Pcm distribution for 4He(e,e'pn) events at 750 MeV/c

Except from the physics interest in the measurement of the cm momentum distribution, we also need it in order to find the acceptance correction for the (e,epn)/(e,ep) ratio..

The PCM distribution can be obtained using two techniques:

1) Comparing the data to the simulation with different widths and choosing that with a minimal Chi square.
2) Plot the width of the Pcm distribution assumed in the simulation versus that obtain after the acceptance cuts applied and compared to the measured with +- 2 sigma deviation.

Second method is what Ran used in his Thesis (see page 69). An example is shown in fig 1:

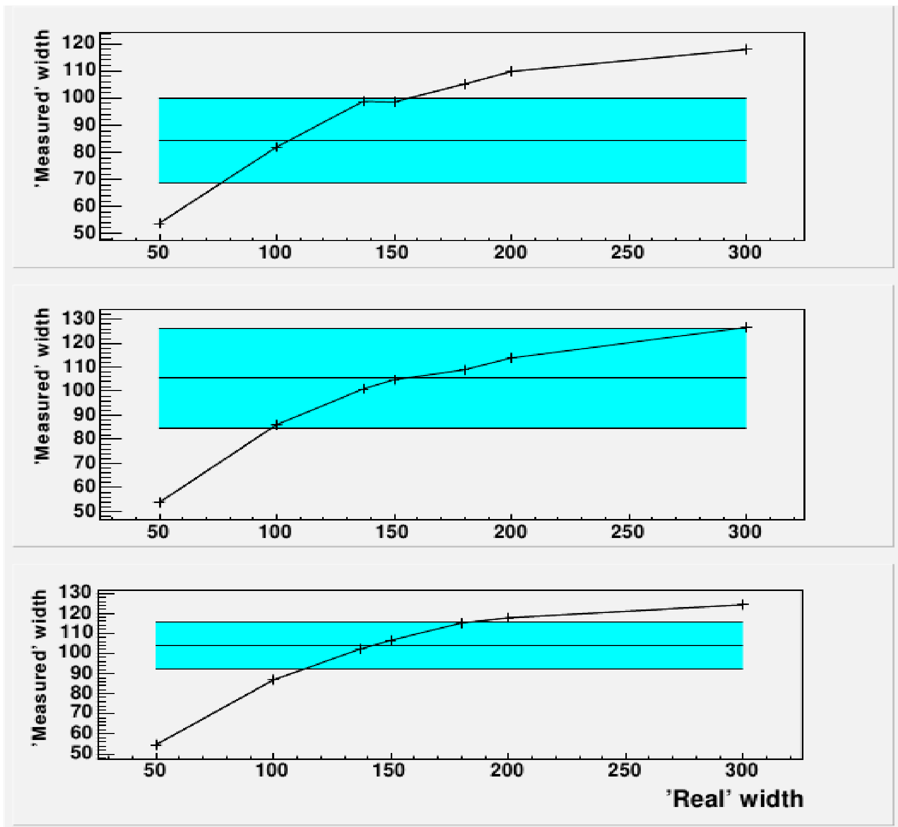

Fig 1.

The first difficulty that we must solve is how to simulate our e,e'pN events.
In the previous experiment, Ran simulated the data in LAB coordinate system and used same width for all axis. No shift in the Pmiss direction was assumed (as Or showed in his CLAS analysis).

In this work I combined these two methods. First I rotated my coordinate system to be along the Pmiss, so only the z axis is in the Pmiss direction . Then, I took the (e,e'p) data and simulated the recoil particle when I gave to each component (in rotated frame) additional momentum based on Gaussian distribution with same sigma. I also simulated assuming an offset in momentum component along the Z axis (along Pmiss).

