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Worm Algorithm Study of the 1D Electron Gas ABHIJIT C. MEHTA, SHAILESH CHANDRASEKHARAN, HAROLD U. BARANGER, Duke University — We develop a new Path Integral Monte Carlo (PIMC) algorithm, based on the ideas of the worm algorithm, to study the behavior of electrons confined to quantum wires and rings at finite temperature. This algorithm should allow efficient measurement of spin and charge fluctuations for Coulomb-interacting fermions in both the liquid and Wigner crystal regimes. In a ring geometry, the algorithm should also be able to sample electron windings. In our first study we focus on the physics of spin-charge separation and spin-incoherence in the 1D electron gas in a harmonically confined quantum wire. Preliminary results show the emergence of an anti-ferromagnetic spin chain with an exponentially suppressed spin exchange coupling.

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