Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Pure Mott phases in confined ultra-cold atomic systems[1] VALERY ROUSSEAU, Louisiana State University, GEORGE BATROUNI, Institut Non Lineaire de Nice, DANIEL SHEEHY, JUANA MORENO, MARK JARRELL, Louisiana State University — We propose a novel scheme for confining atoms to optical lattices by engineering a spatially-inhomogeneous hopping matrix element in the Hubbard-model (HM) description, a situation we term off-diagonal confinement (ODC). We show, via an exact numerical solution of the boson HM with ODC, that this scheme possesses distinct advantages over the conventional method of confining atoms using an additional trapping potential, including the presence of incompressible Mott phases at commensurate filling and a phase diagram that is similar to the uniform HM. The experimental implementation of ODC will thus allow a more faithful realization of correlated phases of interest in cold atom experiments.

[1]This work was supported by NSF OISE-0952300, and by the Louisiana Board of Regents grant No. LEQSF (2008-11)-RD-A-10.

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Date submitted: 17 Nov 2009 Electronic form version 1.4