review, and comment on information about itself previously entered into SAM.gov by a Federal awarding agency. As part of its review of risk posed by applicants, NIST GMD will consider any comments made by the applicant in SAM.gov in making its determination about the applicant's integrity, business ethics, and record of performance under Federal awards. Upon completion of the pre-award risk assessment, the Grants Officer will make a responsibility determination concerning whether the applicant is qualified to

receive the subject award and, if so, whether appropriate specific conditions that correspond to the degree of risk posed by the applicant should be applied to an award.

4.04.02 Release of Proposal Review Information

After final award decisions have been announced, a summary of the merit evaluations of applications that passed the screening criteria will be provided to the applicant with written notification of award/non-award. The identity of the reviewers will not be disclosed.

4.04.03 Release of Fast-Track Phase II Funds

For Fast-Track Applications, at the conclusion of their Phase I period of performance, NIST will review the Phase I Final Report and Commercial Viability and Domestic Production plan to assess progress and whether the milestones/goals described in the Technical Proposal (see Section 3.04.02(3)(a) of this NOFO) were achieved, as well as assess the project's potential for commercial success to determine which projects will transition to Phase II.

The release of Phase II funding will be made at that time, provided that the recipient has met all project objectives during the Phase I portion of the award. If a recipient has not successfully met its project objectives as identified and communicated to the recipient by NIST, NIST may require additional recipient action before proceeding to Phase II and/or the Fast-Track award may be terminated.

Approval to proceed with Phase II activity and the release of Phase II funding will occur approximately four (4) months after the completion of Phase I.

Final decisions regarding whether to release Phase II funds will be made by the Selecting Official, the Director of the CHIPS Metrology Program, or designee. The NIST Grants Officer will notify award recipients whether their Phase II funds will be released.

5.0 CONSIDERATIONS

5.01 Awards

Through [2 C.F.R. § 1327.101](#), the Department of Commerce adopted **Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards** at [2 C.F.R. Part 200](#), which apply to awards in this program.

The Department of Commerce will apply to all awards made under this NOFO the [Financial Assistance Standard Terms and Conditions](#) in effect on the date of award. The current version is dated November 12, 2020.

The **Department of Commerce Pre-Award Notification Requirements for Grants and Cooperative Agreements**, [79 FR 78390](#) (December 30, 2014), are applicable to this NOFO.

Contingent upon availability of funds, NIST anticipates making a total number of twenty four awards, approximately fourteen (14) Fast Track awards for Open Topics and ten (10) awards for Closed Topics, either as Fast-Track awards or Phase II awards.

These awards will have a period of performance of up to six (6) months for Phase I awards and up to (24) months for Phase II awards. A period of one (1) month is allotted after the six (6) month Phase I R&D duration for the awardee to prepare and submit a Phase I final report and Commercial Viability and Domestic Production plan.

Individual award amounts for Phase I awards may be up to \$283,500 with up to an additional \$6,500 for Technical and Business Assistance (TAB A), see section 5.12 for TAB A information. Individual award amounts for Phase II awards may be up to \$1,910,000 with up to \$50,000 for Technical and Business Assistance (TAB A), see section 5.12 for TAB A information.

While the Fast-Track awards will be fully funded and reflect one continuous period of performance, release of the Phase II portion will be determined following the completion of Phase I (see Section 4.05 of this NOFO).

The funding vehicle for the awards will be in the form of cooperative agreement.

In no event will NIST or the Department of Commerce be responsible for application preparation costs. This NOFO does not obligate NIST or the Department of Commerce to make any awards under either Phase I or Phase II. Furthermore, NIST will not fund any costs incurred by the applicants before awards are made. Publication of this NOFO does not oblige NIST or the Department of Commerce to award any specific project or to obligate any available funds. NIST issues this notice subject to the appropriations made available under the current continuing resolution funding the Department of Commerce: the Continuing Appropriations Act, 2024 and Other Extensions Ac, Pub. L. 118-15 (September 30, 2023). NIST anticipates making awards for the program listed in this notice provided that funding for Fiscal Year 2024 is continued beyond November 17, 2023, the expiration of the current continuing resolution.

5.02 Reporting Requirements: Research Performance Progress Reports and the Commercial Viability and Domestic Production (CVDP) Plan

Awardees will be required to submit a Research Performance Progress Report (RPPR), covering the award's first three months, prior to the end of the fourth month of the period of performance, and a Phase I final report and Commercial Viability and Domestic Production plan for any resulting intellectual property seven months after the start of the award. If funding is released for the Phase II portion of the award, awardees will be required to submit an RPPR 30 days after the end of the 6th, 12th, 18th, and 24th month of the Phase II portion of the award's period of performance. Publication citation information as well as links to publicly available data or revised Data Management Plans (DMP) shall be submitted as soon as they become available.

The RPPR should include a response to each of the metric questions that address the technical details regarding the research conducted up to that point in the project, detailed plans for the next stages of the project, results obtained, estimates of technical feasibility, a description of TABA services provided, and the benefits and results of TABA services provided for those awardees who requested and were approved for TABA services.

Consideration will be given to changes from the solicited and proposed milestones if results from experimentation warrant a deviation from the plan. Inclusion of proprietary information within the RPPRs may be necessary in order to effectively communicate progress and gain appropriate consultation from NIST experts regarding next steps. All such proprietary information must be marked by the awardee according to instructions provided in Section 5.04.01.

Commercial Viability and Domestic Production (CVDP) plan

In keeping with the provisions of Executive Order 14104 and the CHIPS Act domestic production requirements (15 U.S.C. §4656(g)), CHIPS R&D requires applicants to develop and provide a Commercial Viability and Domestic Production Plan describing activities to be funded in Phase II as part of the project. This plan will be submitted with their Phase I final report for resulting intellectual property for consideration in advance of the Release of Fast-Track Phase II Funds.

The CVDP plan must include a realistic business model for the resulting intellectual property, include a technology transition plan, and describe pathways to benefitting national and economic security, such as through the domestic availability of the

technology and successful adoption by commercial or defense partners. Applicants should propose measurable CVDP targets that demonstrate the viability of the proposed business model and of domestic production. Where relevant, CVDP milestones should complement the technical approach for Phase II.

Strong CVDP plans will present evidence of existing or potential demand for the resulting intellectual property; identify existing or potential customers, or categories of customers, at volumes necessary for commercial viability; provide an initial assessment of marketability in terms of cost and value proposition that can be updated as the project advances; describe existing or potential competitors and competing technologies; and demonstrate the potential to attract private capital, such as venture capital.

CHIPS R&D strongly encourages CVDP plans that identify approaches to maximizing market advantages of the resulting intellectual property, such as by reducing manufacturing costs and improving yields, where applicable to the resulting intellectual property. Other approaches could include addressing performance, availability, conformance to technical standards, and environmental sustainability. For the purposes of 15 U.S.C. §4656(g), “production” includes the manufacture, integration, assembly, testing, and packaging of semiconductors, materials used to manufacture semiconductors, or semiconductor manufacturing equipment developed or improved as a result of CHIPS-funded intellectual property. CHIPS R&D does not require the covered “production” to occur exclusively within the United States. However, applicants that are unable to conduct certain “production” activities in the United States should explain, to the extent practicable at the current level of technology development, why such production may not be possible, considering the following factors:

- The availability or lack of availability of domestic production capabilities, which may consider:
 - Planned or previous efforts made to locate, develop, or contract for the production of the CHIPS R&D funded technology, or relevant similar technologies, in the United States;
 - Access to resources and other material inputs required for production;
 - The expected additional product development time or cost required to make U.S. production of the CHIPS R&D-funded technology commercially feasible;
- The relative costs of domestic versus foreign production of the resulting intellectual property, at relevant production volumes;
- Commercial adoption risks and benefits, such as
 - Risks to the market acceptance and to the value proposition for the CHIPS R&D funded technology, resulting from U.S. production;

- Expected commercial, economic, or national security benefits to the United States resulting from distributed production among U.S. and overseas sites;
- Any other factors that important to the success of the CHIPS R&D-funded technology.

To help assess the effectiveness of our program in meeting programmatic and SBIR objectives, NIST and CHIPS R&D may periodically request information from small businesses about progress taken towards commercial viability and domestic production of the technology after the completion of Phase I and II awards.

5.03 Payment Schedule

Cooperative agreements will include an award term with electronic payment system information. Pursuant to 2 C.F.R. § 200.305 awardees are to be paid in advance, provided they maintain or demonstrate the willingness to maintain: written procedures that minimize the time elapsing between the transfer of funds and disbursement by the recipient, and financial management systems that meet the standards for fund control and accountability as established in 2 C.F.R. § 200.302. Advances of funds to a recipient organization shall be limited to the minimum amounts needed and be timed to be in accordance with the actual, immediate cash requirements of the recipient organization in carrying out the purpose of the approved program or project.

The Department of Commerce policy requires that in the usual case, non-Federal entities time advance payment requests so that Federal funds are on hand for a maximum of 30 calendar days before being disbursed by the non-Federal entity for eligible award costs.

5.04 Innovations, Inventions and Patents

5.04.01 Proprietary Information Contained in Proposals

Information contained in unsuccessful applications will remain the property of the applicant. Unsuccessful applications will be retained in accordance with the [General Record Schedule 1.2/021](#). The Federal Government may, however, retain copies of all applications. Public release of information in any application submitted will be subject to existing statutory and regulatory requirements. Applicants are discouraged from submitting proprietary information unless the information is deemed essential for proper evaluation of the application. If proprietary information is provided by an applicant in a proposal, which constitutes a trade secret, proprietary commercial or financial

information, confidential personal information, or data affecting national security, it will be treated in confidence to the extent permitted by law, provided that the proposal is clearly marked by the applicant as follows:

(A) The following legend must appear on the title page of the proposal:

“This proposal contains information that shall not be disclosed outside the Federal Government and shall not be duplicated, used, or disclosed in whole or in part for any purpose other than evaluation of this proposal, unless authorized by law. The Government shall have the right to duplicate, use, or disclose the data to the extent provided in the resulting award if award is made as a result of the submission of this proposal. The information subject to these restrictions are contained on all pages of the proposal except for pages [insert page number or other identification of pages that contain no restricted information.]”

(End of Legend); and

(B) The following legend must appear on each page of the proposal that contains information the applicant wishes to protect:

“Use or disclosure of information contained on this sheet is subject to the restriction on the title page of this proposal.”

(End of Legend)

The use of any other legend is unacceptable to the Government and may constitute grounds for removing the application from further consideration without assuming any liability for inadvertent disclosure.

5.04.02 Rights in Data Developed Under SBIR Funding Agreements

In lieu of the [Department of Commerce Financial Assistance Standard Terms and Conditions](#), Section C.03, Intellectual Property Rights, the following terms and conditions will apply to and be included in all SBIR awards issued under this NOFO:

(a) Definitions. All definitions below are excerpted from the [SBA SBIR/STTR Policy Directive](#).

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FY 2024 SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM
FOR CHIPS FOR AMERICA – CHIPS METROLOGY

NOTICE OF FUNDING OPPORTUNITY No. 2024-SBIR-CHIPS-01

April 16, 2024

- (1) Computer Database. A collection of data recorded in a form capable of being processed by a computer. The term does not include Computer Software.
- (2) Computer Programs. A set of instructions, rules, or routines recorded in a form that is capable of causing a computer to perform a specific operation or series of operations.
- (3) Computer Software. Computer programs, source code, source code listings, object code listings, design details, algorithms, processes, flow charts, formulae, and related material that would enable the software to be reproduced, recreated, or recompiled. Computer Software does not include Computer Databases or Computer Software Documentation.
- (4) Computer Software Documentation. Owner's manuals, user's manuals, installation instructions, operating instructions, and other similar items, regardless of storage medium, that explain the capabilities of the Computer Software or provide instructions for using the software.
- (5) Data. All recorded information, regardless of the form or method of recording or the media on which it may be recorded. The term does not include information incidental to contract or grant administration, such as financial, administrative, cost or pricing or management information.
- (6) Form, Fit, and Function Data. Data relating to items, components, or processes that are sufficient to enable physical and functional interchangeability, and data identifying source, size, configuration, mating and attachment characteristics, functional characteristics, and performance requirements. For Computer Software it means data identifying source, functional characteristics, and performance requirements, but specifically excludes the source code, algorithms, processes, formulas, and flow charts of the software.
- (7) Government Purpose. Any activity in which the United States Government is a party, including cooperative agreements with international or multi-national defense organizations or sales or transfers by the United States Government to foreign governments or international organizations. Government Purposes include competitive procurement, but do not include the rights to use, modify, reproduce, release, perform, display, or disclose Technical Data or Computer Software for commercial purposes or authorize others to do so.
- (8) Operations, Maintenance, Installation, or Training Purposes (OMIT) Data. Data

that is necessary for operation, maintenance, installation, or training purposes (but not including detailed manufacturing or process data).

(9) SBIR/STTR Computer Software Rights. The Federal Government's rights during the SBIR/STTR Protection Period in specific types of SBIR/STTR Data that are Computer Software.

(A) The Federal Government may use, modify, reproduce, release, perform, display, or disclose SBIR/STTR Data that are Computer Software within the Government. The Federal Government may exercise SBIR/STTR Computer Software Rights within the Government for:

- (i) Use in Federal Government computers;
- (ii) Modification, adaptation, or combination with other Computer Software, provided that the Data incorporated into any derivative software are subject to the rights in § 3(ee) of the SBIR/STTR Policy Directive and that the derivative software is marked as containing SBIR/STTR Data;
- (iii) Archive or backup; or
- (iv) Distribution of a computer program to another Federal agency, without further permission of the Awardee, if the Awardee is notified of the distribution and the identity of the recipient prior to the distribution, and a copy of the SBIR/STTR Computer Software Rights included in the Funding Agreement is provided to the recipient.

