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Low-energy QCD – kaonic atom experiments at DAFNE and J-PARC

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The antikaon-nucleon interaction close to threshold provides crucial information on the interplay between spontaneous and explicit chiral symmetry breaking in low-energy QCD. The unique feature of DAFNE, namely the production of low-energy kaons, as well as J-PARC with its high intensity kaon beam, has led to a series of successfully conducted experiments with light kaonic atoms, which have provided important contributions to low-energy QCD.
An overview of the status of the proposed kaonic deuterium measurement at J-PARC and DAFNE will be given, which will allow for the first time, together with the already existing kaonic hydrogen data, the determination of the isospin dependent antikaon-nucleon scattering lengths a0 and a1.
Finally, an outlook of possible future experiments at DAFNE, using this unique source of kaons, will be discussed:
Measurements of light kaonic atoms transitions are fundamental to address important open problems like kaon-nuclei potential and chiral models below threshold.
While new precise measurements of transitions to low n levels of heavy kaonic atoms allows to study multi-nucleon interactions of the kaon.
New precise measurements of medium and heavy kaonic atoms transitions will allow measuring the charged kaon mass with higher precision in order to solve the existing kaon mass puzzle.
The study of elastic K-p scattering, but also of inelastic channels near threshold with high precision, provides tight constrains on models using Coupled-Channels Chiral SU(3) Dynamics. It has to be mentioned that there are almost no scattering data available at low energy or if, only with large error bars.

Collaboration

SIDDHARTA-2 and E57

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