Missing Mass

We looked on the missing mass of the A-2 system:

$$(q + p_A - p_p - p_n)^2 = p^2_{A-2}$$

$$(\omega + m_A - E_p - E_n)^2 - (\vec{q} - \vec{p}_p \vec{p}_n)^2 = M^2_{A-2}$$

For the deuterium case, we get missing mass (square) around zero. The resolution is about 5 MeV.

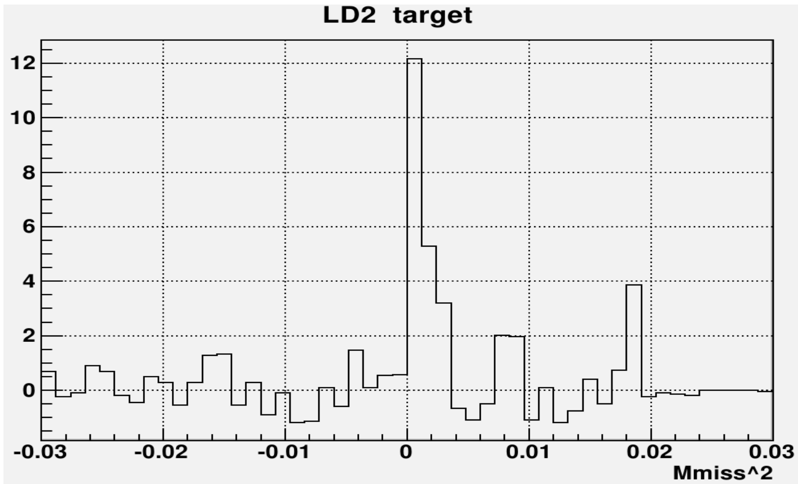

Fig 1: Missing mass for LD2 target

The missing mass distribution during the production (with cut x>1.05):

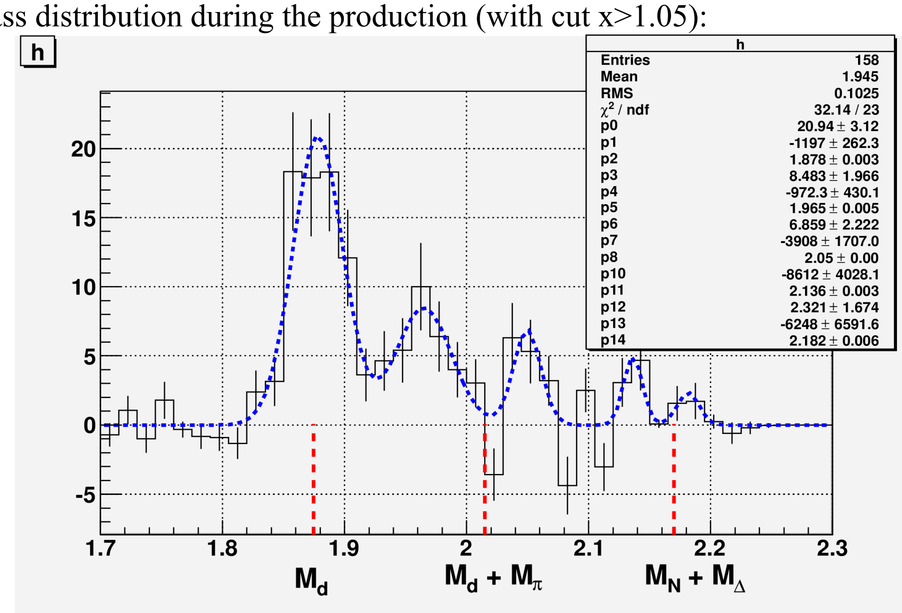

Fig 2:The data is fitted to the 5 Gaussian distributions. In the main peak, the missing mass is equal to the deuterium mass. This missing mass spectra is for 750 MeV/c settings. In the lower missing momentum settings we see main peak in the same position. For the 625 MeV/c case we have low

statistics, so any structure that may exist is almost invisible. In the 500 MeV/c case, we probably don't have enough energy to create a pions. However, I still working on it.

