# Measurement of the $pn \to d\omega$ reaction at ANKE

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As it was discussed in [1], the study of ω-production in the *pn* isospin channel is important to clarify the production mechanism and to test the OZI-rule in $\phi/\omega$ cross section ratio. The only published data on the $pn \to d\omega$ total cross section [2] are too poor for this purpose. Moreover, neither in the *pp* nor in the *pn* channels differential cross sections are so far measured below an excess energy of Q=90 MeV. Now, as a result of the experiment successfully carried out at ANKE in the end of July 2008, high-statistics data for the determination of total and differential cross sections of the $pn \to d\omega$ reaction in 10 MeV to 90 MeV Q-range will be obtained.

The measurements were done at two proton beam energies of 2.124 GeV and 2.219 GeV. Two Silicon Tracking Telescopes were installed at 3cm distance to the left (STT1) and the right (STT2) from the ANKE deuterium cluster target to detect low energetic particles in coincidence with fast particles going into the ANKE Forward detector (Fd). Besides the acceptance increase to about 2 *sr*, the use of 2 STT allows to cover the full c.m. angular range up to Q=70MeV. Each of the STT, consisting of 3 double-side segmented detectors (70$\mu$m / 300$\mu$m / 5mm), provides a clean identification (Fig. 1) and momentum determination for particles stopped in either the 2nd or the 3rd detector. Detected in STT1, deuterons from the pd elastic scattering will be finally used for the normalization.

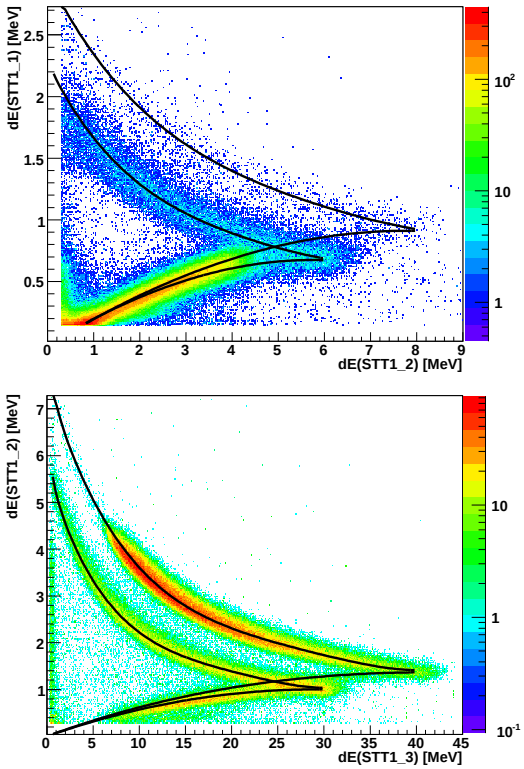


Fig. 1: dE-E plots for the STT1. The upper panel shows the energy loss correlation for the 1st and the 2nd detectors, the lower panel - the same for the 2nd and the 3rd ones. Expected dE-E dependences for protons and deuterons are shown by solid lines. Low energetic deuterons are suppressed because corresponding protons are beyond the Fd angular acceptance.

Since at ANKE the $pn \to d\omega$ reaction can be identified by the missing mass technique only, one has to pay a special attention to the missing mass reconstruction. This can be verified using the pd and the quasi-free NN elastic scattering reactions which are very sensitive to the actual detector positions. The alignment of the silicon detectors as well as of the Fd multiwire chambers was investigated using pd elastic scattering. The relative displacement of detectors was found to be very small - 0.2mm for both the STT and about 0.6mm for the Fd chambers. Having these corrections fixed, missing mass distributions for the $pd \to ppX$ reaction were obtained (see Fig. 2). One of protons in final state was selected using the dE-E dependence to be stopped in the 2nd detector of either STT1 or STT2. Any particle detected in coincidence by the Fd was considered as the second proton because the admixture of pions and deuterons is known to be less than 5%. Peaks corresponding mainly to the quasi-free NN elastic scattering are well positioned at the neutron mass with only a small background.

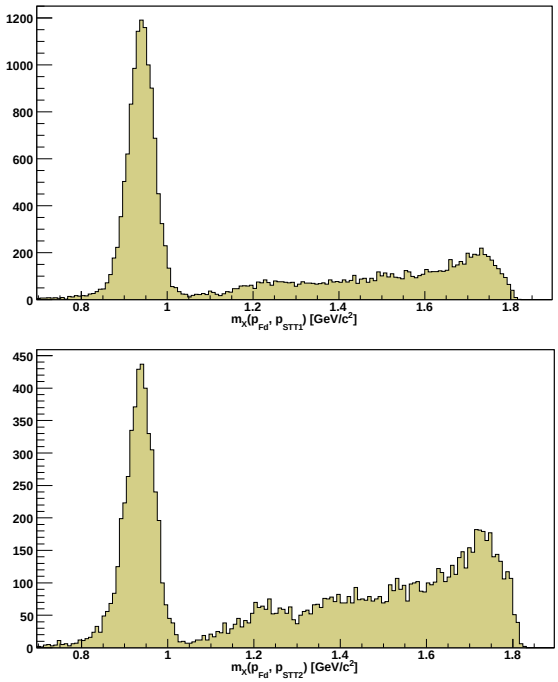


Fig. 2: Missing mass of two protons. One proton is detected in the Fd and other either in the STT1(upper panel) or in the STT2(lower panel).

The further data analysis is in progress. Taking into account the knowledge from our previous measurement [2], the total statistics collected in this experiment can be roughly estimated from the inelastic continuum (Fig. 2) to be, at least, 100 times higher than it has been before.

**References:**

[1] Proposal COSY-175 (2007)
[2] S.Barsov et al., EPJ A 21, 521 (2004)

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