Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Study of two-dimensional interacting electrons under the renormalized-ring-diagram approximation XIN-ZHONG YAN, C. S. TING, Texas Center for Superconductivity, University of Houston — The renormalized-ring-diagram approximation (RRDA) is an important approximation for investigating interacting electrons system. It is a challenge to understand the theoretical behavior of a two dimensional electron gas (TDEG) under this approximation. So far, this has never been done in the strong- coupling regime. With a super-high-efficient numerical algorithm, we self-consistently solve the integral equations for the electron Greens function under RRDA in a TDEG with long-range Coulomb interactions from weak to strong couplings. In our numerical calculation, the equations are solved at the imaginary Matsubara frequency, so we avoid dealing with singularities in the Green's function with real frequency. Our momentum convolution is computed with the Fourier transform into real space, so reducing the two-dimensional calculation to a one-dimensional one. By so doing, the momentum-integral can be performed precisely. The obtained ground-state energy is found to be in excellent agreement with that of the Monte Carlo simulation. We will also present the numerical results of the self-energy, the effective mass, the distribution function, and the renormalization factor of the Green's function for the coupling constants in a wide range.

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Date submitted: 05 Dec 2006 Electronic form version 1.4