

# BigBite Analysis

MWDC 1-pass Residual Issue and Preliminary Elastic  $^3\text{He}$  Asymmetries

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03/11/2011

## 1 BigBite 1-Pass MWDC Residual Issue

## 2 1-Pass $^3\text{He}$ Asymmetries

- Elastic or Quasi-Elastic
- $^3\text{He}$  Mass Asymmetries
- Nucleon Mass Asymmetries

## 3 Summary

## 4 What's Next

# From Last Week

- Last week, an issue with the T2/T6 trigger type events was found with the track residuals...

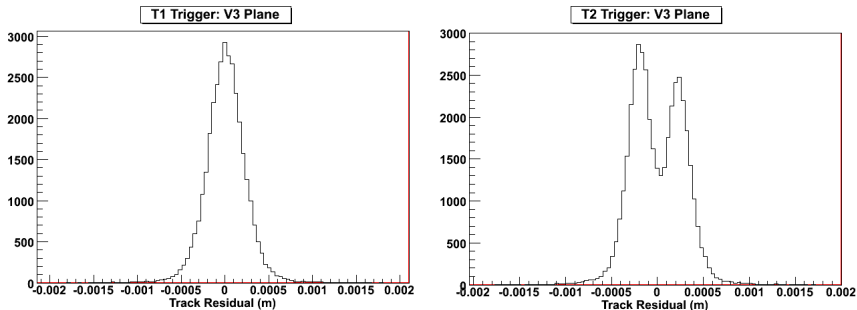


Figure: T1(left) and T2(right) events of MWDC plane v3 in chamber 2 for elastic  $^3\text{He}$  run

# Trigger Hole?...

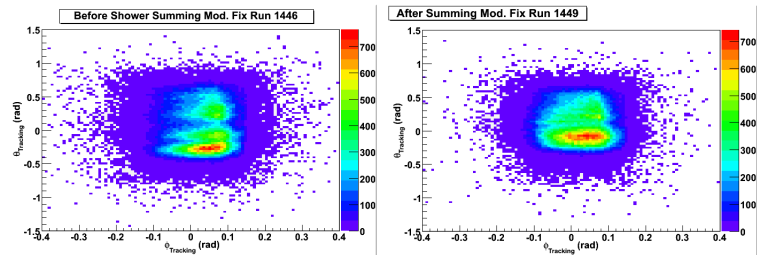


Figure: Acceptance before(left) and after(right) trigger hole fix.

# Residuals Before and After Trigger Fix

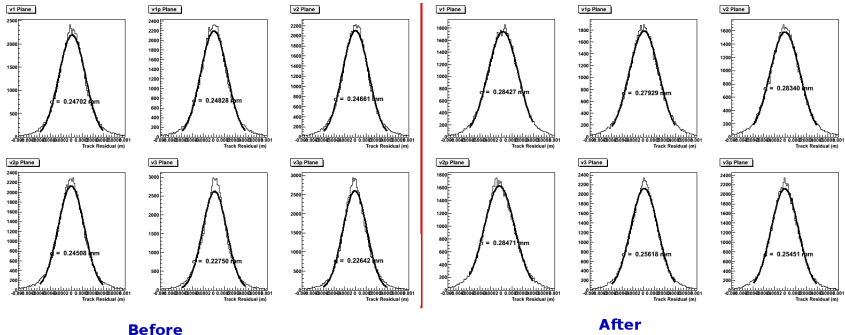


Figure: Chamber 2 Residuals before(left) and after(right) trigger hole fix.

