Contribution ID: **4** Type: **Poster**

Calculation of spin-dependent relativistic corrections in small atoms with one and two p-electrons using explicitly correlated Gaussians

Monday 10 June 2024 18:00 (2 hours)

In the framework of the perturbation theory we consider the fine structure of the energy levels of few-electron atoms and ions in the states with the dominant configuration containing one or two p-electrons (or one d-electron). Using highly accurate expansions
of the nonrelativistic wave functions in terms of all-particle explicitly correlated Gaussians, we derived analytical expressions for matrix elements and then evaluate
the expectation values of the spin-orbit and electron spin-spin interactions. We apply our approach to study the fine structure splittings in the ground ^3P state of the carbon atom. The calculated fine structure includes the leading-order spin-orbit and electron spin-spin corrections ($\propto m\alpha^4$), contribution from the electron anomalous magnetic moment ($\propto m\alpha^5$), and accounts for the coupling between the ground and low-lying excited states (off-diagonal matrix elements between $^3P_0$ and $^1S_0$ states, and between $^3P_2$ and $^1D_2$ states). The calculated values are compared with the available experimental data and NIST Atomic Spectra Database.

Author: RZHEVSKII, Pavel (Nazarbayev University, Astana, Kazakhstan)

Co-authors: TUMAKOV, Dmitry (Nazarbayev University, Astana, Kazakhstan; I. Institute for Theoretical Physics, Universitat Hamburg, Hamburg, Germany); BUBIN, Sergiy (Nazarbayev University, Astana, Kazakhstan)

Presenter: RZHEVSKII, Pavel (Nazarbayev University, Astana, Kazakhstan)

Session Classification: Poster Session 1