Opportunity Title: Demonstration of Quantum Sensing and Radar, Experimental Research
Opportunity Reference Code: ICPD-2020-28

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 2/28/2020 6:00:00 PM Eastern Time Zone

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

Entangled microwave photons can be exploited to increase sensing and ranging performance of radar by suppressing the background noise. Increasing signal-to-noise of radar by using such quantum properties could improve detector performance and/or lessen power requirements. Such a system could also unveil low observable targets and be jam-proof. Quantum illumination via microwave photons was demonstrated, during the summer of 2019, in a proof-of-concept tabletop experiment. One of the most critical roadblocks in achieving a viable fielded system is the fast and efficient generation of entangled microwave photons. It is estimated that 10^9 entangled photons per millisecond would be necessary to determine the presence of a target 25km away with an 80% detection probability in low visibility conditions.

Research should encompass innovative approaches to substantially advance the efficient generation of entangled photons. While nonlinear crystals have been used to generate entangled photons in the optical regime, much less is known about how to do so for microwave photons. Potentially viable ideas include quantum dots, resonant quantum electrodynamics (QED) cavities, and down-conversion from optical photons.

Example Approaches:

Barzanjeh, S., Pirandola, S., Vitali, D., Fink, J. M. (2019). Experimental Microwave Quantum Illumination. arXiv quant-ph/1908.03058v1.

Relevance to the Intelligence Community:

Increasing signal-to-noise of radar by using such quantum properties could improve detector performance and/or lessen power requirements. Such a system could also unveil stealthy targets and be jam-proof.

Key Words: Quantum Radar, Quantum Sensing, Photons

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):**
  - **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 👁)