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Recoil effect to the g factor of boronlike ions

g factor of highly-charged ions proved to be an excellent tool for the high-precision comparison between experiment and theory. Measurements of the bound-electron g factor in light highly charged ions during the last 15 years have reached an accuracy of ppb and better [1-4]. As a spectacular result of these investigations, the most accurate value of the electron mass was obtained [5]. Experiments with heavy ions, in particular, those planned at FAIR, will give an opportunity to test quantum electrodynamics in strong electric and magnetic fields. In addition, simultaneous study of g factors of heavy hydrogenlike and boronlike ions will allow for precise determination of the fine structure constant [6]. Currently, the g-factor measurements for boronlike argon are performed at GSI (ARTEMIS experiment) [7]. At present, the accuracy of the corresponding theoretical value is at the ppm level [8] and its improvement is in demand.

We present the evaluation of the nuclear recoil effect to the g factor of boronlike ions in the ground P_1/2 state and in the first excited P_3/2 state in the medium-Z region. Recoil correction is calculated to first order in the electron-to-nucleus mass ratio, and to zeroth and first orders in 1/Z. The leading-order relativistic corrections are taken into account to zeroth order in 1/Z according to the formulae obtained in Ref. [9]. The first-order contribution in 1/Z is considered within the nonrelativistic theory. The results allow us to improve accuracy of the recoil correction to the g factor of boronlike ions for P_1/2 and P_3/2 states.

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