

Hadron Physics at COSY

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Scattering experiments using nucleons or light nuclei are an important tool to investigate the production of hadrons as well as their interactions and their decays. With the COoler SYnchrotron COSY a powerful accelerator and storage ring is available at the Forschungszentrum Jülich, which provides proton and deuteron beams with momenta up to 3.7 GeV/c. The availability of both an electron cooler as well as a stochastic beam cooling system allows for a high energy resolution of the beam which is needed for precision measurements especially close to the production thresholds. Furthermore, a polarized ion source enables to perform experiments with proton beams with a polarization of up to 80% as well as with vector and tensor polarized deuterons.

The beam energy available at COSY allows to perform studies on a variety of mesons in the pseudoscalar, vector and scalar sector up to a mass of ~ 1 GeV/c². The production of strangeness degrees of freedom is accessible e.g. via the associated production of hyperons and kaons.

From 2007 on the major experimental facilities at COSY are the internal magnetic spectrometer ANKE, the external 4 π TOF spectrometer as well as the recently installed WASA-at-COSY detector. At these installations a rich physics program is addressed, covering e.g. studies on the structure of hadronic states and investigations on rare and very rare meson decays, which allow to test fundamental symmetries. Furthermore, measurements on the isospin dependence of the interaction of (polarized) hadron systems, e.g. nucleon-nucleon or nucleon-hyperon, are performed as well as investigations on meson-nucleus systems with respect to possible meson-nucleus bound states.

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