The results of the simulations is shown in Fig 2,3 and 4:

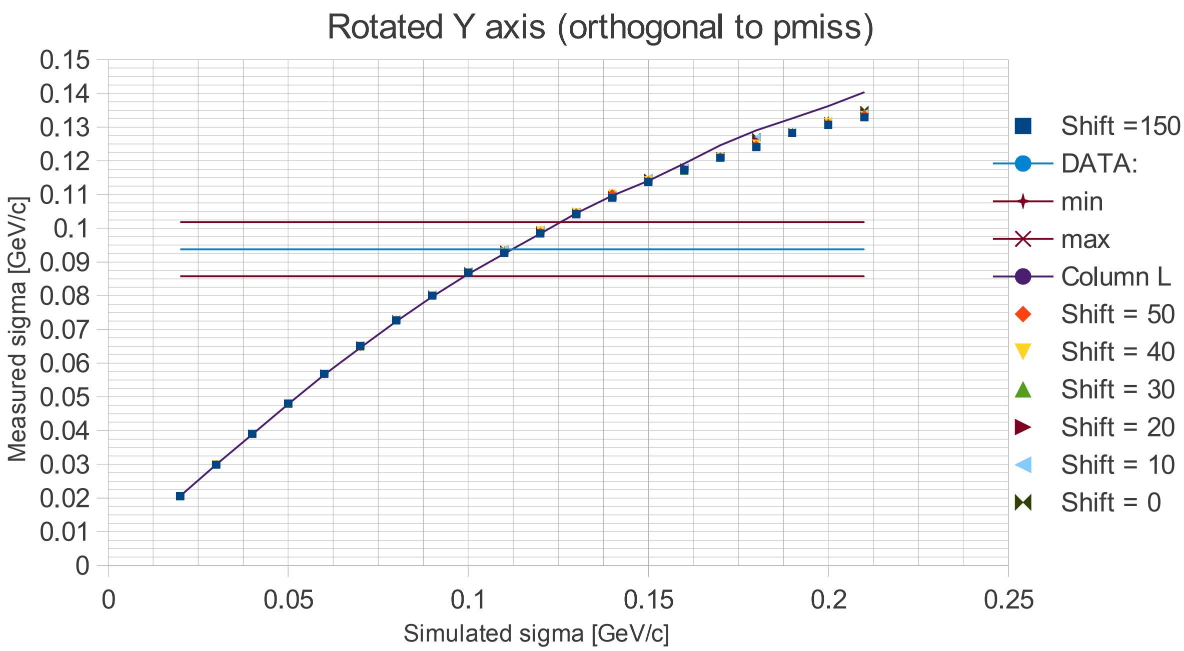

Fig 2: Labeling explained in the text below figure 4

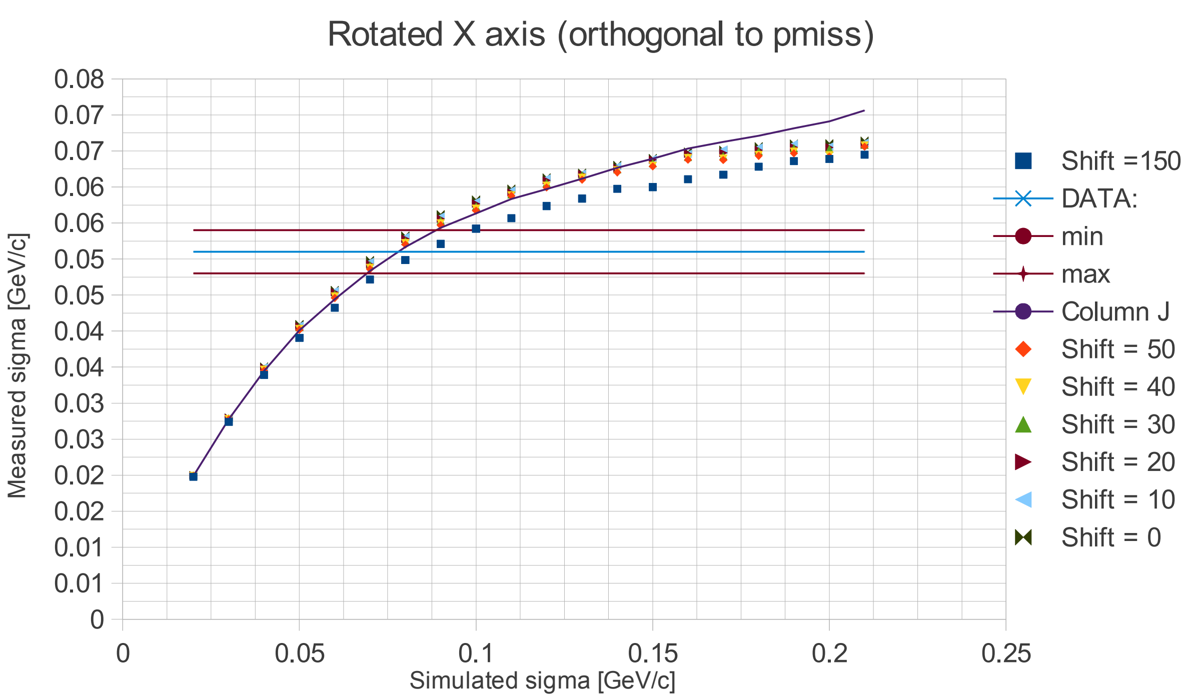

Fig 3: Labeling explained in the text below figure 4

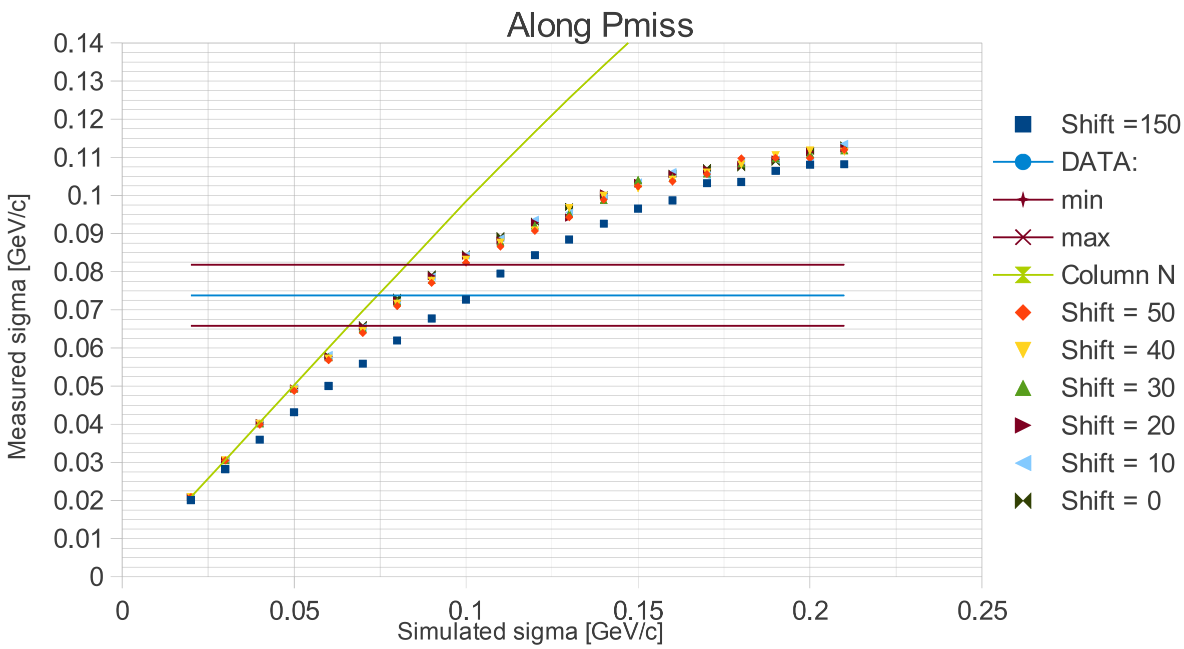

Fig 4: See text below

In three figures were you can see measured sigma vs simulated sigma. Simulated sigma is what I insert to the simulation and the measured width is the width after I apply a acceptance cuts.
Different points correspond to different offset values. I run from 10 MeV/c offset up to 150 MeV/c.
In these three figures you can see a lines labeled as: Column L, J and N. These are results of the simulation with offset equal to 50 MeV/c and NO CUT ON P recoil! As can be seen immediately from the simulation this is what we expect because the Z axis correlated with the momentum acceptance.
The horizontal line labeled as “DATA”, correspond to width extracted from data and the lines called “min” and “max” correspond to the **two** sigma range. The results for the data are shown in fig 5:

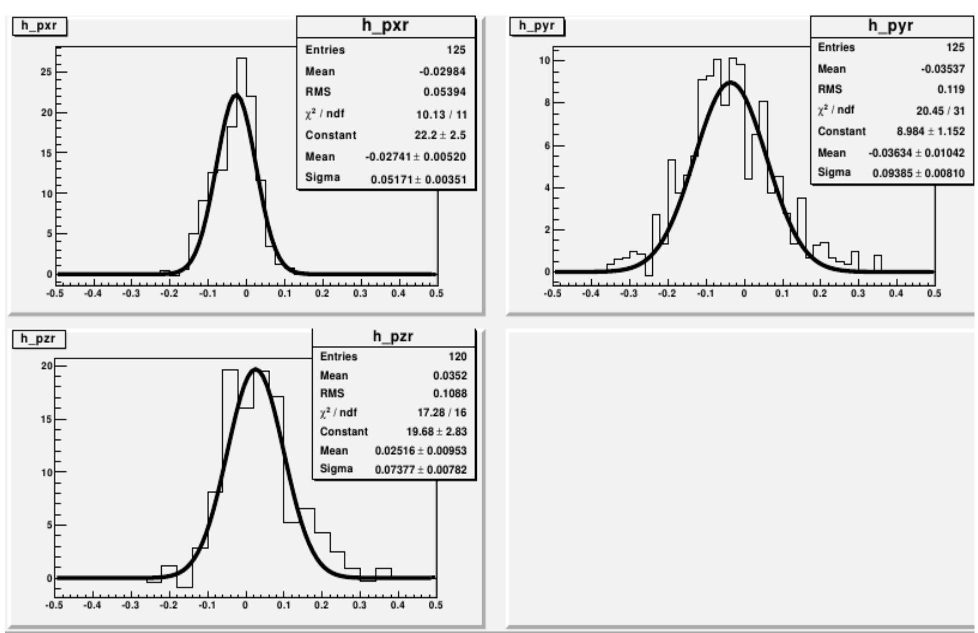

Fig 5: Fitted data. HAND 750 MeV/c

Additional technique that we plan to use is fitting the distribution of the data to the simulated distribution. Right now I'm working on it, however for some reason my fit is bin dependent.

In fig 6 I show an example of the results but it's very preliminary!!! Moreover, this don't take any offsets in to account.

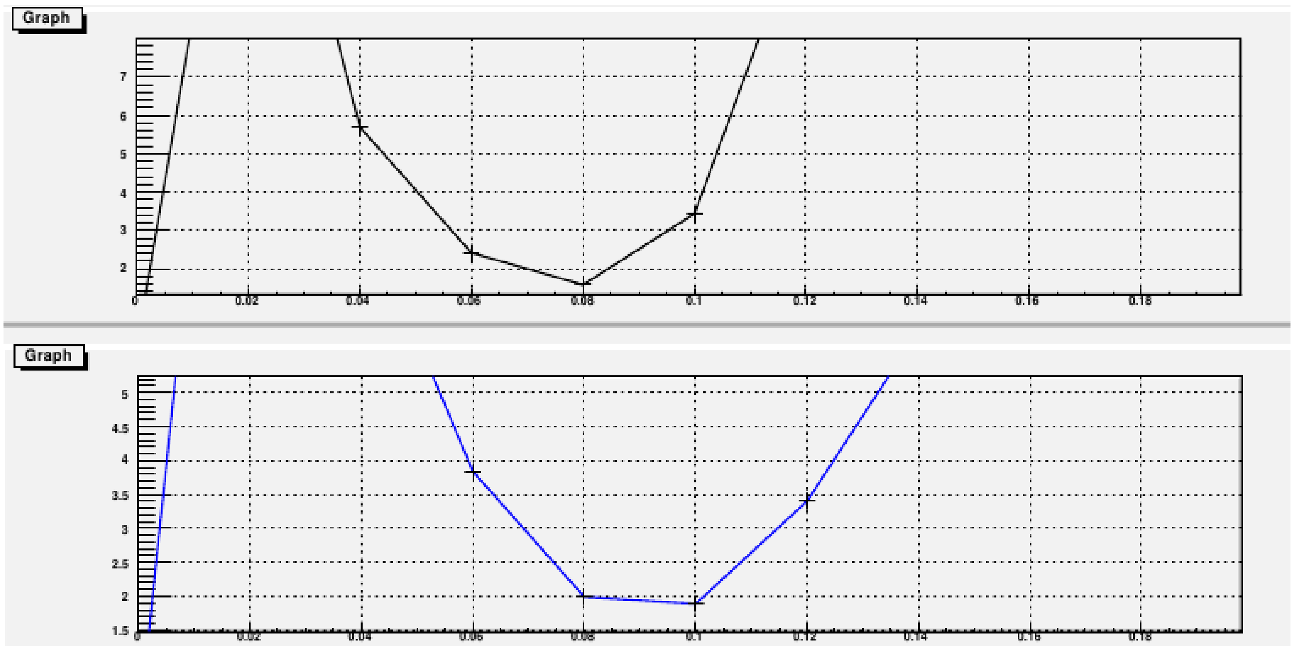

Fig 6: Chi square over NDF vs simulated sigma.