(B) The Federal Government shall not release, disclose, or permit access to SBIR/STTR Data that is Computer Software for commercial, manufacturing, or procurement purposes without the written permission of the Awardee. The Federal Government shall not release, disclose, or permit access to SBIR/STTR Data outside the Government without the written permission of the Awardee unless:

- (i) The non-Governmental entity has entered into a non-disclosure agreement with the Government that complies with the terms for such agreements outlined in § 8 of the SBIR/STTR Policy Directive; and
- (ii) The release or disclosure is—

- (I) To a Federal Government support service contractor or their subcontractor for purposes of supporting Government internal use or activities, including evaluation, diagnosis and correction of deficiencies, and adaptation, combination, or integration with other Computer Software provided that SBIR/STTR Data incorporated into any derivative software are subject to the rights in § 3(ee) of the SBIR/STTR Policy Directive; or
 - (II) Necessary to support certain narrowly tailored essential Government activities for which law or regulation permits access of a non-Government entity to a contractors' data developed exclusively at private expense, non-SBIR/STTR Data, such as for emergency repair and overhaul.
- (10) SBIR/STTR Data. All Data developed or generated in the performance of an SBIR or STTR award, including Technical Data and Computer Software developed or generated in the performance of an SBIR or STTR award. The term does not include information incidental to contract or grant administration, such as financial, administrative, cost or pricing or management information.
- (11) SBIR/STTR Data Rights. The Federal Government's license rights in properly marked SBIR/STTR Data during the SBIR/STTR Protection Period are as follows: SBIR/STTR Technical Data Rights in SBIR/STTR Data that are Technical Data or any other type of Data other than Computer Software; and SBIR/STTR Computer Software Rights in SBIR/STTR Data that is Computer Software. Upon expiration of the protection period for SBIR/STTR Data, the Federal Government has a royalty free license to use, and to authorize others to use on its behalf, these data for Government Purposes, and is relieved of all disclosure prohibitions and assumes no liability for unauthorized use of these data by third parties. The Federal Government receives Unlimited Rights in Form Fit, and Function Data, OMIT Data, and all unmarked SBIR/STTR Data.
- (12) SBIR/STTR Protection Period. The period of time during which the Federal Government is obligated to protect SBIR/STTR Data against unauthorized use and disclosure in accordance with SBIR/STTR Data Rights. The SBIR/STTR Protection Period begins at award of an SBIR/STTR Funding Agreement and ends not less than twenty years from that date (See § 8(b)(4) of the SBIR/STTR Policy Directive).

(13) SBIR/STTR Technical Data Rights. The Federal Government's rights during the SBIR/STTR Protection Period in SBIR/STTR Data that are Technical Data or any other type of Data other than Computer Software.

(A) The Federal Government may, use, modify, reproduce, perform, display, release, or disclose SBIR/STTR Data that are Technical Data within the Government; however, the Government shall not use, release, or disclose the data for procurement, manufacturing, or commercial purposes; or release or disclose the SBIR/STTR Data outside the Government except as permitted by paragraph (B) below or by written permission of the Awardee.

(B) SBIR/STTR Data that are Technical Data may be released outside the Federal Government without any additional written permission of the Awardee only if the non- Governmental entity or foreign government has entered into a non-disclosure agreement with the Federal Government that complies with the terms for such agreements outlined in § 8 of the SBIR/STTR Policy Directive and the release is:

(i) Necessary to support certain narrowly tailored essential Government activities for which law or regulation permits access of a non- Government entity to a contractors' data developed exclusively at private expense, non- SBIR/STTR Data, such as for emergency repair and overhaul;

(ii) To a government support services contractor in the performance of a government support services contract for internal Government use or activities, including evaluation, diagnosis, or modification, provided that SBIR/STTR Technical Data incorporated into any derivative Data are subject to the rights in § 3(ii) of the SBIR/STTR Policy Directive, and the release is not for commercial purposes or manufacture;

(iii) To a foreign government for purposes of information and evaluation if required to serve the interests of the U.S. Government; or

(iv) To non-Government entities or individuals for purposes of evaluation.

(14) Technical Data. Recorded information, regardless of the form or method of the recording, of a scientific or technical nature (including Computer Software Documentation and Computer Databases). The term does not include Computer Software or financial, administrative, cost or pricing, or

management information, or other data incidental to contract or grant administration. The term includes recorded Data of a scientific or technical nature that is included in Computer Databases.

- (15) Unlimited Rights. The Government's rights to access, use, modify, prepare derivative works, reproduce, release, perform, display, disclose, or distribute Data in whole or in part, in any manner and for any purpose whatsoever, and to have or authorize others to do so.

(b) Allocation of SBIR/STTR rights.

- (1) An SBC retains ownership of all SBIR/STTR Data it develops or generates in the performance of an SBIR/STTR award. The SBC retains all rights in SBIR/STTR Data that are not granted to the Federal Government in accordance with the SBIR/STTR Policy Directive. These rights of the SBC do not expire.
- (2) During the SBIR/STTR Protection Period, the Federal Government receives SBIR/STTR Technical Data Rights in appropriately marked SBIR/STTR Data that is Technical Data or any other type of Data other than Computer Software; and SBIR/STTR Computer Software Rights in appropriately marked SBIR/STTR Data that is Computer Software.
- (3) After the protection period, the Federal Government may use, and authorize others to use on its behalf, for Government Purposes, SBIR/STTR Data that was protected during the SBIR/STTR Protection Period. Awards issued by the U.S. Department of Energy are subject to Unlimited Rights after the expiration of the SBIR/STTR Protection Period.
- (4) The Federal Government receives Unlimited Rights in Form Fit, and Function Data, OMIT Data, and all unmarked SBIR/STTR Data.

- (c) Identification and Delivery of SBIR/STTR Data. Any SBIR/STTR Data delivered by the Awardee, and in which the Awardee intends to limit the Federal Government's rights to SBIR/STTR Data Rights, must be delivered with restrictive markings. The Federal Government assumes no liability for the access, use, modification, reproduction, release, performance, display, disclosure, or distribution of SBIR/STTR Data without markings. The Awardee or its subcontractors or suppliers shall conspicuously and legibly mark all such SBIR/STTR Data with the appropriate legend.

- (1) The authorized legend shall be placed on each page of the SBIR/STTR Data. If only portions of a page are subject to the asserted restrictions, the SBIR/STTR Awardee shall identify the restricted portions (e.g., by circling or underscoring with a note or other appropriate identifier). With respect to SBIR/STTR Data embodied in Computer Software, the legend shall be placed on: (1) the printed material or media containing the Computer Software; or (2) the transmittal document or storage container. The legend shall read as follows:

“SBIR/STTR DATA RIGHTS

Funding Agreement No.	
Award Date	
SBIR/STTR Protection Period	
SBIR/STTR Awardee	
SBIR/STTR Awardee Address	

This is SBIR/STTR Data (or is Computer Software or a Prototype that embodies or includes SBIR/STTR Data) to which the SBIR/STTR Awardee has SBIR/STTR Data Rights and to which the Federal Government has received SBIR/STTR Technical Data Rights (or SBIR/STTR Computer Software Rights) during the SBIR/STTR Protection Period and rights of use for Government Purposes after the SBIR/STTR Protection Period, as those terms are defined in the SBIR/STTR Funding Agreement. Awards issued by the U.S. Department of Energy are subject to Unlimited Rights after the SBIR/STTR Protection Period, as that term is defined in the SBIR/STTR Funding Agreement. Any reproduction of SBIR/STTR Data or portions of such data marked with this legend must also reproduce the markings.”

(End of Legend)

- (2) Data submitted without the correct or appropriate markings may be corrected within 6 months from the date that the data is delivered.

(d) Relation to patents. Nothing regarding SBIR/STTR Data Rights in this clause shall imply a license to or imply a requirement to license to the Federal Government any patent to a Subject Invention (as defined under the Bayh-Dole Act implemented at 37 CFR 401) made under an SBIR/STTR award.

(End of Clause)

(e) Copyright.

(1) Data first produced in the performance of this award.

- (i) Except as otherwise specifically provided in this award, the Awardee may assert copyright subsisting in any data first produced in the performance of this award.
- (ii) When asserting copyright, the Awardee shall affix the applicable copyright notice of 17 U.S.C. § 401 or § 402 and an acknowledgment of Government sponsorship (including award number).

For data other than computer software, the Awardee grants to the Government, and others acting on its behalf, a paid-up nonexclusive, irrevocable, worldwide license to reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, by or on behalf of the Government. For computer software, the Awardee grants to the Government, and others acting on its behalf, a paid-up, nonexclusive, irrevocable, worldwide license in such copyrighted computer software to reproduce, prepare derivative works, and perform publicly and display publicly, by or on behalf of the Government.

(2) Data not first produced in the performance of this award. The Awardee shall not, without prior written permission of the Grants Officer, incorporate in data delivered under this award any data that are not first produced in the performance of this award unless the Awardee: (i) identifies such data; and (ii) grants to the Government, or acquires on its behalf, a license of the same scope as set forth in subparagraph (c)(1) of this clause.

(3) Removal of copyright notices. The Government will not remove any copyright notices placed on data pursuant to this paragraph (c) and will include such notices on all reproductions of the data.

(End of Clause)

5.04.03 NIST-Owned Inventions

Awardees will not have any automatic rights to make, use or sell products or services incorporating NIST-owned inventions. For any SBIR award that requires a license to use a NIST- owned invention covered by a patent or patent application, the SBIR awardee will be required to contact NIST's Technology Partnerships Office for a patent license for research or for commercial use.

To the extent that such NIST-owned invention is available for licensing and has not otherwise been exclusively licensed to another party, the SBIR awardee will be granted a non-exclusive research license and will be given the opportunity to negotiate a non-exclusive or an exclusive commercialization license to the NIST-owned invention, in accordance with the Federal patent licensing regulations, set forth in 37 C.F.R. Part 404.

5.04.04 Patent Rights

Normally, SBCs may retain worldwide patent rights to any invention developed with Federal support. The specific requirements governing the development, reporting, and disposition of rights to inventions and patents resulting from Federal awards are described in more detail in 37 C.F.R. Part 401, which implements 35 U.S.C. § 202 through 204 and includes standard patent rights clauses in 37 C.F.R. § 401.14, which are incorporated by reference into all awards.

5.04.05 Invention Reporting

SBIR awardees must report inventions to the NIST SBIR Program Office within 2 months of the inventor's report to the awardee. Inventions must also be reported through the iEdison Invention Reporting System at www.iedison.gov.

5.05 Cost Sharing

Cost sharing is permitted for applications under this program NOFO; however, cost sharing is not required and will not be considered in evaluation of applications.

5.06 Profit or Fee

A reasonable profit or fee not to exceed 7% of the sum of the direct and indirect costs is allowed.

5.07 Joint Ventures or Limited Partnerships

Joint ventures and limited partnerships are eligible provided the entity created qualifies as an SBC as defined in this NOFO.

5.08 Research and Analytical Work

For Phase I, a minimum of two-thirds of the research and/or analytical effort, per Section 1.03, must be performed by the proposing SBC. The total cost for all consultant fees, facility leases, usage fees, and other subcontract/subaward or purchase agreements may not exceed one-third of the total award. For Phase II, a minimum of one-half of the research and/or analytical effort, per Section 1.03, must be performed by the applicant. The total cost for all consultant fees, facility leases, usage fees, and other subcontract/subaward or purchase agreements may not exceed one-half of the total award.

5.09 Awardee Commitments

Upon award of a funding agreement, the awardee will be required to make certain legal commitments through acceptance of numerous Specific Award Conditions (SAC) in the funding agreement. Awards also will be governed by the Department of Commerce Financial Assistance Standard Terms and Conditions (November 12, 2020 or successor version); the Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards at 2 C.F.R. Part 200, adopted by the Commerce Department through 2 C.F.R. § 1327.101; when applicable, 48 C.F.R. Subpart 31.2, Contracts with Commercial Organizations; and the Department of Commerce Pre-Award Notification Requirements for Grants and Cooperative Agreements, 79 FR 78390 (December 30, 2014).

Section 5.10 describes the types of terms and conditions to which the awardee would commit. This list is not a complete list of terms and conditions to be included in Phase I and Phase II funding agreements and is not the specific wording of such terms and conditions.

5.10 Summary Statements

The following statements apply to Phase I and Phase II awards and are examples of some of the topic areas that will be addressed in the award terms and conditions.

- (1) Access to Records. Government officials have the right of timely and unrestricted access to records of awardees, including access to personnel for discussion related to the records. See [2 C.F.R. 200.337](#).

- (2) Termination. Awards may be terminated (a) by the NIST Grants Officer, if an awardee materially fails to comply with the terms and conditions of an award; (b) by the Federal awarding agency or pass-through entity, to the greatest extent authorized by law, if an award no longer effectuates the program goals or agency priorities; (c) by the NIST Grants Officer with the consent of the awardee, in which case the two parties shall agree upon the termination conditions, including the effective date and, in the case of partial termination, the portion to be terminated; (d) by the awardee upon sending to the NIST Grants Officer written notification setting forth the reasons for such termination, the effective date, and, in the case of partial termination, the portion to be terminated. See [2 C.F.R. §§ 200.339-343](#).
- (3) Non-Discrimination. The awardee will be required to comply with statutory and other non-discrimination requirements. No person in the United States shall, on the ground of race, color, national origin, handicap, age, religion, or sex, be excluded from participation in, be denied the benefits of, or be subject to discrimination under any program or activity receiving Federal financial assistance. See Section G.02 of the [Department of Commerce Financial Assistance Standard Terms and Conditions](#) (November 12, 2020).
- (4) Audit Requirements. Government officials may conduct an audit of an award at any time. Unless otherwise specified in the award, for-profit organizations that expend \$750,000 or more in Department of Commerce funds during their fiscal year must have an audit conducted for that year in accordance with Section D.01.c of the [Department of Commerce Financial Assistance Standard Terms and Conditions](#) (November 12, 2020).
- (5) Codes of Conduct. The awardee must maintain written standards of conduct to establish safeguards to prohibit employees from using their positions for a purpose that constitutes or presents the appearance of personal or organizational conflict of interest, or personal gain in the administration of the award. See Section F.01 of the [Department of Commerce Financial Assistance Standard Terms and Conditions](#) (November 12, 2020).
- (6) Officials Not to Benefit. No Federal Government official may benefit personally, to include financial and/or profession gain, from the SBIR/STTR Funding Agreement.
- (7) Duplication of Effort. The funding agreement shall not support the duplication of other federally-funded research.

