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THEORETICAL STUDY OF HALO NUCLEUS OF ^{11}Be

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The aim of work is theoretical study of Coulomb breakup of halo nuclei in nonstationary quantum approach. Exotic nuclei are the subject of intensive experimental research. Coulomb breakup are relevant for interpretation and planning of experiments in radioactive beams. These investigations have opened new prospects in studying the structure of nucleus and have found applications in other areas of physics, including nuclear astrophysics.

The halo is one of the most intensively studied objects in modern low-nucleus physics. The mean radii of certain nucleons orbits may be larger than nuclear interaction range. A characteristic feature of halo nuclei physics is correlations between the mechanism of nuclear reaction and structure [1].

The breakup is one of the important tools for studying halo properties. In these reactions, the information from dissociation of projectile into fragments could be used to conclude about the properties of halo part of wave function. With a good approximation, the breakup could be regarded as a transition from the bound state of two (three) particles to the continuum, due to the changing Coulomb field [2].

Among the halo nuclei, the ^{11}Be nucleus is of particular importance, since the relative simplicity of its structure allows more accurate theoretical studies. In fact, the bound states of the ^{11}Be nucleus can be described quite well as a ^{10}Be nucleus and a weakly bound neutron. With a good approximation, the decay can be regarded as a transition from a two-particle bound state to a continuum due to a changing Coulomb field in the process of collision of nuclei with a target [3].

The energy of ground and first exotic states of ^{11}Be were calculated by using the potential of Woods-Saxon form with taking into account the spin-orbital interaction as in [2,3]. In addition, the root-mean-square (rms) radius of the ground state of ^{11}Be nucleus was calculated numerically. The rms radius of the core is one of the most fundamental and important of its characteristics.

This work is the initial stage of work on the investigation of the breakup of halo nuclei in the quantum-mechanical approach. A detailed investigation is planned to research the effect of the external field on the breakup of the halo nucleus, using the numerical method for solving the nonstationary Schrodinger equation.

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