BigBite Analysis:

Very Perlim. 4.7Gev Cross-Section Parametrization and Spin Structure Functions

Matthew Posik

[1] Temple University
Philadelphia, PA 19122

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Outline

Fitting Very Preliminary LHRS Cross-Sections

- In order to compute spin structure functions g_1 and g_2, we need the absolute cross-section
- Fits were made to the LHRS measured cross-sections using the function:

$$y = \frac{e^{(A+Bx)}}{x^2}$$

- Once parametrized with the fit function, cross-sections at the mean x-value of the BigBite bins can be extracted
- This allows the evaluation of the spin structure functions at each BigBite x-bin.

Extracting Very Preliminary Cross-Sections at BigBite Bin Values

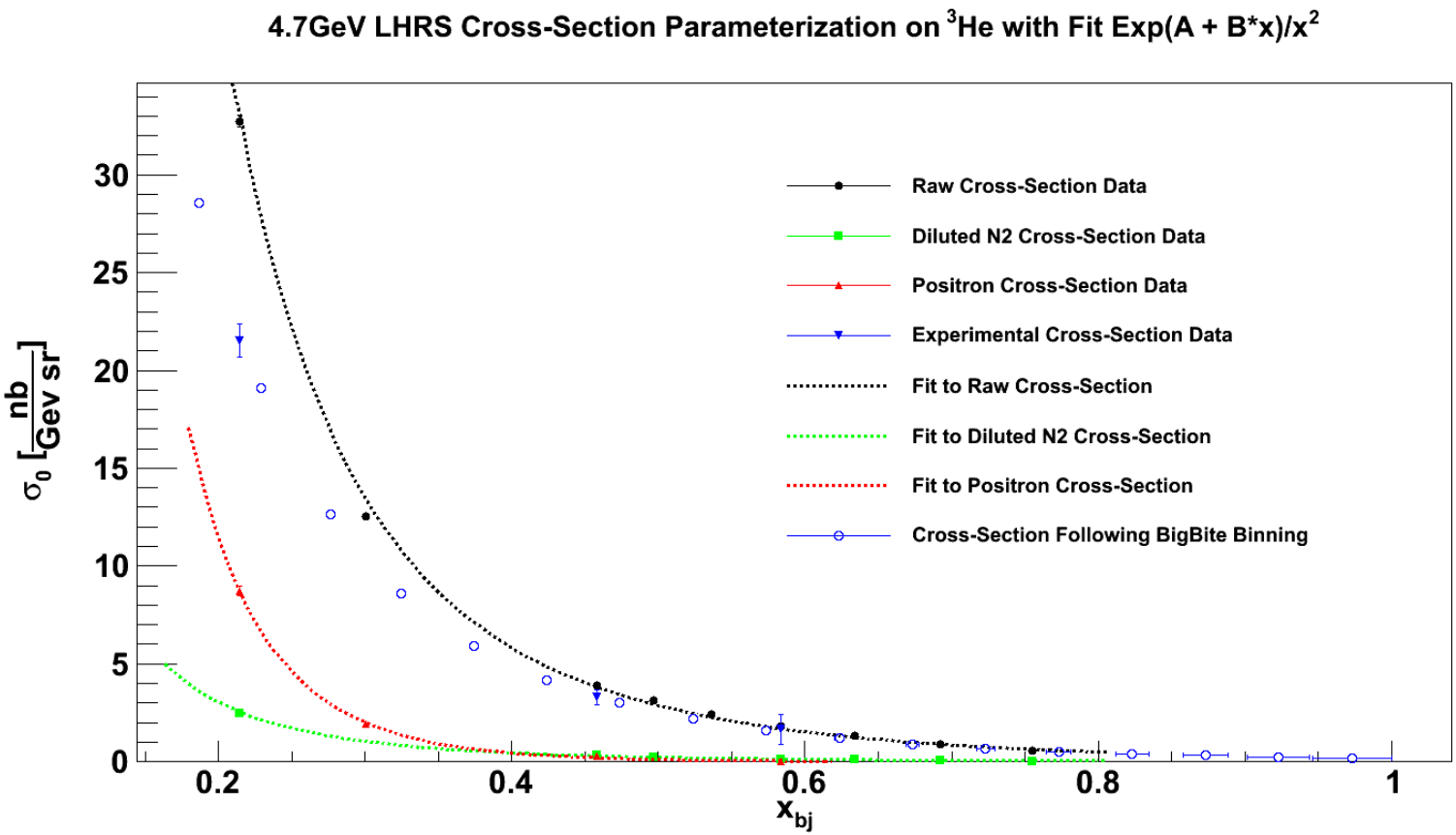


Figure: Fits to the measured LHRS cross-sections and the extracted cross section that corresponds to the BigBite mean x-bin.

