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Regular Perturbation Theory About Generalized Self-Consistent Field Hamiltonian ARMEN KOCHARIAN, California State University, Northridge, CHI YANG, Tamkang University, Tamsui, Taiwan 251, YOU LING CHIANG, Chinese Culture University, Taipei, Taiwan 111, L.Y. CHEN, Tamkang University, Tamsui, Taiwan 251 — Strongly correlated electrons require non-traditional approaches to describe their unexpected properties. The perturbation theory about non-interacting electron gas first developed by Abrikosov and Khalatnikov has a zero convergence radius for the resulting perturbation series. The analytical theory of Gell-Mann and Bruckner, now known as random phase approximation (RPA), gives exact values for the correlation energy in the high density-weak coupling regime. However, this method also runs into difficulties due to the insufficient treatment of fluctuations. We give a formulation of a regular perturbation theory within the repulsive Hubbard model for interacting quasi-particles about exactly solvable generalized self-consistent field (GSCF) Hamiltonian for studying the intermediate range of interaction strength U/t, where there is no small parameter. Proposed perturbation series for interacting quasi-particles in entire parameter space of U/t and electron concentration n do not diverge. Performed analytical calculations of the ground state properties in extreme conditions of one dimensionality provide good numerical agreement with the Bethe-*ansatz* results and reasonable interpolation scheme for intermediate range of U/t and n. The method can be used also for studies electron correlations in finite size clusters.

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