

The HERMES Internal Polarized H/D Target

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The HERMES experiment in the HERA electron storage ring at DESY is studying the spin structure of the proton and neutron via deep inelastic scattering (DIS) of polarized electrons off the nucleons in a highly polarized internal gas target.

The HERMES polarized H/D target is running since 1996. A beam of Hydrogen or Deuterium atoms is generated in an RF/MW dissociator which forms part of the atomic beam source (ABS)[1]. The atoms are electron polarized by means of Stern-Gerlach separation in a sextupole magnet system, the polarization is then transferred to the nucleons by means of adiabatic high frequency transitions (HFT). The beam of nuclear polarized atoms is injected into the center of a thin-walled storage cell via a side tube and the atoms then diffuse to the open ends of the cell where they are removed by a high speed pumping system. The storage cell is coated with Drifilm [2] in order to minimize wall interaction effects. A holding field provides a quantization axis for the spins and inhibits nuclear spin relaxation by decoupling nucleon and electron spins. The direction of the holding field was longitudinal respect to the incoming lepton momentum in the running years 1996- 2000, while it will be transversal for the running starting in 2002. A second side tube is provided to sample the gas within the target cell. The beam emerging from this tube is analysed with a Breit-Rabi polarimeter (BRP) [3] to measure its atom polarization and a target gas analyser (TGA)[4] to determine its atomic fraction. During the atom diffusion process relaxation by wall and spin exchange collisions and wall recombination changes the polarization and the atomic fraction of the target gas. The atom polarization and atomic fraction values measured by the BRP and TGA must be corrected for these effects to obtain the absolute target polarization [5]. The target was operated with Hydrogen in the data taking period of 1996- 1997, while it has been switched to Deuterium for the years 1998-2000. For the new running measurement with a transversally polarized Hydrogen target is foreseen for the investigation of the still unmeasured trasnerse structure functions.

In the presentation, besides the description of the past target performance, the attention will be given to the problematics related to the new running.

References

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