# Investigation of the reaction $\vec{d}+p \to {}^3He+\eta$ at ANKE*

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The reaction $\vec{d}+p \to {}^3He+\eta$ shows a very striking energy dependence near threshold [1, 2]. Despite the angular distribution remaining essentially isotropic, the square of the amplitude decreases by a factor of three over a few MeV in excess energy. The general feeling is that this is due to a very strong FSI, which suggests that this system has a nearby pole in the complex momentum plane. Now close to threshold there are two independent $d+p \to {}^3He+\eta$ amplitudes A and B. The moduli-squared of these amplitudes can be separated by measurements of the diffential cross sections and tensor analysing power $t_{20}$ [3].

Before submitting a dedicated experimental proposal to determine the energy dependence of A and B, the feasibility of the measurements of $t_{20}$ has to be shown. The first measurement has been carried out parasitically at an ANKE beam time on the deuteron charge-exchange reaction in February 2005 [4]. This reaction was studied for different energies and among other beam momenta at one setting corresponding to the $d+p \to {}^3He+\eta$ production at an excess energy of Q = 7.4 MeV (p = 3,17 GeV/c).

To search for the events of the reaction channel of interest the $^3$He nuclei were identified using the ANKE forward detector. The reaction $\vec{d}+p \to {}^3He+\eta$ can be isolated by plotting the transversal versus the longitudinal reconstructed momentum, as shown in figure 1. For a reaction with two particles in the exit channel, one expects a momentum ellipse with a fixed radius. The calculated momentum ellipse of the exit channel ${}^3He+\eta$ is sketched in the plot (black line).

The identification of the $\eta$ events is done using the missing mass distribution. To describe the background behaviour subthreshold data (Q = -4 to 0 MeV) from the $^3$He$\eta$ beam time of January 2005 were used. An explanation of this method can be found in ref. [5]. Preliminary missing mass plots for the spin-mode 4 ($P_z = 0$ and $P_{zz} = 1$) and different $\cos\vartheta^{CM}$ intervals are plotted in figure 2.

The current results of the analysis show a clear $\eta$-signal on a background that can be described by the available subthreshold data. Hence the determination of $t_{20}$ is feasible. Future measurements at different excess energies should be considered to study the FSI effects separately for the A and B terms [3].

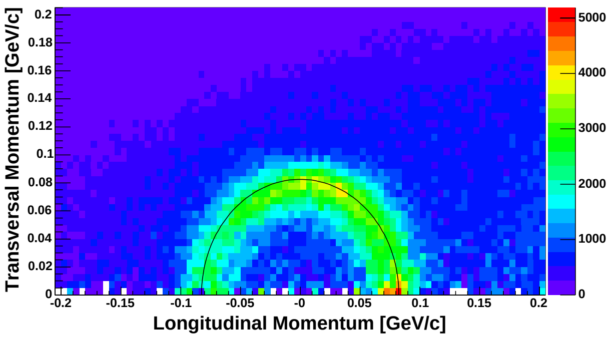


Fig. 1: $^3$He momentum plot to identify a momentum ellipse. Preliminary results of the analysis at an average excess energy of Q = 7.4 MeV.

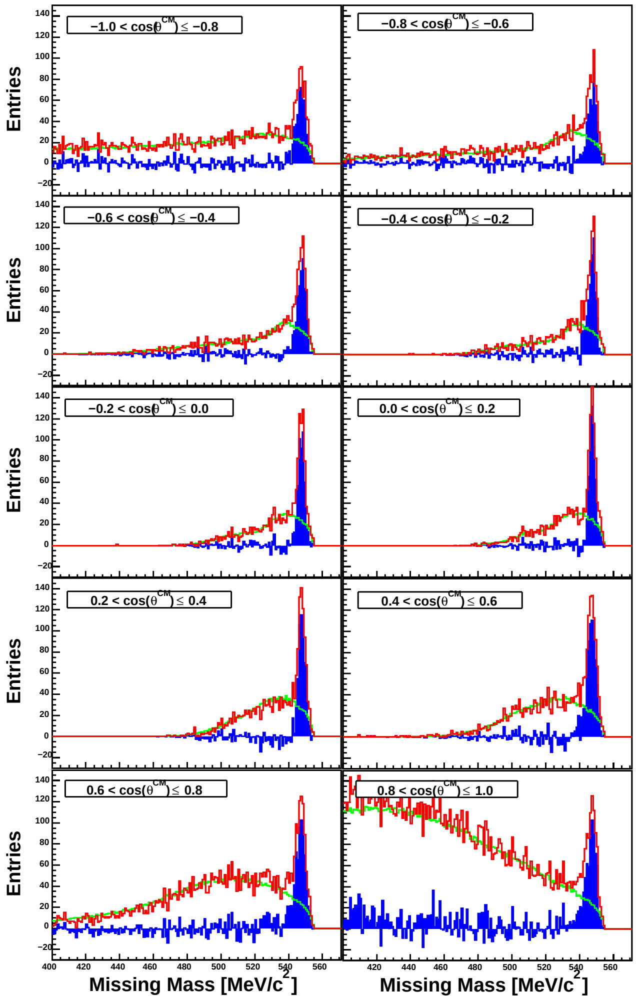


Fig. 2: Missing mass plots (red lines) for spin-mode 4 in various $\cos\vartheta^{CM}$ intervals at an excess energy of Q = 7.4 MeV, the background description (green lines) and the difference (blue filled histograms) are also included. The results are still preliminary.

## References:

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