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Impact of uncertainties of unbound ^{10}Li on the ground state of two-neutron halo ^{11}Li

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Since the discovery of the neutron halos, they have gained extensive attention of the nuclear physics community. Particularly two-neutron halo systems, consisting of a core and two weakly bound valence neutrons, demand a three-body description with proper treatment of continuum. The stability of such three-body ($\mathrm{core} + \mathrm{n} + \mathrm{n}$) system is linked to the continuum spectrum of the two-body ($\mathrm{core} + \mathrm{n}$) subsystem. Although ^{11}Li is the first observed two-neutron halo four decades ago. Since then a lot of experimental and theoretical studies have been reported on structure of the ^{11}Li. Recently role of ^{10}Li resonances is investigated in the halo structure of ^{11}Li via $^{11}\mathrm{Li}(p,d)^{10}\mathrm{Li}$ transfer reaction at TRIUMF [1] and at same facility the first conclusive evidence of a dipole resonance in ^{11}Li having isoscalar character has been reported [2, 3]. These new measurements and the sensitivity of core+n potential with structure of three-body system, are the motivation for selecting ^{11}Li for the present study.

For this study we use our recently implemented three-body structure model for the ground and continuum states of the Borromean nuclei [4, 5]. Within this framework, we start from the solution of the unbound subsystem and the two-particle basis is constructed by explicit coupling of the two single-particle continuum wave functions. We will present the results on the ground-state properties and two-neutron correlations in ^{11}Li with different choices of the ^{9}Li +n potential. We compare our findings with the more recent experimental works and the theoretical work that has been done in the past. We also present the ^{9}Li +n potential dependence on the configuration mixing in the ground state of 11Li.

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