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Energy levels in three-particle muonic ions (μ e Li), (μ e Be), (μ e B)

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Coulomb systems of three particles, consisting of an electron, a negative muon and a nucleus, are of significant interest in many areas of physics, including atomic spectroscopy and quantum electrodynamics. The ions of muonic lithium (μ e Li), beryllium (μ e Be), and boron (μ e B) include the simplest light nuclei behind hydrogen and helium. The lifetime of such ions is determined by the lifetime of the negative muon. These bound states have a complex energy structure, which arises as a result of the Coulomb interaction of particles, as well as the interaction of their magnetic moments. The interest in these systems is due to the fact that the composite particles in them have very different masses. As a result, the muon and the nucleus form a quasi-nucleus around which the electron moves, and the three-particle system itself looks, in the first approximation, like a two-particle atom. The electronic excited states 2S and 2P in such atoms can be investigated experimentally. In any case, such a program already exists for the muonic helium atom (μ e He). To calculate the energy levels in three-particle systems, in this work, we use the stochastic variational method, which has proven itself in the study of hydrogen mesomolecules.

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