# $^3\text{He}$ and $^2\text{H}$ Comparison (MWDC Threshold Change in Between Runs)

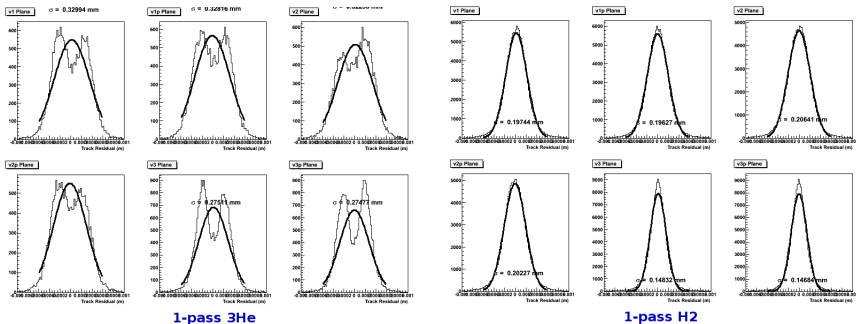


Figure: Chamber 2 Residuals for 3He run 1205 (left) and H2 run 1258(right). There was a mwdc threshold change before 1258.

# Conclusions

- Issue with residuals appears not to be from trigger hole.
- In between the time of the  $^2\text{H}$  elastic and  $^3\text{He}$  1-pass data there was a mwdc threshold change on all 3 chambers
- But then why no problem with the T1 trigger, only T2/T6
- Calibration issue with the T2/T6 trigger? (will look into)

# Elastic or Quasi-Elastic

- To determine if we are elastically scattering off of  $^3\text{He}$ , I plotted the difference of the reconstructed momentum  $p_{tr}$  and elastic momentum  $p_{^3\text{He}}$
- $p_{tr} = skim.p[]$
- $p_{^3\text{He}} = \frac{E_b M_{^3\text{He}}}{M_{^3\text{He}} + E_b(1 - \cos\theta)}$
- $E_b = 1.232\text{GeV}$
- $M_{^3\text{He}} = 2.8\text{GeV}$
- $\cos\theta = BB.tr.pz[] / skim.p[]$



# Quasi-Elastic!

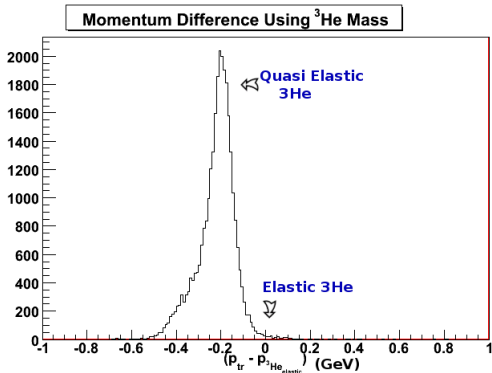


Figure: Difference between reconstructed momentum and  $^3\text{He}$  elastic momentum shows we are in  $^3\text{He}$  Quasi-Elastic

# Overview

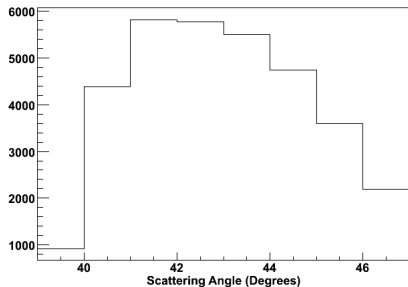
- Bin T1/T2 asymmetries in W bins.
- See how W and asymmetries vary with 1 degree scattering angle slices
- Combine 1/2 wave plate IN and OUT asymmetries

# Cuts

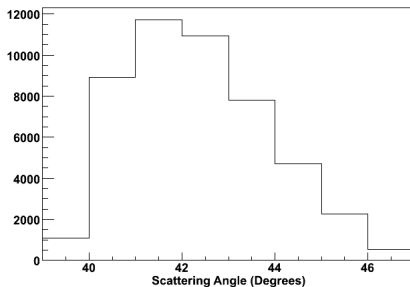
```
BB.optics.vzflag[]==1&& BB.tr.tg_th[]<0.2
TMath::Abs(BB.tr.vz[])<0.17 && BB.optics.charge[]==-1
((TMath::Abs((BB.tr.x[]+1.28*BB.tr.th[])-(BB.ts.sh.x+%f))<0.1)
(TMath::Abs((BB.tr.y[]+1.28*BB.tr.ph[])-(BB.ts.sh.y+%f))<0.1))
((TMath::Abs((BB.tr.x[]+0.97*BB.tr.th[])-(BB.ts.ps.x+%f))<0.25)
(TMath::Abs((BB.tr.y[]+0.97*BB.tr.ph[])-(BB.ts.ps.y+%f))<0.2)))
(skim.p[]>0.0 && skim.p[]<10.0)&& skim.beam_trip==0
BB.tr.chi2[]/BB.tr.ndof[]<5
(BB.optics.bendx + 0.23*BB.tr.ph)>-0.097
(BB.optics.bendx + 0.23*BB.tr.ph)<0.13
0.5*BB.ts.ps.e>200.0
TMath::Abs((0.5*BB.ts.ps.e+BB.ts.sh.e)/(1000.0*skim.p[])-1.0)<0.2
Good Cer TDCs && Good Cer Mirror Hits
```

