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Ab initio many-body calculations of light nuclei neutron and proton scattering[1]

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One of the greatest challenges of nuclear physics today is the development of a quantitative microscopic theory of low-energy reactions on light nuclei. At the same time, technical progress on the theoretical front is urgent to match the major experimental advances in the study of exotic nuclei at the radioactive beam facilities. We build a new *ab initio* many-body approach[2] capable of describing simultaneously both bound and scattering states in light nuclei, by combining the resonating-group method[3] with the *ab initio* no-core shell model.[4]. In this way, we complement a microscopic-cluster technique with the use of realistic interactions, and a microscopic and consistent description of the nucleon clusters, while preserving Pauli principle and translational symmetry. I will present results for neutron and proton scattering on light nuclei, including n- and p-^{4}He phase shifts, and low-lying states of one-neutron halo p-shell nuclei, obtained using realistic nucleon-nucleon potentials. In particular, I will address the parity inversion of the ^{11}Be ground state.

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