Combined Spectator and Vertex Detection at ANKE

S. Barsov, T. Krings, I. Lehmann, D. Protic, S. Merzliakov, A. Mussgiller and R. Schleichert

For the ANKE experiment a vertex detector based on double-sided silicon strip detectors [2] is under construction [1]. The original motivation in 1999 was, to built a vertex detector around the extended target region of the storage cell of the polarized **A**tomic **B**eam **S**ource ABS [3].

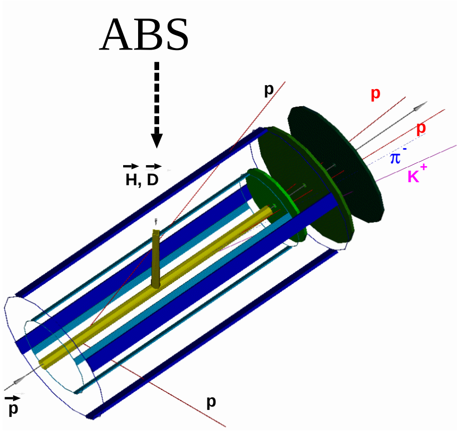

Figure 1: The ANKE Vertex detector around the 40 cm long storage cell of the Atomic Beam Source

The use of a 40 cm long strorage cell provides about 100 times more luminosity compared with the pure atomic beam. But it can only be used together with a vertex detector which determines the vertex of each individual reaction and which must distinguish between interactions of the COSY beam with the polarized gas and the wall of the cell.
The additional identification and tracking of low energy protons will allow to use polarized deuterons as a polarized neutron target [4] and therfore e. g. to study reactions of the type $pn \to pn$ or $pn \to dX$.
The basic design considerations for the silicon vertex detector are

- MIP tracking within the ANKE spectrometer magnet D2 with $\Delta p/p \leq 1\,\%$. 3 planes of $300\,\mu$m thick detectors.
- ΔE deuteron identification in forward direction ($pn \to dX$) s. fig. 3 (1 plane of $5500\,\mu$m thick detectors).
- $\Delta E/E$ proton identification (3-40 MeV). Telescope structure of $65/300/5500\,\mu$m thick detectors in the barrel region.
- Time of flight particle identification with a resolution of FWHM ≤ 1 ns. Development of dedicated preamplifiers.

Fig. 2 shows the forward tracking system within the ANKE magnet D2. Three planes of $300\,\mu$m thick double-sided silicon strip detectors will determine the track and therfore the momentum of the particles. An additional plane of $5500\,\mu$m thick double-sided

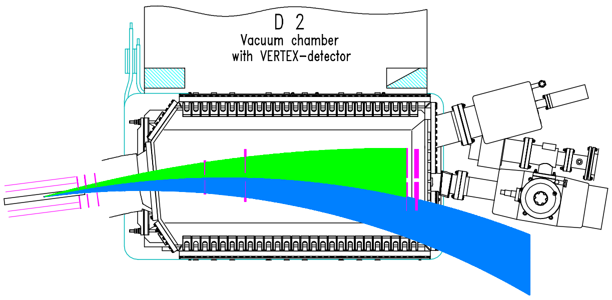

Figure 2: Three $300\,\mu$m plus one $5500\,\mu$m thick planes of silicon detectors within the magnetic field of D2.

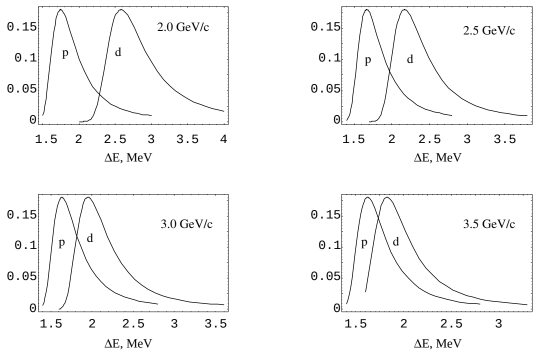

Figure 3: With the good intrinsic energy resolution of the $5500\,\mu$m thick silicon detectors, it will be possible to distinguish between protons and deuterons by ΔE only up to 2.5 GeV/c.

silicon detectors [2] will be used for ΔE deuteron identification.
The main goals for the coming year 2001 are

- Check the final layout of the read-out chips.
- A first set of the $65/300/5500\,\mu$m thick double-sided silicon strip detectors has to be assembled and tested in the proton beam of the Cologne tandem accelerator.
- Check new electronics for time of flight measurements with a resolution ≤ 1 ns FWHM.
- Mechanical construction of the vertex detector.
- Assembly of a cooling system for the in-vacuum chip electronics.

References:

[1] The ANKE Vertex homepage, http://ikp442.ikp.kfa-juelich.de.

[2] *Semiconductor Detectors*, contribution to this report.

[3] *The Polarized Internal Gas Target for ANKE*, contribution to this report.

[4] *Meson Production on the Neutron at ANKE*, contribution to this report.