

BigBite Analysis

BB Cer HV2 Calibration, MWDC 1-pass t0 and Residuals and Preliminary Elastic ^3He Asymmetry Error Fix

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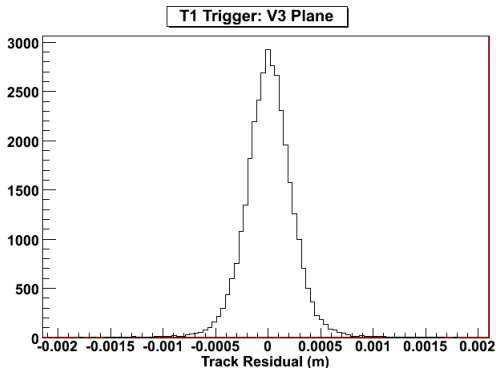
- 1 BigBite Čerenkov HV2 Calibration
- 2 BigBite 1-Pass MWDC Stability Check
 - The Trigger Hole Effect
 - MWDC:Track Residual
 - MWDC: t_0
- 3 Elastic Asymmetry
 - Asymmetry Error
 - Elastic Kinematics
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Čerenkov HV2 period

- The HV2 period, is where there was a HV change to the Čerenkov ADCs. This affected runs [1401-1474](#)
- During the calibration, PMT 12 needed a very high gain constant...
 - PMT and base were bad and swapped at end of HV2 period
http://www.jlab.org/~daq/halog/html/0902_archive/090215224231.html
- Calibration was done by aligning good electron ADC signals to those of the HV4 period
- Updated DB and put gain constants on the wiki
https://hallaweb.jlab.org/wiki/index.php/HV_Tables
- HV1 (runs 1002-1389) is the last period that need to be calibrated
- This period had some ADC problems and used v792 ADCs

Trigger Hole Effect (T1 plot)

- While looking at 1pass MWDC stability, T1 trigger (lower shower threshold) cut was used
- Using the T2 or the T6 triggers (higher shower threshold triggers) the trigger hole is evident
- Below is the v3 plane with a T1 trigger cut



Trigger Hole Effect (T2 and T6 Plots)

