Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Quantum Zigzag Phase Transition in Quantum Wires[1] ABHIJIT C. MEHTA, Duke University, CYRUS J. UMRIGAR, Cornell University, HAROLD U. BARANGER, Duke University — We use Quantum Monte Carlo (QMC) techniques to study the quantum phase transition of interacting electrons in quantum wires to a quasi-one dimensional zigzag phase. The phase diagram of particles with Coulomb interaction that undergo a linear to zigzag transition is relevant to electrons in quantum wires [Meyer et al, PRL 2007] and ions in linear traps [Simshoni et al., PRL 2011]. Interacting electrons confined to a wire by a transverse harmonic potential form a Wigner crystal at low densities; as density increases, symmetry about the axis of the wire is broken and the electrons undergo a transition to a quasi-one-dimensional zigzag phase. Using QMC, we characterize this phase transition by measuring the power spectrum and addition energies.

[1]Supported by the U.S. Department of Energy (Materials Sciences and Engineering, DE-SC0005237) and U.S. NSF (DMR-0908653).

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Date submitted: 11 Nov 2011 Electronic form version 1.4