

**Opportunity Title:** Research into improved methods for trapped-ion magnetometer sensors, detection and reporting

**Opportunity Reference Code:** ICPD-2019-23

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

**Reference Code** ICPD-2019-23

**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** 3/1/2019 6:00:00 PM Eastern Time Zone

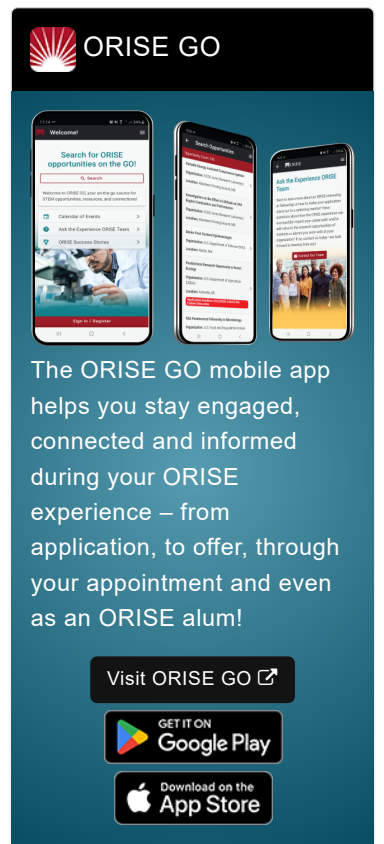
**Description** **Research Topic Description, including Problem Statement:**

- Understanding the origin and source of signals within an environment are at the heart of protecting organizations assets from external and internal electronic threats. Signals can come from a vast range of sources such as unwanted mobile phone signals, Wi-Fi, RF frequencies, Unmanned Aerial Vehicles (UAVs) and so on. The ability to monitor, measure and assess these signals gives insight and protection across a wide range of government departments.
- Current generation ion-trap magnetometers are limited to measuring magnetic field strength at a particular point in space and are usually constrained to small areas over modest KHz (Kilo Hertz) ranges.
- Research and the development of a new Sensor is sought to be capable of much greater sensitivity and increased Signal to Noise Ratio (SNR) over existing systems.
- Required capability includes collecting magnetic fields over a large area, detection of extremely weak RF and microwave signals, sensing of magnetic fields in the DC-RF and in the GHz range with sensitivities on the order of  $\text{pT/Hz}^{1/2}$  (pico Teslas per square root Hertz) and a bandwidth in the  $\mu\text{Hz}$  (micro Hertz) range as well as the ability to detect magnetic field gradients and detection of extremely weak RF and microwave signals.

**Example Approaches:**

Example approaches include:

- Alternative Magnetometer Coil approaches rely on high gain amplifiers which can add noise and instability to the overall system.
- A solution that is designed to be portable.
- Sensing range with the ability of the sensor to reject noise of any frequency apart from the one of interest. In addition, the sensor is expected to be able to sense magnetic fields with a frequency resolution down to the  $\mu\text{Hz}$  level, Direct Current (DC) to 100s of MHz as well as



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sensing microwave fields around 12.6 GHz.

**Key Words:**

Trapped-ion magnetometer, magnetic fields, DC-RF (Direct Current Radio Frequency), magnetic field gradients, NMR (Nuclear Magnetic Resonance), SNR (Signal to Noise Ratio), NQR (Nuclear Quadrupole Resonance), microwave fields.

**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** ([6](#) )
  - **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** ([5](#) )
  - **Physics** ([16](#) )
  - **Science & Engineering-related** ([1](#) )
  - **Social and Behavioral Sciences** ([28](#) )