What happens if I release the cut on x:

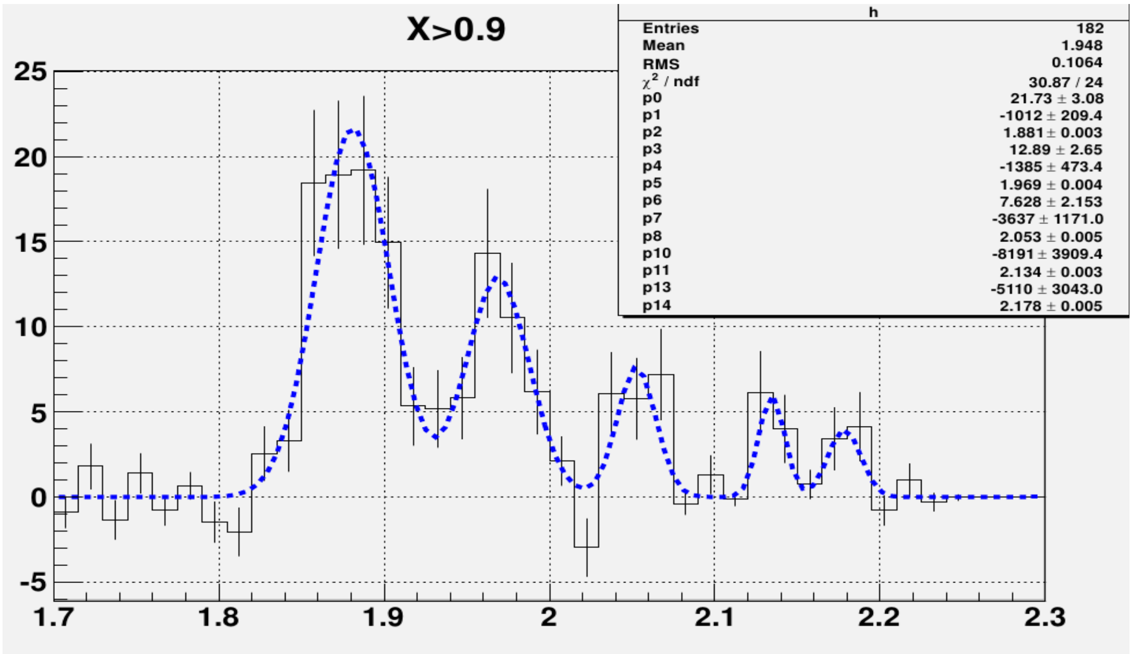

Fig 3: Actually in the data we have even lower than X=0.9 values, but they were suppressed in the replay. I'm now replaying the data with these values.

If we look on the correlations:

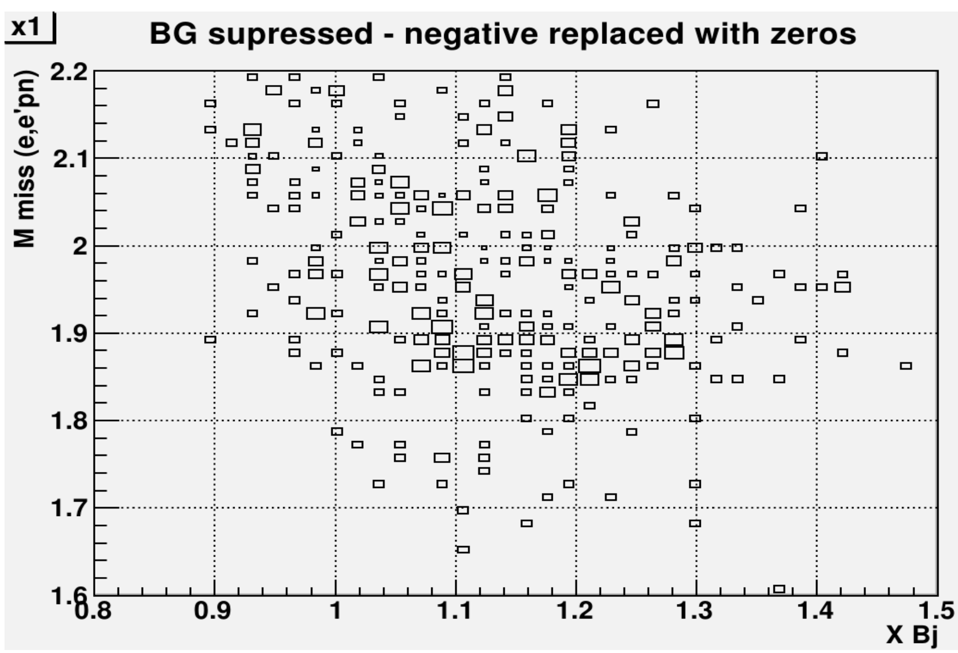

Fig 4: Correlation between XB and missing mass is clearly seen. In addition we can see that part of the excitations are in the region x>1 and part below. The d peak is clear at x>1 and the higher missing mass at larger X values. More data will be available soon.

