

# Exchange and Correlation in the Strongly Inhomogeneous Electron Gas

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Using the variational quantum Monte Carlo method, in combination with a constrained variance-minimization technique, we have calculated the central quantities in density-functional theory (DFT): the coupling-constant-integrated exchange-correlation hole, the exchange-correlation energy density, and the total exchange-correlation energy, for several strongly inhomogeneous electron gas systems. This talk describe our approach and discusses the insights gained by comparing our results with those corresponding to various approximate exchange-correlation functionals. In the systems we consider, we find that the local density approximation can be significantly improved by including a nonlinear dependence on the Laplacian of the electron density.