## DREB 2012 - Direct Reactions with Exotic Beams



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## Structure and reactions of three-body exotic nuclei using discretization methods

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In order to study weakly-bound systems, such as halo nuclei, it is essential to take into account the unbound states of the system. Since these unbound states form a continuum of energies, their inclusion in reaction calculations requires the introduction of a discretization method, i.e., the representation of the continuum by a finite and discrete basis. Among the different discretization methods in the literature, we will discuss about the binning procedure and the Transformed Harmonic Oscillator (THO) method, the last as an example of Pseudo-State (PS) method. The binning procedure is the discretization method that has been traditionally used within the standard Continuum-Discretized Coupled-Channels (CDCC) formalism for 2-body projectiles (3-body CDCC). Recently it has been extended to 3-body projectiles (4-body CDCC), in order to be applied to Borromean nuclei like 6He and 11Li. Alternatively, the spectrum can be represented using a PS basis. These PS are obtained as the eigenstates of the Hamiltonian of the system in a basis of square-integrable functions. One of these PS methods is the THO, whose basis functions are readily obtained by applying a local scaling transformation to the conventional HO functions. The identification of continuum structures in this PS basis, such as resonances, is discussed and applied to several three-body systems. Elastic and breakup of Borromean nuclei (6He, 11Li) are also presented, comparing the results obtained with both methods.

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