Abstract Submitted
for the DAMOP19 Meeting of
The American Physical Society

Brillouin resonances and Brownian ratchets in dissipative optical lattices[1] ALEXANDER STARON, AJITHAMITHRA DHARMASIRI, ANTHONY RAPP, SAMIR BALI, Miami University — A Brownian ratchet is a device that operates away from thermal equilibrium and is used to produce directed motion without a net force. Dissipative optical lattices allow us to precisely tune the noise-coupling between the system and the environment, enabling a search for stochastic resonances. In order to characterize our optical lattice, we measure vibrational and propagation modes in the transmission spectrum of a weak resonant light beam. We find that the weak probe introduces a propagating modulation that "ripples" through the lattice and "drags" along some cold atoms. We propose to elucidate the interplay between the vibrational frequency, the modulation frequency, and the photon scattering rate by performing detailed pump-probe spectroscopy measurements using different probe polarizations and angles. We will compare our pump-probe data with time-of-flight fluorescent imaging of the atoms diffusing through the optical lattice using a home-built, sub-millisecond, low-jitter imaging system. We propose to explore parameter space for the optimal settings to achieve maximum ratchet efficiencies. Our goal is to understand how to create artificial Brownian nanoratchets with efficiencies that can come close to rivaling natural biomolecular motors.

[1]Army Research Office

Alexander Staron
Miami University

Date submitted: 01 Feb 2019 Electronic form version 1.4