

BigBite Analysis

4-pass N2 Dilution, Asymmetries

Matthew Posik

¹Temple University
Philadelphia, PA 19122

04/08/2011

Outline

1 Last Week

- BigBite Čerenkov Cuts

2 N2 Dilution

3 4-Pass Asymmetries

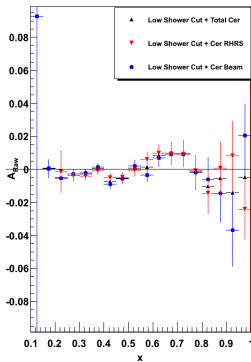
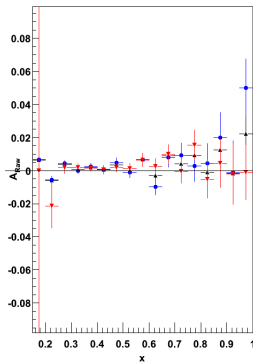
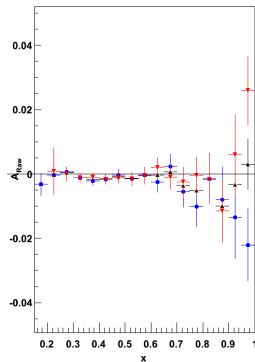
4 4-Pass Positive Polarity

5 What's Next

BigBite Čerenkov Cuts

- To check if the asymmetries overlap when using the small (beamline-side) and large (RHRS-side) angle,
- Compute the asymmetries applying the small and large angle Čerenkov cuts separately
- Compare to asymmetry using the total Čerenkov cut (small || large angle)
- Plot I showed last week was double counting last bin

4-Pass Asymmetries with Angle Dependent Čerenkov Cuts

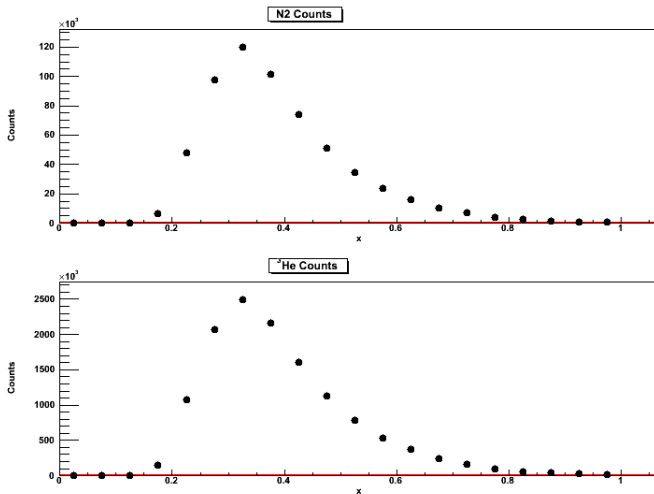
 $A_{R2W}^{\text{low}} \quad S = 0$

 $A_{R2W}^{\text{low}} \quad S = 90$

 $A_{R2W}^{\text{low}} \quad S = 270$


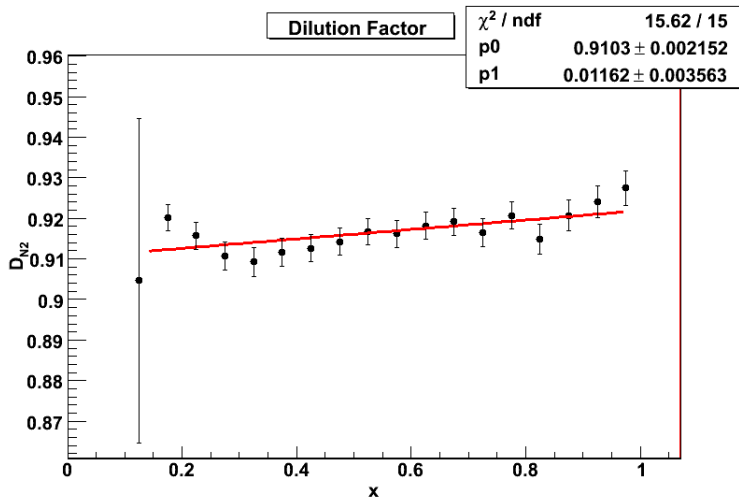
- Used 3 4-pass nitrogen target runs to compute the nitrogen dilution factor
- this is found by

$$D_{N_2} = 1 - \frac{N_{ref}}{N_{prod}} \frac{Q_{prod} \rho_{prod}^{N_2}}{Q_{ref} \rho_{ref}^{N_2}}$$

