BigBite Analysis

BB Cer HV3 Calibration, BB Cer Low ADC Events and Preliminary Quasi Elastic ^{3}He Asymmetries

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Outline

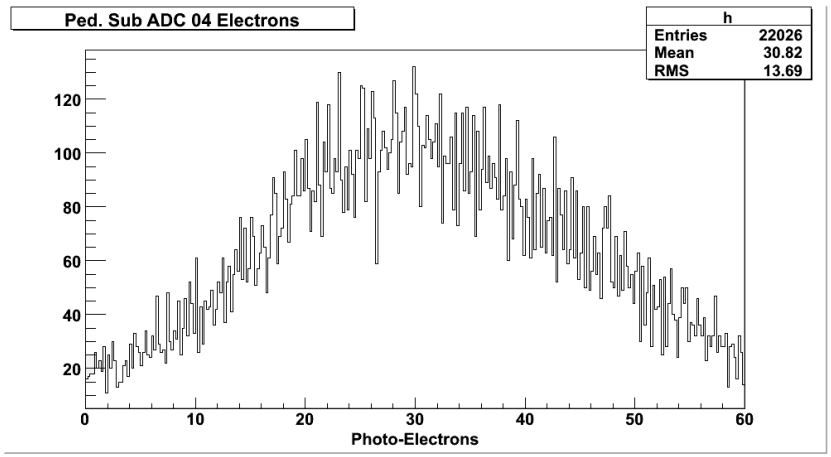
Čerenkov HV3 period

- The HV3 period, is where there was a HV change to the Čerenkov ADCs. This affected runs 1475-1824
- HV3 has two calibrations
  - 1475-1509, which just had HV changes on the 1881 ADCs from the previous settings
  - 1510-1824, which had the 1881 split with the FADCs
- Since there were no LED runs for this run period, the HV3 was calibrated to the HV4 period (runs 1833-2086)

