Neutrino-nucleus scattering in the quasi-elastic region

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Several upcoming experiments have the ambitious goal to understand neutrino mixing, including the mass hierarchy and CP violation, to search for physics beyond the standard model. These experiments aim to reach a precision at the per-cent level, and, in order to accurately interpret these measurements, the knowledge of the neutrino-nucleus interaction is critical. In this talk we will present recent Green's Function Monte Carlo calculations of the euclidean correlation functions that are relevant for the neutrino-12C scattering in the quasi-elastic region. These non-perturbative calculations fully include long- and short-range correlations in the nuclear wave function, and give an excellent description of properties of light nuclei. We will show that the inclusion of two-body operators consistent with the nuclear Hamiltonian is crucial and their contribution is quite sizable, as already predicted by similar calculations and experimental measurements of electron-scattering. These contributions are necessary to understand electron scattering and are also very important in neutrino-nucleus scattering.