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Strongly enhanced effects of Lorentz symmetry violation in highly charged ions MARIANNA SAFRONOVA, University of Delaware, V. A. DZUBA, V. V. FLAMBAUM, UNSW, Australia, S.G. PORSEV, University of Delaware, T. PRUTTIVARASIN, RIKEN, Japan, M. A. HOHENSEE, LLNL, H. HÄFFNER, University of California, Berkeley — It has been suggested that Lorentz symmetry may be violated in theories aiming at unifying gravity with other fundamental interactions. While the energy scale of such strongly Lorentz symmetry-violating physics is much higher than that currently attainable by particle accelerators, the observable, but extremely small, Lorentz-violating effects may appear in low-energy experiments carried out with very high precision. In the atomic experiments testing local Lorentz invariance (LLI) of the electron motion in Coulomb potential of a nucleus, one searches for variations of the atomic energy levels when the orientation of the electronic wave function is rotated with respect to the standard reference frame. We carried out a systematic theoretical investigation of the sensitivity of a wide range of atomic systems to LLI violation. We find large sensitivities to LLI violating physics in Yb^+ [1] and a number of highly charged ions that should allow improvements of LLI tests in the electron-photon sector by several orders of magnitude.
[1] V. A. Dzuba, V. V. Flambaum, M. S. Safronova, S. G. Porsev, T. Pruttivarasin, M. A. Hohensee, H. Häffner, Nature Physics, advanced online publication, doi:10.1038/nphys3610 (2016).

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