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Isotope shift and the search for a New Physics¹

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During the last decades a great interest has arisen in high-precision atomic physics experiments aiming at searching for a New Physics beyond the Standard Model. One of the very promising scenarios of such experiments is the measurement of the isotope shift of atomic (or ionic) levels. Besides the nuclear properties, this shift is believed to be affected by the coupling of an atom or ion with new hypothetical boson particles. In this presentation, we will briefly discuss these beyond-the-Standard-Model effects and will argue that their analysis requires better understanding of "usual" interactions between electron cloud and nucleus. Special attention will be paid to the violation of the linearity of the King's plot. Based on the detailed calculations, performed for Be-like, B-like, and C-like Argon ions, we discuss the sizable nonlinearities that arise for light elements from the quadratic recoil effect [1]. We argue that this next-to-leading order effect may impose serious restrictions of a search of new long-range forces between electrons and a nucleus. [1] V. A. Yerokhin , R. A. Müller, A. Surzhykov, P. Micke, and P. O. Schmidt, *Phys. Rev. A* **101**, 012502 (2020)

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