(8) Scheduling and Use of Federal Agency Facilities and Equipment. The Awardee must schedule, reserve, and complete usage within the period of performance of the Funding Agreement.

5.11 Additional Information

This NOFO reflects current planning. If there is any inconsistency between the information contained herein and the terms of any resulting SBIR funding agreement, the terms of the funding agreement are controlling.

Before award of a SBIR funding agreement, the Government may request the applicant to submit certain organizational, management, personnel, and financial information to assure responsibility of the applicant.

The Government is not responsible for any funds expended by the applicant before award of any funding agreement.

This program NOFO is not an offer by the Government and does not obligate the Government to make any specific number of awards. Also, awards under the SBIR Program are contingent upon the availability of funds.

The SBIR Program is not a substitute for existing unsolicited application mechanisms. Unsolicited applications will not be accepted under the SBIR Program in either Phase I or Phase II.

If an award is made pursuant to an application submitted under this SBIR Program NOFO, a representative of the awardee will be required to certify that the concern has not previously been, nor is currently being, paid for essentially equivalent work by any Federal agency.

The responsibility for the performance of the principal investigator, and other employees or consultants who carry out the proposed work, including those of subrecipients or contractors, lies with the management of the organization receiving an award.

Safety is a top priority at NIST. Employees and affiliates of award recipients who conduct project work at NIST will be expected to be safety-conscious, to attend NIST safety training, and to comply with all NIST safety policies and procedures, and with all applicable terms of their guest research agreement.

5.12 Technical and Business Assistance

NIST is committed to the goal of commercialization of the results of SBIR projects and will provide funding for Technical and Business Assistance (TABAs) to Phase I and

Phase II awardees as authorized by 15 U.S.C. § 638(q). The NIST TABA program assists in providing additional funding for the successful commercialization of products, services, or technologies developed in association with the NIST SBIR Program. The NIST TABA program provides funding for guidance and mentoring in topics such as assessing small business commercialization needs; planning, developing, and assisting in the preparation of a commercialization and Commercial Viability Domestic Production plan; and identifying markets and developing entry strategies. Allowable services include assistance with product sales, intellectual property protections, market research, market validation, and development of regulatory plans and manufacturing plans, or access to technical and business literature available through on-line databases.

If requested, NIST may provide up to an additional \$6,500 for TABA services during Phase I and up to \$50,000 for TABA services during Phase II. NIST's inclusion of TABA funds in the award will be subject to the availability of NIST funding.

To request TABA funding, include up to an additional \$6,500 for Phase I and up to \$50,000 for Phase II in the budget; provide vendor information in the budget justification that demonstrates the provider can provide the services needed; and include a letter of commitment from the provider (see Section 8.01 for additional information). NIST may disapprove a proposed TABA provider. TABA requests must be part of the application submission and may not be requested subsequent to award.

Reimbursement is limited to services received that comply with 15 U.S.C. § 638(q). Requested TABA funds should be clearly labeled in the Budget Narrative (see Section 8.01.8).

5.13 Technical Assistance for Application Preparation and Project Conduct

Applicants may wish to contact the NIST Hollings Manufacturing Extension Partnership (MEP), a nationwide network of locally managed extension centers whose sole purpose is to provide small- and medium-sized manufacturers with the help they need to succeed. The centers provide guidance to high-technology companies seeking resources and teaming relationships. To be referred to an MEP center for technical assistance, call 1-800-MEP-4- MFG (1-800-637-4634) or visit [MEP's website](#).

MEP Centers are also prepared to provide referrals to state and local organizations offering resources and technical assistance to all NIST SBIR applicants after awards have been announced. If you would like your local MEP Center to contact you, please respond affirmatively to the statement (#11) about MEP on the Cover Sheet.

6.0 SUBMISSION OF APPLICATIONS

6.01 Deadline for Applications

Applications must be received no later than 11:59 p.m. Eastern Time, June 14, 2024. Only electronic applications submitted via Grants.gov will be accepted.

Applicants should be aware, and factor in their application submission planning, that the Grants.gov system closes periodically for routine maintenance. Applicants should visit [Grants.gov](https://www.grants.gov) for information on any scheduled closures. Applications cannot be submitted when Grants.gov is closed.

Applicants are cautioned to be careful of unforeseen delays that can cause late arrival of applications, with the result that they **will not** be forwarded for evaluation.

Applications not received by the specified due date and time, as recorded by Grants.gov, or that do not adhere to the other requirements of this NOFO (see Section 4.02 Screening Criteria and Section 8.01 Required Forms and Documents) will not be considered.

NIST strongly recommends that applicants do not wait until the last minute to submit an application. NIST will not make allowance for any late submissions. To avoid any potential processing backlogs due to last minute Grants.gov registrations, applicants are highly encouraged to begin their Grants.gov registration process early. No extensions will be granted.

When developing your submission timeline, please keep in mind that (1) all applicants are required to have current registrations in the System for Award Management (SAM.gov) and Grants.gov; (2) the free annual registration process in the electronic System for Award Management (SAM.gov) (see Section 6.03.1.b) of this NOFO) generally takes between three and five business days but can take more than three weeks; and (3) applicants will receive a series of e-mail messages from Grants.gov over a period of up to two business days before learning whether a Federal agency's electronic system has received its application. **Please note that a federal assistance award cannot be issued if the designated recipient's registration in the System for Award Management (SAM.gov) is not current at the time of the award.**

Applicants will find instructions on registering with SAM.gov as part of the Grants.gov process at: <https://www.grants.gov/applicants/applicant-registration>.

6.02 Standard Application Package

The standard application package, consisting of the standard forms, i.e., SF-424 (R&R), Research & Related Budget, CD-511, Research and Related Other Project Information,

SF-LLL (if applicable), and Research & Related Subaward Budget is available at www.grants.gov.

Please see Section 8.01 for a complete list of required forms and documents.

6.03 Application Submission

Applications must be submitted electronically through Grants.gov. Paper applications or applications submitted by other electronic means will not be accepted.

Supplementary material, revisions, substitutions, audio or video tapes, or computer storage media or devices will not be accepted. While applicants may not submit replacement pages or missing documents once an application has been submitted, an applicant may submit a complete, new application including such information by the required deadline. Applications are limited to one proposal per SBC. The last application received in Grants.gov will be used for evaluation.

- (1) Applications must be submitted via Grants.gov, under announcement 2024-SBIR-CHIPS-01.
 - a) Applicants should carefully follow specific Grants.gov instructions to ensure the attachments will be accepted by the Grants.gov system. A receipt from Grants.gov indicating an application is received does not provide information about whether attachments have been received. Attachment file names should be kept as short as possible due to potential file corruption after the addition of extensions by Grants.gov. For further information or questions regarding the electronic application process for the 2024-SBIR-CHIPS-01 announcement, send inquiries via e-mail to grants@nist.gov.
 - b) Applicants are strongly encouraged to start early and not wait until the approaching due date before logging on and reviewing the instructions for submitting an application through Grants.gov. The Grants.gov registration process must be completed before a new registrant can apply. If all goes well, the registration process takes three (3) to five (5) business days. If problems are encountered, the registration process can take three (3) weeks or more. Applicants must have a valid unique entity identifier number and must maintain a current registration in the Federal government's primary registrant database, the [System for Award Management](#), as explained on the Grants.gov website. See *also* Section 8.04 of this NOFO. After registering, it may take several days or longer from the initial log-on before a new Grants.gov system user can submit an application. Only authorized individuals(s) will be able to submit an

application, and the system may need time to process a submitted application. Applicants should save and print the proof of submission they receive from Grants.gov. If problems occur while using Grants.gov, the applicant is advised to (a) print any error message received and (b) call Grants.gov directly for immediate assistance. If calling from within the United States or from a U.S. territory, please call 800-518- 4726. If calling from a place other than the United States or a U.S. territory, please call 606-545- 5035. Assistance from the Grants.gov Help Desk will be available around the clock every day, with the exception of Federal holidays. Help Desk assistance will resume at 7:00 a.m. Eastern Time the day after Federal holidays. For assistance using Grants.gov, you may also contact support@grants.gov.

- c) To find instructions on submitting an application on Grants.gov, Applicants should refer to the “Applicants” tab in the banner just below the top of the [Grants.gov](https://www.grants.gov) homepage. Clicking on the “Applicants” tab produces two exceptionally useful sources of information, Grant Applications and Applicant resources, which applicants are advised to review.

Applicants will receive a series of e-mail messages over a period of up to two business days before learning whether a federal agency’s electronic system has received its application. Closely following the detailed information in these subcategories will increase the likelihood of acceptance of the application by the Federal agency’s electronic system.

Applicants should pay close attention to the guidance under “Applicant FAQs,” as it contains information important to successful submission on Grants.gov, including essential details on the naming conventions for attachments to Grants.gov applications.

The [Grants.gov Online Help](#) page provides vital information on checking the status of applications. See especially the “Check Application Status” option, found by clicking first on Applicants, and then by clicking on Grant Applications.

The application must be both received and validated by Grants.gov. The application is “received” when Grants.gov provides the applicant a confirmation of receipt and an application tracking number. If an applicant does not see this confirmation and tracking number, the application has not been received. After the application has been received, it must still be validated. During this process, it may be “validated” or “rejected with errors.” To know whether the application was rejected with errors and the reasons why, the applicant must log in to

Grants.gov, select “Applicants” from the top navigation, and select “Track my application” from the drop-down list. If the status is “rejected with errors,” the applicant may still seek to correct the errors and resubmit your application before the deadline. If the applicant does not correct the errors, the application will not be forwarded to NIST by Grants.gov.

NIST uses the Tracking Numbers assigned by Grants.gov and does not issue Agency Tracking Numbers.

Applicants should be aware that adequate time must be factored into applicants’ schedules for delivery of their application. Submitters are advised that volume on Grants.gov may be extremely heavy leading up to the deadline date.

Refer to important information in Section 6.01 Deadline for Applications, to help ensure your application is received on time.

Any amendments to this NOFO will be announced through Grants.gov. Applicants can sign up for Grants.gov NOFO amendments or may request copies from Tracey Smith by e-mail to tracey.smith@chips.gov

7.0 SCIENTIFIC AND TECHNICAL INFORMATION RESOURCES

Background information related to the NIST research programs referenced within the research areas may be found within the [NIST website](#). The [NIST Research Library](#), may also provide valuable scientific and technical information resources. A search for NIST-patented technologies may be conducted at the [NIST Patent Website](#).

8.0 SUBMISSION OF FORMS AND CERTIFICATIONS

8.01 Required Forms and Documents

Applicants should review the following list carefully to ensure the proposal includes all required forms and documents. **Failure to include any of the applicable listed forms and/or documents will result in rejection of the proposal without consideration.** All required forms and documents must be complete. Please also review Section 4.02 Phase I Screening Criteria. Guidelines provided below are based on frequently asked questions and are not intended to be comprehensive – all forms must be fully completed.

A complete application contains the following forms and documents:

1. SF-424 (R&R), Application for Federal Assistance. The SF-424(R&R) must be signed by an authorized representative of the applicant's organization.

For SF-424 (R&R), items 5, 14, and 19, use the Zip Code +4 format (##### - ####) when addresses are called for.

For SF-424 (R&R), item 16, the NIST SBIR Program is not covered by that Executive Order. For SF-424 (R&R), item 17, the list of certifications and assurances is contained in the Federal Financial Assistance Certifications and Representations (Certs and Reps) as part of the SAM.gov entity registration.

For SF-424 (R&R), item 18, if the SF-LLL, Disclosure of Lobbying Activities form (item 6. below) is applicable, attach it to field 18.

Instructions for filling in the SF-424 (R&R) can be found on Grants.gov, as well as in the NIST Grants Management Division [SF-424 Research and Related \(R&R\) Application Package Guidance](#).

2. Research and Related Budget (Total Fed + Non-Fed). The budget should reflect anticipated expenses for the full term of the project, considering all potential cost increases, including cost of living adjustments.

The budget should be detailed in these categories:

- A. Senior/Key Persons (Covered Individuals);
- B. Other Personnel;
- C. Equipment Description;
- D. Travel;
- E. Participant/Trainee Support Costs (not relevant to this competition);
- F. Other Direct Costs;
- G. Direct Costs (automatically generated);
- H. Indirect Costs;
- I. Total Direct and Indirect Costs (automatically generated);
- J. Fee;
- K. Total Costs and Fee (automatically generated);
- L. Budget Narrative and Justification document (item 8. below) should be attached to field L.

Instructions for completing the Research & Related Budget (Total Fed + Non-Fed) form can be found on Grants.gov, as well as in the NIST Grants Management Division [SF-424 Research and Related \(R&R\) Application Package Guidance](#).

3. **CD-511, Certification Regarding Lobbying.** Enter “2024-SBIR-CHIPS-01” in the Award Number Field. Enter the title of the application used in field 11 of the SF-424 (R&R), or an abbreviation of that title, in the Project Name field.
4. **Research and Related Other Project Information.** Answer the highlighted questions and use this form to attach the Cover Sheet and Technical Proposal (item (6) below), the Indirect Cost Rate Agreement (item (9) below), the SBA Company Registry Form (item (10) below), the Data Management Plan (item (11) below), the Research & Related Personal Data form(s) (item 13 below), the Current and Pending Support Form (item (14) below), the Compliance with SBIR Program Requirements, Applicant Fraud Awareness Training (item (15) below), Letters of Commitment (item (16) below), Company Commercialization Report (item (17) below), and Appendix C. Required Disclosures or Relationships to Foreign Countries (item (18) below). Instructions for completing the Research and Related Other Project Information can be found on Grants.gov, as well as in the NIST Grants Management Division [SF-424 Research and Related \(R&R\) Application Package Guidance](#).

Please note that the Project Summary/Abstract is not relevant to this competition. However, Grants.gov requires an attachment to field 7 of the Research and Related Other Project Information form to successfully pass through Grants.gov. Please attach a document to field 7 stating, “A Project Summary/Abstract is not relevant to this competition”.