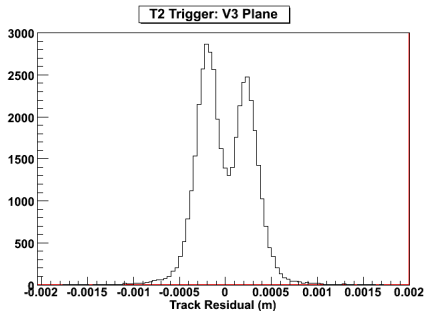


Figure: T2 events of MWDC plane v3 in chamber 2 for elastic ^3He run

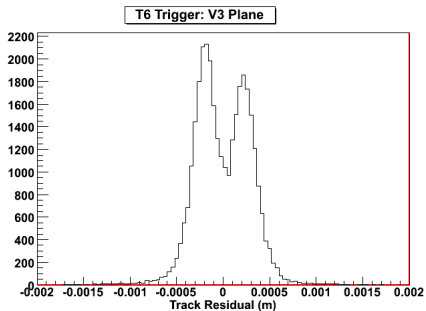


Figure: T6 events of MWDC plane v3 in chamber 2 for elastic ^3He run

MWDC Track Residuals Chamber 1 Run 1212

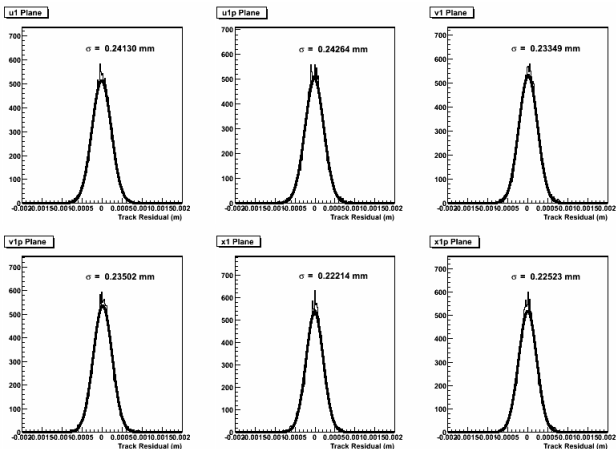


Figure: Track residuals for MWDC chamber 1 planes for elastic ^3He run 1212

MWDC Chamber 1 Mean Track Residual Stability

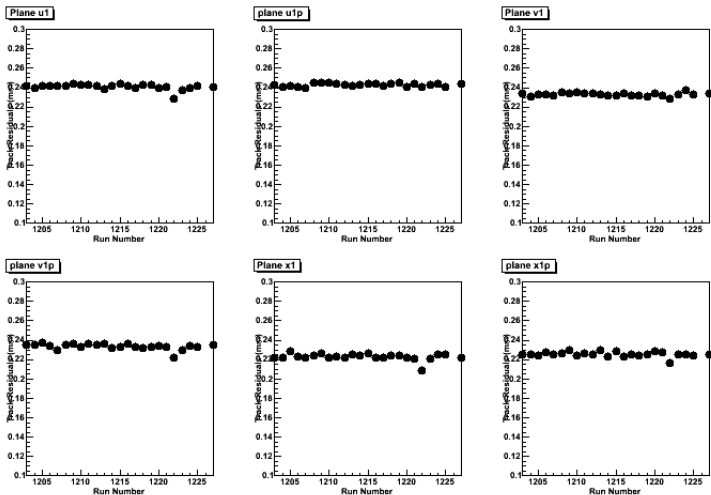


Figure: Track residuals for MWDC chamber 1 planes for elastic ^3He runs

MWDC Chamber 2 Mean Track Residual Stability

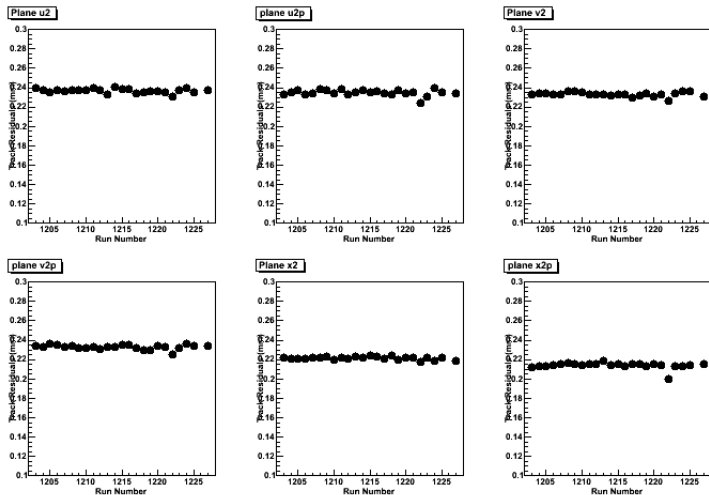


Figure: Track residuals for MWDC chamber 2 planes for elastic ^3He runs

MWDC Chamber 3 Mean Track Residual Stability

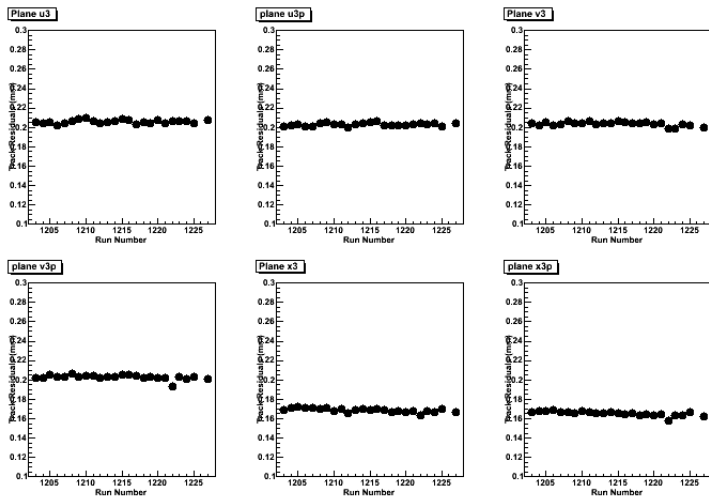
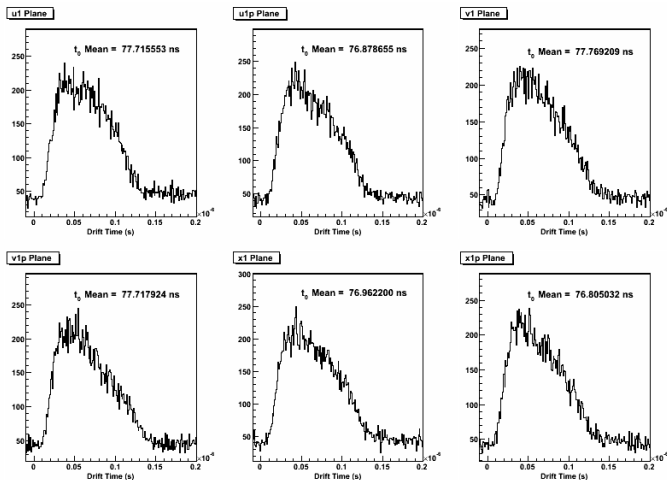


