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**Polarized Protons at HERA**

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After routinely obtaining longitudinal electron spin polarization in HERA, the possibility of obtaining proton spin polarization at high energy has become very attractive and is being studied. Polarized proton beams have never been accelerated to an energy above approximately 25GeV; the polarized proton beam at RHIC will have 250 GeV. It will be discussed which challenges have to be faced when striving for energies as high as 820GeV at HERA. Electron beams polarize themselves at HERA by emitting synchrotron radiation, but there is no convincing self polarization mechanism available for protons. Consequently, the polarized protons must be obtained from a polarized source and accelerated though the entire proton pre-accelerator chain of the HERA complex. Problems involved with accelerating polarized protons from an $H^-$ source to medium energies will be illustrated by the pre-accelerators DESY III (7.5 GeV/c) and PETRA (40 GeV/c). Solutions to these problems will be suggested. After the polarization has been maintained during the acceleration process up to 820GeV, it is then essential that the polarization survives for times comparable to the lifetime of the beam itself in order to be useful for the experiments H1 and ZEUS and for any future experiment. A proton beam in collision with electrons in HERA is typically used for ten hours. Therefore, studies about the acceleration of polarized protons to high energy as well as an analysis of the stability of the polarized beam at high energy will be shown. 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 spin dynamics and therefore also the polarization direction of individual particles can vary substantially across the beam in the interaction region of the high energy experiments. It will be explained how countermeasures can be taken.

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