# Scattering Angle Binning

Scattering Angle With T1 Trigger Events

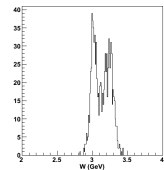


Scattering Angle With T2 Trigger Events

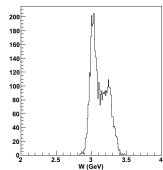


# W Over Scattering Angle (T1 events)

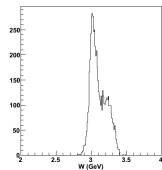
Scattering Angle 39 - 40 Degrees, With T1 Trigger Events



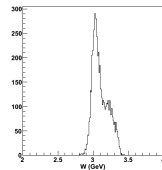
Scattering Angle 40 - 41 Degrees, With T1 Trigger Events



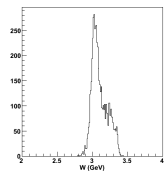
Scattering Angle 41 - 42 Degrees, With T1 Trigger Events



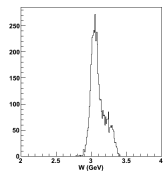
Scattering Angle 42 - 43 Degrees, With T1 Trigger Events



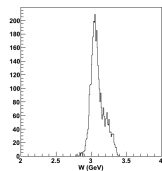
Scattering Angle 43 - 44 Degrees, With T1 Trigger Events



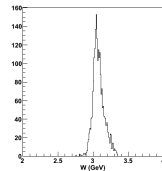
Scattering Angle 44 - 45 Degrees, With T1 Trigger Events



Scattering Angle 45 - 46 Degrees, With T1 Trigger Events

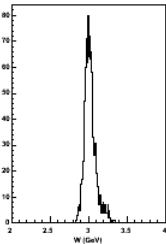


Scattering Angle 46 - 47 Degrees, With T1 Trigger Events

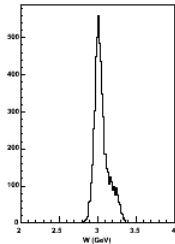


# W Over Scattering Angle (T2 events)

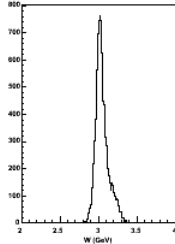
Scattering Angle 0° - 40 Degrees, W0's T2 Trigger Events



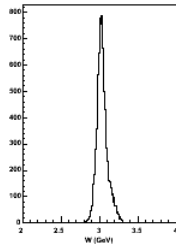
Scattering Angle 40° - 60 Degrees, W0's T2 Trigger Events



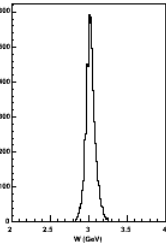
Scattering Angle 60° - 80 Degrees, W0's T2 Trigger Events



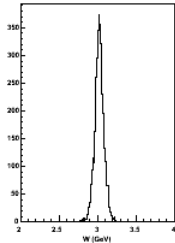
Scattering Angle 80° - 90 Degrees, W0's T2 Trigger Events



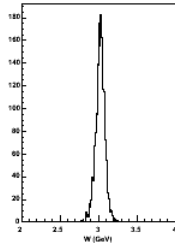
Scattering Angle 0° - 40 Degrees, W1's T2 Trigger Events