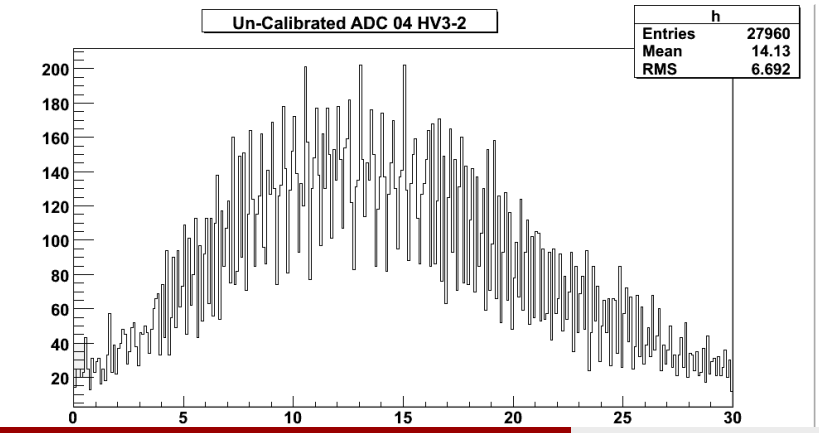
Čerenkov HV3 Calibration Results

Before

HV3-1

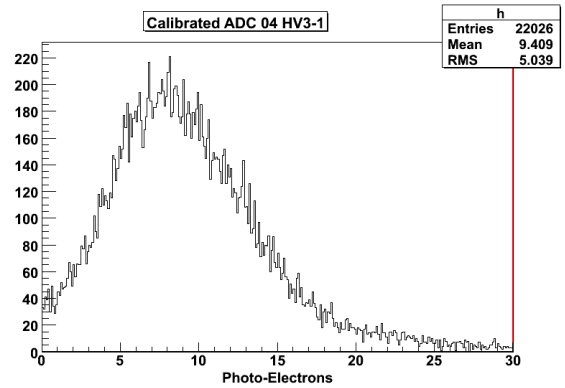


HV3-2

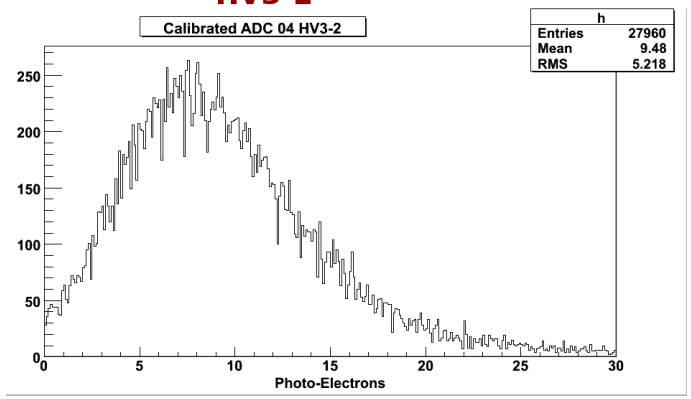


After

HV3-1



HV3-2



Čerekov HV4 Comparison and Summary

- Here is a comparison to ADC 04 to the HV4 run period
- Calibration coefficients were updated in my personal DB
- I will also post the calibration constants to the wiki
- Waiting to send Brad the updated DB until I finish HV1 and HV2 (in progress, will be done by Tues)
- The HV1,HV2 and HV3 calibrations affect corrected, not ped subtracted ADCs for runs before 1833

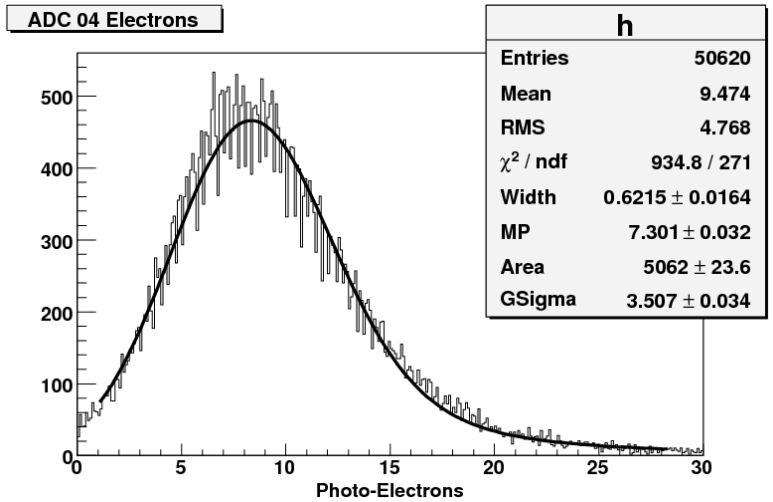


Figure: Shows ADC 04 from HV4 setting. Used to calibrate the HV3 settings.

Poisson Probability

- To estimate the probability of having good electrons with a photo-electron cut, the following formula was used:

$$P(\lambda; n) = 1 - \sum_{n=0}^{pecut} \frac{\lambda^n e^{-\lambda}}{n!}$$

- n = photo-electron cut
- λ = mean photo-electron
- $P(\lambda; n)$ = probability of having an electron with a n photo-electron cut

Poisson Probability Results

- Using a mean photo-electron of 6 (λ)
- Using a photo-electron cut of 3 (n)
- The probability of having an electron ($P(\lambda; n)$) is 84.88%
- This is about 13% less than the probability of having a 1 photo-electron cut ($n = 1$) with a mean of 6 photo-electrons
- This estimate seems to agree with what Diana saw in cutting 3pe in the ADCs

ADC < 90 Events on Čerenkov Mirrors (1)

- So where do the Čerenkov ADCs less than 3pe events fall on the Čerenkov mirrors?
- Plot show mirror group 1 (ADC 01,ADC 02, ADC 11, ADC 12)
- Each with a Good TDC + Mirror cut + ADC < 90

