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Dissipation in Parametrically Driven Few-Atom Systems[1]
MIKKEL F. ANDERSEN, ANDREW J. HILLIARD, MATT MCGOVERN, TZAHI GRUNZWEIG, YIN H. FUNG, Department of Physics University of Otago — Few body systems provide an exciting platform for studying irreversible processes such as dissipation in isolated systems. They are sufficiently small such that all degrees of freedom can be modeled, and yet large enough that they may display irreversible behavior. Few interacting atoms in an optical micro-trap is an excellent testing ground in this field as the atoms are effectively shielded from interactions with the environment. In this talk we will describe our recent experiments. We trap a controlled number of atoms in an optical micro-trap and drive the trapping potential parametrically. Strong resonances in the energy absorbed by the atom are expected due to periodic motion of the atom in the trap. These provide a standard method of measuring trap frequencies. We perform the experiment and gradually change the initial number of atoms in the trap from 1 to 50. When only one atom is present in the trap we observe excellent agreement with the single particle model. When more atoms are introduced to the trap we observe a gradual transition to a strongly damped regime where the trap dependent resonances vanish.

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