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Solving the many body pairing problem through Monte Carlo methods MARK LINGLE, ALEXANDER VOLYA, Florida State University — Nuclear superconductivity is a central part of quantum many-body dynamics. In mesoscopic systems such as atomic nuclei, this phenomenon is influenced by shell effects, mean-field deformation, particle decay, and by other collective and chaotic components of nucleon motion. The ability to find an exact solution to these pairing correlations is of particular importance. In this presentation we develop and investigate the effectiveness of different methods of attacking the nucleon pairing problem in nuclei. In particular, we concentrate on the Monte Carlo approach. We review the configuration space Monte Carlo techniques, the Suzuki-Trotter breakup of the time evolution operator, and treatment of the pairing problem with non-constant matrix elements. The quasi-spin symmetry allows for a mapping of the pairing problem onto a problem of interacting spins which in turn can be solved using a Monte Carlo approach. The algorithms are investigated for convergence to the true ground state of model systems and calculated ground state energies are compared to those found by an exact diagonalization method. The possibility to include other non-pairing interaction components of the Hamiltonian is also investigated.

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