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Polarized protons in HERA

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ABSTRACT

Polarized protons have never been accelerated to more than about 25GeV/c. The production of polarized proton beams in RHIC (250GeV/c), HERA (820GeV/c), and the TEVATRON (900GeV/c) are therefore challenging projects. A collaboration of many different laboratories has been evaluating the possibilities of accelerating and storing polarized proton beams in HERA. Problems involved with accelerating polarized protons from an H⁻ source to medium energies will be illustrated by the preaccelerators DESY III (7.5 GeV/c) and PETRA (40 GeV/c). Solutions to these problems will be suggested. After polarized beams are accelerated to high energy, the polarization has to be stable for several hours in order to be useful for the experiments H1 and ZEUS and for any future experiment. At HERA energies the spin of a particle rotates by 90° if the particles trajectory is curved by only 1 mrad. This illustrates that the equilibrium polarization direction can vary substantially across the beam in the interaction region of the high energy experiments when no countermeasure is taken. It will be shown how the polarization can be optimized by minimizing the opening angle of the equilibrium spin distribution with a suitable choice of Siberian snakes.