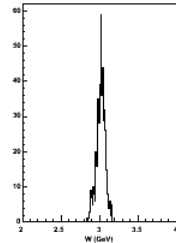
Scattering Angle 40° - 60 Degrees, W1's T2 Trigger Events



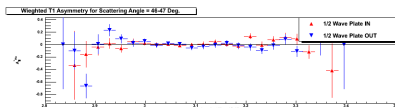
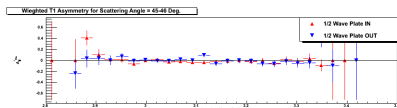
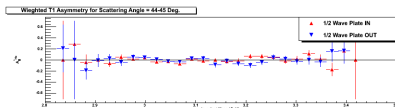
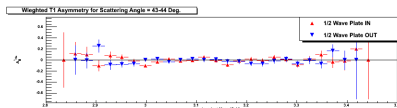
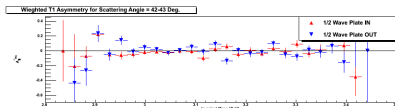
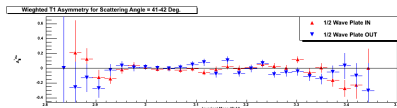
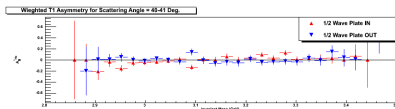
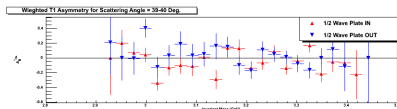
Scattering Angle 60° - 80 Degrees, W1's T2 Trigger Events



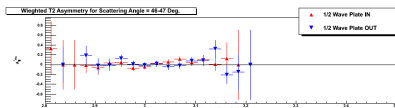
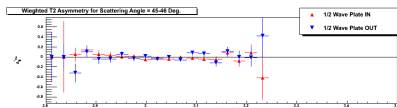
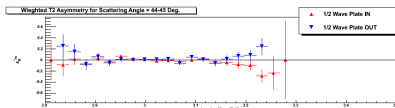
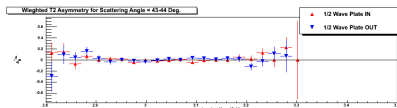
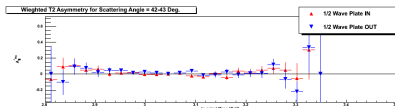
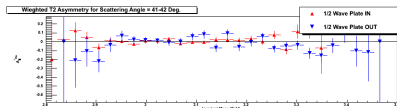
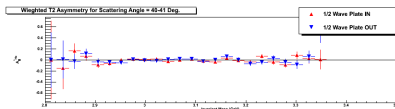
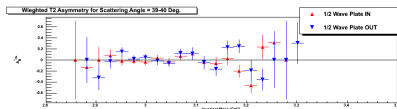
Scattering Angle 80° - 90 Degrees, W1's T2 Trigger Events



# Asymmetry Over Scattering Angle (T1 events)



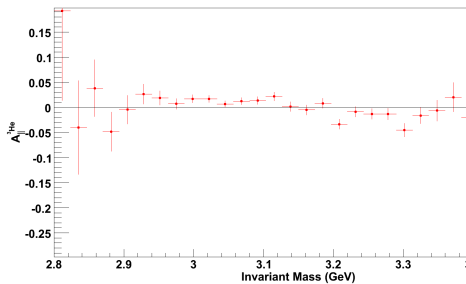
# Asymmetry Over Scattering Angle (T2 events)



