

NEW PRECISION MEASUREMENTS OF THE STRONG INTERACTION IN HADRONIC ATOMS

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Abstract

New precision studies of the strong interaction in hadronic atoms are under way at the Paul Scherrer Institute (PSI)/Switzerland (pionic hydrogen) and at Laboratori Nazionali di Frascati (LNF)/Italy (kaonic hydrogen). The measurements at LNF take advantage of the nearly mono-energetic low-energy kaons emitted in the decay of the Φ -meson produced by the electron-positron collider DAΦNE. Using this kaon “beam” the low-energy kaon-nucleon interaction in kaonic hydrogen and deuterium can be studied under unprecedented conditions.

The DEAR (DAΦNE Exotic Atom Research) experiment at LNF delivered already the most precise data on kaonic hydrogen [1]. The DEAR experiment and its follow-up experiment SIDDHARTA (Silicon Drift Detector for Hadronic Atom Research by Timing

Application) are applying precision X-ray spectroscopy of kaonic hydrogen and kaonic deuterium atoms to measure the strong interaction induced shift and width of the ground state. The isospin-dependent antikaon-nucleon scattering lengths can be determined from these quantities – thus contributing to the understanding of aspects of chiral symmetry breaking in the strangeness sector. Last but not least important information for the research on deeply bound kaonic nuclear clusters can be obtained.

In this talk the status and an outlook to future experiments will be presented.

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[1] G. Beer et al. (DEAR Collaboration), Phys. Rev. Lett. 94 (2005) 212302