Status report ANKE*

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The ANKE experimental program on K^+-meson production in pA collisions has been continued during a two-week beam time in February 2000. For the measurements a dedicated detection system at the side of the spectrometer dipole D2 (see Fig. 1) optimized for the identifcation of kaons in an up to 10^6 times more intense background has been used. Data taken with carbon, copper and gold targets at beam energies $T = 1.0, 1.2, 1.5, 1.8, 2.0, 2.2$ and 2.3 GeV are now being analyzed [1, 2]. Double-differential cross sections $d^2\sigma/d\Omega dp$ for K^+-production under forward angles $\vartheta \leq 12°$ in the momentum range $p_{K+} \approx 170 \ldots 510$ MeV/c could be determined even at beam energies far below the free NN-threshold (T = 1.58 GeV). As a first unexpected result, the target-mass dependence of the cross sections scales roughly like $A^{2/3}$, both at T = 1.0 and 2.3 GeV.

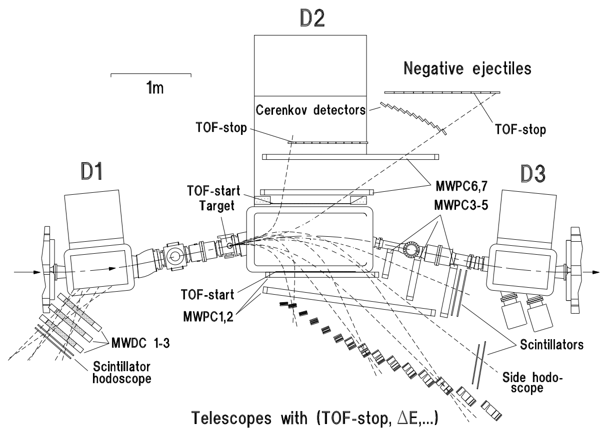

Figure 1: Floor plan of ANKE.

During a second beam time in Sept. 2000, ANKE has been equipped with target-near semiconductor counters for spectator-proton detection [3]. Using deuterium as target material in a cluster-jet target, this technique allows one to define reactions of the COSY-beam protons on neutron targets. The data from the first test beam time show that events from elastic proton-neutron scattering (pn $\rightarrow$ pn) as well as from π^0-production (pn $\rightarrow$ pnπ^0) can be identified. In both cases, the fast ejectile, p or d, emitted in coincidence with the spectator proton is detected in the ANKE forward detectors [4, 5] (see Fig. 1, located close to the beam pipe between D2 and D3). Data from previous beam times on the reactions pp $\rightarrow$ dπ^+/pnπ^+) have been analyzed [6, 7] with the goal to determine the spin-singlet/triplet ratio at $T_{\rm beam}$ = 500 MeV. It turned out that the singlet contribution is at most a few percent at this beam energy.

The experimental program with ANKE in 2001 will focus on the following topics: •Investigation of the nature of $a_0(980)$-mesons in the reaction pp $\rightarrow$ da_0^+ [8, 9, 10]. The measurements foresee to determine the production cross section for this meson in pp collisions and to observe the two decay channels of the a_0^+-meson, $a_0^+ \rightarrow K^+\overline{K^0}/\pi^+\eta$, in order to shed light on the structure of the resonance. The experimental program has been intensively discussed during a workshop held at ITEP/Moscow on July 13/14, 2000 [11]. •Measurement of the deuteron breakup involving large momentum transfers in the reaction pd $\rightarrow$ ppn [12]. In a first beam time in Febr. 2001, it is planned to measure the spin-averaged cross sections at various beam energies in the range T = $500 \ldots 2000$ MeV. •Measurement of ω- [3] and $\pi^0\eta$-production [13] in pn interactions.

Two new targets are currently in preparation for ANKE: a polarized target [14], to be operated with a storage-cell, and a frozen-pellet target [15]. The former will allow to use polarized hydrogen and deuterium as target material. During first tests of the atomic beam source, target densities comparable to best values published for other sources could be achieved. The pellet target has been transfered from ITEP/Moscow to IKP and, as result of several test runs in 2000, first production of droplets from liquid hydrogen has been accomplished.

Further technical developments for ANKE are: •installation of a detection system for negatively charged particles, in particular K^--mesons [16], see Fig. 1; •extension of the target-near detection system in order to allow for vertex reconstruction of ejectiles emitted from an extended storage-cell target [17] and •design studies and tests of a photon detector made from $PbWO_4$ to be installed around the target region of ANKE.

References:

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