Next week I plan to finish the simulations for all kinematics and detectors with these two techniques. In fig 7, the result is shown.

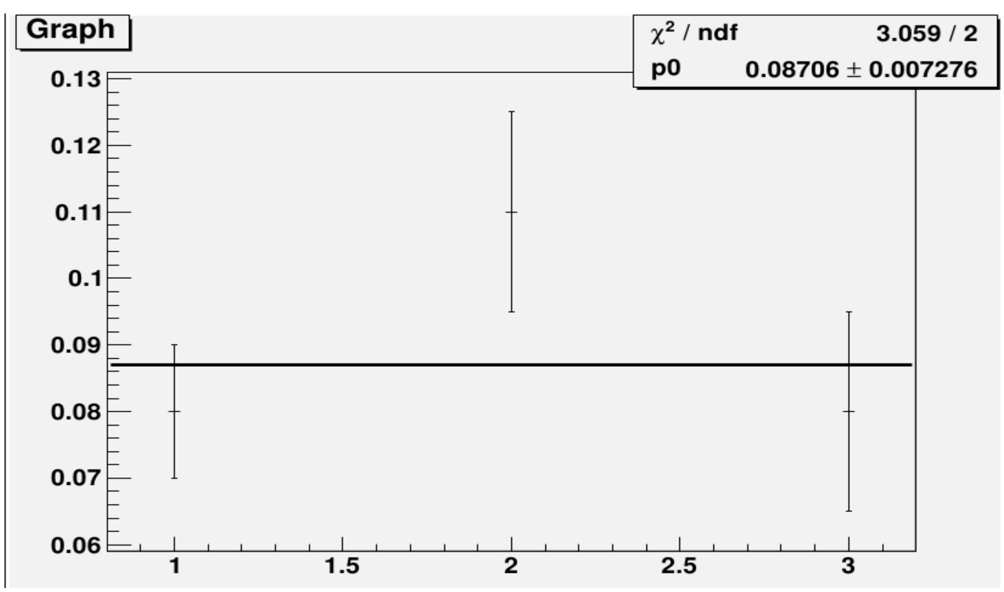

Fig 7: Pcm

The prelimenary result is: PCM = 0.087 +- 0.007 [GeV/c]

Fig 8 show the result for 12C:

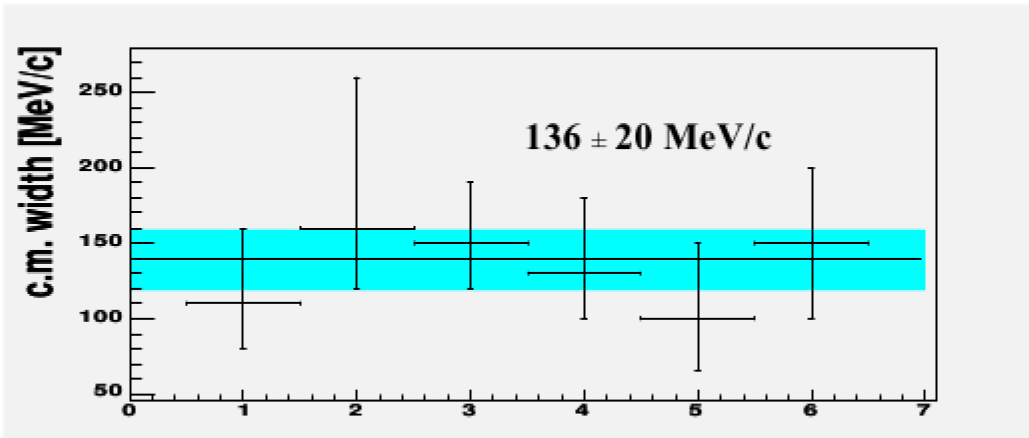

Fig 7: Data from E05 – 015 Experiment