There are no separate documents required for field 9, “Bibliography & References Cited”; or for field 10, “Facilities & Other Resources;” or for field 11, “Equipment”. Any details relating to these topics should be included in other documents and forms, if and as specified in this NOFO.

5. **SF-LLL, Disclosure of Lobbying Activities (if applicable).**
6. **Cover Sheet (Appendix A) and Technical Proposal.** Read Section 3.04 of this NOFO very carefully, and in its entirety, for directions on completing this section of the application. The Technical Content is limited to 15 pages including optional letters of support – see Section 3.04.02 (4).
7. **Resume(s) or CV(s).**
Resumes or CVs are required for all key personnel, including the principal investigator (those that meet the definition of “covered individuals” as described in

Section 1.05). Resumes are limited to one (1) page per individual. Additional pages per resume will not be considered during the evaluation of the application.

8. Budget Narrative and Justification. There is no set format for the Budget Narrative and Justification; however, the written justification should include the necessity and the basis for the cost, as described below. Proposed funding levels must be consistent with the project scope, and only allowable costs should be included in the budget. Information on cost allowability is available in the Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards at [2 C.F.R. Part 200](#), which apply to awards in this program. TABA funds, if requested by the applicant (see Section 5.12), should be included in the Budget Narrative and Justification.

The Budget Narrative and Justification must be attached to the Research & Related Budget (Total Fed + Non-Fed) and it does not count against the 15-page limit of the Technical Proposal.

Information needed for each budget category is as follows (categories not listed are automatically generated by the form or are not relevant to this competition):

(a) **Senior/Key Person (Covered Individuals)** – At a minimum, the budget justification should include the following: name, 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 direct charges on the proposed project, description of the role of the individual on the proposed project, and the work to be performed.

Fringe benefits should be identified separately from salaries and wages and based on rates determined by organizational policy. The items included in the fringe benefit rate (e.g., insurance, parking, etc.) should not be charged under another cost category.

(b) **Other Personnel** – Data is requested at the project role level, and not at the individual level for Other Personnel. The budget justification 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 direct charges on the proposed project, description of the role of the position on the proposed project and the work to be performed.

Fringe benefits should be identified separately from salaries and wages and based on rates determined by organizational policy. The items included in the fringe benefit rate (e.g., health insurance, parking, etc.) should not be charged under another cost category.

- (c) **Equipment Description** – 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 to 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 (i.e. prorated cost). Any items that do not meet the threshold for equipment can be included under the Materials and Supplies line item in Section F, Other Direct Costs.
- (d) **Travel** - For all travel costs, required by the recipient to complete the project, including attendance at any relevant conferences, the budget justification for travel should include the following: destination; names or number of people traveling; dates and/or duration; mode of transportation, lodging and subsistence rates; and description of how the travel is directly related to the proposed project. For travel that is yet to be determined, please provide best estimates based on prior experience. If a destination is not known, an approximate amount may be used with the assumptions given for the location of the meeting.
- (f) **Other Direct Costs** – For costs that do not easily fit into the other cost categories, please list the cost, and the breakdown of the total costs by quantity or unit of cost. Include the necessity of the cost for the completion of the proposed project. Only allowable costs can be charged to the award.

Each subaward or contractual cost should be treated as a separate item in the Other Direct Costs category. Describe the services to be provided and the necessity of the subaward or contract to the successful performance of the proposed project. Contracts are for obtaining goods and services. Subawardees perform part of the project scope of work. For each subaward, applicants must provide budget detail justifying the cost of the work performed on the project.

- (h) **Indirect Costs** – Commonly referred to as Facilities & Administrative Costs, Indirect Costs are defined as costs incurred by the applicant organization that

cannot otherwise be directly assigned or attributed to a specific project. For more details, see Section 8.01(9) of this NOFO.

- (j) **Fee** – Profit or fee not to exceed 7% of the sum of the direct and indirect costs must be listed in this cost category if included in the proposed budget.

9. **Indirect Cost Rate Agreement.** NIST will not negotiate indirect cost rates for Phase I awards. If indirect costs are included in the proposed budget, provide a copy of the approved negotiated agreement if this rate was negotiated with a cognizant Federal audit agency. If a rate has not been established, provide a statement to this effect and a computation for the cost in the budget narrative. Applicants without an established rate may propose estimated indirect costs at a rate not to exceed 40 percent of the total direct costs and will not be required to provide further justification if selected for an award. Any profit or fee requested is not considered a direct cost for the purpose of the indirect cost base calculation.

10. **SBA Company Registry Form.** SBA maintains and manages a [Company Registry](#) to track ownership and affiliation requirements for all companies applying to the SBIR Program. The SBIR/STTR Policy Directive requires each Phase I applicant to register in the Company Registry prior to submitting an application. The applicant must save its information from the registration in a .pdf document. Attach this document to the Research and Related Other Project Information form as described in Section 8.02.

11. **Data Management Plan.** Consistent with [NIST Policy 5700.00, Managing Public Access to Results of Federally Funded Research](#), and [NIST Order 5701.00, Managing Public Access to Results of Federally Funded Research](#), applicants proposing projects that include the conduct of research must include a Data Management Plan (DMP).

All applications for activities that will generate scientific data using NIST funding are required to adhere to a DMP or explain why data sharing and/or preservation are not within the scope of the project. For the purposes of the DMP, NIST adopted the definition of “research data” at 2 C.F.R. § 200.315(e)(3).

The DMP must include, at a minimum, a summary of proposed activities that are expected to generate data; a summary of the types of data expected to be generated by the identified activities; a plan for storage and maintenance of the data expected to be generated by the identified activities, including after the end of the award’s period of performance; and a plan describing whether and how data generated by the identified activities will be reviewed and made available to the public.

A template for the DMP, an example DMP, and the rubric against which the DMP will be evaluated for sufficiency is available on NIST's Public Access to NIST Research [Information for Awardees](#) webpage. Please pay particular attention to the 20 Performance Criteria (PC) that appear in the [rubric section](#) (see pages 5 to 12 in the DMP template) and ensure all 20 PCs are addressed.

If an application stands a reasonable chance of being funded and the DMP is determined during the review process to be insufficient, the program office may contact the applicant to resolve the deficiencies in the DMP. If an award is issued prior to the deficiencies being fully rectified, the award will include a Specific Award Condition (SAC) stating that no research activities shall be initiated, or costs incurred for those activities under the award until the NIST Grants Officer amends the award to indicate the SAC has been satisfied.

Reasonable costs for data preservation and access may be included in the application.

12. **Subaward Budget Form.** The Research & Related Subaward Budget Attachment Form is required if sub-recipients and contractors are included in the application budget.

Instructions for completing and attaching subaward budget forms are available by visiting the [R & R Family section](#) of the Grants.gov Forms Repository and scrolling down to the R & R Subaward Budget Attachment(s) Form and selecting "Instructions."

13. **Research & Related Personal Data.** Answer the highlighted questions. Complete and print the form available in the [R&R Family section](#) of the Grants.gov Forms Repository and scrolling down to the Research & Related Personal Data form. Attach this document to the Research and Related Other Project Information form as described in Section 8.02.

14. **Current and Pending Support Form.** Any application that includes investigators, researchers, and key personnel (those that meet the definition of "covered individual" as described in Section 1.05) must identify all sources of current and potential funding, including this proposal. Any current project support (e.g., Federal, state, local, public, or private foundations, etc.) must be listed on this form. The proposed project and all other projects or activities requiring a portion of time of the Principal Investigator (PI), co-PI, and key personnel must be included, even if no salary support is received. The total award amount for the entire award period covered,

including indirect costs, must be shown as well as the number of person-months per year to be devoted to the project, regardless of the source of support. Similar information must be provided for all proposals already submitted or that are being submitted concurrently to other potential funders.

Applicants must complete the Current and Pending Support Form, using multiple forms as necessary to account for all activity for each individual identified in the PI, co-PI, and key personnel roles. A separate form should be used for each identified individual.

Applicants must download the Current and Pending Support Form from the NIST Grants Management Division [Current and Pending Support](#) webpage and reference the guidance provided as it contains information to assist with accurately completing the form.

15. **Compliance with SBIR Program Requirements, Applicant Fraud Awareness Training – Certification of Training Completion.** Complete the training at: <https://www.nist.gov/file/384881>. After completion, print and fill out the last page of the training presentation. Attach this document to the Research and Related Other Project Information form as described in Section 8.02.
16. **Letters of Commitment.** Letters must be submitted by all funded and unfunded entities that will have an active role in executing the activities outlined in the Project Narrative. 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 of Commitment must also specify any voluntary committed cost-share, including the specific services and/or products to be used in the project. Letters of Commitment must be signed by an individual with authority to legally bind the organization to its commitment. Letters of commitment do not count against the specified page limits.
17. **Company Commercialization Report (CCR).** Attach a PDF copy of the CCR which was completed in your account at Sbir.gov and submit along with your proposal (refer to Section 3.03 SBA Data Collection Requirement).
18. **Appendix C. Required Disclosures or Relationships to Foreign Countries.** Attach a PDF copy of the completed signed and dated Appendix C disclosure form and submit along with your proposal.

8.02 Attachment of Required Application Documents

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FY 2024 SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM
FOR CHIPS FOR AMERICA – CHIPS METROLOGY

NOTICE OF FUNDING OPPORTUNITY No. 2024-SBIR-CHIPS-01

April 16, 2024

Items 8.01.1 through 8.01.4 above are part of the standard application package in Grants.gov and can be completed through the download application process.

Item 8.01.5, the SF-LLL, Disclosure of Lobbying Activities form, is an optional application form which is part of the standard application package in Grants.gov. If item 8.01.5, the SF-LLL, Disclosure of Lobbying Activities form is applicable to this proposal, attach it to field 18 of the SF-424 (R&R), Application for Federal Assistance.

Item 8.01.6, the Cover Sheet, and Technical Proposal, should be attached to field 8 (Project Narrative) of the Research and Related Other Project Information form by clicking on “Add Attachment”.

Item 8.01.8, the Budget Narrative and Justification, should be attached to field L (Budget Justification) of the Research and Related Budget (Total Fed + Non-Fed) form by clicking on “Add Attachment”.

Items 8.01.7, Resume(s) or CV(s); 8.01.9, the Indirect Cost Rate Agreement; 8.01.10, the SBA Company Registry Form; 8.01.11, the Data Management Plan; 8.01.13, the Research & Related Personal Data; 8.01.14, the Current and Pending Support Form; 8.01.15, the SBIR Applicant Fraud Awareness Training Certificate of Training Completion; 8.01.16, Letters of Commitment; 8.01.17, Company Commercialization Report (CCR), and 8.01.18, Appendix C. Required Disclosures or Relationships to Foreign Countries, must be attached by clicking on “Add Attachments” found in item 12 (Other Attachments) of the Research and Related Other Project Information form.

Item 8.01.12, the Subaward Budget Form(s), if applicable to the submission, should be attached to the Research & Related Subaward Budget (Total Fed + Non-Fed) Attachment(s) Form in the application package.

Following these directions will create zip files which permit transmittal of the documents electronically via Grants.gov.

8.03 Verifying the Submission and Tracking the Application

Applicants should carefully follow specific Grants.gov instructions at www.Grants.gov to ensure the attachments will be accepted by the Grants.gov system. A receipt from Grants.gov indicates only that an application was transferred to a system. It does not provide details concerning whether all attachments (or how many attachments) transferred successfully. Attachment file names should be kept as short as possible due to potential file corruption after the addition of extensions by Grants.gov. Applicants will

receive a series of e-mail messages over a period of up to two business days before learning whether a Federal agency's electronic system has received its application.

Applicants are strongly advised to use Grants.gov's "Download Submitted Forms and Applications" option to check that their application's required attachments were contained in their submission.

After submitting the application, check the status of your application here: [CHECK APPLICATION STATUS](#). If any, or all, of the required attachments are absent from the submission, follow the attachment directions found above, resubmit the application, and check again for the presence of the required attachments.

If the directions found on [the Grants.gov Online Help page](#) are not effective, please contact the Grants.gov Help Desk immediately. If calling from within the United States or from a U.S. territory, please call 800-518-4726. If calling from a place outside the United States or a U.S. territory, please call 606-545-5035. E-mails should be addressed to support@grants.gov. Assistance from the Grants.gov Help Desk will be available around the clock every day, with the exception of Federal holidays. Help Desk service will resume at 7:00 a.m. Eastern Time the day after Federal holidays.

Applicants can track their submission in the Grants.gov system by following the procedures at the [Grants.gov Track My Application page](#). It can take up to two business days for an application to fully move through the Grants.gov system to NIST. NIST uses the Tracking Numbers assigned by Grants.gov, and does not issue Agency Tracking Numbers.

8.04 Unique Identifier and System for Award Management (SAM)

Pursuant to 2 C.F.R. Part 25, applicants and recipients (as the case may be) are required to: (i) be registered in SAM before submitting its application; (ii) provide a valid unique entity identifier in its application; and (iii) continue to maintain an active SAM registration with current information at all times during which it has an active Federal award or an application or plan under consideration by a Federal awarding agency, unless otherwise excepted from these requirements pursuant to 2 C.F.R. § 25.110. NIST will not make a Federal award to an applicant until the applicant has complied with all applicable unique entity identifier and SAM requirements and, if an applicant has not fully complied with the requirements by the time that NIST is ready to make a Federal award pursuant to this NOFO, NIST may determine that the applicant is not qualified to receive a Federal award and use that determination as a basis for making a Federal award to another applicant.

