On the possible existence of 4n resonances

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We examine possibility for a four neutron system to posses a narrow resonance as suggested by a recent experimental result in RIKEN [1]. Since any sensitive modification of the nucleon-nucleon (NN) potentials or on the leading contributions of the three-nucelon (NNN) forces affect strongly the nuclear chart, we have introduced [2] a phenomenological T = 3/2 three neutron force, in addition to a realistic NN interaction, as an artefact to accommodate a 4n nearthreshold states. We inquired what would be the strength of such a 3n force in order to generate a resonance compatible with the experimental findings. The reliability of the resulting three-neutron force in the T = 3/2 channel is examined, by analyzing its consistency with the low-lying T = 1 states of ^{4}H, ^{4}He and ^{4}Li and the ^{3}H + n scattering.

Two independent configuration space methods are used in solving the four-body problem: the Gaussian expansion method [3, 4, 5] to solve the Schrodinger equation and the Lagrange-mesh technique applied to solve the Fadeev-Yakubowsky equation [6]. The boundary conditions related to the four-body problem in the continuum are implemented by using the complex scaling method [7, 8] and the position of the 4n resonances in the complex energy-plane are determined.

References

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