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The interaction of dark atoms of dark matter with atomic nuclei

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The problem of dark matter particle search is at the frontier of the modern physics. The scenario of composite dark matter, in which hypothetical, stable, lepton-like particles X having a charge - 2n, where n is any natural number, and forming neutral atom-like states of X-helium with primary helium nuclei, called “dark” atoms, offer a solution to the problem of direct searches for dark matter particles. The solution of the problem is connected with a rigorous proof of the existence of a low-energy bound state in the interaction of a dark atom with a nucleus, which requires a self-consistent description of nuclear attraction and Coulomb repulsion in such an interaction. As part of our approach, we use numerical modeling to describe the dark atom interaction of with nuclei and study the features of such interaction. Considering the classical three-body problem, we consistently add the effects of quantum physics to more accurately describe this interaction.

Primary author(s) : BIKBAEV, Timur (National Research Nuclear University MEPhI)

Co-author(s) : KHLOPOV, Maxim (National Research Nuclear University MEPhI; Institute of Physics, Southern Federal University; Virtual Institute of Adtroparticle Physics, Université de Paris, CNRS, Astroparticule et Cosmologie)

Presenter(s) : BIKBAEV, Timur (National Research Nuclear University MEPhI)

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