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Study of cluster decay channels characteristics of low-lying and highly-exited states of light nuclei using ab initio methods

The study of cluster properties of various nuclear states is extremely important for nuclear physics as they are manifested at nuclear decay, fusion of colliding nuclei, reactions of knockout and transfer of clusters, etc. As in other fields of light nuclei theory ab initio approaches are actively developing for studying them. [1, 2, 3] These methods are based on solving A-nucleon Schrödinger equation using realistic nucleon-nucleon potentials. Nevertheless all the existing schemes of such a type have rather narrow ranges of applicability.
Being motivated by that we developed [4, 5] a theoretical scheme and the corresponding computer codes adopted for investigating of clustered (A+X)-nucleon states of light nuclei. This scheme is rather universal and in this study it is used for ab initio calculations of the quantities of traditional nuclear reaction theory such as spectroscopic factors, reduced widths, and asymptotic normalization coefficients.
In the present talk we present this method on the example of calculation of cluster decay channels characteristics of low-lying and highly exited states of 7Li and 8Be, both strongly and weakly clustered. These results turn out to be in a good agreement with the known experimental data containing in the spectroscopic tables.

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