9.0 RESEARCH AREAS

The CHIPS Metrology Program emphasizes measurements that are accurate, precise, and fit-for-purpose for the production of microelectronic materials, devices, circuits, and systems. This work leverages NIST's proven measurement science expertise, foundational communications and computing research capabilities, standards development contributions, and stakeholder engagement practices to address the highest priority metrology challenges identified across industry, academia, and government agencies. NIST will expand upon its strong track record of supporting the semiconductor technology and manufacturing ecosystem by developing, advancing, and deploying standards, reference materials, best practices, and measurement methods. CHIPS Metrology seeks critically needed measurement services, tools, and instrumentation; innovative manufacturing metrologies; novel assurance and provenance technologies and advanced metrology R&D testbeds to achieve U.S.-led global semiconductor industry in the following areas:

9.01 FY24 CHIPS SBIR Open Topics

Open Topics:

Recognizing that metrology is critical to enabling future microelectronics innovation, NIST has worked with stakeholders to identify the critical challenges requiring R&D. Information gained by NIST through a series of workshops, a request for information, and discussions with major companies has informed a proposed strategic path forward focused on seven Grand Challenges, outlined in the [Strategic Opportunities for U.S. Semiconductor Manufacturing](#) publication. For the Open Topic SBIR Section, the CHIPS Metrology SBIR program seeks applicants to propose innovation that relates to an outlined path forward elements identified in the Metrology Grand Challenges.

Grand Challenge 1: Metrology for Materials Purity, Properties, and Provenance

The challenge: Meet increasingly stringent requirements for semiconductor materials purity, physical properties, and provenance across a diverse supply chain through development of new measurements and standards.

The strategy: Develop measurement technologies, properties data, and standards focused on defect contaminant identification. The objective is to support uniform materials quality across suppliers and to enable tracking of potential sources of impurity.

The path forward: Conduct high impact R&D and related activities in critical areas:

- New measurements with increased sensitivity and throughput for detection of particles and contaminants in material throughout the supply chain, including in-line quality assessment.

- Innovative, higher-throughput techniques for measuring physical properties for microelectronics feed materials.
- Evaluation and correlation of properties data across the materials supply infrastructure to support both standards and provenance.
- Standard Reference Materials (SRMs) for trace impurity detection and reference data, including those for thermophysical properties of materials.
- Documentary standards that can assist manufacturers in following materials through the supply chain, such as detailed versions of certificates of analysis (shows materials properties, keeps track of any potential source of contamination).

Grand Challenge 2: Advanced Metrology for Future Microelectronics Manufacturing

The challenge: Ensure that critical metrology advances are made to keep pace with cutting-edge and future microelectronics and semiconductor manufacturing, while maintaining a competitive U.S. advantage.

The strategy: Develop advanced physical and computational metrology adaptable to next-generation manufacturing of advanced complex, integrated technologies, and systems.

The path forward: Conduct activities in critical areas to develop innovative, cost-effective metrology applicable to 3D device and next-generation manufacturing, including tool and methods in the following critical areas:

- Properties of new materials and devices, such as GAA, complementary FET, and novel interconnects and dielectrics.
- Physical properties characterization (e.g. size, roughness, thermal, mechanical, electrical, magnetic, optical) for surfaces, buried features, interfaces and devices with increased resolution, sensitivity, accuracy, and throughput.
- Rapid, high-resolution, non-destructive techniques for characterizing defects and impurities and correlating them with performance and reliability.
- Evaluation and correlation of relevant data across the semiconductor manufacturing process.
- Standards for process design, development, and control, such as reference materials and documentary standards.
- Statistical analysis for rare but catastrophic defects such as stochastic events in extreme ultraviolet (EUV) lithography.

Grand Challenge 3: Enabling Metrology for Integrating Components in Advanced Packaging

The challenge: Provide enabling metrology that spans multiple length scales and physical properties and supports acceleration of advanced packaging concepts for future-generation microelectronics.

The strategy: Develop metrology to enable complex integration of sophisticated components and novel materials for advanced microelectronics, strengthening the domestic semiconductor packaging industry and U.S. leadership in this critical sector.

The path forward: Conduct R&D to develop metrology to address the unique challenges presented by advanced packaging, including subsurface features and aspects related to heterogeneous integration and other innovative concepts. Critical areas include:

- Measurements for in situ, rapid measurements and verification methods for interfaces and subsurface interconnects, and internal 3D structures including warpage, voids, substrate yield, stresses, adhesion and reliability with improved throughput and resolution.
- Physical properties (e.g., size, thermal, mechanical, electrical, magnetic, optical) for films, surfaces, buried features, and interfaces.
- Methods for integrating chiplets, dielets, SoCs, and memories into packages.
- Mechanical measurements for component integration (e.g., hybrid bonding and interfacial adhesion and bond integrity).
- Evaluation and correlation of data across the packaging process.
- Standards for packaging, such as reference materials and documentary standards for areas including chiplets and SoCs.

Grand Challenge 4: Modeling and Simulating Semiconductor Materials, Designs, and Components

The challenge: Improve the tools needed to effectively model and simulate future semiconductor materials, processes, devices, circuits, and microelectronic system designs.

The strategy: Develop advanced designs simulators based on multi-physics models, a spectrum of critical measurements, and next-generation concepts such as artificial intelligence, creating a suite of tools to empower U.S. microelectronics designers.

The path forward: Conduct R&D to develop robust data, mathematical models, and measurement techniques for important future device parameters that are needed to support effective design simulators. Critical R&D areas include:

- Multi-physics models, including those that capture thermal, chemical, physical, mechanical, signal integrity, reliability, power consumption, and other

parameters.

- Measurements of material, component, and circuit properties across a broad temperature, bias, and frequency range as input to, and as verification of, the above models.
- Application and validation of advanced analytics such as ML and AI for modeling and optimization of complex materials, circuits, and systems operating in real environments.
- Methods for robustly estimating model uncertainty.

Grand Challenge 5: Modeling and Simulating Semiconductor Manufacturing Processes

The challenge: Seamlessly model and simulate the entire semiconductor value chain, from materials inputs to chip fabrication, system assembly, and end products.

The strategy: Create a suite of advanced computational models, methods, data, standards, and tools that will enable domestic semiconductor manufacturers and the value chain to improve overall yields, accelerate time to market of devices, and enhance competitiveness in global markets.

The path forward: Conduct R&D to develop a variety of effective manufacturing simulation tools and related standards that can be applied to in-line processes and model key parameters. Critical R&D areas include:

- Modeling, data analysis, and validation tools to enable efficient process development and optimization.
- Standards, protocols, and standard data for automation and virtualization.
- Measurements and standards supporting digital twins, from individual processing steps up to the complete chip fabrication and system assembly.
- Application and validation of advanced analytics such as ML and AI for modeling and optimization of complex manufacturing process design, development, automation, and integration.

Grand Challenge 6: Standardizing New Materials, Processes and Equipment for Microelectronics

The challenge: Create the standards and validation methods necessary to accelerate the development and manufacturing of future information and communication technologies.

The strategy: Create standards and validation protocols to support the use of new materials, processes, and equipment in future-generation microelectronics, paving the way for accelerated innovation and cost-competitiveness in U.S. industry.

The path forward: Conduct R&D, data collection, process validation, and other standards-related activities to support the development of documentary standards, SRMs, and calibration protocols and services for next-generation semiconductor manufacturing. Critical areas of pursuit include:

- SRMs, data, instruments, and calibration and measurement services; product development kits; and a diversity of best-known methods.
 - Reference materials to detect defects, contaminants, and trace impurities at the nanoscale.
 - Reference materials for nanoscale dimensional and materials characterization.
 - Calibration, validation, and new methods to enable high-accuracy fleet matching for equipment in both process development and high-volume manufacturing (I.e. matching the suite of tools to the process/materials of use).
 - SRMs and data for advanced packaging and heterogeneous integration, including high-frequency electrical properties and thermomechanical properties.
- Standards for interoperable equipment and software from different vendors that ensure the protection of intellectual property (IP), data integrity and provenance across the supply chain.
- Standards for tracking materials from creation to end use in the fab, including anything that could alter the properties of the material.

Grand Challenge 7: Metrology to Enhance Security and Provenance of Microelectronic-based Components and Product

The challenge: Create the metrology advances needed to enhance the security and provenance of microelectronic components and products across supply chains and increase trust and assurance.

The strategy: Pursue a comprehensive approach to hardware security protection that includes standards, protocols, formal testing processes, and advanced computational technologies while providing avenues for assurance and provenance of microelectronic components across the supply chain and end products.

The path forward: Conduct activities to support the development of standards, protocols, and testing processes for analyzing security vulnerabilities in microelectronics across their entire life cycle. Critical areas of pursuit include:

- Methods, reference design kits, and guidelines for security analytics and automation, including pervasive security to address formalized threats models.
- Enhances vulnerability management across the overall product life cycle from

inception to end of life, including activities such as:

- Formal testing and processes for independent V&V.
- Tracking of materials and components, as well as detecting and mitigating trigger mechanisms.
- Common test structures, test methods, and test and measurement strategies for end-to-end provenance.
- Documentary standards for hardware security and provenance.
- Development and use of trusted emerging techniques, e.g. AI and ML methods across the entire semiconductor value chain.

9.02 FY24 CHIPS SBIR Closed Topics

Closed Topics:

The CHIPS Metrology Program has also funded research & development projects teams, comprised of NIST researchers with collaborative partners from industry, academia, and other government/nonprofit research centers, to address the highest priority metrology challenges aligned with the Seven Metrology Grand Challenges. Several of these teams are specifically seeking SBIR applicants with the following innovative technology with whom they'd work collaboratively related to the following topics. Please note, applicants that have related, successfully completed Phase I awards from NIST or another federal agency are eligible to submit for a Phase II application to the Closed Topics. All other applicants should submit for a Fast Track Phase 1 and Phase 2 award for these Closed Topics.

1. Closed Topic Title: Near-Real Time RF Propagation Measurement System

Scope Description: Accurate characterization of wireless environments is crucial for the development of efficient and reliable wireless communication systems. The complexity of RF propagation, influenced by multipath components, necessitates sophisticated measurement and analysis techniques. Existing sounder-based designs offer a foundation, but there is a significant need for enhanced systems that can automatically acquire, process, and analyze RF propagation measurements with greater speed and accuracy. The anticipated commercial outcome of this innovation is a RF channel sounder for characterizing dynamic propagation channels frequencies.

This solution seeks to develop advancements to a RF channel sounder system capable of automatically acquiring and processing RF propagation measurements and extracting multipath components (MPC) to accurately characterize the effects of the wireless environment. The system should leverage and extend existing sounder designs, incorporating innovative methods for accelerated measurement data processing, while addressing the following requirements:

- TX/RX boards and hardware circuitry interfacing to a digitized sampling rate of up to 192 GB/s;
- Accurate TX/RX synchronization (up to 0.5ps);
- Switch digital or analog beamforming and antenna calibration;
- MPC feature extraction and selection algorithms in near real-time: minimum of 50% processing time reduction;
- Extracted MPC resolution/average errors for path gain less than 1 dB, 3D angle less than 2 deg, and delay less than 1ns.

Desired Objectives of Phase I and Phase II:

Phase I: Feasibility Study and Planning

Outputs: Research & Prototype

- Conduct a comprehensive feasibility study on various methods to accelerate RF measurement processing, focusing on SAGE algorithm among others.
- Evaluate existing technologies (ASICs, FPGA, GPU) and sounder designs for potential integration and enhancement.
- Develop a detailed plan for Phase 2, outlining the design, development, and testing of the proposed system, including specific acceleration modules and any joint testing components.
- A final report detailing the initial exploratory research to evaluate various acceleration methods for RF data processing, assess the integration potential with current technologies, and plan the development of a versatile prototype.

Phase II: System Development and Prototyping

Outputs: Analysis, Hardware, and Prototype

- Based on Phase 1 findings, develop a comprehensive system that includes hardware and software components for RF measurement acquisition, processing, and analysis.
- Integrate acceleration modules to enhance processing speed and efficiency.
- Construct a working prototype and conduct testing in both laboratory and real-world environments to validate performance and reliability.
- A final report detailing test outcomes, underscored by a narrative that contrasts the prototype's performance across lab-controlled and real-world scenarios.

2. Closed Topic Title: Compact, fieldable cryogenics for deployment of superconducting-nanowire single-photon detectors in a circuit-evaluation microscope

Scope Description: Superconducting-nanowire single-photon detectors offer excellent performance for measuring the faint photonic emission from transistors. Utilizing these detectors in a field analysis lab at a semiconductor development company requires deployment of cryostats to operate in a microscopy apparatus with minimal

maintenance and cryogenic expertise required by the laboratory technician. The anticipated commercial outcome of this innovation is a compact cryostat for cooling small sensors and/or samples.

This solution seeks advancements in compact, fieldable cryostats, in which the CHIPS Metrology team is seeking to install its superconducting sensors used in time-resolved emission microscopy (TREM) to support a field analysis circuit evaluator with no knowledge of superconducting electronics or cryogenics, with the following requirements set:

- The cryostat must reach a base temperature of 2.3K
- It must not require replenishment of liquid cryogens
- The cryostat must be wired for direct readout of 64 superconducting nanowire single-photon detectors
- The cooling power of the lowest temperature stage must be sufficient to keep all detectors at the above-specified base temperature when all wiring is connected and the sensor array is in operation
- The cryostat must include an input optical window mated to the output of the TREM microscope in such a manner that lateral vibrations of the focal plane array relative to the incoming optical beam are less than or equal to 2 μ m. This optical interface between the microscope and the cryostat must require minimal user maintenance for beam alignment and focusing
- The cryostat must include low-temperature optical filters for eliminating blackbody

Desired Objectives of Phase I and Phase II:

Phase I:

Outputs: Analysis & Prototype

- A final report detailing the design of the cryostat that meets the above requirements set, including the choice of pulse tube based on required cooling power, the design of the low-temperature stage accommodating the focal plane array, the optical path, with low-temperature focusing optics, the cryogenic amplifiers on the 4K stage, the micro-coax wiring going to 300K, and the design of the optical and mechanical mating to the microscope.

Phase II:

Outputs: Hardware

- A fully functional version of this cryostat meeting all the above specifications, capable of mating to the microscope.

3. Closed Topic Title: Microscope for time-resolved emission microscopy with superconducting-nanowire single-photon detectors

Scope Description: Current microscopes used in circuit evaluation and failure analysis achieve excellent spatial resolution through the use of solid-immersion lenses. These microscopes are tailored primarily for laser probing, yet the basic concepts can be straightforwardly adapted to complementary circuit evaluation technique of time-resolved emission microscopy (TREM). The anticipated commercial outcome of this innovation is a mid-infrared microscope and probe station that can accommodate a compact cryostat.

