

Supervisor reference
on the bachelor thesis
of Artem Kotov
4th year student
division of quantum mechanics

In his bachelor's thesis, Artem Kotov solves the problem of high-precision calculation of energy levels in heavy diatomic quasimolecules with one and two electrons. The Dirac equation with the exact two-center potential is solved in spherical coordinates within the dual-kinetic-balance approach in the basis of B-splines. The energies and wave functions of the ground and several excited states are calculated as functions of the nuclear charge and the internuclear distance. For two-electron systems, the electron-electron interaction correction is calculated in the first order of perturbation theory.

High-precision values of energy levels in heavy molecular ions are necessary for a correct dynamical description of the heavy-ion collisions, where in the supercritical regime a spontaneous electron-positron pair production is possible. Corresponding experiments are planned, in particular, within the framework of the international FAIR project (Darmstadt, Germany).

Artem Kotov has been working in my group for a year and a half. His excellent programming and analytical skills enable him to successfully reach the proposed goals. Currently we prepare for publication an article with the results obtained in this work. The first results were already presented at the "Science and Progress" conference. In my opinion, this work deserves the highest mark, and Artem Kotov should be recommended to continue study for MSc degree.

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Dr. Dmitry A. Glazov
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