- $N_{ref}, (N_{prod})$ Total counts for a reference N2,(production ^3He) run
- $Q_{ref}, (Q_{prod})$ is the total charge incident on the reference,(production) target
- $\rho_{ref}^{N_2}, (\rho_{prod}^{N_2})$ is the density of N2 in the reference, (production) target
- $\rho_{prod}^{N_2} = 0.113 \text{ amg} \pm 3\%$
- $\rho_{ref}^{N_2} = 7.71 \text{ amg} \pm 2.1\%$

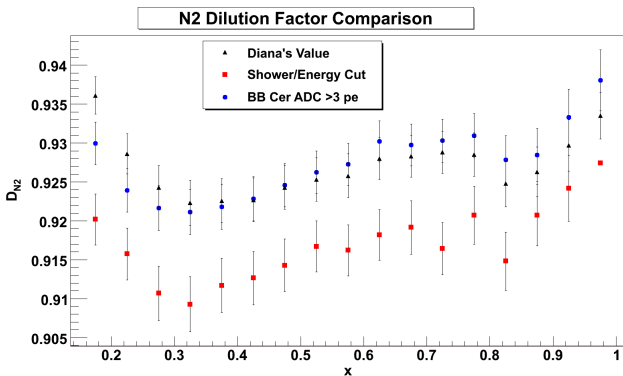
D_{N_2} : Counts in 4-Pass Reference and Production Cell



D_{N_2} : N2 Dilution Factor

D_{N_2} : Comparison

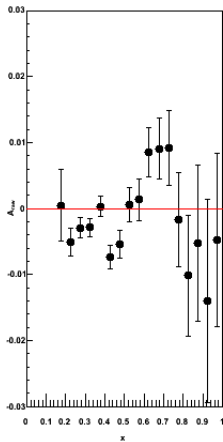
- Compare to Diana's dilution factor and dilution factor with different cuts



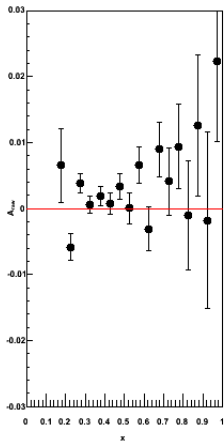
- Using all our cuts, including:
- the shower > 100 MeV
- $E > 600$ MeV
- Čerenkov ADC > 0
- Applying N2 dilution factor to each x-bin for physics and A_{\parallel}, A_{\perp} asymmetries
- Beam Polarization: $P_E = 62.3366 \pm 1.0\%$
- Target Polarization Error: 4.9%

