Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

In situ Microscopy of a Two-dimensional Quantum Gas XIBO ZHANG, CHEN-LUNG HUNG, PETER SCHERPELZ, NATE GEMELKE, CHENG CHIN, University of Chicago — Two-dimensional (2D) atomic quantum gases exhibit many unique many-body phenomena. By directly probing coexisting local phases in an inhomogeneous atomic cloud, in situ imaging provides a powerful tool to study quantum many-body physics. Starting from a cesium-133 Bose-Einstein condensate loaded into a 2D potential, we ramp up a 2D optical lattice. The surface density is measured by high-resolution absorption imaging along the tightly confined direction. Our system holds promise for directly probing quantum many-body physics, including the bosonic superfluid to Mott insulator quantum phase transition, as well as the Berezinskii-Kosterlitz-Thouless (BKT) transition of a 2D system. From the density profile, we derive the local compressibility and local density fluctuations to characterize the local phases of the atomic cloud. At deep optical lattice depths, the Mott insulating phase provides an ideal starting point to study few-body physics.

Xibo Zhang
University of Chicago

Date submitted: 20 Nov 2009 Electronic form version 1.4