Ab Initio Study of Energies and Decay Widths of Neutron Resonances

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The modern theory of the light nuclei structure is being actively developed due to the introduction of ab initio methods for describing nuclear systems. An important place among these methods is occupied by various versions of the No-Core Shell Model (NCSM), which use realistic NN-potentials to describe the interaction of nucleons and bases of multinucleon states, the dimensions of which reach $10^{10}\times10^{10}$. As a rule, the discussed potentials are constructed within the framework of the chiral effective field theory. Such methods make it possible to describe the spectra of the lower states of nuclei up to masses A~16, their moments, and the probabilities of electromagnetic transitions.

The talk presents an ab initio approach that extends the possibilities of NCSM - the method of orthogonal functions of nucleon and cluster channels - which allows one to calculate the widths of real and virtual decays of nuclear states into nucleon and cluster channels. The prospects of a developed approach for describing the energies and decay widths of near-threshold neutron resonances of light nuclei are demonstrated.