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11Li induced reactions within a four-body framework

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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. 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). In 2009, it was extended to 3-body projectiles (4-body CDCC) [PRC 80 051601(R)], in order to be applied to Borromean halo nuclei such as 6He (4He+n+n) and 11Li (9Li+n+n). The binning procedure has shown to be more appropriate than other discretization methods in order to describe the reactions induced by Borromean nuclei at energies around to the Coulomb barrier.

The recent experimental data on 11Li+208Pb at incident energies 24.3 and 29.8 MeV, measured at TRIUMF, are analyzed within the 4-body CDCC formalism including the binning procedure. The comparison between data and 4b-CDCC suggests the presence of a low-lying dipole resonance in 11Li close to the breakup threshold. These results have been recently published in Phys. Rev. Lett. [PRL 109 262701; PRL 110 142701].

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