Figure: Track residuals for MWDC chamber 3 planes for elastic ^3He runs

MWDC Drift Time Chamber 1 Run 1212

Figure: Drift Times for MWDC chamber 1 planes for elastic ^3He run 1212

MWDC Chamber 1 Mean Drift Time Stability

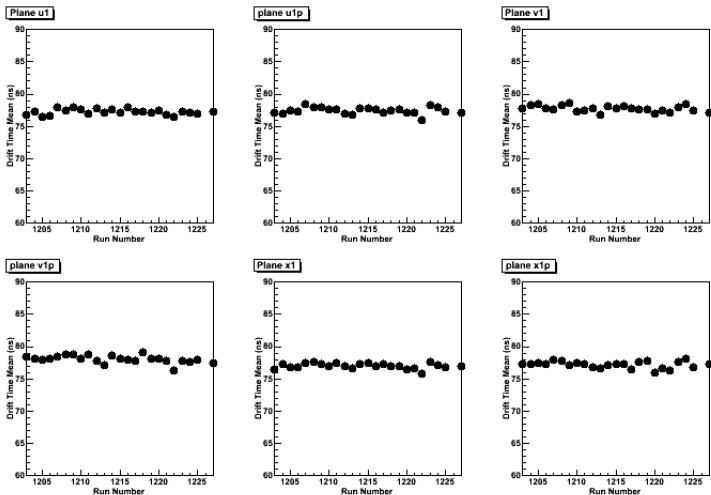


Figure: Mean Drift Times for MWDC chamber 1 planes for elastic ^3He runs

MWDC Chamber 2 Mean Drift Time Stability

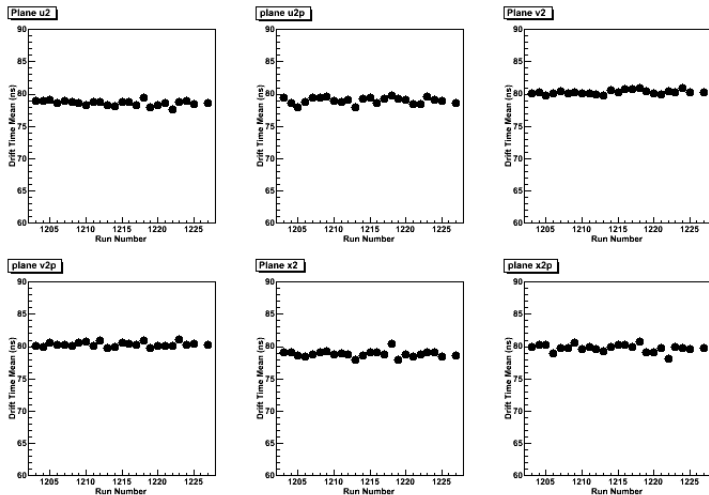


Figure: Mean Drift Times for MWDC chamber 2 planes for elastic ^3He runs

MWDC Chamber 3 Mean Drift Time Stability

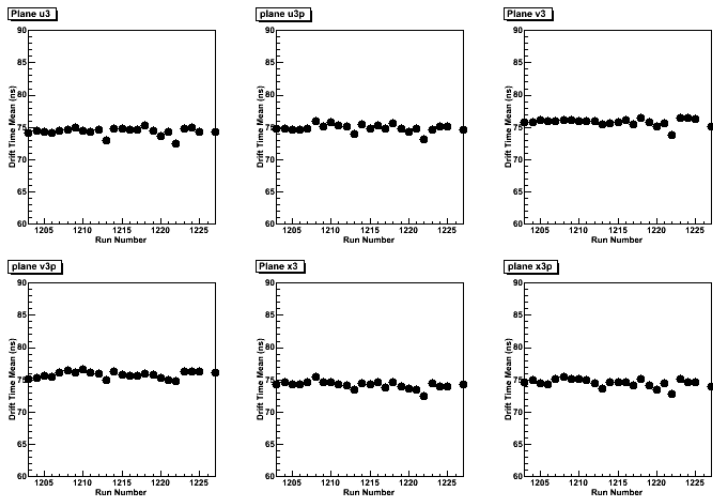


Figure: Mean Drift Times for MWDC chamber 3 planes for elastic ^3He runs

Wrong Asymmetry Error Calculation

- Realized that I was applying the wrong error to the asymmetries when I summed over runs
- I was doing the following...

$$\bar{A}^i = \sum_j A_j^i$$

- Then I applied the asymmetry error $\bar{\sigma}^i$ as...

$$\bar{\sigma}^{i^2} = \sum_j 4 \frac{M_j^i P_j^i}{(M_j^i + P_j^i)^3}$$

- Where $M(P)$ = minus(plus) helicity events
