

Towards polarized antiprotons

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Great interest in the hadron physics community has been raised by the recent proposal of the PAX Collaboration to perform experiments using a polarized antiproton beam at the future facility FAIR at Darmstadt. The availability of a beam of polarized antiprotons would allow us to access for the first time a wealth of fundamental physics observables. One of the most important is the so-called transversity, the distribution of the transverse polarized quarks in a transversely polarized nucleon, which is directly measurable by means of the double-spin asymmetry in the production of Drell-Yan pairs in double-polarized proton-antiproton interactions. Other unique measurements address the determination of the phase of the electromagnetic form factors in the time-like region and scattering observables in double polarized hard proton-antiproton reactions. A necessary preliminary step for these experiments is the production of an intense beam of polarized antiprotons. At the moment the most promising technique to polarize antiprotons is the "spin-filtering" technique. Spinfiltering exploits the spin dependence of the interaction between an initially unpolarized proton (or antiproton) beam stored in a storage ring and a polarized internal hydrogen target. The proof of principle of the technique has been carried out with a proton beam stored in the TSR ring in Heidelberg more than ten years ago. The interpretation of the result is at the moment under discussion. In order to gain a full understanding of the spin-filtering technique, a series of experiments must be carried out at the COSY storage ring in Jülich with protons and at the AD storage ring at CERN with antiprotons. The talk will give an overview about the physics potential using polarized antiprotons, and the ongoing investigations at COSY towards the production of a beam of polarized antiprotons.

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