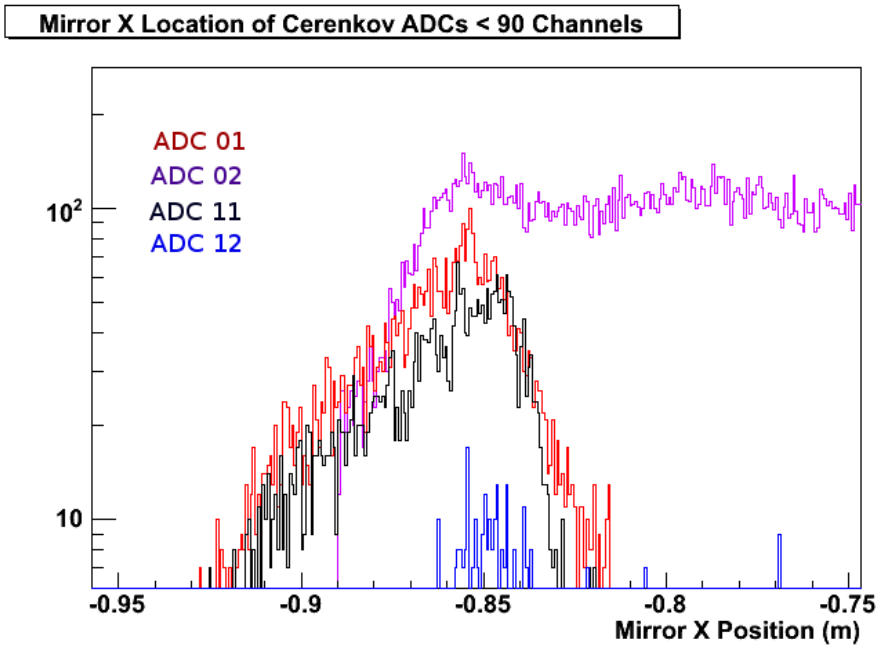


Figure: Shows where individual group1 ADCs less than 3pe fall on the Čerenkov mirror in the vertical direction

ADC $<$ 90 Events on Čerenkov Mirrors (2)

- The mirrors in group 1 seem to have a good amount of events less than 3 photo-electrons overlaping at around -0.85m
- Diana's mirror edge was around -0.89m, but in her cut she allowed for some overlapping which makes -0.85m a reasonable edge
- I think that a good amount of these low ADC events may be good electrons
  - We are looking at individual ADCs here
  - The T2 trigger uses mirror group ADC sums
  - Maybe when the ADCs are summed into groups, some of the low ADC events fall above the 3 photo-electron mark

