Interplay of Break-Up and Transfer Processes in Reactions Involving Weakly-Bound Systems: A Simple One-Dimensional Model

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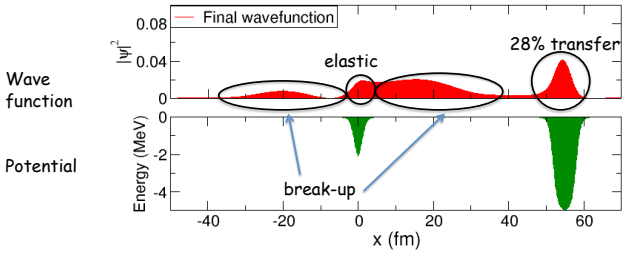
In this contribution we discuss a line of research which been developed to describe the structure and the dynamics of weakly-bound systems with one or more active valence particles. To simplify the problem we are assuming particles moving in one dimension, a model that despite the drastic assumption encompasses many characteristics observed in experiments.

We start with one or more particles moving in a fixed "target-like" potential and follow the evolution of the "exact" one- or many-body wave function under the action of a second moving "projectile-like" potential. By varying the parameters of the two potentials, the initial velocity and the acceleration of the moving potential, and the distance of closest approach one can simulate a full variety of situations ranging from low to high bombarding energy, from cental to peripheral collisions, from weak to tight binding. By projecting out the final wave function on the bound and continuum states of the two potentials one can determine the probabilities of elestic, inelastic, transfer and break-up final processes.



Exact final wavefunctions can be compared with those obtained by using standard approximation schemes, such as coupled-channels or first-order approximation, and one can test different prescription for the treatment of continuum channels. In the case of two active particles one can study specifically the two-particle transfer channel and point out the role of the residual pairing interaction between the two particles, as well as the reaction mechanism (sequential vs cluster-like transfer).

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