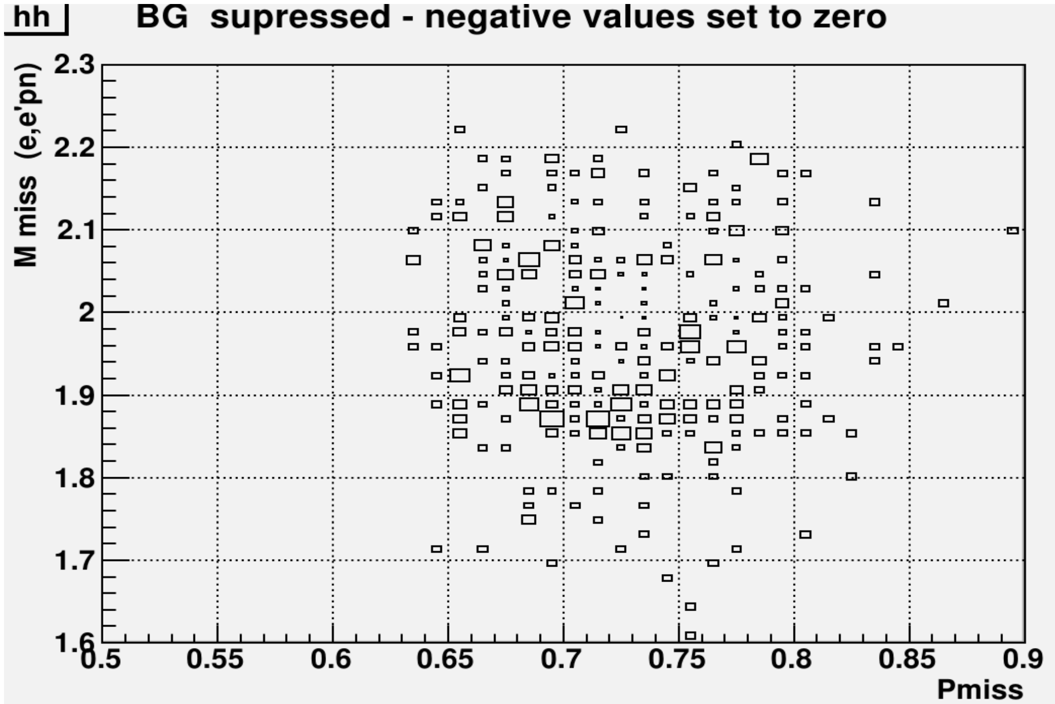

Fig 5: no apparent correlation with the Pmiss. Is it indication that the additional excitation originate at the SRC pair?

