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Study of neutron decay channels of light neutron-excess nuclei using ab initio methods

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In recent decades, research related to low-energy nuclear physics has shown two basic trends. In experimental research, there has been a rapid transition from the study of stable and long-lived nuclei to the study of exotic, including nucleon-unstable systems. In theoretical research, an increasing place is occupied by high-precision microscopic approaches, in particular ab initio (from first principles) methods of describing nuclear systems. The energy levels of light exotic nuclei are the subject of a large number of the investigation of such a type. Usually ab initio approaches are based on the use of NCSM model together with realistic nucleon-nucleon potentials. The problem of ab initio studies of nucleon- or cluster-decay properties of the states of nuclei looks more complicated. A number of methods to solve it are presented in literature [1-3] but they all have rather narrow ranges of applicability.
Being motivated by that we developed [4-7] a new theoretical scheme adopted for investigating of the decay properties of light nuclei and successfully applied it for the study of the energy levels and decay properties of 7Li and 8Be nuclei. A rather good description of the experimental data was achieved. The properties of a number of states which have not been observed were predicted.
In the present talk an advanced version of the method and the results of study of the spectra and neutron decay channels characteristics of unstable neutron-excess nuclei 7He and 10Li are presented. The predictions have been made may serve as a theoretical support of modern experiments which are performed at FLNR JINR.

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