- i is the i^{th} bin
- j is the run number

Correct Asymmetry Error Calculation

- I am now computing the asymmetry and error as follows...

$$\bar{A}^i = \frac{\sum_j A_j^i / (\sigma_j^i)^2}{\sum_j \frac{1}{(\sigma_j^i)^2}}$$

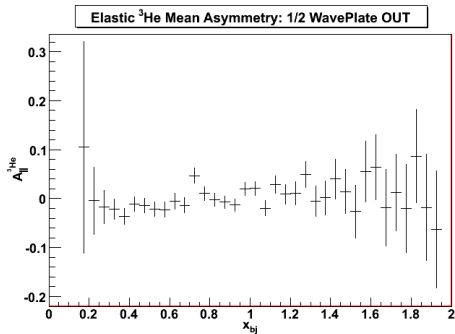
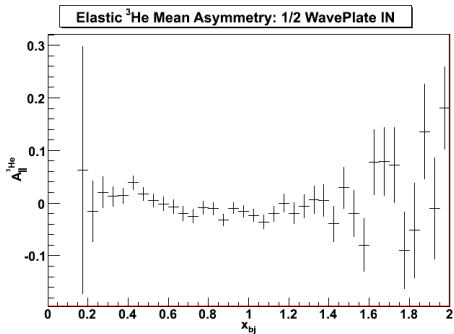
- applying the error

$$(\bar{\sigma}^i)^2 = \frac{1}{\sum_j \frac{1}{(\sigma_j^i)^2}}$$

$$(\sigma_j^i)^2 = 4 \frac{M_j^i P_j^i}{(M_j^i + P_j^i)^3}$$

- Where $M(P)$ = minus(plus) helicity events
- i is the i^{th} bin
- j is the run number

T1 Elastic ^3He Asymmetries with Correct Error

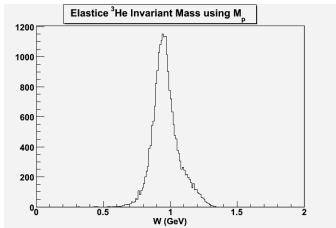


Elastic Kinematics

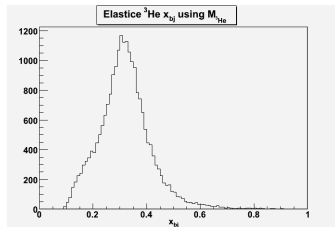
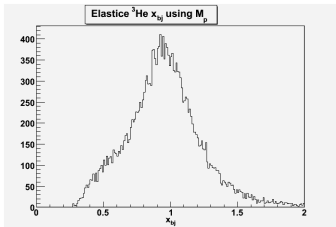
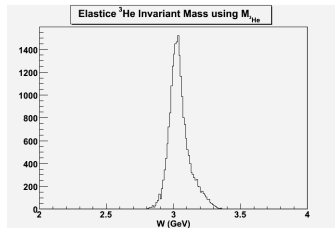
- While looking at the elastic ^3He asymmetries I noticed that the elastic kinematics were computed using the proton mass
- Diana was kind enough to do a 1-pass replay using the ^3He mass
- We can take a look at the differences in the kinematic variables...

