Post-doctoral position:

QND measurement on lattice atom interferometry with an optical clock transition

Quantum technology has opened up new frontiers in precision science and technology. In an atom interferometer, matter-waves are split and recombined using momentum exchange between photons and atoms, generating interference fringes which depend sensitively on forces encountered by atoms, allowing for high precision measurement of inertial effects and studies in fundamental physics. Most of the current state-of-the-art atom interferometric sensors use a pair of the hyperfine ground states or momentum states of Alkaline-metal atoms for atomic interference through a two-photon process in free space. Despite their success, they are currently reaching new challenges, limiting their capability for higher sensitivity and broader applications. Our research proposal is aiming to harvest these cutting-edge technologies, proposing an optical lattice guided atom interferometer based on a single photon process on the Strontium optical clock transition and to detect the interferometer states with quantum non-demolition measurement.

We will use the optical $^1S_0$-$^3P_0$ transition in 88-strontium atoms as the interferometer state. Atoms in the coherent superposition of the clock states will be guided by two distinct optical lattices to realize a large spatial separation of the wavepackets and, thus, accumulate a large phase shift of the interference fringe. In addition to the interferometer, we plant to demonstrate spin-squeezing using quantum non-demolition (QND) measurement. We propose to implement a new method for the QND measurement using a three-photon resonance. In contrast to other proposed methods, here, we can directly measure the difference of clock states population which simplifies the protocol.

The successful applicant will work on this abounding and competitive research field. The candidate should be highly self-motivated and have a PhD in relevant fields. Applications with a full CV, a brief statement of research interests, and electronic contact details of at least two referees should be sent via email to David Wilkowski or Lan Shau-Yu

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