g_1 and g_2 Definitions

Definition

$$g_1 = (C_1^{g_1}\Delta_{\parallel} + C_2^{g_1}\Delta_{\perp}) * w$$
$$g_2 = (C_1^{g_2}\Delta_{\parallel} + C_2^{g_2}\Delta_{\perp}) * w,$$

- $C_1^{g_1} = \frac{MQ^2}{4\alpha^2}\frac{y}{(1-y)(2-y)}$
- $C_2^{g_1} = \frac{MQ^2}{4\alpha^2}\frac{y}{(1-y)(2-y)}tan(\frac{\theta}{2})$
- $C_1^{g_2} = -\frac{MQ^2}{4\alpha^2}\frac{y^2}{2(1-y)(2-y)}$
- $C_2^{g_2} = \frac{MQ^2}{4\alpha^2}\frac{y^2}{2(1-y)(2-y)}\frac{1+(1-y)cos(\theta)}{(1-y)sin(\theta)}$
- $\Delta_{\parallel,\perp} = 2\sigma_0 A_{\parallel,\perp}$
- w converts nb to $[GeV^-2]$ units to make structure functions unitless
- $w = nb = 2.5681E-6GeV^{-2}$

Preliminary g_1 and g_2 Kinematics (1)

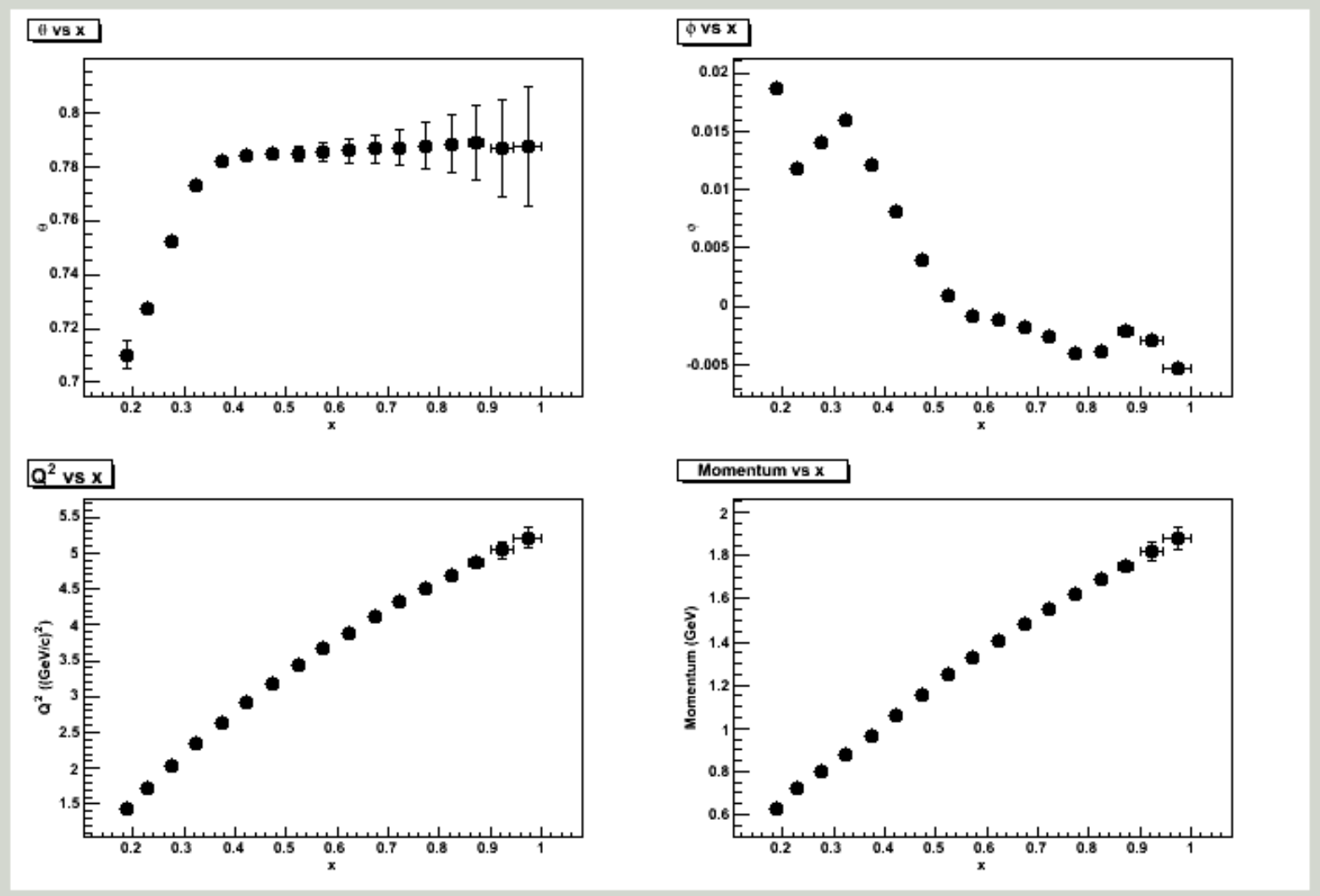


Figure: Scattering angle, out of plane angle, Q^2 and momentum as a function of mean x-bin value