Elastic W, x_{bj} Kinematics

Proton Mass



^3He Mass



Elastic Kinematics Distributions

Proton Mass

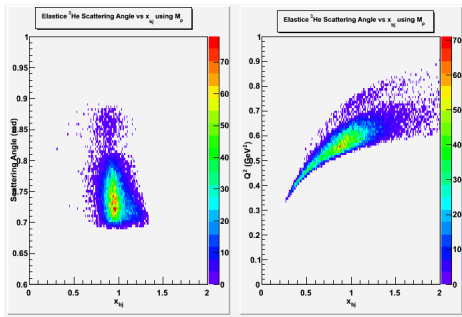


Figure: Shows the scattering angle vs x_{bj} on the left and Q^2 vs x_{bj} on the right using the proton mass

³He Mass

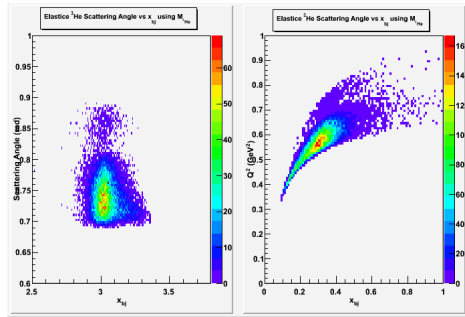
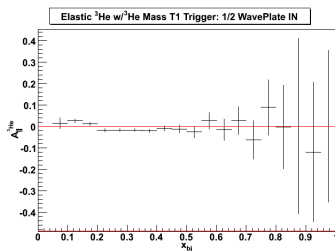


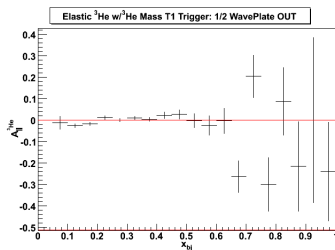
Figure: Shows the scattering angle vs x_{bj} on the left and Q^2 vs x_{bj} on the right using the ³He mass

T1 Asymmetry (No E/p Cut)

1/2 Wave Plate IN:

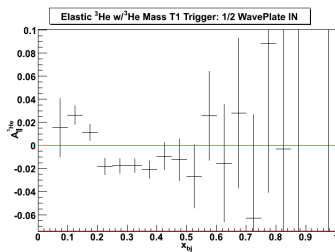


1/2 Wave Plate OUT:

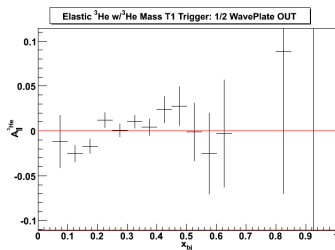


T1 Asymmetries (Zoomed IN)

1/2 Wave Plate IN:

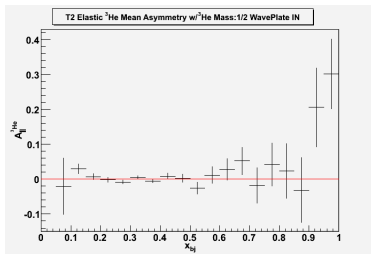


1/2 Wave Plate OUT:

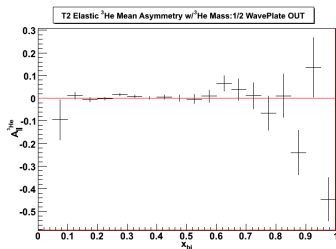


T2 Asymmetry (No E/p Cut)

1/2 Wave Plate IN:

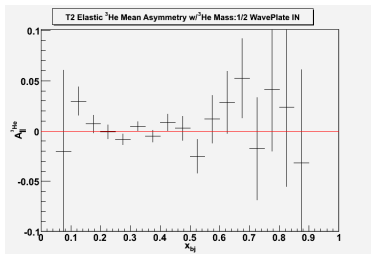


1/2 Wave Plate OUT:

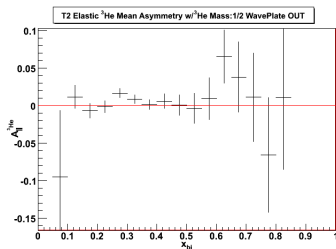


T2 Asymmetries (Zoomed IN)

1/2 Wave Plate IN:



1/2 Wave Plate OUT:



For Next week

- Finish BB Čerenkov HV1 calibration
- Do a MWDC check for our 4-pass runs
- Continue Looking at elastic ${}^3\text{He}$ asymmetries using ${}^3\text{He}$ mass