ADC < 90 Events Group 1 ADCs

- Seem to regain a significant amount when adding the ADCs

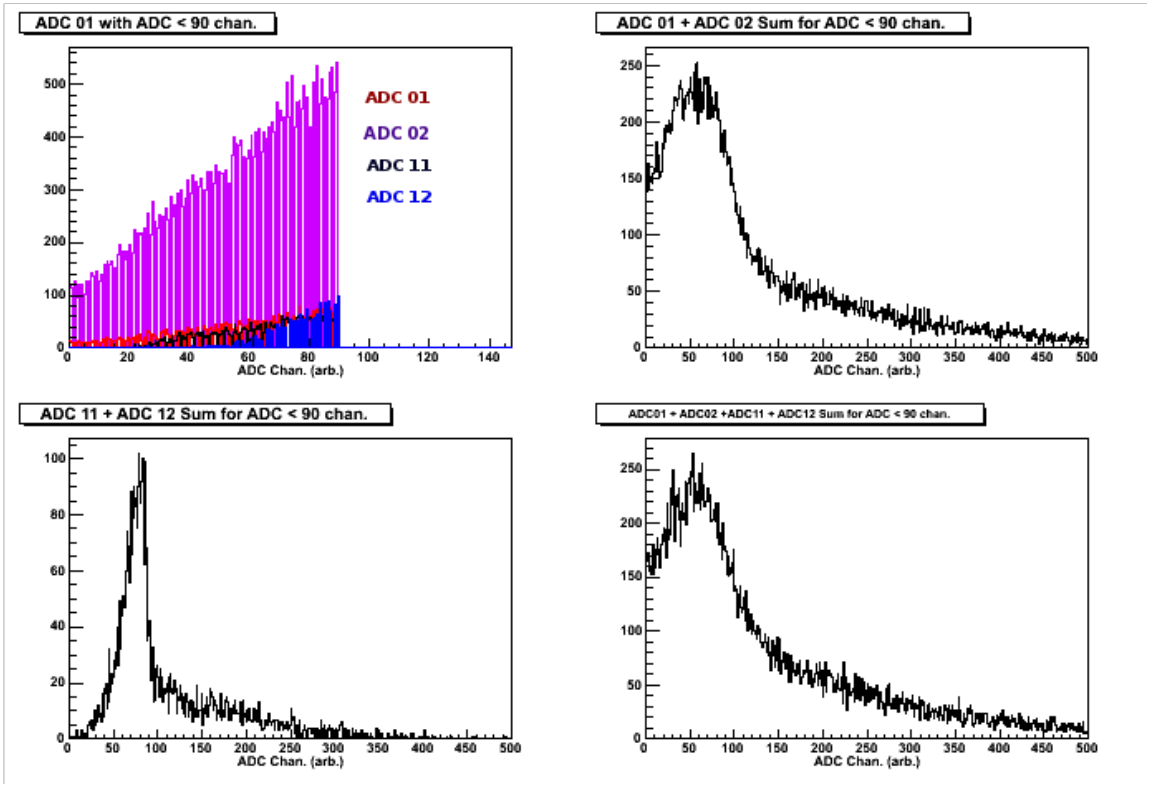
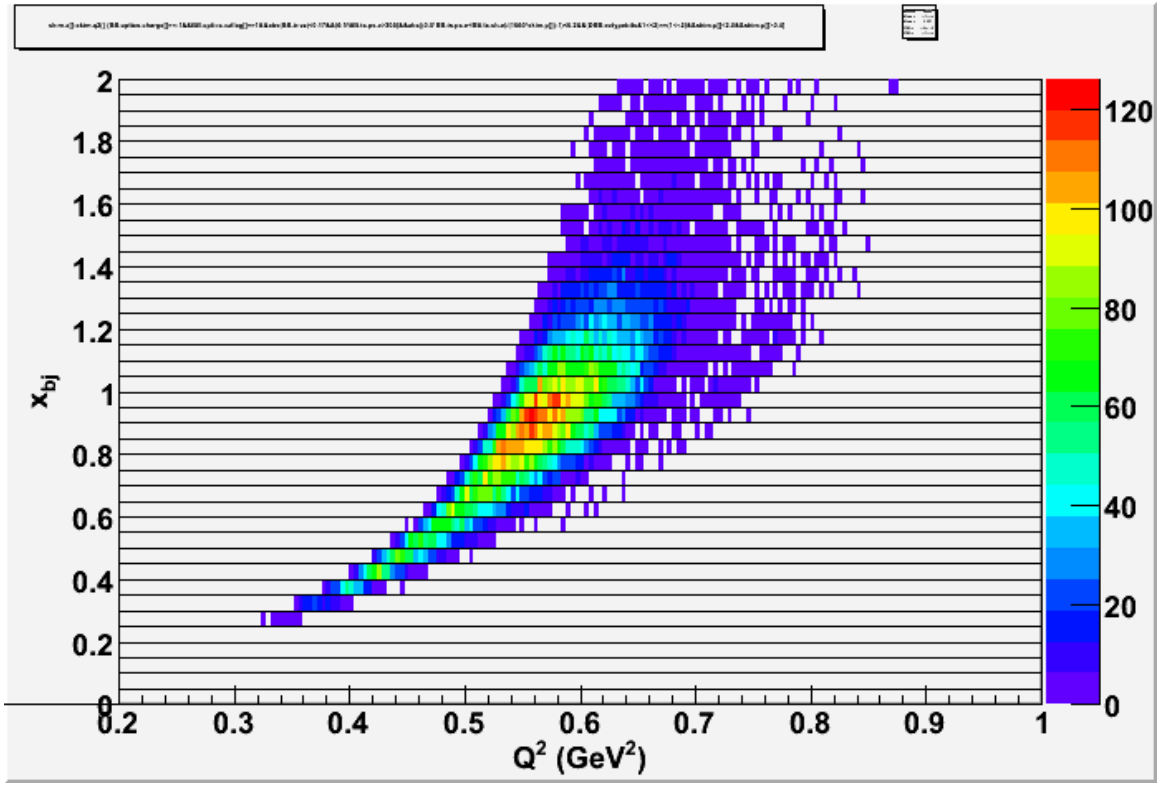