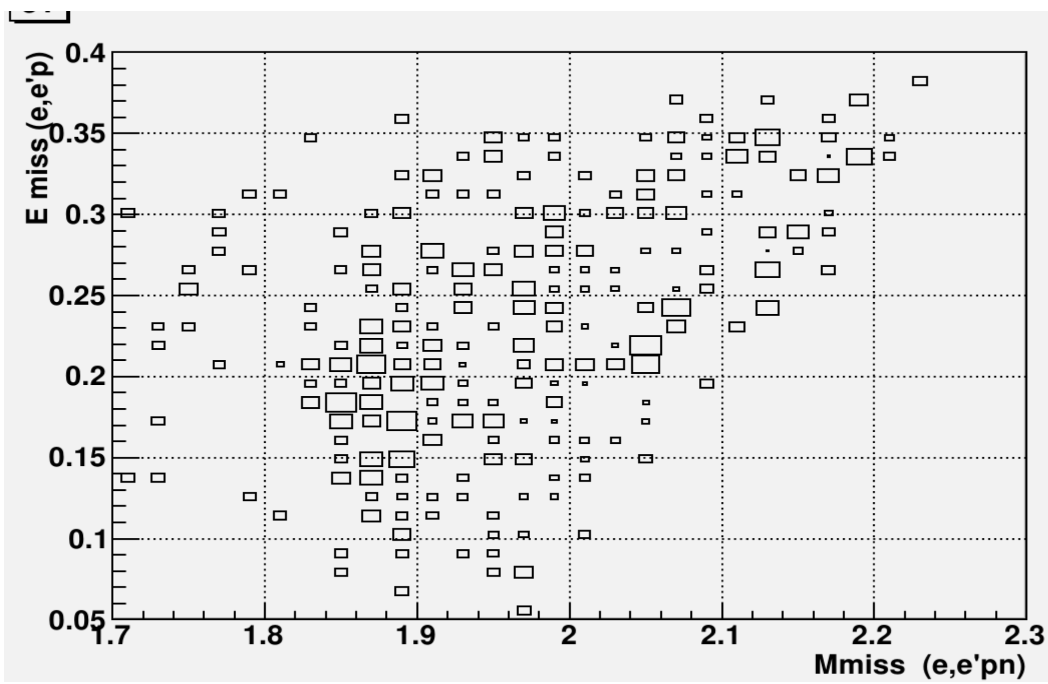

Fig 6: Correlation between E miss (e,e'p) and missing mass is seen. We see that in this kinematics, we have enough energy to give a neutron kinetic energy of 0.08 – 0.25 GeV and to create a pion (at lower neutron energy).

what we find in the literature:

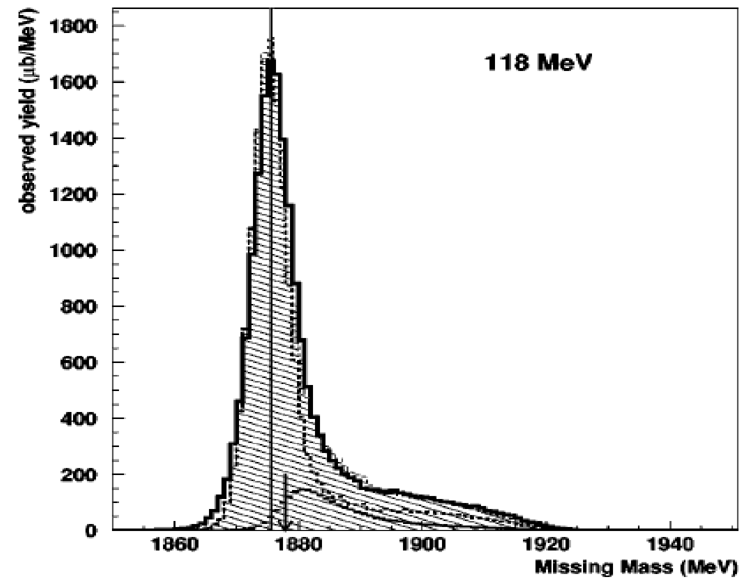

FIG. 1. The missing mass reconstructed from two observed protons in the selected [pp] channel. The dark solid line is the data, the hatched distribution is the sum of the fitted Monte Carlo distributions. The dashed line is the contribution from $(pp)d$ and the light solid line the contribution from $(pp)pn$. The vertical line indicates the deuteron mass and the arrow the pn end point. The yield has not been corrected for detector acceptance and losses, nor for the effects of the kinematic cuts applied.

Fig 7: taken from PRC 58, p 942, 1998

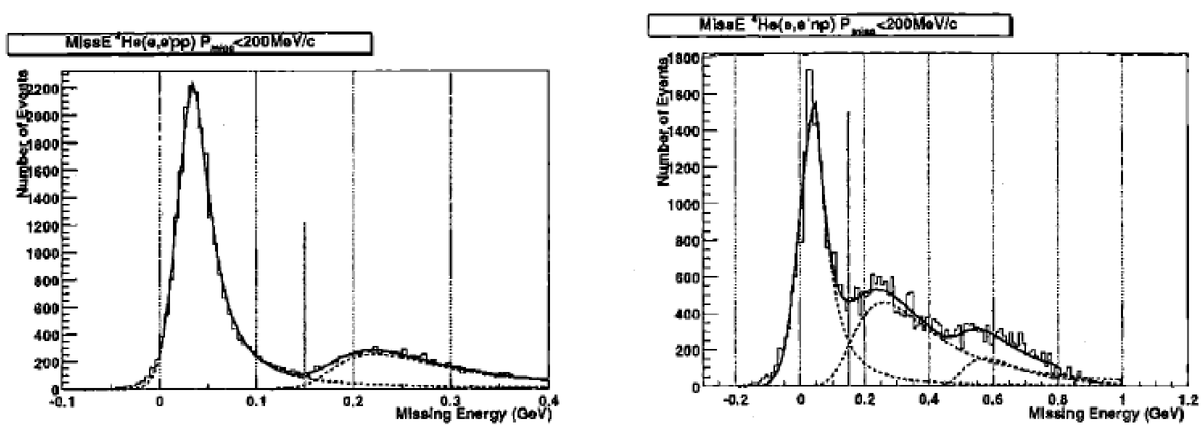

Fig 8: taken from PhD thesis of Bin Zhang