BigBite Analysis:

LHRS/BB scattering angle, LHRS Bin Asymmetries, Tape ROOTfiles

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Outline

Acquiring the Scattering Angle

- Dave Fitted the LHRS scattering angle at various momentum setting to a Gaussian fit to acquire the mean value.
- To mimic this in BigBite:
  - Make a momentum cut that is $\pm$ 3.5% of the LHRS central momentum values (p_0).
  - Fit each p_0 scattering angle with a Gaussian to get the mean scattering angle.
- Compare the LHRS and BigBite mean scattering angles at each p_0.
- There is quite a bit of structure to the BigBite scattering angle

BigBite Scattering Angle Fits

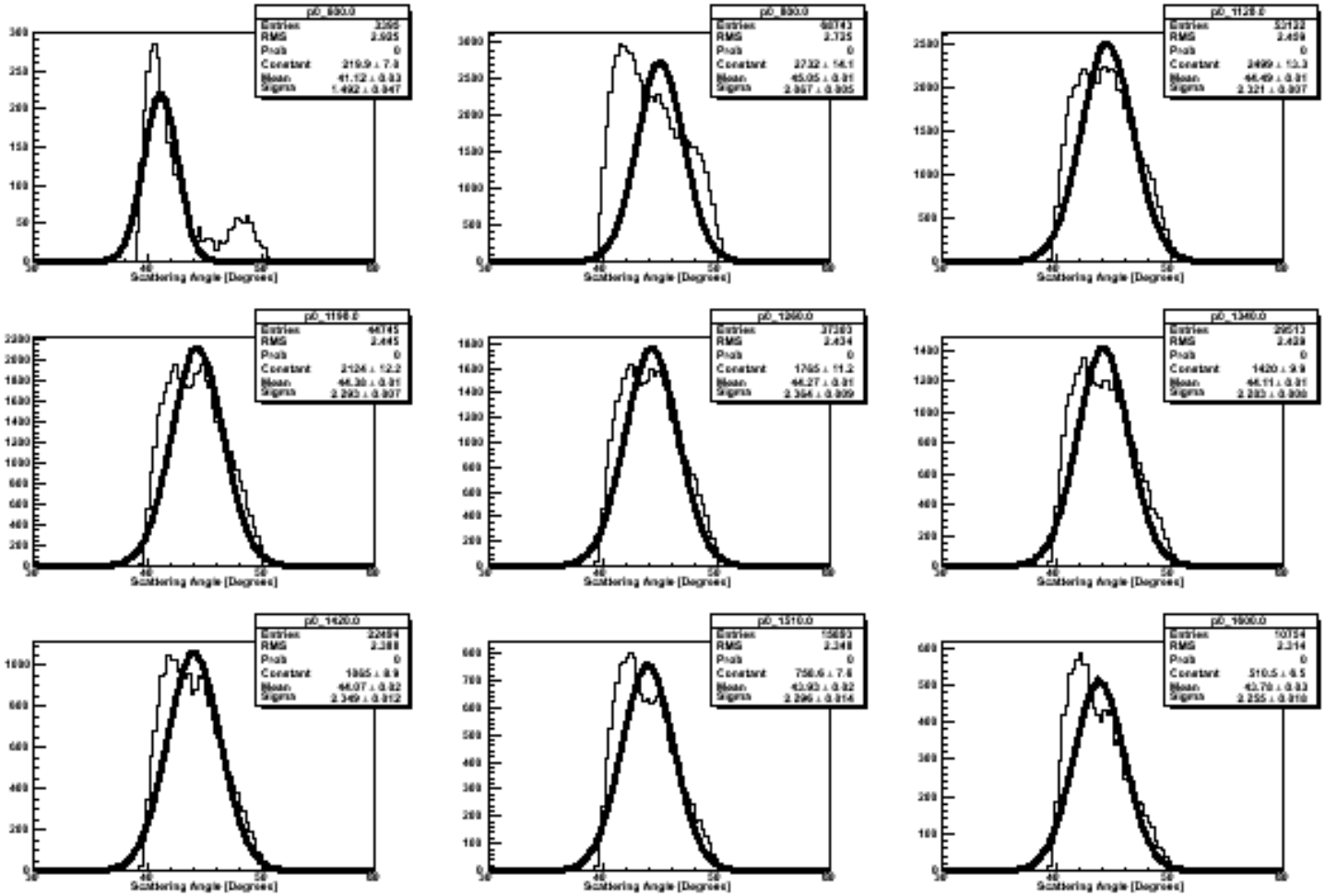

Figure: The BigBite scattering angle at the matching p_0 value of the LHRS, with a 3.5% acceptance window for each p_0 value.

