

Modifications of the HESR layout for polarized antiproton-proton physics

Andreas Lehrach

Forschungszentrum Jülich, Institut für Kernphysik, Postfach 1913, D-52425 Jülich, Germany

The High-Energy Storage Ring (HESR) is planned as an antiproton ring in the momentum range from 1.5 to 15 GeV/c for the future International Facility for Antiproton and Ion Research (FAIR) [1] at GSI in Darmstadt, Germany. An important feature of this new facility is the combination of phase space cooled beams with thick internal targets, equipped with the PANDA experiment [2]. Two other experimental groups (ASSIA [3] and PAX [4]) expressed interest in spin physics experiments utilizing the HESR. This requires generation of polarized protons in a state-of-the-art polarized ion-source and advanced techniques to produce polarized antiprotons [5]. To preserve polarization during acceleration additional devices like fast tune-jump quadrupoles and Siberian snakes have to be implemented into several machines of the acceleration chain. Two different concepts have been worked out to finally collide these two polarized beams, an asymmetric and a symmetric collider [4,6]. In this talk the required modifications and extensions of the accelerator layout are discussed and the proposed concepts compared.

1. An International Accelerator Facility for Beams of Ions and Antiprotons, Conceptual Design Report, GSI Darmstadt, November 2001, see <http://www.gsi.de/GSI-Future/cdr/>.
2. Strong Interaction Studies with Antiprotons, Letter-of-Intent, PANDA collaboration, January 2004, see <http://www.gsi.de/documents/DOC-2004-Jan-1151.pdf>.
3. A Study of Spin-dependent Interactions with Antiprotons, Letter-of Intent, ASSIA collaboration, January 2004, see <http://www.gsi.de/documents/DOC-2004-Jan-152-1.pdf>.
4. Antiproton-Proton Scattering Experiments with Polarization, Letter-of-Intent, PAX collaboration, January 2004, see <http://www.gsi.de/documents/DOC-2004-Jan-1251.pdf>.
5. F. Rathmann et al., Phys. Rev. Lett. 93, 224801 (2004).
6. F. Bradamante et al., Conceptual Design for a Polarized Proton-Antiproton Collider Facility at GSI, INFN-TC-05-14 (2005), [arXiv.org: physics/0511252](http://arXiv.org/physics/0511252).