Contribution ID: **104** Type: **not specified**

High precision calculations of the hyperfine structure in Li-like bismuth

Investigations of the hyperfine splitting (HFS) in highly charged ions can provide tests of quantum electrodynamics (QED) in the strongest electromagnetic field presently avail- able. The simultaneous study of the HFS in H- and Li-like ions is required, since the Bohr- Weisskopf effect, dominating the theoretical uncertainty, is almost cancelled in the specific difference of the HFS values (cf. [1]). Ab-initio calculations of the screened QED corrections are needed to decrease the uncertainty of the theoretical prediction for this specific difference. Recently, the HFS in Li-like bismuth was observed in laser spectroscopy experiment at the experimental storage ring (ESR) in GSI (cf. [2]). In the present work the screened diagrams containing electric and magnetic vacuum-polarization loops have been evaluated to all orders in αZ [3, 4, 5]. The internal-loop contributions are rigorously approached including the Uehling and the Wichmann-Kroll terms. The accuracy of the theoretical prediction for the specific difference of the hyperfine splitting values in H- and Li-like bismuth is improved.

---

[1] V. M. Shabaev et al., Phys. Rev. Lett. 86, 3959 (2001).
[2] W. Nörtershäuser et al, Phys. Scr. T156, 014016 (2013).
[3] O. V. Andreev et al., Phys. Rev. A. 85, 022510 (2012).
[4] A. V. Volotka et al., Phys. Rev. Lett. 108, 073001 (2012).
[5] O. V. Andreev et al., Phys. Scr. T156, 014018 (2013).

Primary author: Dr ANDREEV, Oleg (St. Petersburg State University)

Co-authors: Dr VOLOTKA, Andrey (Technische Universität Dresden); Mr GLAZOV, Dmitry (Saint Petersburg State University); Dr PLUNIEN, Günter (Technische Universität Dresden); SHABAEV, Vladimir (GSI, Darmstadt)

Presenter: Dr ANDREEV, Oleg (St. Petersburg State University)