Scattering Angle Comparison Table

p_0[MeV]	LHRS Scattering Angle[Deg.]	BB Scattering Angle[Deg.]	(BB-LHRS)/(LHRS) [%]
600	44.85	41.12	-8.32
800	44.85	45.05	0.44
1120	44.89	44.49	-0.89
1190	44.90	44.38	-1.16
1260	44.80	44.27	-1.18
1340	44.78	44.11	-1.15
1420	44.80	44.07	-1.62
1510	44.80	43.93	-1.95
1600	44.69	43.78	-2.05

Table: LHRS and BigBite scattering angles at various p_0 settings. Note:Average error on ratio is $\sim$ 5.5%, this is based on the LHRS and BigBite sigma of the Gaussian fits.

Scattering Comparison Plot

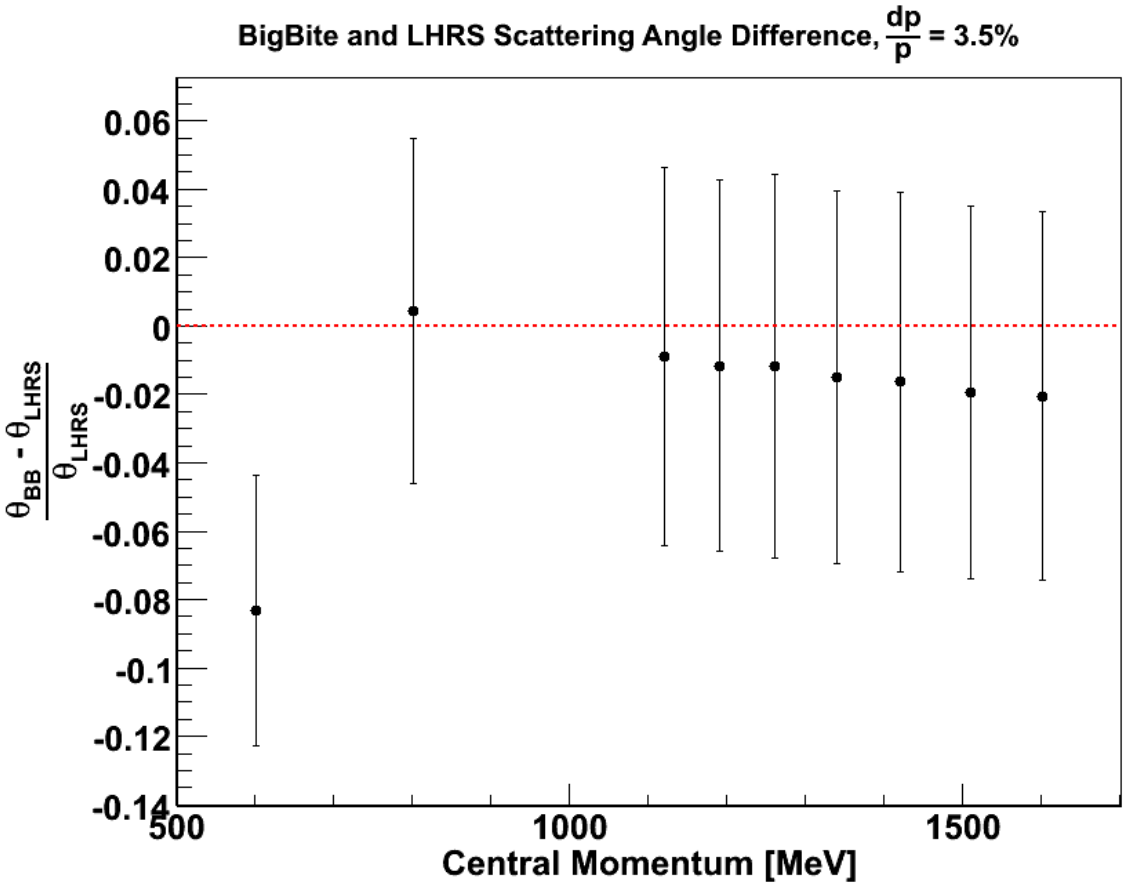

Figure: The BigBite and LHRS scattering angle comparison at matching p_0 values of the LHRS, with a 3.5% acceptance window for each p_0 value.

