Status Report ANKE*

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The measurements of inclusive K^+ production in pA collisions under forward angles were completed during beam times in Oct. and Dec. '01. Data for beam energies $T = 1.0, 1.2, 1.5, 1.75, 2.0, 2.3$ GeV and C, Cu, Ag and Au targets are now available [1, 2]. Even at the lowest beam energy, far below the free nucleon-nucleon threshold at T_{NN}=1.58 GeV where the signal-to-background ratio is $\sim 10^{-6}$, double-differential cross sections $\mathrm{d}^2\sigma/\mathrm{d}\Omega\mathrm{d}p$ covering the full momentum range of the produced kaons could be extracted from the data, see Fig. 1. The spectra reveal a high degree of collectivity

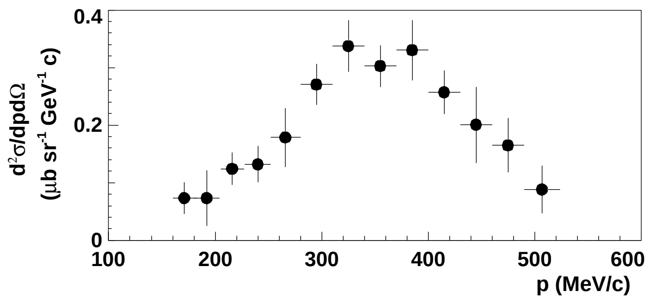

Fig. 1: Double differential cross section for the production of K^+ mesons in $p^{12}C$ reactions under forward angles $\vartheta \leq 12°$ at $T = 1.0$ GeV [3].

in the target nucleus, e.g., a simple kinematical analysis shows that 6 target nucleons (at rest) are needed to produce kaons with the highest observed momenta [3]. The low-momentum parts of the spectra at high energies are strongly sensitive to Coulomb effects and the repulsive nuclear K^+-potential. As a next step the measurement of correlated K^+p and K^+d events is foreseen. The feasibility of such studies has already been shown during the beam time in Oct. '01.

Scalar-meson studies have begun in a two-weeks beam time (Jan./Feb.) during which $p(2.65\ \mathrm{GeV})p \to dK^+\overline{K}^0$ and $\to d\pi^+\eta$ reactions where measured [4]. The data allow to determine the production cross section for the $a_0^+(980)$-resonance for the two main a_0^+ decay channels ($K\bar{K}$ and $\pi\eta$) and, thus, will supply novel information about the structure of light scalar resonances [5]. During this beam time the Münster cluster-jet target was used and high luminosities of $\sim 3 \cdot 10^{31}$ cm^{-2}s^{-1} could be achieved. The experiments will be continued in spring 2002 with measurements at energies up to 2.8 GeV.

The investigation of the deuteron-breakup process $pd \to (pp)_S\, n$ with emission of a fast forward S-wave proton pair has begun [6]. The first measurements in Feb. '01 showed that such processes can be investigated at ANKE and that novel information about short-range effects in the deuteron breakup can be expected. In Sept. '01 the first ANKE beam time with polarized beam took place, aiming at the measurements of the vector analyzing power of the deuteron-breakup process.

Data on the production of ω mesons in pn collisions were taken in Aug. '01. The measurement was performed with a deuterium cluster-jet target and target-near semiconductor counters [7] for spectator-proton detection. The data are currently being analyzed [8].

Data from previous beam times on the reactions $p(492\ \mathrm{MeV})p \to d\pi^+/pn\pi^+$ show that for small relative energies of the pn pair the spin-singlet contribution to the cross section is at most a few percent [9].

Two new targets are currently in preparation for ANKE: The *polarized target (ABS)* [10], to be operated with a storage-cell which will allow to use polarized hydrogen and deuterium as target material and, thus, make possible double polarization measurements. The *pellet target* for high luminosity studies which, during test runs in 2001, produced droplets of liquid hydrogen [11].

The experimental program with ANKE in 2002 will focus on the following measurements: • ϕ-meson production in pp collisions [12]. For these measurements a new detection system for K^- mesons will be installed at ANKE. • $\pi^0\eta$-production in pn interactions [13]. Further measurements under preparation are: • Investigation of neutral scalar mesons a_0/f_0 [14]; • Measurement of η-meson production in $dd \to \alpha\eta$ reactions close to threshold [15]; • Investigation of spin effects in the charge-exchange deuteron-breakup reaction $dp \to (pp)n$ [16].

During the year 2002 a new scattering chamber, developed at the ZAT of the FZJ, will be installed in the target area of ANKE. This large chamber will, e.g., be used for storage-cell tests. Further technical developments comprise: • New target-near position sensitive Si(Li) counters [7]. First test with such counters have already been performed in 2001. • The ANKE photon detector [17] made of $PbWO_4$ crystals. First tests of prototype arrays will be performed at MAMI and ANKE. • New readout electronics for the ANKE MWPCs (ZEL, FZJ).

References:

[1] M. Nekipelov et al., contr. to this report

[2] Proc. Workshop on Strangeness Production in pp and pA Interactions at ANKE, Berichte des FZ-Jülich Jül-3922, ISSN 0944-2952, Editors M.Büscher, V.Kleber, P.Kulessa and M.Nekipelov

[3] V. Koptev et al., Phys. Rev. Lett. **87**, 022301 (2001)

[4] V. Kleber et al., contr. to this report

[5] V. Bratkovskaya et al., contr. to this report

[6] S. Dymov et al., contr. to this report

[7] A. Mussgiller et al., contr. to this report

[8] S. Barsov et al., contr. to this report

[9] V.Abaev et al., Phys. Lett. B **521**, 158 (2001); V. Abaev et al., contr. to this report

[10] M. Mikirtychiants et al., contr. to this report

[11] M. Büscher et al., contr. to this report

[12] M. Hartmann et al., contr. to this report

[13] A. Khoukaz et al., COSY proposal #94 (2000)

[14] M. Büscher et al., COSY proposal #97 (2001)

[15] A. Wrońzka et al., contr. to this report

[16] V. Glagolev et al., contr. to this report

[17] V. Hejny et al., contr. to this report

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