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Zigzag Quantum 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 a quantum wire to a quasi-one-dimensional zigzag phase. Interacting electrons confined to a wire by a transverse harmonic potential form a linear 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. The phase diagram of particles with Coulomb interaction that undergo a linear to zigzag transition is relevant to electrons in quantum wires and ions in linear traps. We characterize this phase transition by using QMC to study the order parameter, correlation functions, pair density, power spectrum, and addition energies.

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