Defining LHRS Bins

- LHRS bins were defined by the magnet central momentum setting of the LHRS.
- For our 4.7 GeV data set we took 9 different central momentum settings
- The bin width is defined as $p_0 \pm 3.5\%$, with p_0 being the bin center.
- This is then converted to $x_{Bjorken}$ variable.
- When plotting the asymmetries, the bin center is the mean $x_{bjorken}$ value of the positive and negative helicity electrons.
- LHRS mid-to-low $x_{Bjorken}$ bins are narrower than the bins previously defined with BigBite.

4.7GeV LHRS $x_{Bjorken}$ Bins

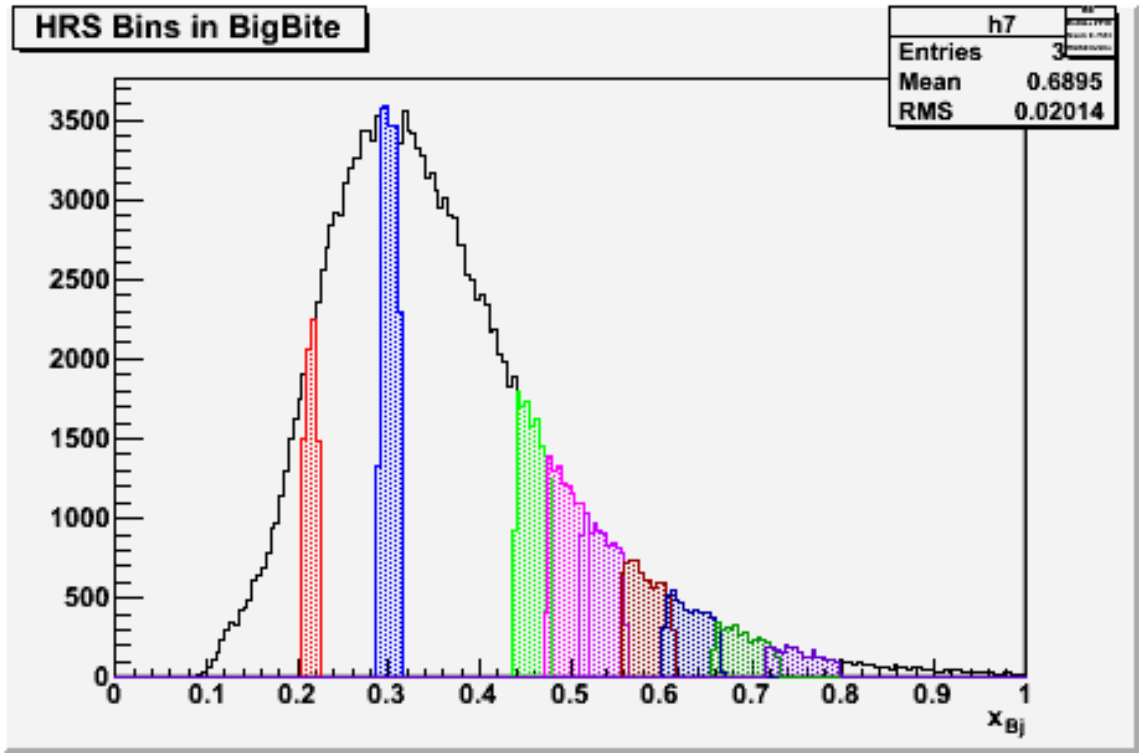

Figure: The LHRS x_{Bjk} bins compared to BigBite x_{Bjk}

4.7GeV LHRS Raw Asymmetries

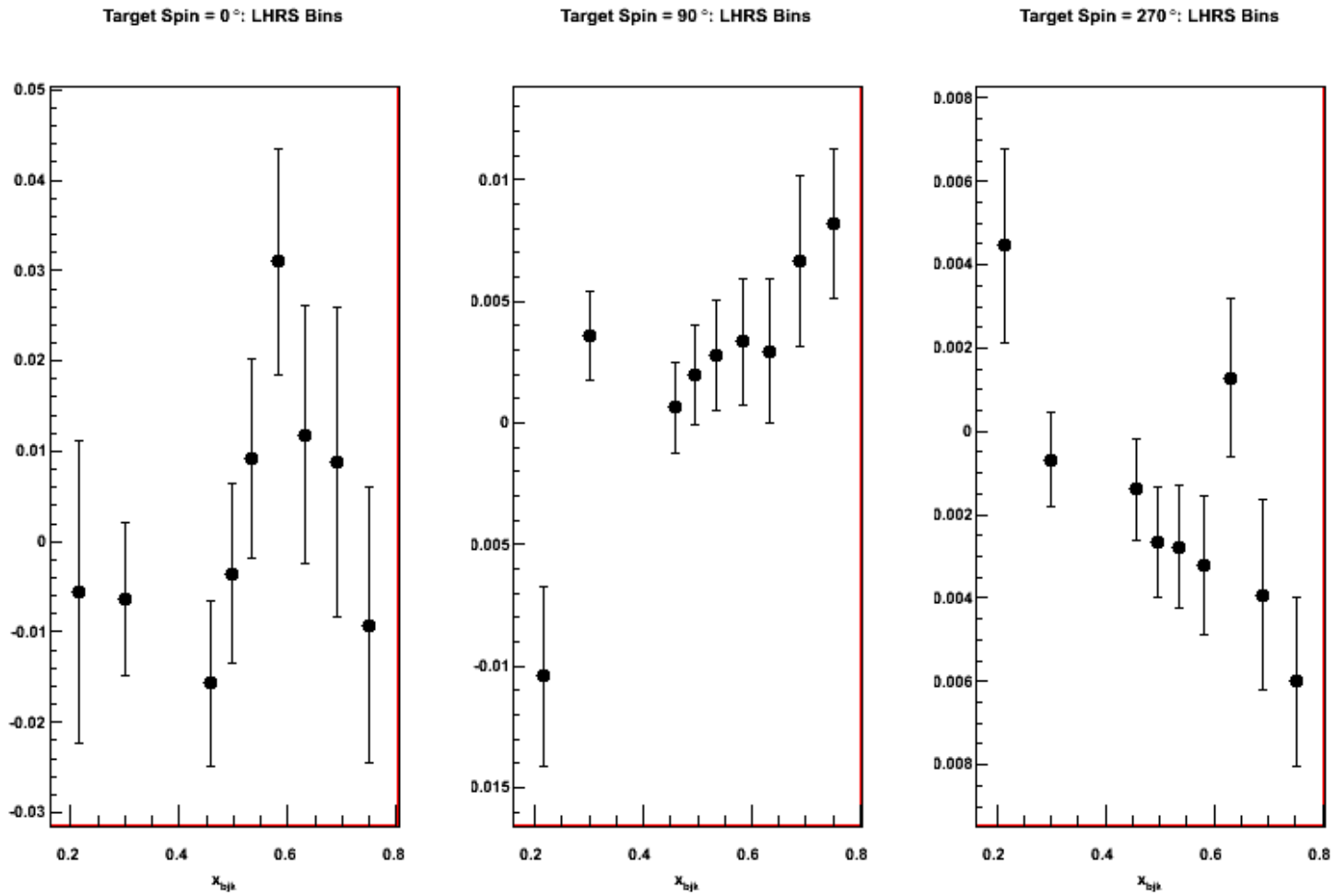

Figure: Raw asymmetry binned in LHRS 4.7 GeV bins.