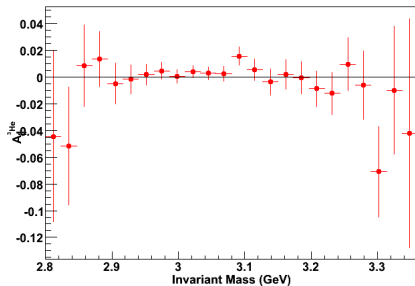


# Total Asymmetries

Wieghted T1 Asymmetry Summed Over Scattering Angle

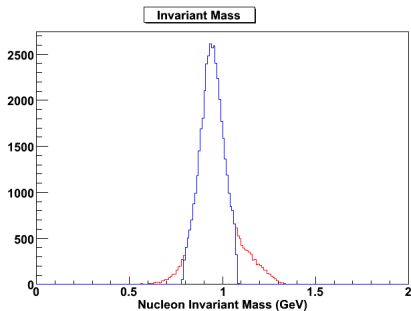
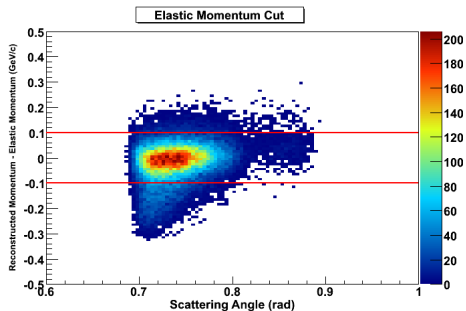


Wieghted T2 Asymmetry Summed Over Scattering Angle

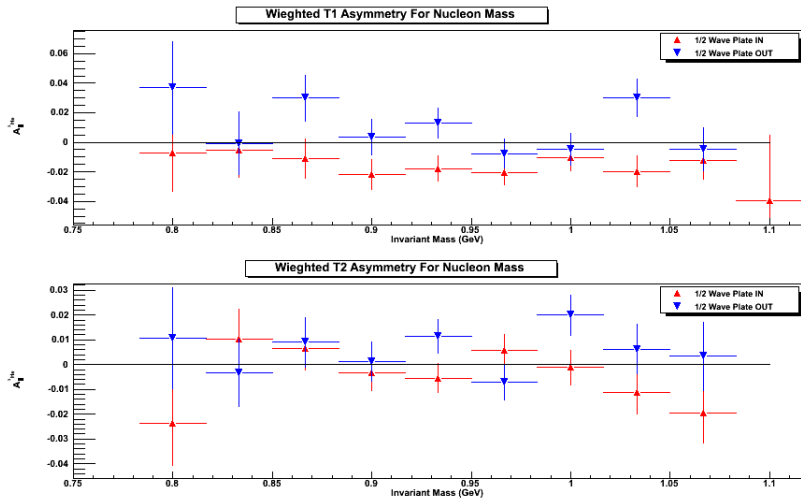


# Elastic Cut

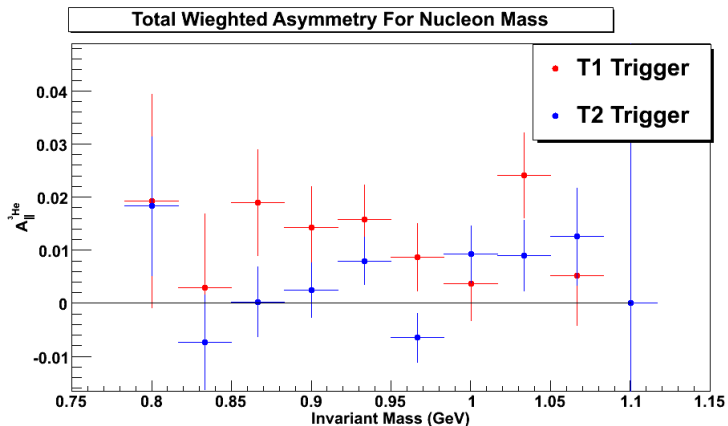
- Add a cut on difference of  $p_{tr}$  and  $p_{elastic}$



# 1/2 Wave Plate Asymmetries



# Total Asymmetries



# For Next week

- Trigger hole not causing the problematic residuals in  $^3\text{He}$  1-pass runs
- Maybe mwdc threshold/calibration issue with T2/T6
- $^3\text{He}$  1-pass asymmetries appear to be positive

# For Next week

- Finish BB Čerenkov HV1 calibration
- Do a MWDC check for our 4-pass runs
- Check calibration of T2 during 1-pass  $^3\text{He}$  runs
- Continue with  $^3\text{He}$  asymmetries (N2 dilution factor, target and beam polarization,  $A_1$ )?