Figure: Top left individual group 1 ADCs (ADC 01,02,11,12), top right sums of ADC 01 and ADC 02, bottom left sums of ADC 11 and ADC 12, bottom right sums of all group 1 ADCs (ADC 01,02,11,12)

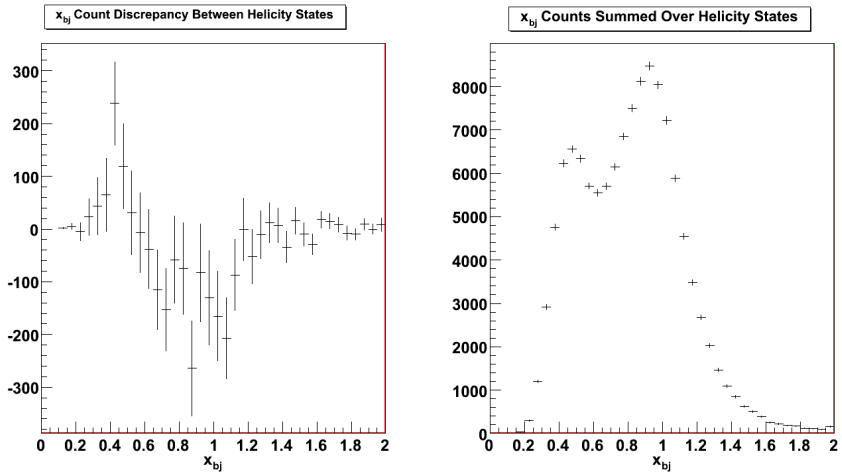
x_{bj} Binning

- Using our 1-Pass quasi-elastic ^{3}He longitudinal runs (1203-1227) I chose a fine binning in x-Bjorken to start
- I took 40 bins in x_{bj} in the range $0.0 < x_{bj} < 2.0$
- Below is a plot showing the binning in x_{bj}



T1 Helicity Sums and Differences

1/2 Wave Plate IN: Left is helicity difference. Right is helicity sums



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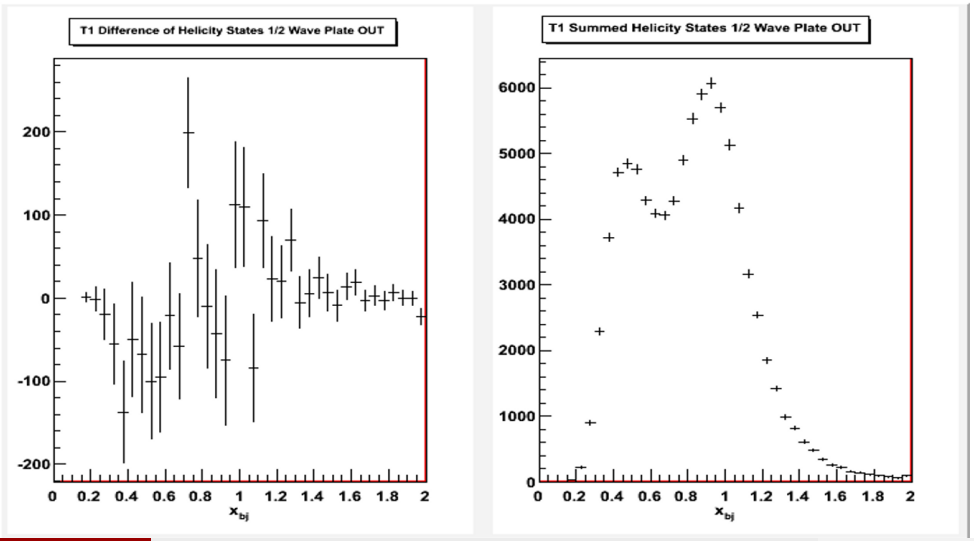
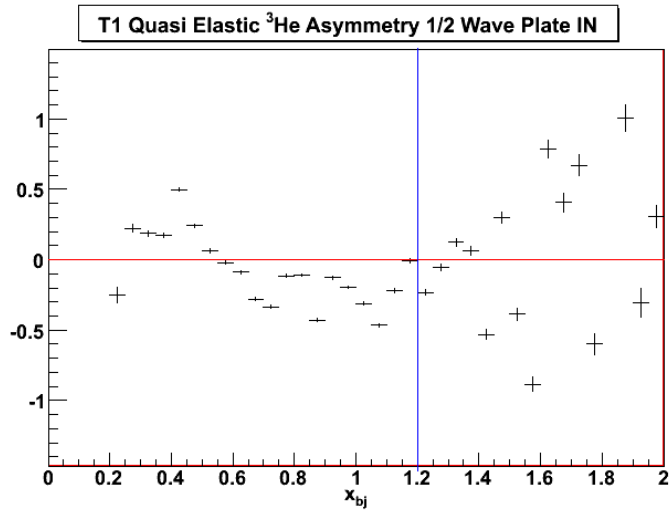