Preliminary g_1 and g_2 Kinematics (2)

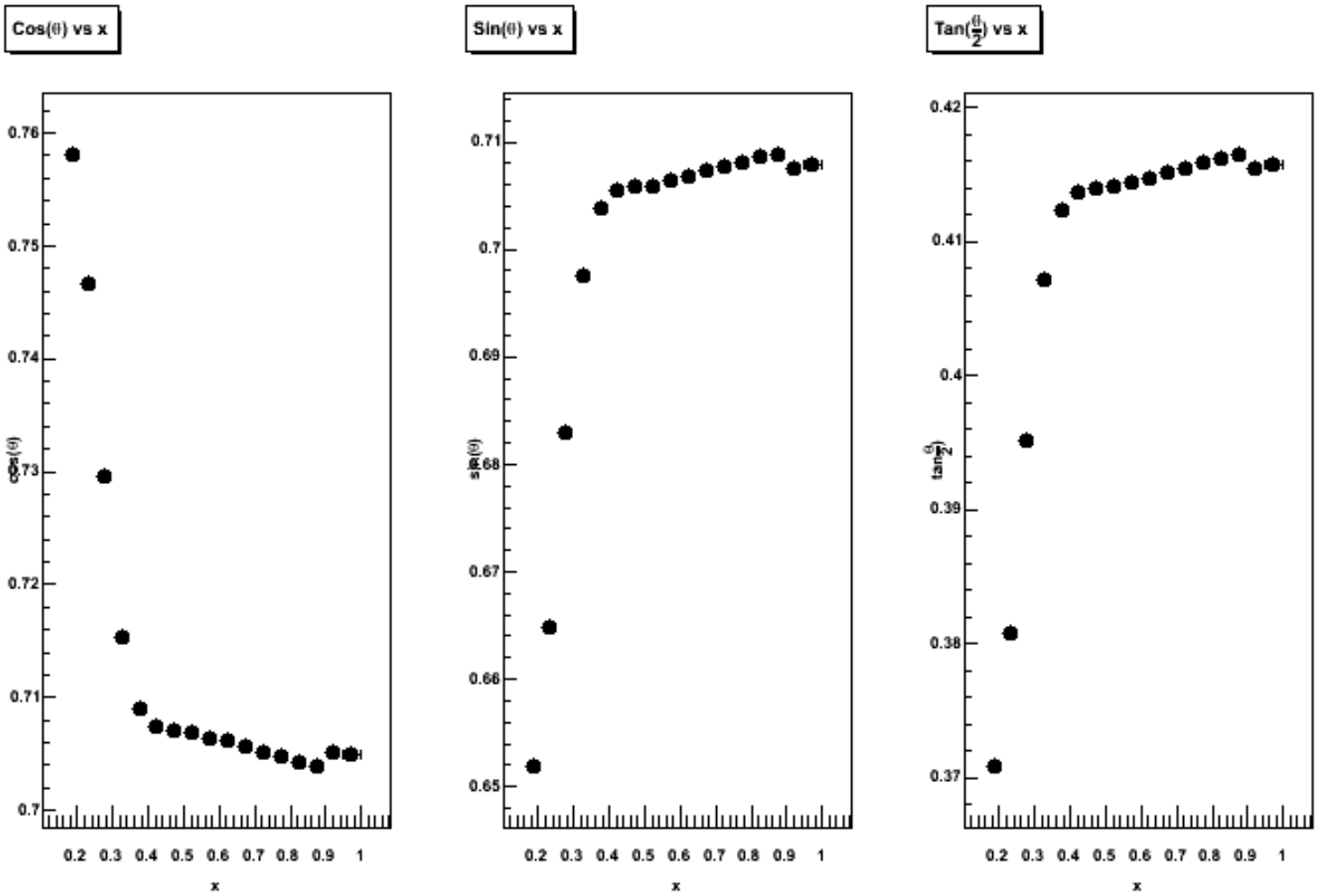
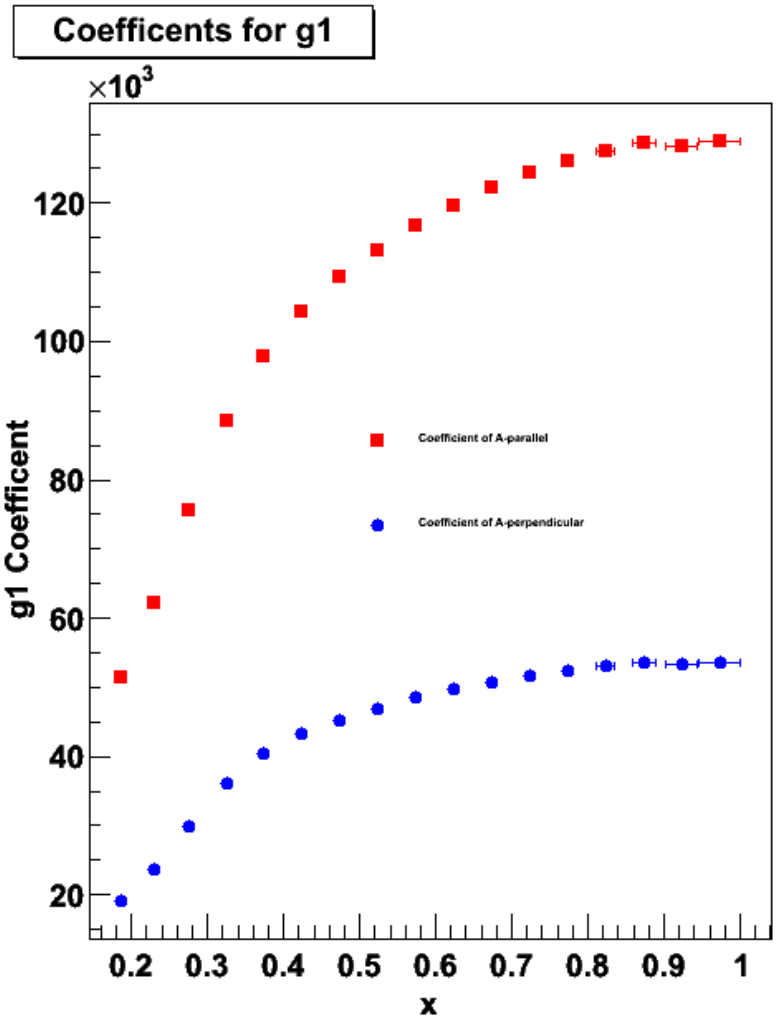


