Abstract Submitted
for the DAMOP08 Meeting of
The American Physical Society

Studying Universality with Bose-Condensed Cesium Atoms in an Optical Lattice CHEN-LUNG HUNG, XIBO ZHANG, NATHAN GEMELKE, CHENG CHIN, James Franck Institute, University of Chicago — We describe methods to investigate universality in few-body systems derived from Bose-condensed atoms in optical lattices. In particular, we describe how precise spectroscopy and the collapse and revival of matter wave coherence may be used as a sensitive probe of collision properties and correlations. We discuss limitations on the technique due to lattice inhomogeneity and hydrodynamic time-of-flight measurement, and suggest remedies based on Feshbach-mediated control of interactions, and possible application of spin-echo techniques to matter-wave revival. To reach this goal, we have recently demonstrated Bose-Einstein condensation of $\sim 10^5$ cesium atoms in a novel crossed- beam dipole trap configuration, which allows us to adiabatically transfer atoms from a harmonic trapping potential into a single layer of two-dimensional optical lattice. This single-layer 2D lattice will allow us to directly and simply monitor the density distribution of atoms, and provide a large number of subsystems to sensitively probe coherence.

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Date submitted: 01 Feb 2008 Electronic form version 1.4