International Nuclear Physics Conference INPC2013: 2-7 June 2013, Firenze, Italy

Unveiling the strangeness secrets:

low-energy kaon-nucleon/nuclei interaction studies at DAΦNE

Catalina Curceanu
On behalf of the SIDDHARTA, SIDDHARTA-2 and AMADEUS Collaborations

Laboratori Nazionali di Frascati dell'INFN, Via E. Fermi 40, 00044 Frascati (Roma), Italy

Contact email: *Catalina.Curceanu@lnf.infn.it*

The low-energy QCD in the strangeness sector is still lacking fundamental experimental results in order to arrive to a breakthrough in its understanding. Part of this information is provided by the low-energy kaon-nucleon/nuclei interaction studies, both as kaonic atoms and nuclear processes.

Combining the excellent quality kaon beam of the DAΦNE collider with new experimental techniques, as fast and very precise X ray detectors like the Silicon Drift Detectors and almost full acceptance detector of charged and neutral particles as KLOE, we have performed unprecedented measurements in the framework of SIDDHARTA and AMADEUS Collaborations.

The kaonic atoms, as kaonic hydrogen and kaonic deuterium, provide the isospin dependent kaon-nucleon scattering lengths from the measurement of X rays emitted in the de-excitation process to the fundamental 1s level of the excited formed atom. The most precise kaonic hydrogen measurement was performed by the SIDDHARTA collaboration, which realized, as well, the first exploratory measurement for kaonic deuterium ever. Additional important measurements of more complex systems, as kaonic helium 3 and kaonic helium 4 were as well done (the kaonic helium 3 was measured for the first time as well). Presently, a major upgrade of the setup, SIDDHARTA-2 is ready to perform in the near future a precise measurement of kaonic deuterium and other exotic atoms.

The kaon – nuclei interactions are being measured by the AMADEUS collaboration for kaon momenta smaller than 100 MeV/c by using the KLOE detector implemented in the central region with a dedicated setup. Preliminary results for the interaction of negatively charged kaons with various type of nuclei will be shown, including an analyses of the mysterious Λ(1405). Future plans will be discussed.

DAΦNE, with SIDDHARTA, SIDDHARTA-2 and AMADEUS, represents an opportunity which is unique in the world to, finally, unlock the secrets of the QCD in the strangeness sector, with important consequences going from particle and nuclear physics to astrophysics.