This solicitation seeks a state-of-the-art TREM apparatus, or a mid-infrared microscope and electronic probe station, that accommodates a compact cryostat including the sensor array and readout electronics, addressing the following requirements set:

- The microscope must have a solid-immersion lens with high numerical aperture at the dominant emission wavelength of 2 μ m, with a spectral bandwidth ranging from 1.3 μ m to 3 μ m
- The microscope must include an active positioning stage and electronic probers for stimulating the circuit under evaluation
- The apparatus must be designed and constructed to mate to a compact cryostat, which will house the superconducting focal plane array
- This design must include optical input to the cryostat and well as mechanical design for low vibration

Desired Objectives of Phase I and Phase II:

Phase I:

Output: Analysis

- A final report detailing the design of the microscope meeting the scope description. The report should contain careful analysis of the optical and mechanical aspects of the instrument.

Phase II:

Outputs: Hardware and Prototype

- A functional microscope prototype capable of mating with a compact cryostat supplied by a third party to perform TREM.

4. Closed Topic Title: Device-Scale AFM-Thermoreflectance Hybrid Metrology

Scope Description: Thermal management is critical for microprocessors and for wide bandgap semiconductor devices (for example, inverters, AC/DC-DC converters, solid-state lighting, RF, and communication devices). The demand for increased performance in increasingly complex semiconductor devices has outpaced the development of measurement techniques and reliable thermal property data needed to effectively model, design, and evaluate advanced microelectronics transistors and packages.

Thermoreflectance (TR) measurements use modulated laser heating and thermal models to probe thermal resistance and interface conductance by exploiting a fundamental relationship between optical reflectance and temperature. Existing thermoreflectance instrumentation, based on Time Domain TR (TDTR), Frequency Domain TR (FDTR), and Steady State TR (SSTR) techniques, can measure the thermal properties of thin film materials and buried interfaces, but are typically home built, have limited spatial resolution, and cannot measure temperature profiles. Atomic force microscope (AFM) techniques can access mechanical properties and topological features at the nanoscale due to their small probe tips. A recent paper, J. Rho, M. Lim, S. S. Lee, and B. J. Lee, RSC Adv., 2018, 8, 27616-27622, [has demonstrated a hybrid AFM-TR technique to map the spatial temperature profiles with < 100 nm spatial resolution. More recent developments in D. Eichfeld, R. A. Maniyara, J. A. Robinson, B. M. Foley, and B. Ramos-Alvarado, AIP Advances, 2023, 13, 105035, have demonstrated an AFM instrument customized with an optical pump-probe scheme inspired by FDTR to characterize the nanomechanical properties of thin film materials. Suggested future improvements include scanning in thermal modes of operation or incorporating other simultaneous optical experiments. Since the measured data is split into magnitude and phase components (common in TR thermal analysis), existing TR thermal modeling could be incorporated in these hybrid AFM-TR systems to also extract thermal properties. The anticipated commercial outcome of this innovation is a hybrid AFM-TR instrument for conducting thermal property measurements.

This solicitation seeks advancements in hybridizing thermoreflectance-based thermal property measurements with Atomic Force Microscopy to generate maps of the thermal resistance, thermal boundary interface resistance, and temperature profiles of wide bandgap materials and devices with < 100 nm spatial resolution. The hybrid thermal metrology tool must be automated, user-friendly, and low cost to operate (advances in consumables may be required). AFM probes have an operation lifetime and require frequent replacement. The tool should be capable of characterizing material thermal properties without the need for an applied transducer coating. The proposed plan must address the following requirements:

- A thermal metrology tool capable of measuring thermal resistance, thermal boundary interface resistance, and temperature profiles of wide bandgap materials with:
 - < 100 nm spatial resolution,
 - < 0.5 °C temperature resolution,
 - and < 10 % measurement uncertainty.
 - Capability of characterizing materials without the need for an applied transducer coating.
- Validation of thermal metrology tool measured values using a combination of measurement comparisons, literature data, and/or reference materials.

- The hybrid thermal metrology tool must be automated, user-friendly, and low cost to operate.
- Delivery of the prototype hybrid AFM-TR instrument to CHIPS Metrology for evaluation and testing.

Desired Objectives of Phase I and Phase II:

Phase I:

Output: Research

- A final report: demonstrating feasibility of hybrid AFM-TR approach, to include measured validation data (thermal resistance, thermal boundary interface resistance) < 100 nm spatial resolution and demonstrating the ability to measure buried interfaces; and detailing a prototype hybrid instrument design, measurement techniques, thermal models, and uncertainty analysis approach.

Phase II:

Outputs: Prototype & Analysis

- Delivery of the prototype hybrid AFM-TR instrument to CHIPS Metrology for evaluation and testing.
- A report detailing the final prototype hybrid AFM-TR instrument design, measurement techniques implemented, a description of AFM tip material and geometry, thermal models used, and the uncertainty analysis. The report must outline how the design of the hybrid thermal metrology tool is automated and user-friendly, and the efforts that were made to reduce the cost of operation.
- A final detailed report demonstrating a functional hybrid AFM-TR instrument, to include measured validation data for thermal resistance, thermal boundary interface resistance, and temperature profiles on transducerless wide bandgap materials with < 100 nm spatial resolution, < 0.5 °C temperature resolution, and < 10 % measurement uncertainty. Validation of measured values may use a combination of measurement comparisons, literature data, reference materials, and/or interlaboratory samples exchanged with CHIPS Metrology.

5. Closed Topic Title: Super-resolution beam scanning, wide bandwidth, optical photothermal infrared (O-PTIR) microscope.

Scope Description: This solicitation seeks advancements of super-resolution beam scanning, wide bandwidth, optical photothermal infrared (O-PTIR) microscopy. The anticipated commercial outcome of this innovation is an O-PTIR microscope. To support NIST CHIPS metrology program needs for measuring chemical composition and thermal properties at the nanoscale, the solution should address the following requirements set:

- Enable O-PTIR measurements of chemical composition via infrared (IR) absorption spectra and IR absorption maps with high spatial resolution (≈ 500 nm) and high measurement throughput (≤ 20 μ s/point)
- Enable wide bandwidth (≥ 500 MHz) measurements of the sample thermalization due to impulsive IR light absorption (which is linked to the sample thermal properties) with high spatial (≈ 500 nm) and temporal (< 2 ns) resolutions and with high throughput (≤ 20 μ s/point)

Desired Objectives of Phase I and Phase II:

Phase I:

Output: Analysis

- A final report detailing signal to noise ratios, measurement throughput and acquisition parameters for recording O-PTIR absorption spectra and maps with ≈ 500 nm spatial resolution using a O-PTIR tool with beam scanning configuration of comparable performance to what is detailed in Sci. Adv., 2023, 9, eadg8814.
- A final report detailing wide bandwidth measurements (sampling rate ≥ 50 MHz and detection bandwidth ≥ 25 MHz) of the sample thermalization due to impulsive IR light absorption with 40 ns temporal resolution or better and ≈ 500 nm spatial resolution.

Phase II:

Outputs: Hardware and Software

- A super-resolution counterpropagating beam scanning, optical photothermal infrared (O-PTIR) microscope prototype operating both in reflection and transmission modes, with suitable wide detection bandwidth (≥ 500 MHz, 5 GHz preferred) and wide bandwidth electronics (≥ 1 GHz, 10 GHz preferred) equipped with a visible (≈ 532 nm) CW laser:
 - Capable of measuring infrared (IR) absorption spectra and IR absorption maps in the 2990 - 2700 cm^{-1} and 1800 - 800 cm^{-1} spectral range (or wider range) with ≈ 500 nm spatial resolution and high throughput (≤ 20 μ s/point).
 - Capable of measuring the sample thermalization due to impulsive IR light absorption with high spatial (≈ 500 nm) and temporal (≤ 2 ns) resolutions and with high throughput (≤ 20 μ s/point).
 - Including an option for 1 additional or compatible optical excitation and detection paths operating in the near-IR. This option shall include a wide bandwidth NIR detector (≥ 500 MHz, 5 GHz preferred) and a CW probe laser operating within the ≈ 1100 - 1300 nm spectral range, and optics for delivering a near-IR excitation laser installed at NIST (≈ 200 fs pulse duration, ≈ 1300 - 1500 nm spectral range).
 - Including an option for measuring Raman spectra with ≈ 500 nm spatial resolution.
 - The final prototype configuration shall be determined in coordination with NIST.

- Early delivery of a O-PTIR prototype microscope at NIST capable of measuring the thermalization of the sample due to impulsive IR light absorption, with ≈ 500 nm spatial resolution and ≈ 40 ns temporal resolution shall be prioritized and later upgraded to full specifications i.e., to ≤ 2 ns temporal resolution.
- Suitable software capable of setting up, acquiring, and analyzing:
 - O-PTIR absorption spectra and maps
 - wide bandwidth measurements of time-domain sample thermalization.
 - Raman spectra and maps

6. Closed Topic Title: High brightness compact X-ray or EUV sources for semiconductor metrology

Scope Description: This solicitation seeks advancements of high intensity, high brightness, compact X-ray sources or Extreme ultraviolet (EUV) sources to support metrology tools, addressing the following requirements set:

- At least 10x higher brightness than commercially available X-ray sources or EUV sources. For this solicitation, X-ray energies span the 0.2 to 30 keV range, and EUV wavelength spans the 5 to 50 nm range. Sources do not have to cover the full range. Sources do not have to cover the full range. Even larger increases in brightness are advantageous.
- Tunability of the photon energy to allow X-ray absorption spectroscopy is desired.
- The footprint of the x-ray source shall be small enough to fit in a typical laboratory facility (5 m by 8 m) or for EUV source, the footprint small enough to fit on a large optical table (1m by 2m).

The anticipated commercial outcome of this innovation is a compact x-ray or EUV source.

Desired Objectives of Phase I and Phase II:

Phase I:

Outputs: Research & Prototype

- A final report detailing a feasibility study for the design and fabrication of the X-ray source or EUV source. The study shall include estimated brightness, wavelength output, spectral bandwidth, energy tunability, coherence, spot size, divergence, flux, and footprint. The study shall discuss the applicability of the X-ray or EUV source for the X-ray or EUV metrology methods currently in use or proposed for use by the semiconductor industry.
- Proof of concept demonstration of the proposed X-ray or EUV production mechanism.

Phase II:

Output: Prototype

- A final report detailing final X-ray or EUV source design, the performance specifications of the prototype source, and a plan for further enhancement of the performance.
- A prototype demonstration of the EUV or X-ray source.

7. Closed Topic Title: Nanoscale dimensional metrology reference standards to support semiconductor metrology

Scope Description: This solicitation seeks advancements in Intellectual Property (IP)-neutral semiconductor reference samples with advanced device structures fabricated using EUV lithography to support metrology development and testing by the CHIPS Metrology Program, addressing the following requirements set:

- Containing a series of line-space target areas with different critical dimensions (line width) and pitches with a minimum pitch of <30 nm and a maximum pitch of 50 nm. There must be at least 50 different combinations of pitch and critical dimension on a single die.
- Be fabricated on 300 mm wafers and patterned with EUV lithography.
- Patterned areas varying in size from 5 um up to 200 um squares. The design should include patterned areas that include identical pitch and critical dimensions but are sized for different metrology methods.
- Conduct a survey of semiconductor metrology companies to identify most important requirements for a nanodimensional reference standard.
- The fabrication process must be capable of producing features with low line edge roughness (3 sigma less than 15% of line width) and sidewall angles steeper than 85 degrees. The process should have uniformity across the wafer and between wafers.

The reference samples will be made commercially available to semiconductor instrument manufacturers and fabricators without restrictions on publication of data collected from the samples. The anticipated commercial outcome of this innovation is reference sample of advanced device structures that can be used to characterize semiconductor test equipment.

Desired Objectives of Phase I and Phase II:

Phase I:

Output: Research

- A final report detailing survey of semiconductor metrology vendors and the key device structures required for the chip design. The report also shall detail the planned process flow for the wafer fabrication

- Full design for an EUV lithography reticle that contains the key test structures identified in the report and in the scope description.

Phase II:

Output: Prototype

- A final report detailing the completed fabrication process for the reference standard structures including microscopy analysis of prototype chips showing the relevant features (critical dimension, pitch, line edge roughness, side wall angle, and reproducibility across the wafer). The report should also outline process variations that can be made to result in patterns with different material stacks.
- Fabricated reticle for EUV lithography.
- Prototype chips fabricated using the EUV lithography reticle and the developed fabrication process.

- 8. Closed Topic Title:** Advanced Electron Backscatter Diffraction (EBSD) detector offering high pixel density, high-speed and low noise operation, and low kV detection enabled by directly detecting electrons using an application specific integrated circuit (ASIC) detector.

Scope Description: This solicitation seeks an advanced 2D pixelated sensor for low energy electron detection targeting Electron Backscatter Diffraction (EBSD) and Transmission Kikuchi Diffraction (TKD) applications. The Government anticipates these sensor advancements will also enable improvements for Photoelectron Emission Microscopy (PEEM) and Low Energy Electron Microscopy (LEEM) applications. The anticipated commercial outcome of this innovation will be a sensor with significant improvements compared to commercially-available detectors in resolution, sensitivity, speed, and will address the following requirements set:

- The sensor must have a pixel resolution of at least 1024 × 1024 with preference given to larger pixel resolution up to 4096 × 4096. The active area of the sensor should be between 15 mm and 40 mm wide. The sensor active area should have an aspect ratio near 1:1 and should not have inactive regions within the active area (e.g. monolithic or gutter free).
- The packaging of the sensor chip must be engineered to minimize the extent of the detector package laterally from the active area of the sensor. Integration of the sensor into the detector package must allow the detector to be fully retractable beyond the chamber wall of commercial scanning electron microscopes (SEMs) through the traditional EBSD port. When fully inserted to typical EBSD detector distances, the detector package should not interfere with Energy Dispersive X-Ray Spectroscopy detectors. The detector package should also enable on-axis TKD configurations that can be retracted beyond the chamber wall of commercial SEMs.

