

A Precision Lamb-shift Polarimeter for the Polarized Gas Target at ANKE

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With a Lamb-shift polarimeter [1,21 it is possible to measure the occupation numbers of the individual hyperfine states in a beam of hydrogen or deuterium atoms. These numbers allow one to calculate the nuclear polarization of the atomic beam in magnetic fields of varying strength. The polarization of a slow (500-2000 eV) ion beam can be measured as well [3].

The modular components of the polaxirneter, consisting of a Glavish-type ionizer [4,51, a Wienfilter, a Cs cell, a Spinfilter [6], and a quenching-region [7] were designed, produced, and tested with an unpolarized ion beam at the Universität zu Köln. Later, the polarimeter was installed at the polarized atomic beam source developed' at the Forschungszentrum Jülich for the future storage-cell gas target of the ANKE/COSY spectrometer [8]. Applying the experimentally known correction factors, it is possible to determine the polarization of the vertical atomic beam of the source, making use of a 90° deflector behind the ionizer in order to deflect the ion beam onto the horizontal polarimeter axis. Results of detailed studies with a polarized H beam and first measurements with a polarized D beam will be presented. Planned studies to investigate the polarization of the gas in storage cells will be discussed as well.

- [1] R. Engels, PhD thesis, Universitit zu X61n (2002).
- [2] A.J. Mendez et al., Rev. Sci. Instr. 67(1996)9.
- [3] ISTC project no. 1861 (PNPI Gatchina, IKP FZ Jilich, IKP UWversitit zu K61n).
- [4] R. Emmerich, diploma thesis, Universität zu Köln (2000).
- [5] H.F. Clavish et al., Nuel. Instr. Meth. 65(1968)1.
- [6] J.L. McKibben et al., Phys. lett. 28B(1969)594.
- [7] J. Ley, diploma thesis, Universität zu Köln (2000).
- [8] M. Mikirtytchiants et al., Proc. of the 9. Int. Workshop on Polarized Sources and Targets (PST01), to be published.

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