Opportunity Title: Quantum Engineering for Quantum Sensors
Opportunity Reference Code: ICPD-2021-27

Organization Office of the Director of National Intelligence (ODNI)

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How to Apply **Create and release your Profile on Zintellect** – Postdoctoral applicants must create an account and complete a profile in the on-line application system. **Please note: your resume/CV may not exceed 2 pages.**

Complete your application – Enter the rest of the information required for the IC Postdoc Program Research Opportunity. The application itself contains detailed instructions for each one of these components: availability, citizenship, transcripts, dissertation abstract, publication and presentation plan, and information about your Research Advisor co-applicant.

Additional information about the IC Postdoctoral Research Fellowship Program is available on the program website located at: https://orise.orau.gov/icpostdoc/index.html.

If you have questions, send an email to ICPostdoc@orau.org. Please include the reference code for this opportunity in your email.

Application Deadline 2/26/2021 6:00:00 PM Eastern Time Zone

Description **Research Topic Description, including Problem Statement:**

Quantum sensors are devices that encode a physical quantity into a few quantum states of the system—for example, atomic magnetometers, atom interferometer gravimeters, atomic clocks, Nitrogen Vacancy-center Diamond (NVD) magnetometers, and so on. Quantum sensors may optionally utilize nonclassical states to increase their performance. As quantum sensors become more sensitive and accurate, a key remaining challenge is to make them more practical outside the laboratory. They need to be easy to operate, fast to turn on, robust against vibration and thermal changes, small, and low power. The emerging field of quantum engineering can address these problems by applying standards and new engineering techniques to quantum devices.

Example Approaches:

Example approaches will depend on the maturity of the quantum sensor and its intended application environment. Some interesting directions include, but are not limited to, using machine learning techniques to simplify the user experience, using quantum or classical control techniques to increase robustness against noise, employing digital signal processing algorithms to increase sensor speed or improve accuracy, and applying advanced packaging techniques to reduce sensor size. These techniques may also be used to improve the performance of enabling technologies for the quantum sensor, such as lasers or photon detectors, but the proposal should then include the use of these enabling technologies in an actual quantum sensor. Proposals may include work on theory, modeling, or algorithms, but must apply these to a quantum sensor in the lab during the first year of the effort.

Relevance to the Intelligence Community:

The Intelligence Community (IC) is always looking for better ways to perform technical collection. Quantum sensors, once usable outside the laboratory, can be used for mission applications such as navigation and timing in GPS-denied environments, efficient and accurate calibration of antennas, communication with magnetic fields, and many other tasks. Making quantum sensors more practical outside the laboratory will make them even more useful to the IC.

Key Words: Quantum, Quantum Engineering, Quantum Sensors, Atomic Sensors, Machine

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Learning, Control Theory, Quantum Control, Enabling Technology, Magnetometer, Gyroscope, Accelerometer, Gravimeter, Atomic Clock, Atom Interferometer, NV Diamond

Qualifications

Postdoc Eligibility

- U.S. citizens only
- Ph.D. in a relevant field must be completed before beginning the appointment and within five years of the application deadline
- Proposal must be associated with an accredited U.S. university, college, or U.S. government laboratory
- Eligible candidates may only receive one award from the IC Postdoctoral Research Fellowship Program

Research Advisor Eligibility

- Must be an employee of an accredited U.S. university, college or U.S. government laboratory
- Are not required to be U.S. citizens

Eligibility Requirements

- **Citizenship:** U.S. Citizen Only
- **Degree:** Doctoral Degree.
- **Discipline(s):**
  - **Chemistry and Materials Sciences** (12 👁)
  - **Communications and Graphics Design** (2 👁)
  - **Computer, Information, and Data Sciences** (16 👁)
  - **Earth and Geosciences** (21 👁)
  - **Engineering** (27 👁)
  - **Environmental and Marine Sciences** (14 👁)
  - **Life Health and Medical Sciences** (45 👁)
  - **Mathematics and Statistics** (10 👁)
  - **Other Non-Science & Engineering** (2 👁)
  - **Physics** (16 👁)
  - **Science & Engineering-related** (1 👁)
  - **Social and Behavioral Sciences** (27 👁)