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Path Integral Quantum Monte Carlo Calculations of ^{4}He with Argonne v_6' Interaction[1] RONG CHEN, KEVIN SCHMIDT, Arizona State University — Quantum Monte Carlo(QMC) methods, which are based on ab-initio principle and featured by their accuracy and efficiency, have been successfully used in various nuclear physics calculations. Among them, Path Integral Monte Carlo(PIMC) method, in particular, by nature, has the advantage of its capability of directly and accurately calculating expectation values of important operators which do not commute with Hamiltonian. In this work, based on Argonne v_6' two-body nucleon-nucleon interaction, we show the first nuclear PIMC calculations of Helium 4, which might be served as a benchmark test for larger nuclei PIMC calculations. For operator commutes with Hamiltonian, eg, Hamiltonian itself, our PIMC ^{4}He ground state binding energy agrees with Green's Function Monte Carlo(GFMC) result which is -26.15(2) MeV. For operators which are important but do not commute with Hamiltonians (and therefore cannot be directly and accurately calculated by other QMC methods without tradeoff), we will show particle number density distribution and Euclidean response functions for single-nucleon couplings. We will also discuss the PIMC algorithms used in this work.

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