These two configurations do not have to be simultaneous (e.g. two configurations, one for EBSD, one for TKD).

- The extent of the detector package in front of the active area should be minimized and must not exceed 3 mm.
- The sensor must be optimized for detection of electrons between 2 keV and 20 keV.

Desired Objectives of Phase I and Phase II:

Phase I:

Output: Analysis

- **Design Study:** The awardees must conduct a design study to prepare for prototype production. The scope of this study may include sensor ASIC design and must include designing sensor packaging, support electronics, and detector package electrical and thermal systems.
- **Report of Anticipated Sensor Capabilities:** The awardees must deliver to CHIPS Metrology a report that summarized the design study effort. This report must include the anticipated performance specifications of the sensor when integrated into the newly designed detector package.
The report must fully document how the newly designed detector package will be integrated into SEMs through the traditional EBSD port for both conventional EBSD and TKD configurations.
- On a case-by-case basis NIST may provide subject matter experts to Phase I awardees for consultation and discussion of design questions relating to EBSD and TKD applications as well as integration into commercial SEMs.

Phase II:

Outputs: Hardware Prototype

- **Hardware Prototype:** The awardees must build and demonstrate a prototype advanced 2D pixelated sensor including detector packaging components described in the Phase I report. The prototype system should be demonstrated for either conventional EBSD or TKD applications (or both) and should meet all of the requirements described above. On a case-by-case basis, NIST may provide subject matter experts, EBSD and TKD samples, and access to SEMs for testing, development, and demonstration of newly designed detector systems.
- **Final Report:** The awardees must provide a final report that describes the demonstrated capabilities of the newly developed 2D pixelated sensor and detector package integration. This report must document EBSD and/or TKD performance of the new sensor at multiple operating voltages including at least 2 kV, 5 kV, 10 kV, and 20 kV at full resolution of the detector. Additionally, mapping performance must be documented for any available high-speed modes (e.g. binning, windowing, partial sampling, etc) and highlight the highest operating speeds achieved for all modes. Finally, the performance of the sensor at “low” probe currents must be

demonstrated. For all performance elements, complete metadata is required to be reported and must include SEM operating conditions (e.g. accelerating voltage, probe current, working distance, etc.), scan configuration (e.g. step size, dwell, etc.), sample descriptions (e.g. material, preparation, etc.), and detector operating settings (e.g. gain, pixel configuration, exposure time, etc.).

- Data Supporting the Final Report: Data that is used for figures within the final report and data to support conclusions drawn in the final report must be provided in an open (e.g. jpeg, csv) or commonly readable format (e.g. xlsx).

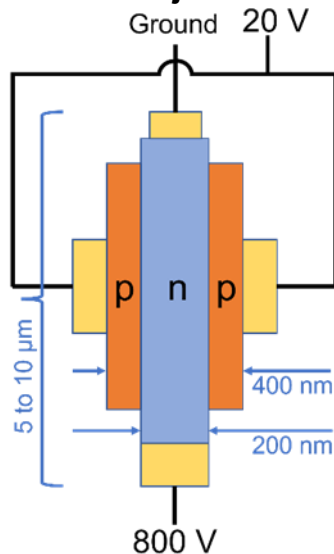
9. Closed Topic Title: TEM High Voltage Biasing Holder

Scope Description: This solicitation seeks advances in transmission electron microscope (TEM) sample holders to support in-situ high-voltage biasing of device lamella during TEM measurements, and addressing the following requirements set:

- One lead capable of applying voltages up to 800 V or higher
- Two leads capable of applying voltages up to 30 V, these leads should be electrically connected away from the sample (see schematic)
- One ground connection
- Contact configuration appropriate for both horizontal and vertical device structures (see schematic)
- Compatible with a Thermo Fisher Scientific Spectra 300 instrument with an X-twin lens

The anticipated commercial outcome of this innovation is a TEM sample holder that can be used to provide high-voltage biasing capable of *in-situ* sample measurements under typical operating conditions.

Desired Objectives of Phase I and Phase II:



Phase I:

Outputs: Research & Prototype

- A final report detailing the process of lead configuration optimization, the expected limitations of the assembly and the possibility of extension to higher voltages and/or different lead configurations. Any anticipated possibilities for noise, voltage fluctuations or other interference shall be documented.
- A prototype holder to be delivered to CHIPS Metrology for independent assessment and testing.

Phase II:

Output: Hardware

- TEM sample holder with: one lead capable of applying 800 V or higher, two connected leads capable of up to 30 V, and a ground connection.

10. Closed Topic Title: Wafer-scale ferromagnetic resonance spectrometer for Advanced MRAM Wafer Data and Quality Control

Scope Description: This solicitation seeks solutions for wafer-scale ferromagnetic resonance (FMR) probing of magnetic random access memory (MRAM) films, of which the CHIPS Metrology team is seeking to survey the across-wafer homogeneity. The anticipated commercial outcome of this innovation will be a FMR system to support wafer-scale quality control and device performance prediction.

The desired solution will support, with the following requirements set:

- The generation of at least 1 T amplitude vertical magnetic field with the ability to generate both positive and negative field directions up to the maximum amplitude, the ability to sweep from positive to negative amplitude in a duration of 10 seconds or shorter, and the ability to maintain a generated field to within +/- 0.002 T for at least 10 seconds
- The ability to superimpose a time-varying alternating current magnetic field of amplitude at least 0.001 T and frequency at least 130 Hz to carry out lock-in FMR detection
- At least *NN* parallel FMR spectrometers, each to include one broadband transmission line, one microwave current source to excite the transmission line, one diode detector, and one lock-in amplifier/demodulator, each of which capable of supporting at least 67 GHz bandwidth

- 4-axis (X-Y-Z-phi) automated stage control to deliver a 300 mm diameter standard foundry silicon complementary metal oxide semiconductor (CMOS) wafer (approximately 0.8 mm thick) into close proximity to the transmission line for FMR stimulation without damaging the sample (no scratches to the surface or inelastic deformation of the underlying wafer) including mitigation for bend/warp in the received wafer
- Software for the execution of FMR measurements, including magnetic field control; *rf* power and frequency control; demodulator control; and wafer translation control
- Software for the FMR measurement data reduction to estimate the resonance field and resonance linewidth for a swept-field FMR observation and generate a report of the dispersion in the across-wafer magnetic properties, including magnetic anisotropy, gyromagnetic ratio, Gilbert damping and inhomogeneous linewidth broadening

Desired Objectives of Phase I and Phase II:

Phase I:

Outputs: Research and Prototype

- A final report detailing (the material properties and the manufacturing processes for the transmission lines and magnet, as well as an evaluation of the extensibility of the measurement system to wafers of interest (i.e., 300 mm diameter or larger wafers)).
- A proof-of-concept FMR spectrometer with limited translation and stimulus of a single spot on a wafer that is capable of returning to within a 1 cm radius of a spot on a 75 mm standard CMOS wafer and generating reproducible FMR measurements of a sample whose vertical FMR field at 21 GHz does not exceed 0.5 T. Proof-of-concept will include validation of the specifications through joint testing. The uncertainty of the measured FMR field and FMR linewidth shall not exceed 20 % above the run-over-run measured uncertainty of these measurands obtained over ten simultaneous FMR observations without translation. The spectrometer and measurement results shall be delivered to CHIPS Metrology for independent assessment and tests.

Phase II:

Outputs: Analysis, Prototype and Hardware

- A final report detailing final manufacturing processes and an updated evaluation of the extensibility of these processes to sizes of interest (i.e., 300 mm wafer diameter or larger) including reports of the magnetic field homogeneity across the wafer, the power delivered to each of the 16 parallel FMR transmission lines as a function of excitation frequency out to 67 GHz; speed per measured FMR observation; and best practices for placing the transmission line into contact with the CMOS wafer without

losing bandwidth due to capacitive, inductive or resistive shunting of the transmission line signal.

- A full-scale prototype FMR system with automated X-Y-Z-Phi wafer scanning and 16 parallel FMR spectrometers capable of simultaneous measurements on a 300 mm CMOS wafer and generation of a report of the FMR measurements dispersion across the CMOS wafer with at least 128 measured points across the wafer characterized by at least 10 field-swept FMR scans at each of 10 distinct frequencies spanning at least 14 GHz in frequency bandwidth. Proof-of-concept will include validation of the specifications through joint testing.

Appendix A. COVER SHEET

(A fillable version of the Cover Sheet is available at <http://www.nist.gov/sbir>)

Application to National Institute of Standards and Technology (NIST) Small Business Innovation Research (SBIR) Program for CHIPS for America – CHIPS Metrology 2024-SBIR-CHIPS-01 (Date April 16, 2024)			
Cover Sheet			
Name & Address of Submitting Firm:			
Project Title			
Principal Investigator (PI) Name		PI Title	
PI Phone #		PI Email	
NIST may verify the following responses with information provided elsewhere in your application or by independent sources.			
THE APPLICANT CERTIFIES THAT:			
1. It is a small business concern (SBC) and meets the definition as stated in this Notice of Funding Opportunity (NOFO).		<input type="checkbox"/> Yes	<input type="checkbox"/> No
2. The primary employment of the PI will be with the SBC at the time of award and during the conduct of research.		<input type="checkbox"/> Yes	<input type="checkbox"/> No
3. A minimum of either two-thirds for Phase I or one-half for Phase II of the research will be performed by the SBC as determined by data provided in the Budget Narrative. See NOFO Section 1.03.01 for details on funding determination.		<input type="checkbox"/> Yes	<input type="checkbox"/> No
4. The applicant and/or PI <input type="checkbox"/> has <input type="checkbox"/> has not submitted applications for essentially equivalent work under other Federal program FFOs and <input type="checkbox"/> has <input type="checkbox"/> has not received other Federal awards for essentially equivalent work. If "has", what agency? Click here to enter text . See NOFO Section 3.04.02(14) for additional details that must be provided.			
5. The applicant qualifies as a socially and economically disadvantaged SBC and meets the definition as stated in this NOFO.		<input type="checkbox"/> Yes	<input type="checkbox"/> No
6. The applicant qualifies as a woman-owned SBC and meets the definition as stated in this NOFO.		<input type="checkbox"/> Yes	<input type="checkbox"/> No
7. The applicant qualifies as a HUBZone-owned SBC and meets the SBA's definition(see http://www.sba.gov/hubzone).		<input type="checkbox"/> Yes	<input type="checkbox"/> No

8. Year SBC founded:	Click here to enter text.
9. Number of Employees:	Click here to enter text.
STATEMENTS:	
10. The applicant will permit the Federal Government to disclose name, address, and telephone number of the corporate official of your concern, if your application does not result in an award, to appropriate local and State-level economic development organizations that may be interested in contacting you for further information.	<input type="checkbox"/> Yes <input type="checkbox"/> No
11. The applicant authorizes contact information and project title to be provided to the NIST Manufacturing Extension Partnership (MEP) after awards have been announced. If 'Yes' your contact information will be provided to NIST MEP. If so, you will be contacted by your local MEP to explore business-related support services that could benefit the potential of the project you proposed.	<input type="checkbox"/> Yes <input type="checkbox"/> No

Signature of Company Official and typed name, title, address, telephone number, and date	
Signature of Principal Investigator and typed name, title, address, telephone number, and date	
TECHNICAL ABSTRACT (limit to 200 words):	
POTENTIAL COMMERCIAL APPLICATION OF THE RESEARCH: (limit to 100 words)	
OTHER INFORMATION:	

Information contained in unsuccessful applications will remain the property of the applicant. The Federal Government may, however, retain copies of all applications. Public release of information in any application submitted will be subject to existing statutory and regulatory requirements. Applicants are discouraged from submitting proprietary information unless the information is deemed essential for proper evaluation of the application. If proprietary information provided by an applicant in a proposal constitutes trade secret, proprietary commercial or financial information, confidential personal information, or data affecting national security, it will be treated in confidence to the extent permitted by law, provided that the proposal is clearly marked by the applicant as follows:

(A) The following legend must appear on the title page of the proposal:

This proposal contains information that shall not be disclosed outside the Federal Government and shall not be duplicated, used, or disclosed in whole or in part for any purpose other than evaluation of this proposal, unless authorized by law. The Government shall have the right to duplicate, use, or disclose the data to the extent provided in the resulting award if award is made as a result of the submission of this proposal. The information subject to these restrictions are contained on all pages of the proposal except for pages [insert page number or other identification of pages that contain no restricted information.]

(End of Legend); and

(B) The following legend must appear on each page of the proposal that contains information the applicant wishes to protect:

Use or disclosure of information contained on this sheet is subject to the restriction on the title page of this proposal.

The use of any other legend is unacceptable to the Government and may constitute grounds for removing the application from further consideration without assuming any liability for inadvertent disclosure.

This collection of information contains Paperwork Reduction Act (PRA) requirements approved by the Office of Management and Budget (OMB). Notwithstanding any other provisions of the law, no person is required to respond to, nor shall any person be subject to a penalty for failure to comply with, a collection of information subject to the requirements of the PRA unless that collection of information displays a currently valid OMB control number. Public reporting burden for this collection is estimated to be 30 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering, and maintaining the data needed and completing and reviewing the collection of information. Send comments regarding this burden estimate or any aspect of this collection of information, including suggestions for reducing this burden, to the National Institute of Standards and Technology, Attn: Jacqueline Gray, 100 Bureau Dr., MS 2200, Gaithersburg, MD 20899.

APPENDIX B. CERTIFICATIONS

SBIR Funding Agreement Certification (at time of award)

All small businesses that are selected for award of an SBIR funding agreement must complete this certification at the time of award and any other time set forth in the funding agreement that is prior to performance of work under this award. This includes checking all of the boxes and having an authorized officer of the awardee sign and date the certification each time it is requested.

