Time-dependent Basis Function Approach to Nuclear Scattering

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In this talk I will introduce the newly developed time-dependent Basis Function (tBF) approach. The goal of tBF is to provide a non-perturbative simulation of the time evolution for nucleon systems on the amplitude level. Its typical applications include nuclear scattering processes in (strong and) time-dependent background fields. This approach operates in the Hamiltonian formalism and in the interaction picture. The "main" part of the Hamiltonian is time-independent and the associated eigenvalue problem is solved through existing *ab initio* shell model methods with both bound states and scattering states retained in the Hilbert space. The "interaction" part describes the time-dependent background fields and induces transitions among the bound states and scattering states.

I will demonstrate this method through a test problem where a polarized deuteron is dissociated by the electromagnetic field from an impinging point charge. The problem is treated in the center-of-mass frame of the deuteron and the multipole expansion is performed on the background electromagnetic field. The time evolution of the distribution of the relative momentum between the proton and the neutron in the deuteron center-of-mass frame will be presented.

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