Opportunity Title: Light Weight Metamaterial Ultrawideband Frequency Absorber
Opportunity Reference Code: ICPD-2025-03

Organization Office of the Director of National Intelligence (ODNI)

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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.

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

Application Deadline 2/28/2025 6:00:00 PM Eastern Time Zone

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

Metamaterials have been widely used in the past few years for RF as well as acoustic shielding applications. These are typically only applicable over a limited bandwidth, and there has been limited research in the metamaterial absorber design for combined acoustic and RF application, from a few Hz up to 30 GHz. There are additional research gaps that RF absorption effects suffer from the incidence polarization of its signal, meaning that shielding often does not fulfill the requirements as desired for its application.

In this topic we would like to explore the research and development of novel lightweight metamaterial absorbers to provide the frequency absorption over a wideband range from a few Hz to 30 GHz that is insensitive to the incident signal phase. The development would help in providing an absorption and attenuation of various sound and RF signals emanating from multiple consumer devices and sources and bring new vitality into traditional approaches.

For further related reading, please see the following references: Zhang et al., 2020, “Engineering Acoustic Metamaterials for Sound Absorption: From Uniform to Gradient Structures”, iScience. Yang and Sheng, 2023, “Acoustic metamaterial absorbers: The path to commercialization”, Applied Physics Letter. Begaud et al., 2018, “Ultra-Wideband and Wide-Angle Microwave Metamaterial Absorber”, MDPI. Tirkey and Gupta, 2019, “The quest for perfect electromagnetic absorber: A review”, International Journal of Microwave and Wireless Technologies

Example Approaches:

- Computational modelling and calculation of the architectural design
- Model and simulate the behavior of metamaterial absorber for its

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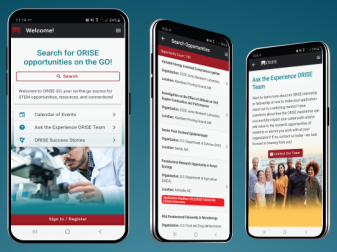

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intended frequency range
- Identifying candidate materials and novel composite structures with negative permittivity and permeability, potentially using conductor and dielectric sandwich materials.
- Optimize the design for the physical construction
- Experimental verification of the physical design and its analysis for its application
- Development of lightweight design for its integration within a physical space

Key Words: Metamaterial, absorber, ultrawideband, polarized, acoustic, RF, technical surveillance, novel materials, attenuation

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 appointment start date
- 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

Point of Contact

Keri Tarwater

Eligibility Requirements

- **Citizenship:** U.S. Citizen Only
- **Degree:** Doctoral Degree.
- **Discipline(s):**
  - **Chemistry and Materials Sciences** (12)
  - **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** (45)
  - **Mathematics and Statistics** (11)
  - **Other Non-Science & Engineering** (2)
  - **Physics** (16)
  - **Science & Engineering-related** (1)
  - **Social and Behavioral Sciences** (30)