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Spin Polarization Resolved Energetics of a Quasi One Dimensional Electron Gas LUKE SHULENBURGER, MICHELE CASULA, RICHARD M. MARTIN, University of Illinois at Urbana-Champaign, GAETANO SENATORE, Dipartimento di Fisica Teorica dell Universita di Trieste, and INFM-CNR Democritos — This work extends that of Casula et. al.[1] by using Quantum Monte Carlo to calculate the exact energy of a quasi one dimensional electron gas at nonzero polarizations. We present a parameterization of the correlation energy suitable for LSDA density functional calculations[2]. The energy of the momentum resolved spin and charge excitations is also calculated via the intermediate scattering function[3]. At low densities, correlation opens a gap for charge excitations near $2k_f$ for each spin species. The modes with periodicity close to the mean interparticle spacing are softened due to the formation of a quasi Wigner crystal. These effects disappear as the density increases and correlation becomes less important. The calculated excitation spectrum agrees with the long wavelength behavior predicted by Luttinger liquid theory.

[1] M. Casula, S. Sorella and G. Senatore, cond-mat/0607130 (2006)

[2] Abedinpour, Polini, Xianlong and Tosi, private communication.

[3] S. Yamamoto, Physical Review Letters, **75**, 3349 (1995)

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