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Strong interaction studies with kaonic atoms

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The understanding of the strong interaction between hadrons in the strangeness sector are an important testing ground for chiral SU(3) symmetry due to the large mass of the strange quark. The antikaon-nucleon interaction at low energy is studied using non-perturbative coupled-channel techniques based on chiral SU(3) effctive Lagrangians.
With SIDDHARTA kaonic hydrogen and helium atoms were studied with up to know unrivalled precision at the DAΦNE electron positron collider of Laboratori Nazionali di Frascati. DAΦNE delivers low-energy charged kaon pairs due to the decay of phi-mesons, which are produced nearly at rest.
For kaonic hydrogen atoms a energy shift of the ground state has been measured with respect to the pure QED value, as well as an broadened ground state level, caused by nuclear absorption. By measuring these observables, the s-wave kaon-nucleon scattering lengths at zero energy could be extracted, which are sensitive measures of the chiral and isospin symmetry breaking pattern in QCD. Because of isospin conservation only the average value of the isospin I=0 and I=1 scattering lengths (a0 and a 1) could be obtained from a kaonic hydrogen measurement. Therefore, in order to determine the isospin dependent scattering lengths, a measurement of the shift and width of both kaonic hydrogen and kaonic deuterium atoms are necessary and will represents the most important experimental information missing in the field of low-energy antikaon-nucleon interactions today.
The final results of SIDDHARTA and as well as plans for kaonic deuterium measurements at DAΦNE and J-PARC will be presented.

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