KAONIC ATOMS AS PROBE FOR LOW-ENERGY QCD

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For light exotic atoms, especially for exotic hydrogen atoms, a detectable energy shift of the ground state has been found (with respect to the pure QED value), as well as an broadening of the ground state level. By measuring these observables, the s-wave kaon-nucleon scattering length at zero energy could be extracted, which is a sensitive measure of the chiral and isospin symmetry breaking pattern in QCD. The understanding of the strong interaction between hadrons in the strangeness sector are an important testing ground for chiral SU(3). With SIDDHARTA kaonic hydrogen and helium atoms were studied with up to know unrivalled precision at the DAFNE electron positron collider of Laboratori Nazionali di Frascati, taking advantage of the low-energy charged kaons from phi-mesons decaying nearly at rest. The experimental determined shift and width of the 1s ground state of kaonic hydrogen are related to the real and imaginary part of the s-wave scattering length. Because of isospin conservation only the average value of the isospin I=0 and I=1 scattering length could be obtained from a kaonic hydrogen measurement. Therefore, in order to determine the isospin dependent scattering length, a measurement of the shift and width of both kaonic hydrogen and deuterium is necessary and will represents the most important experimental information missing in the field of the low-energy antikaon-nucleon interactions today.

The final results of SIDDHARTA and as well plans for a kaonic deuterium measurement at J-PARC and DAFNE will be presented.