T1 Asymmetries

1/2 Wave Plate IN: Red line is at 0. Above Blue line x_{bj} tail has fallen off a lot



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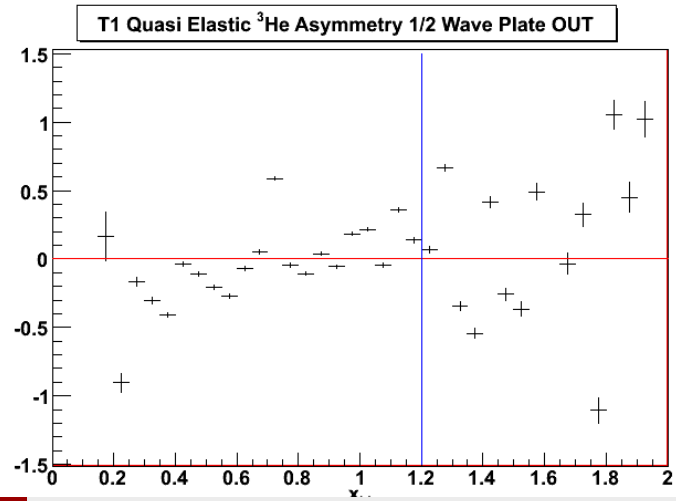
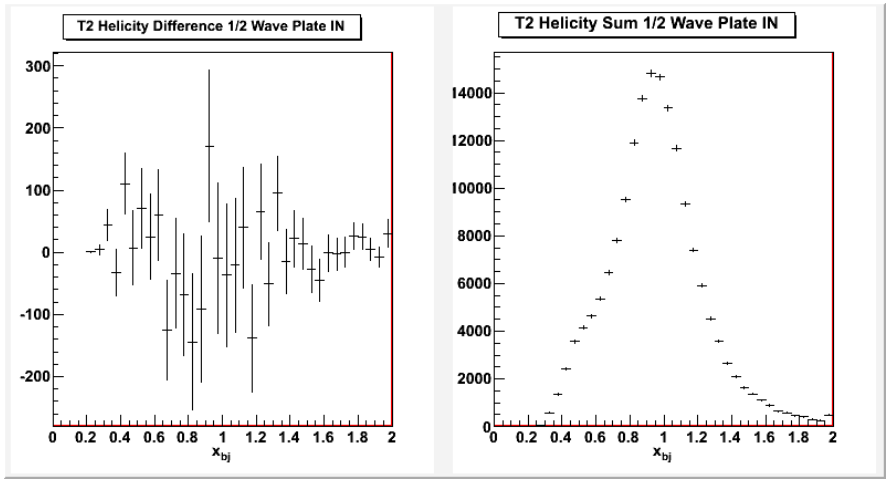
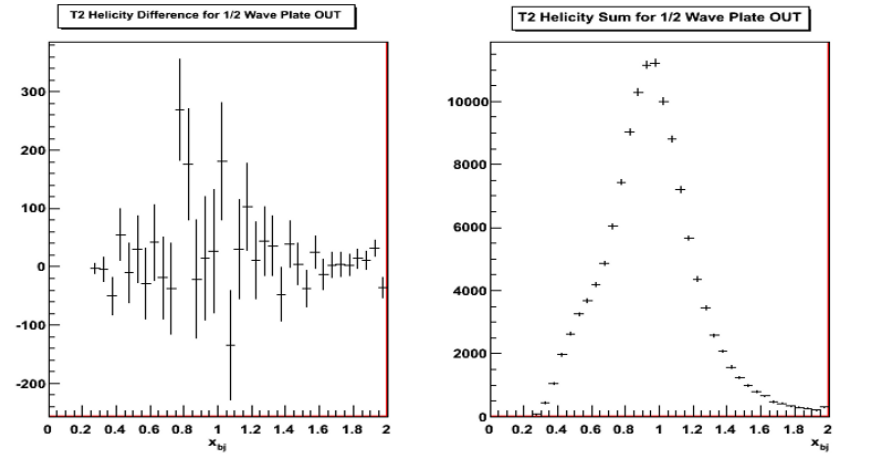