4.7GeV LHRS Physics Asymmetries

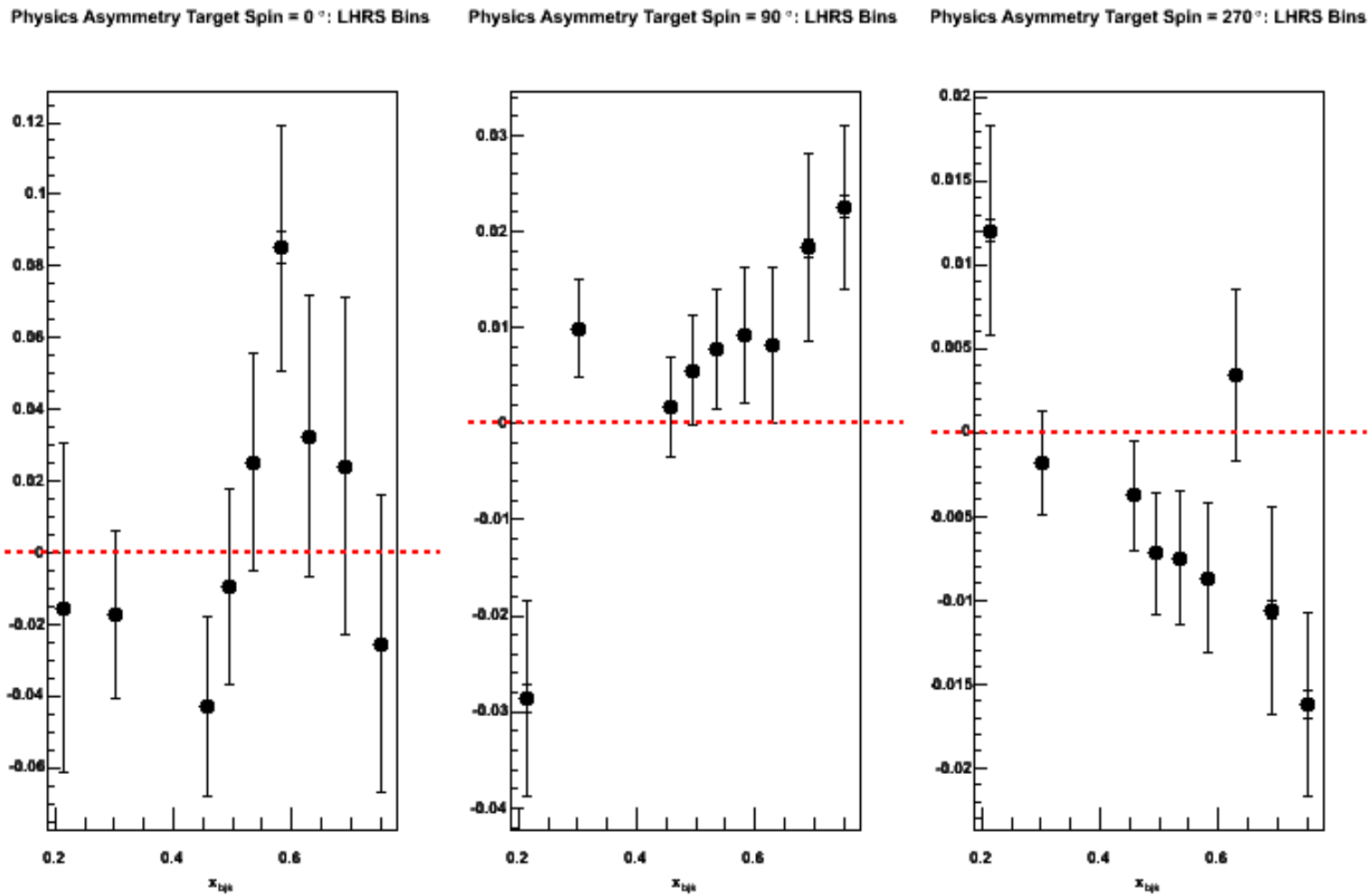

Figure: Physics asymmetry binned in LHRS 4.7 GeV bins.Note: There is no N2 dilution correction yet.

