



U.S. NATIONAL SCIENCE FOUNDATION
2415 EISENHOWER AVENUE
ALEXANDRIA, VIRGINIA 22314

NSF 24-042

Dear Colleague Letter: Funding Opportunities for Engineering Research in Quantum Information Science and Engineering

December 22, 2023

Dear Colleagues:

With this Dear Colleague Letter, the U.S. National Science Foundation (NSF) Directorate for Engineering (ENG) encourages the submission of research and education proposals related to **Quantum Information Science and Engineering as an Emerging Industry**.

Quantum Information Science and Engineering (QISE) research will advance fundamental understanding of uniquely quantum phenomena that can be harnessed to promote information processing, transmission, and measurement in ways that classical approaches do less efficiently, or not at all. Current and future QISE applications differ from prior applications of quantum mechanics, such as lasers, transistors, and magnetic resonance imaging, by using distinct quantum phenomena—superposition and entanglement—that do not have classical counterparts. The development of these new applications will form the basis of one of the major technological revolutions of the 21st century. Building upon more than three decades of exploratory discovery, NSF investment in QISE will help propel the Nation forward as a leading developer of quantum technology. These investments are a key component of the National Quantum Initiative (NQI) and address the Nation's focus on helping build emerging industries.

NSF and the Engineering Directorate invest in research and education that align with the needs of the nation in QISE and support the National Quantum Initiative, the CHIPS and Science Act of 2022, White House strategies, and other policy directives (such as the 2018 National Science and Technology Council report, [A National Strategic Overview for Quantum Information Science](#)) to enable new quantum technologies for U.S. prosperity and welfare.

ENGINEERING DIRECTORATE INTERESTS

The Directorate for Engineering encourages the submission of all types of research and education proposals related to QISE, including proposals in the following areas:

Quantum devices: Novel devices that leverage quantum information science and exhibit performances that advance the field of QISE; devices may exhibit explicitly quantum or classical functions necessary for the full optimization of quantum information systems, such as quantum sensors, networks, or computers.

Quantum systems: Quantum systems that develop new platforms that will advance the field in areas of quantum sensing, quantum communication, and quantum computation or simulation.

Quantum information processing: Integration of devices, circuits and controls that result in quantum sub-system functionalities, including hybrid quantum-classical electronics integration; quantum information processing capabilities to leverage and advance future computation, communication and sensing systems that outperform classical systems.

Quantum-based network security: Demonstration of advanced cyber security for energy, power and other networks by leveraging quantum information and artificial intelligence.

Cryogenics: Research towards innovative approaches for cryogenic cooling of quantum systems including alternatives to ^3He dilution refrigerators.

Quantum manufacturing: Development of innovative manufacturing techniques that enable manufacturing of quantum devices and integrated systems to advance scalability and reproducibility.

Turbulent flows, heat transfer, and material behavior: Development of quantum computational methods that can resolve all physical (temporal and spatial) scales for full-scale aerodynamic, hydrodynamic, thermal, and mechanical applications.

Thermal management for quantum technologies: Quantum sensors for thermal measurements; thermal transport in quantum materials and quantum phenomena; thermal solutions for next-generation qubits, qubit coupling, and quantum information storage; mechanical behavior of quantum material and devices.

Quantum technology interfaces: Methods to integrate quantum components with classical hardware and systems, including for user input, process control, measurement, and transduction needed to realize quantum advantage for applications.

Process design, optimization, and control: Development of process modeling, design, control and optimization theory and computational tools, based on quantum computing methods.

PROGRAMS AND CONTACTS

The Engineering Directorate encourages the submission of QISE-related proposals to the

ENG core and cross-NSF programs listed below, and to other relevant programs. To determine which program best fits a project idea, Principal Investigators are encouraged to read the program descriptions and reach out to program contacts with questions.

- **Advanced Manufacturing:** AdvancedManufacturing@nsf.gov
- **Communications, Circuits, and Sensing-Systems:** Rosa (Ale) Lukaszew, rlukasze@nsf.gov
- **Dynamics, Control, and Systems Diagnostics:** Jordan Berg, jberg@nsf.gov
- **Electronics, Photonics and Magnetic Devices:** Dominique Dagenais, ddagenai@nsf.gov
- **Energy, Power, Control, and Networks:** Anthony Kuh, akuh@nsf.gov
- **Fluid Dynamics:** Ronald D. Joslin, rjoslin@nsf.gov
- **Mechanics of Materials and Structures:** moms@nsf.gov
- **Particulate and Multiphase Processes:** Shahab Shojaei-Zadeh, sshojaei@nsf.gov
- **Process Systems, Reaction Engineering, and Molecular Thermodynamics:** Raymond A. Adomaitis, radomait@nsf.gov
- **Thermal Transport Processes:** Sumanta Acharya, sacharya@nsf.gov

The Engineering Directorate also encourages proposals for research centers, which tackle grand challenges and spur industrial innovation, and for workforce development, which provides experiential learning opportunities and opens new career paths.

- **Engineering Research Centers (ERC):** nsferc@nsf.gov
- **Industry–University Cooperative Research Centers (IUCRC):** Prakash Balan, pbalan@nsf.gov
- **Non-Academic Research Internships for Graduate Students (INTERN):** Prakash Balan, pbalan@nsf.gov
- **Research Experiences for Teachers (RET):** Amelia Greer, agreer@nsf.gov
- **Research Experiences for Undergraduates (REU):** reu.eng@nsf.gov (REU for ERCs: reu.eng.erc@nsf.gov)

SUBMISSION GUIDANCE

Proposals submitted in response to this DCL should focus on scientific research and education relevant to the topical area of quantum information science and engineering. Proposal titles should begin with “**ENG-QUANT:**” followed by any other relevant prefixes and the project name.

For consideration during fiscal year 2024, proposals to programs without deadlines should be submitted by April 30, 2024; proposals submitted later will be considered for fiscal year 2025.

NSF welcomes proposals that broaden geographic and demographic participation to engage

the full spectrum of diverse talent in STEM. Proposals from minority-serving institutions, emerging research institutions, primarily undergraduate institutions, two-year colleges, and institutions in EPSCoR-eligible jurisdictions, along with collaborations between these institutions and those in non-EPSCoR jurisdictions, are encouraged.

This DCL does not constitute a new competition or program. Proposals submitted in response to this DCL should be prepared and submitted in accordance with guidelines in the [NSF Proposal & Award Policies & Procedures Guide](#) (PAPPG) and instructions found in relevant program descriptions.

Sincerely,

Susan Margulies
Assistant Director, Engineering