Old Dominion University
Department of Physics

Virtual Colloquium

Thursday, March 25, 2021
3:00 pm

"Quantum Backaction-Limited Measurements in Bose-Einstein Condensates"

Dr. Emine Altuntas
National Institute of Standards and Technology

Abstract: Minimally destructive measurement techniques are weak measurements that provide powerful tools for understanding the system-reservoir dynamics of many-body systems. Weak measurements yield a controlled reservoir (i.e. an external environment) and consequently allow the time-resolved study of the system evolution. Ultracold neutral atoms are an ideal platform for studying system-environment interaction via weak measurements as they have a high degree of controllability and present novel, precise detection methods. We experimentally study the quantum backaction induced by weak measurements in quasi-one dimensional 87Rb Bose-Einstein condensates (BECs). In this talk, I first discuss the theoretical model for weak measurement via phase contrast imaging (PCI) of BECs [1]. I then describe our experimental work and analysis of the quantum backaction via the measurement of density-density correlations in the atom shot noise in PCI in-situ images of BECs. I also present our proposal to perform a matter-wave beamsplitter experiment in BECs and preliminary results acquired using single quantum backaction-limited measurements with partial-transfer PCI (PT-PCI) technique. Finally, I will discuss possible feedback control protocols for future applications of Hamiltonian engineering using weak measurements and feedback.
[1] H. M. Hurst, and I. B. Spielman, Phys. Rev. A 99, 053612 (2019).

BIO: Emine Altuntas received her B.A. from Amherst College in physics and political science in 2011. Subsequently she received her Ph.D. in physics from Yale University in 2017. Currently she is a postdoctoral researcher at the National Institute of Standards and Technology Gaithersburg and the Joint Quantum Institute in Ian Spielman's group. Her research interests include precision measurements with diatomic molecules and atoms, and quantum simulation and quantum measurement with ultracold atoms.

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Dr. Emine Altuntas

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Topic: Colloquium - Dr. Emine Altuntas (NIST)
Time: Mar 25, 2021 03:00 PM Eastern Time (US and Canada)

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