Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Non-linear Structures in One and Two-mode BECs[1] DOUGLAS FAUST, WILLIAM P. REINHARDT, University of Washington, Dept. of Physics, Seattle, WA, 98195-1560 USA — In recent years, precise control of atoms in optical potentials has allowed initially coherent BECs to be split into multiple entities. The most famous example is the superfluid to Mott insulator transition, where phase coherence is completely lost between wells. We present results from a novel computational method which is able to break the spatial symmetry of a mean-field state in the presence of a barrier and give a full accounting of both non-linear effects and tunneling to access the superfluid and Mott insulator regimes as well as give, previously unknown, details of the transition between them. Our results include a new characterization of BEC atom interferometry experiments and an investigation of two-mode analogues of one-mode structures such as solitons and phase-driven oscillations.

[1]Work supported, in part, by NSF grant PHY 07-3278.

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Date submitted: 30 Nov 2009 Electronic form version 1.4