PREP Research Associate

This position is part of the National Institute of Standards (NIST) Professional Research Experience (PREP) program. NIST recognizes that its research staff may wish to collaborate with researchers at academic institutions on specific projects of mutual interest, thus requires that such institutions must be the recipient of a PREP award. The PREP program requires staff from a wide range of backgrounds to work on scientific research in many areas. Employees in this position will perform technical work that underpins the scientific research of the collaboration.

Research Title:

- Advanced Low-Noise Frequency Synthesis and Phase Noise Metrology

The work will entail:

The primary objective of this project is two-fold: first, to innovate low-phase and amplitude noise frequency synthesis techniques spanning from radio frequencies to the optical regime; and second, to develop advanced analog and digital measurement systems for precise phase and time characterization. This capability is vital to the NIST mission, enabling the creation of sophisticated instrumentation with significantly lower noise floors and higher throughput—essential requirements for characterizing next-generation atomic clocks and ultra-low-noise oscillators.

To achieve these rigorous performance standards, the work requires a synergistic approach that bridges the analog and digital domains. The research will focus on integrating high-performance analog front-ends—critical for signal purity—with modern FPGA-based digital signal processing. By leveraging the low-noise characteristics of precision analog design alongside the flexibility of digital analysis, this project aims to create robust measurement architectures that outperform traditional single-domain solutions.

Key responsibilities will include but are not limited to:

- Design and construct low phase frequency synthesizers and oscillators
- Amplitude and phase noise metrology
- PCB layout and design of measurement system circuits
- Develop FPGA based measurement system firmware
- Presenting results at internal meetings, and occasional meetings with external stakeholders
- Ensuring that results, protocols, software, and documentation have been archived or otherwise transmitted to the larger organization

Qualifications

- **U.S. Citizen Preferred**
- Bachelor's, Master's or PhD degree in a STEM discipline
- High level skill in RF/microwave signal analysis and system design
- Experience in phase locked loops
- Proficiency in FPGA with Xilinx ZynQ
- Proficiency in Altium Designer
- Familiarity with phase noise metrology is advantageous
- Ability to code with, or learn to code with: MATLAB, LabView, and Python is required

Privacy Act Statement

Authority: 15 U.S.C. § 278g-1(e)(1) and (e)(3) and 15 U.S.C. § 272(b) and (c)

Purpose: The National Institute for Standards and Technology (NIST) hosts the Professional Research Experience Program (PREP) which is designed to provide valuable laboratory experience and financial assistance to undergraduates, post-bachelor's degree holders, graduate students, master's degree holders, postdocs, and faculty.

PREP is a 5-year cooperative agreement between NIST laboratories and participating PREP Universities to establish a collaborative research relationship between NIST and U.S. institutions of higher education in the following disciplines including (but may not be limited to) biochemistry, biological sciences, chemistry, computer science, engineering, electronics, materials science, mathematics, nanoscale science, neutron science, physical science, physics, and statistics. This collection of information is needed to facilitate administrative functions of the PREP Program.

Routine Uses: NIST will use the information collected to perform the requisite reviews of the applications to determine eligibility, and to meet programmatic requirements. Disclosure of this information is also subject to all the published routine uses as identified in the Privacy Act System of Records Notices: NIST-1: NIST Associates.

Disclosure: Furnishing this information is voluntary. When you submit the form, you are indicating your voluntary consent for NIST to use of the information you submit for the purpose stated.