Abstract Submitted
for the DAMOP10 Meeting of
The American Physical Society

Phases of a 2D Bose Gas in an Optical Lattice[1] KARINA JIMENEZ-GARCIA, JQI, NIST and The University of Maryland, ROBERT COMPTON, Honeywell International Inc, YU-JU LIN, WILLIAM PHILLIPS, JAMES PORTO, IAN SPIELMAN, JQI, NIST and The University of Maryland — We realize the Bose-Hubbard (BH) model with a ^{87}Rb Bose- Einstein condensate (BEC) and measure condensate fraction to determine the Superfluid (SF) to Mott-Insulator (MI) transition as a function of atom density and lattice depth. We start with a 3D BEC in $|F = 1, m_F = 1\rangle$, in the presence of a magnetic field gradient along $\hat{z}$, and load it into a 3D optical lattice to get an ensemble of ≈60 2D systems along $\hat{z}$ and to realize the 2D BH model in $\hat{x}$- $\hat{y}$. With a MRI approach, we address a localized group of nearly identical 2D systems from the ensemble. We choose an rf magnetic field $B_{\rm rf}$ to maximize the transfer from $|m_F = 1\rangle$ to $|m_F = 0\rangle$ using a 400 μs Blackman pulse. After the rf pulse the lattices are adiabatically ramped down. Simultaneously, all other confinement potentials are turned off and the atoms evolve in time of flight (TOF). During part of TOF a magnetic field gradient along $\hat{y}$ separates the m_F components. Our results are in agreement with the Quantum Monte Carlo universal state diagram, suitable for trapped systems, introduced by Rigol *et.al.*(Phys. Rev. A 79, 053605 (2009)).

[1]ONR, DARPA/OLE, NSF/JQI-PFC, CONACYT, NIST/NRC

Karina Jimenez-Garcia
JQI, NIST and The University of Maryland

Date submitted: 12 Jan 2010 Electronic form version 1.4