Abstract Submitted
for the DAMOP12 Meeting of
The American Physical Society

First order SF-MI transition in the Bose-Hubbard model with tunable three-body onsite interaction BARBARA CAPOGROSSO-SANSONE, University of Oklahoma, ARGHAVAN SAFAVI-NAINI, Harvard/MIT CUA, JAVIER VON STECHER, JILA, SETH RITTENHOUSE, ITAMP — Ultracold atoms in optical lattices have allowed for exploration of quantum effects beyond the superfluid to Mott insulator transition. Moreover, many-body interactions might give rise to new intriguing phenomena. In this work we study how the presence of an onsite, tunable, 3-body interaction term affects the many-body physics of the two-dimensional Bose Hubbard model. The 3-body interaction can be tuned by coupling the triply occupied states to a trapped universal trimer. We present mean field results which we compare with Monte Carlo calculations. We find that, as the 3-body interaction strength increases, the $n = 3$ Mott lobe grows larger at the expense of the neighboring lobes and phase transitions from superfluid to Mott insulator become of first order. Our studies at finite temperature show that these transitions remains of first order at temperatures of order of the hopping.

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Date submitted: 27 Jan 2012 Electronic form version 1.4