TRIUMF Advanced Rare Isotope Laboratory (ARIEL)

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Ab initio calculations of 6He + p reactions

A long-standing goal of nuclear theory is development of a predictive *ab initio* framework for nuclear structure and reactions. One such framework is the no-core shell model with continuum (NCSMC), in which the many-body wave function is expanded in terms of eigenstates of the many-body Hamiltonian obtained within the no-core shell model (NCSM), *i.e.* using the harmonic-oscillator basis, and basis states in which the nucleons are distributed between clusters, each described within the NCSM. Recent developments of the NCSMC allow for inclusion of different distributions of the nucleons between the clusters (mass partitions) in a single coupled-channel calculation, which allows for calculations of charge-exchange and nucleon-transfer reactions. I will present results of the first ever NCSMC calculation coupling three mass partitions, namely ^{6}He + p, ^{6}Li + n, and ^{4}He + ^{3}H, using chiral nuclear forces as input. In particular, I will present cross sections of the (p,p), (p,n), and (p,t) reactions on radioactive ^{6}He and compare them to available experimental data.

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