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Kaonic atoms and strangeness in nuclei: SIDDHARTA-2 and AMADEUS experiments

The dynamics of the strong interaction processes in the non-perturbative regime is currently described by lattice calculations and effective field theories (ChPT), still lacking several experimental results, fundamental for reaching a good understanding of the strangeness sector. Among these, the information provided by the low-energy kaon nucleon/nuclei interaction, accessible through the study of kaonic atoms and kaonic nuclear processes, plays a key-role. The lightest atomic systems, namely the kaonic hydrogen and the kaonic deuterium, provide in a model-independent way the isospin-dependent kaon-nucleon scattering lengths, through the timed X-ray spectroscopy of the exotic atoms during their de-excitation to the fundamental level.

The most precise kaonic hydrogen measurement to-date, together with an exploratory measurement of kaonic deuterium and of upper-level transitions in kaonic helium 3 and kaonic helium 4 were carried out at the DAFNE collider by the SIDDHARTA collaboration. The experiment took advantage of the monochromatic charged kaon beam provided by DAFNE and of the new, fast, spectroscopic SDD detectors developed by the collaboration. Presently, a significantly upgraded setup, developed by the SIDDHARTA-2 collaboration, is ready to perform a precise measurement of kaonic deuterium and, afterwards, of heavier exotic atoms.

In parallel, the kaon-nuclei interaction at momenta below 130 MeV/c is studied by the AMADEUS collaboration, using the KLOE detector and a dedicated setup inserted in the central region, near the interaction point. Preliminary results of the study of charged antikaons interacting with nuclei are shown, including an analysis of the still controversial Lambda 1405. Future experimental plans will be introduced, as well.

Summary

Progress and perspectives in the low-energy kaon-nucleon/nuclei interaction studies at the DAFNE collider will be presented.

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