T2 Helicity Sums and Differences

1/2 Wave Plate IN: Left is helicity difference. Right is helicity sums

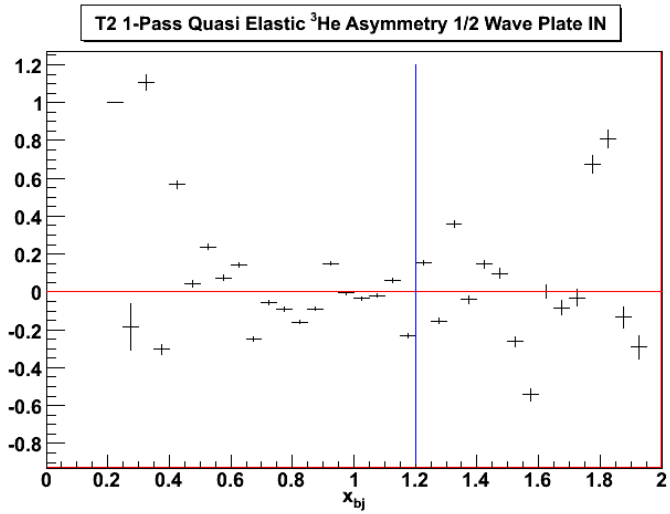


1/2 Wave Plate OUT: Left is helicity difference. Right is helicity sums



T2 Asymmetries

1/2 Wave Plate IN: Red line is at 0. Above Blue line x_{bj} tail has fallen off a lot



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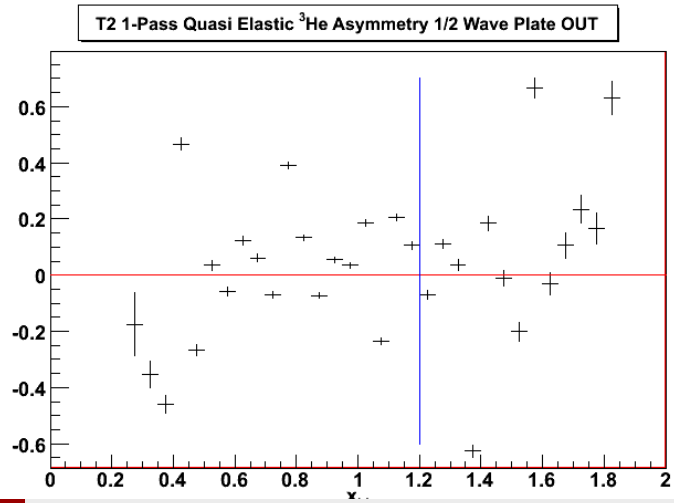

For Next week

- Finish BB Čerenkov HV2 calibration (in progress)
- Do a MWDC check for our 1-pass runs
- Look at particles bending down (positrons) in our 1-pass data? Or/and e^+ in positive polarity runs?
- Play with x binning (too fine?), suggestions?