4.7GeV LHRS Longitudinal and Transverse Asymmetries

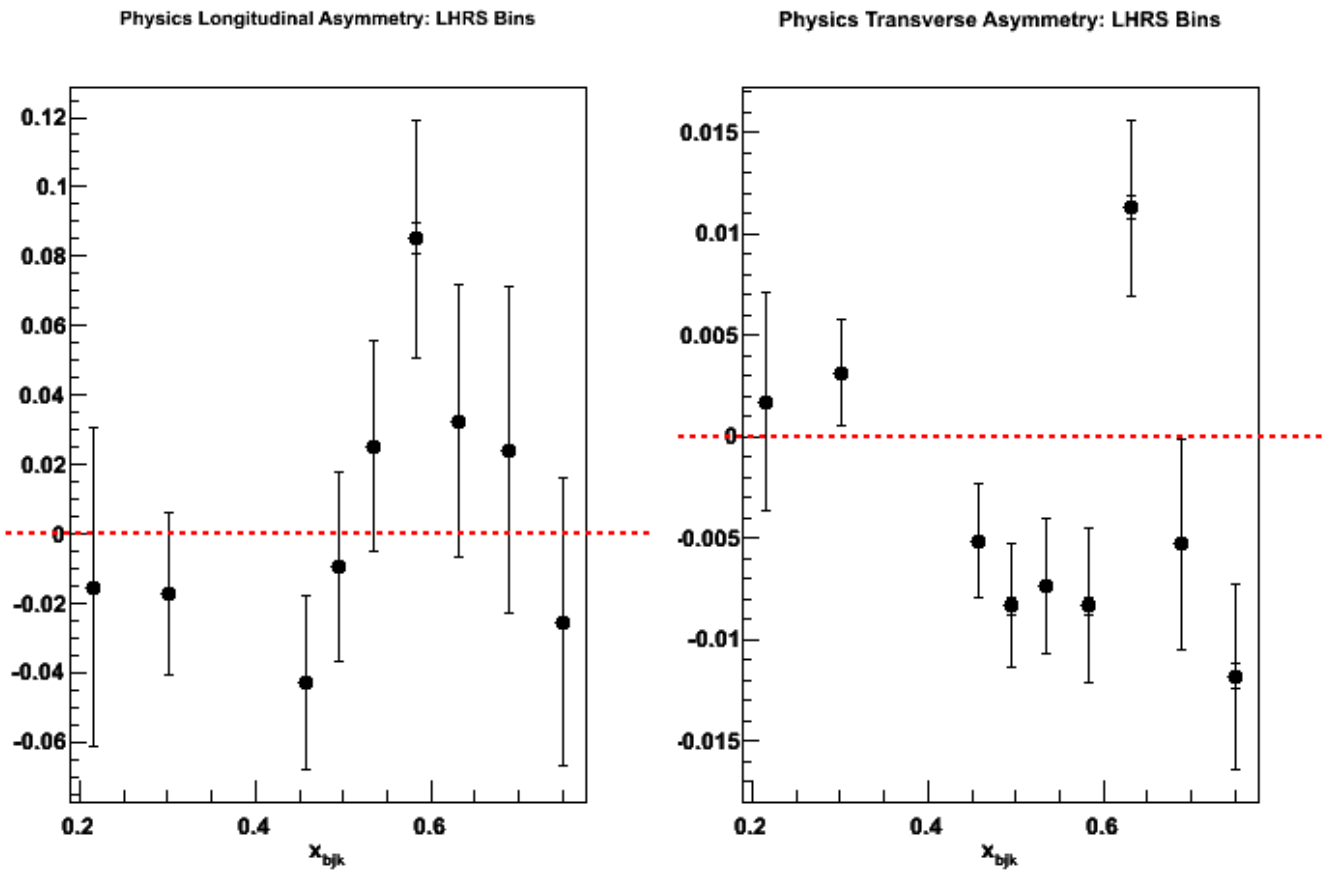

Figure: Longitudinal and transverse asymmetry binned in LHRS 4.7 GeV bins.Note: There is no N2 dilution correction yet.

SkimROOTfile Tape Locations

- Moved all BigBite Raw and SkimROOT files to Tape
- ROOT files on tape located at

  https://hallaweb.jlab.org/wiki/index.php/Analysis_resources_for_d2n#Replayed_ROOTfile_Locations

What's Next...

- Get N2 dilution factor and kinematics in LHRS bins
- Start compiling 5-pass wave-plat IN/OUT and target spin file
- Radiative Correction
  - Waiting to here back from Karl about getting PolRad
  - Looking through RadCor, there seems to be a polarized cross-section radiative correction program. I will start to look into this code.