

**Opportunity Title:** Solid-State Quantum Magnetometer Integration

**Opportunity Reference Code:** ICPD-2023-09



**Organization** Office of the Director of National Intelligence (ODNI)

**Reference Code** ICPD-2023-09

### 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](mailto:ICPostdoc@orau.org). Please include the reference code for this opportunity in your email.

**Application Deadline** 2/28/2023 6:00:00 PM Eastern Time Zone

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

Quantum systems based on solid-state spins, have attracted substantial interest as potential sensor platforms, particularly for magnetometry. These solid-state quantum systems allow measurements tied to fundamental physical constants, in principle producing a calibration and drift-free sensor. Compared to existing alternatives, these quantum sensors can provide a unique combination of state-of-the-art sensitivity; high-bandwidth sensing, and low size, weight, and power (SWaP) requirements. Of particular interest with this call is the application of integrated photonics with these quantum sensors. Despite potential advantages, current devices are at a nascent stage, predominantly as demonstrations in a laboratory environment. In order to compete with decades of development of established legacy sensors such as atomic vapor cells, these novel devices must be designed for fielded operation and manufacturability. Research in this area will focus on approaches and development of these sensors with integrated photonics. Essentially a system that will process the photons in embedded chip thus addressing the SWaP challenges with quantum spin systems.

**Example Approaches:**

Research for this topic may include a variety of methods to improve integration and manufacturability while maintaining performance.

**Relevance to the Intelligence Community (IC):**

Navigation in the absence of GPS, especially over featureless terrain such as the ocean, is a serious challenge. One way the DoD/IC is looking to address this is via magnetic field aided navigation. The earth's crustal magnetic field is suitable for this purpose because it has significant spatial and negligible temporal variation. We aim to develop a high-sensitivity quantum sensor to measure the vector components of the magnetic field. The envisioned sensor will provide quality data to help Map the Earth's crustal magnetic field globally, to a resolution capable of supporting DOD's Alternative Positioning and Navigation applications.

**Key Words:** #Quantum sensor; #Magnetometer, #Integrated Photonics, #Readout Fidelity; #Optical Readouts, #Atomic Sensors; #Solid-state spin; #Integration

### Qualifications

**Postdoc Eligibility**

- U.S. citizens only

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- 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):**
  - **Communications and Graphics Design** (3 )
  - **Computer, Information, and Data Sciences** (17 )
  - **Earth and Geosciences** (21 )
  - **Engineering** (27 )
  - **Environmental and Marine Sciences** (14 )
  - **Life Health and Medical Sciences** (48 )
  - **Mathematics and Statistics** (11 )
  - **Other Non-S&E** (2 )
  - **Other Physical Sciences** (12 )
  - **Other S&E-Related** (1 )
  - **Physics** (16 )
  - **Social and Behavioral Sciences** (29 )