Please carefully read the following certification statements. The Federal government relies on the information to determine whether the business is eligible for a Small Business Innovation Research (SBIR) Program award. A similar certification will be used to ensure continued compliance with specific program requirements during the life of the funding agreement. The definitions for the terms used in this certification are set forth in the Small Business Act, SBA regulations (13 C.F.R. Part 121), the SBIR/STTR Policy Directive and also any statutory and regulatory provisions referenced in those authorities.

If the funding agreement officer believes that the business may not meet certain eligibility requirements at the time of award, they are required to file a size protest with the U.S. Small Business Administration (SBA), who will determine eligibility. At that time, SBA will request further clarification and supporting documentation in order to assist in the verification of any of the information provided as part of a protest. If the funding agreement officer believes, after award, that the business is not meeting certain funding agreement requirements, the agency may request further clarification and supporting documentation in order to assist in the verification of any of the information provided.

Even if correct information has been included in other materials submitted to the Federal government, any action taken with respect to this certification does not affect the Government's right to pursue criminal, civil, or administrative remedies for incorrect or incomplete information given in the certification. Each person signing this certification may be prosecuted if they have provided false information.

The undersigned has reviewed, verified, and certifies that (all questions must be responded to by checking the appropriate box):

(1) The Awardee business concern meets the ownership and control requirements set forth in 13

C.F.R. § 121.702.

Yes No

(2) If a corporation, all corporate documents (namely: articles of incorporation and any amendments, articles of conversion, by-laws and amendments, shareholder meeting minutes showing officer elections, organizational meeting minutes, all issued stock certificates, stock ledger, buy-sell agreements, stock transfer agreements, voting agreements, and documents relating to stock options, including the right to convert non-voting stock or debentures into voting stock) must include evidence that the corporation meets the ownership and control requirements set forth in 13 C.F.R. § 121.702.

Yes No N/A Explain why N/A:

(3) If a partnership, the partnership agreement evidences that it meets the ownership and control requirements set forth in 13

C.F.R. § 121.702.

Yes No N/A Explain why N/A:

(4) If a limited liability company, the articles of organization and any amendments, and operating agreement and amendments, evidence that it meets the ownership and control requirements set forth in 13 C.F.R. § 121.702.

Yes No N/A Explain why N/A:

(5) The birth certificates, naturalization papers, or passports show that any individuals it relies upon to meet the eligibility requirements are U.S. citizens or permanent resident aliens in the United States.

Yes No N/A Explain why N/A:

(6) The Awardee business concern has no more than 500 employees, including the employees of its affiliates.

Yes No

(7) SBA has not issued a size determination currently in effect finding that this business concern exceeds the 500-employee size standard.

Yes No

(8) During the performance of the award, the principal investigator will spend more than one half of his/her time (based on a 40-hour workweek) as an employee of the awardee or has requested and received a written deviation from this requirement from the funding agreement officer.

Yes No Deviation approved in writing by funding agreement officer:
_____%

(9) All, essentially equivalent work, or a portion of the work proposed under this project (check the applicable line):

- a. **Has not** been submitted for funding to this agency or another Federal agency.
- b. **Has** been submitted for funding to this agency or another Federal agency **but has not**

been funded under any other grant, contract, subcontract, or other transaction.

- c. A portion has been funded by another grant, contract, or subcontract as described in detail in the application and approved in writing by the funding agreement officer.

(10) During the performance of award, the Awardee will perform the applicable percentage of work unless a deviation from this requirement is approved in writing by the funding agreement officer (check the applicable line and fill in if needed):

- a. SBIR Phase I: at least two-thirds (66 2/3%) of the research.
- b. SBIR Phase II: at least half (50%) of the research.
- c. Deviation approved in writing by the funding agreement officer: _____%

(11) During performance of award, the research/research and development will be performed in the United States unless a deviation is approved in writing by the funding agreement officer.

Yes No Waiver has been granted

(12) During performance of award, the research/research and development will be performed at the Awardee's facilities with the Awardee's employees, except as

otherwise

indicated in the SBIR application and approved in the funding agreement.

Yes No

(13) The SBIR Awardee has registered itself on SBA's database as majority-owned by venture capital operating companies, hedge funds or private equity firms.

Yes No N/A Explain why N/A:

(14) The SBIR Awardee is a Covered Small Business Concern (a small business concern that:(a) was not majority-owned by multiple venture capital operating companies (VCOCs), hedge funds, or private equity firms on the date on which it submitted an application in response to an SBIR solicitation; and (b) on the date of the SBIR award, which is made more than 9 months after the closing date of the solicitation, is majority-owned by multiple venture capital operating companies, hedge funds, or private equity firms).

Yes No

(15) The SBIR Awardee will notify this agency immediately if all or a portion of the work authorized and funded under this award is subsequently funded by another Federal agency.

Yes No

(16) I understand that the information submitted may be given to Federal, State, and local agencies for determining violations of law and other purposes.

Yes No

I am an officer of the business concern authorized to represent it and sign this certification on its behalf. By signing this certification, I am representing on my own behalf, and on behalf of the business concern that the information provided in this certification, the application, and all other information submitted in connection with this application, is true and correct as of the date of submission. I acknowledge that any intentional or negligent misrepresentation of the information contained in this certification may result in criminal, civil or administrative sanctions,

including but not limited to: (1) fines, restitution and/or imprisonment under 18 U.S.C. § 1001; (2) treble damages and civil penalties under the False Claims Act (31 U.S.C. § 3729 *et seq.*); (3) double damages and civil penalties under the Program Fraud Civil Remedies Act (31 U.S.C. § 3801 *et seq.*); (4) civil recovery of award funds, (5) suspension and/or debarment from all Federal procurement and nonprocurement transactions (FAR Subpart 9.4 or 2 C.F.R. Part 180); and (6) other administrative penalties including termination of SBIR/STTR awards.

Signature _____ Date ____/____/____

Print Name (First, Middle, Last) _____

Title _____

Business Name _____

SBIR Funding Agreement Certification (Life-Cycle Certification)

All SBIR Phase I and Phase II awardees must complete this certification at all times set forth in the funding agreement (see §8(j) of the SBIR/STTR Policy Directive). This includes checking all of the boxes (unless otherwise directed) and having an authorized officer of the awardee sign and date the certification each time it is requested.

Please carefully read the following certification statements. The Federal government relies on the information to ensure compliance with specific program requirements during the life of the funding agreement. The definitions for the terms used in this certification are set forth in the Small Business Act, the SBIR/STTR Policy Directive, and also any statutory and regulatory provisions referenced in those authorities.

If the funding agreement officer believes that the business is not meeting certain funding agreement requirements, the agency may request further clarification and supporting documentation in order to assist in the verification of any of the information provided.

Even if correct information has been included in other materials submitted to the Federal government, any action taken with respect to this certification does not affect the Government's right to pursue criminal, civil, or administrative remedies for incorrect or incomplete information given in the certification. Each person signing this certification may be prosecuted if they have provided false information.

The undersigned has reviewed, verified, and certifies that (all questions must be responded to by checking the appropriate box):

(1) The principal investigator spent more than one half of his/her time (based on a 40-hour workweek) as an employee of the awardee or the awardee has requested and received a written deviation from this requirement from the funding officer.

Yes No Deviation approved in writing by funding agreement officer: _____%

(2) All, essentially equivalent work, or a portion of the work performed under this project (check applicable line):

- Has not** been submitted for funding to this agency or another Federal agency.
 Has been submitted for funding to this agency or another Federal agency but **has not** been funded under any other grant, contract, subcontract, or other transaction.

(3) A portion has been funded by another grant, contract, or subcontract as described in detail in the proposal and approved in writing by the funding agreement officer. Upon completion of the award the awardee will have performed the applicable percentage or work, unless a deviation from this requirement is approved in writing by the funding agreement officer (check the applicable line and fill in if needed):

- SBIR Phase I: at least two-thirds (66 2/3%) of the research.
- SBIR Phase II: at least half (50%) of the research.
- Deviation approved in writing by the funding agreement officer: _____%

(4) The work is completed, and the small business awardee has performed the applicable percentage of work, unless a deviation from this requirement is approved in writing by the funding agreement officer (check the applicable line and fill in if needed):

- SBIR Phase I: at least two-thirds (66 2/3%) of the research.
- SBIR Phase II: at least half (50%) of the research.
- Deviation approved in writing by the funding agreement officer: _____%
- N/A because work is not completed.

(5) The research/research and development is performed in the United States unless a deviation is approved in writing by the funding agreement officer.

- Yes
- No
- Waiver has been granted

(6) The research/research and development is performed at the awardee's facilities by the awardee's employees, except as otherwise indicated in the SBIR application and approved in the funding agreement.

- Yes
- No

(7) I will notify the Federal agency immediately if all or a portion of the work authorized and funded under this award is subsequently funded by another Federal agency.

- Yes
- No

(8) I understand that the information submitted may be given to Federal, State, and local agencies for determining violations of law and other purposes.

- Yes
- No

(9) I am an officer of the awardee business concern authorized to represent it and sign this certification on its behalf. By signing this certification, I am representing on my own behalf, and on behalf of the business concern, that the information provided in this certification, the application, and all other information submitted in connection with the award, is true and correct as the date of submission. I acknowledge that any intentional or negligent misrepresentation of the information contained in this certification may result in criminal, civil or administrative sanctions, including but not limited to: (1) fines, restitution and/or imprisonment under 18 U.S.C. § 1001; (2) treble damages and civil penalties under the False Claims Act (31 U.S.C. § 3729 *et seq.*); (3) double damages and civil penalties under the Program Fraud Civil Remedies Act (31 U.S.C. § 3801 *et seq.*); (4) civil recovery of award funds, (5) suspension and/or debarment from all Federal procurement and nonprocurement transactions (FAR Subpart 9.4 or 2 C.F.R. Part 180); and (6) other administrative penalties including termination of SBIR/STTR awards.

Yes No

Signature _____ Date ____/____/____

Print Name (First, Middle, Last) _____

Title _____

Business Name _____

Appendix C. Required Disclosures of Foreign Affiliations or Relationships to Foreign Countries

(A fillable version of this Appendix C, is available at <http://www.nist.gov/sbir>)

Relevant Definitions

Covered individual - the term "covered individual" means an individual who-

(A) contributes in a substantive, meaningful way to the scientific development or execution of a research and development project proposed to be carried out with a research and development award from a federal research agency; and

(B) is designated as a covered individual by the federal research agency concerned.

Foreign affiliation - the term "foreign affiliation" means a funded or unfunded academic, professional, or institutional appointment or position with a foreign government or government-owned entity, whether full-time, part-time, or voluntary. This includes appointments or positions deemed adjunct, visiting, or honorary with research institutions located in a foreign country of concern.

Foreign country of concern - the term "foreign country of concern" means the People's Republic of China, the Democratic People's Republic of Korea, the Russian Federation, the Islamic Republic of Iran, or any other country determined to be a country of concern by the Secretary of State.

Malign foreign talent recruitment program - the term "malign foreign talent recruitment program" has the meaning given such term in section 19237 of title 42.

Federally funded award - the term "federally funded award" means a Phase I, Phase II (including a Phase II award under subsection (cc)), or Phase III SBIR or STTR award made using a funding agreement.

Applicant or awardee Name: _____

Applicant or awardee EIN (UEI if EIN is unavailable): _____

Responses to disclosure questions may contain trade secrets or commercial or financial information that is privileged or confidential and is exempt from public disclosure. Such information shall be used or disclosed only for evaluation purposes or in accordance with an award between the submitter and the Government.

An up-to-date list of countries determined to be countries of concern by the Secretary of State will be maintained and accessible on SBIR.gov at https://www.sbir.gov/foreign_disclosures.

Disclosure Questions

1. Is any owner or covered individual of the applicant or awardee party to any malign foreign talent recruitment program?
 Yes No

If yes, disclose the first and last name of each owner or covered individual, identify their role (i.e., owner or covered individual), and the malign foreign talent recruitment program.

2. Is there a parent company, joint venture, or subsidiary, of the applicant or awardee that is based in or receives funding from, any foreign country of concern?
 Yes No

If yes, disclose the name, full address, applicant, or awardee relationships (i.e., parent company, joint venture, or subsidiary) of each entity based in, or funded by, any foreign country of concern.

3. Does the applicant or awardee have any current or pending contractual or financial obligation or other agreement specific to a business arrangement, or joint venture-like arrangement with an enterprise owned by a foreign state or any foreign entity?
 Yes No

If yes, disclose the name of each enterprise or foreign entity, type of obligation, agreement, or arrangement (i.e., contractual, financial, or other), description of obligation, agreement, or arrangement, and the foreign state(s) and/or the country of the foreign entity (or entities).

4. Is the applicant or awardee wholly owned in a foreign country?

Yes No

If yes, disclose the foreign country.

5. Does the applicant or awardee have any venture capital or institutional investment?

Yes No

If yes, proceed to question 5a. If no, proceed to question 6.

5a. Does the investing entity have a general partner or any other individual holding a leadership role who has a foreign affiliation with any foreign country of concern?

Yes No Unable to determine

If yes or unable to determine, disclose the venture capital or institutional investing entity's name, the percentage of ownership obtained by the investing entity, and the type of investment (i.e., equity, debt, or combination of equity and debt).

6. During the previous 5-year period, did the applicant or awardee have any technology licensing or intellectual property sales or transfers, to a foreign country of concern?

Yes No

If yes, disclose the name, address, and country, of the institution or entity that licensed, purchased, or received the technology or intellectual property.

7. Is there any foreign business entity, offshore entity, or entity outside the United States related to the applicant or awardee?

Yes No

If yes, disclose the entity name, relationship type (i.e., foreign business entity, offshore entity, entity outside the United States), description of the relationship to the applicant or awardee, and entity address and country.

8. Does the applicant or awardee have an owner, officer, or covered individual that has a foreign affiliation with a research institution located in a foreign country of concern?

Yes No

If yes, disclose the first and last name of each owner, officer, or covered individual that has a foreign affiliation with a foreign country of concern, identify their role (i.e., owner, officer, or covered individual), and the name of the foreign research institution and the foreign country of concern where it is located.

Signature _____ *Date* ____/____/____

Print Name (First, Middle, Last) _____

Title _____

Business Name _____