Raw Asymmetries

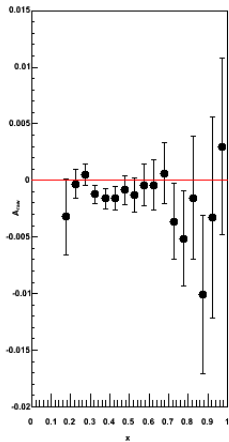
Raw Asymmetry S=0



Raw Asymmetry S=90

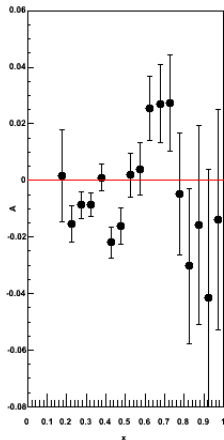


Raw Asymmetry S=270

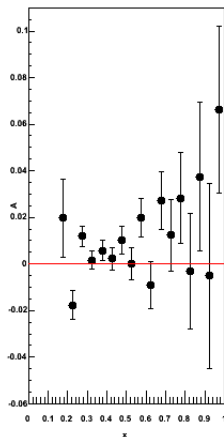


Physics Asymmetries

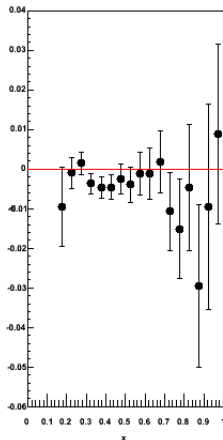
Physics Asymmetry S=0



Physics Asymmetry S=90

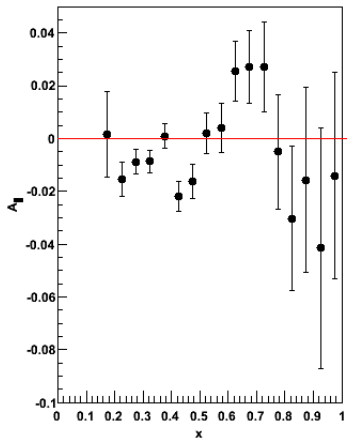


Physics Asymmetry S=270

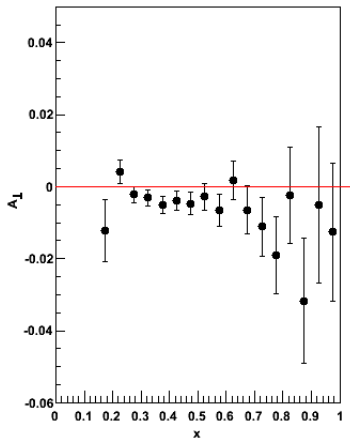


$$A_{\parallel}, A_{\perp}$$

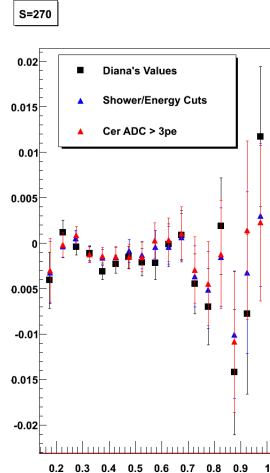
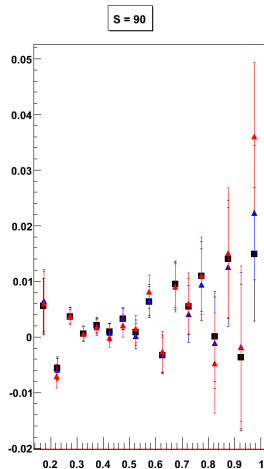
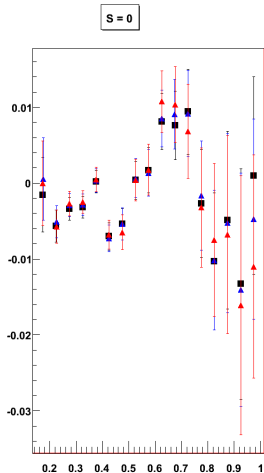
Parallel Asymmetry



Perpendicular Asymmetry

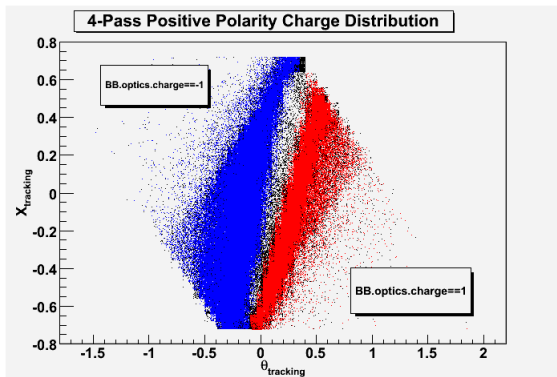


Raw Asymmetries Comparison



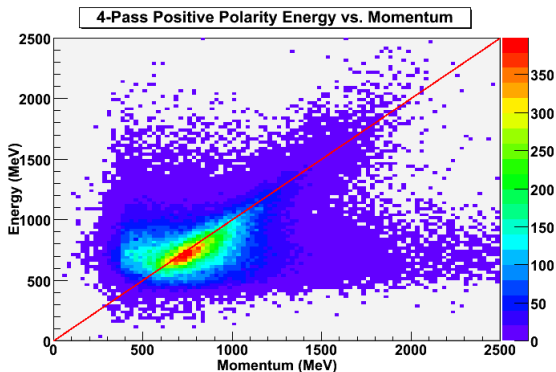
Charge Distribution

- Skimed 4-pass positive polarity (runs 2199-2212) now on d2n machine
- Positive polarity data is [target spin 270](#)
- With BigBite in positive polarity charge cut of -1 now selects real positive charge events



Charge Distribution

- Need a new Calibration of Shower with positive polarity?



For Next week

- Continue working towards getting A1, A2, g1, g2 on 4pass data
 - Compute x-binned kinematic variables
- BB Čerenkov HV1 runs calibration (in progress)