Figure: Scattering angle dependent trig quantities as a function of mean x-bin value

Preliminary g_1 and g_2 Coefficients



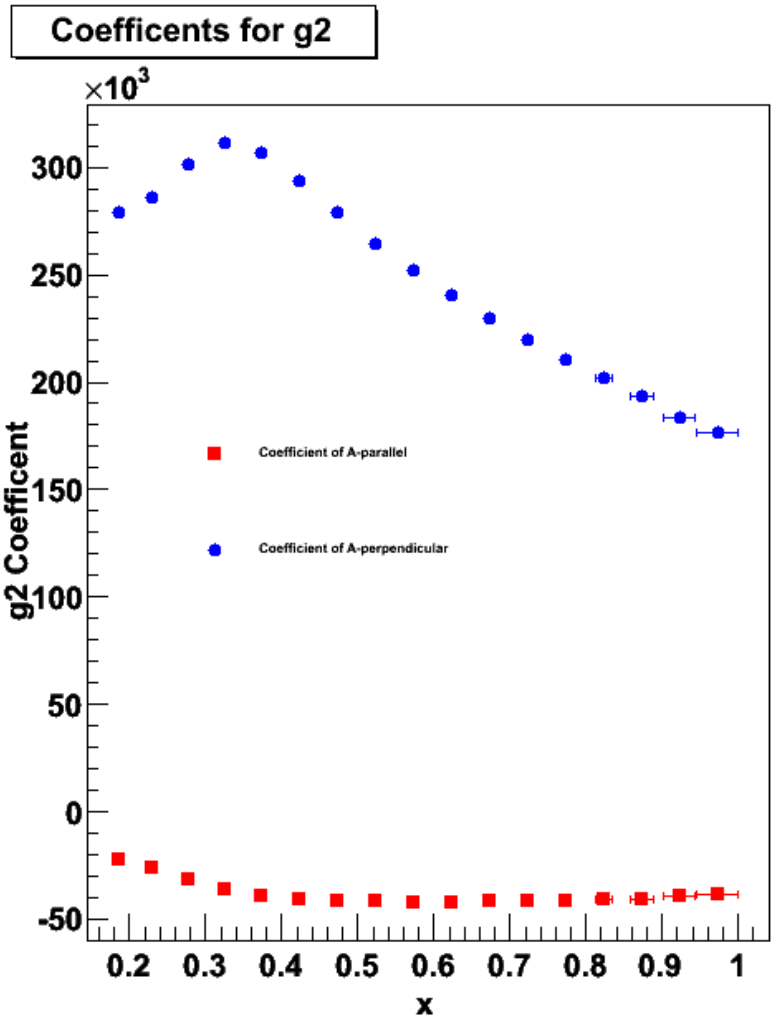
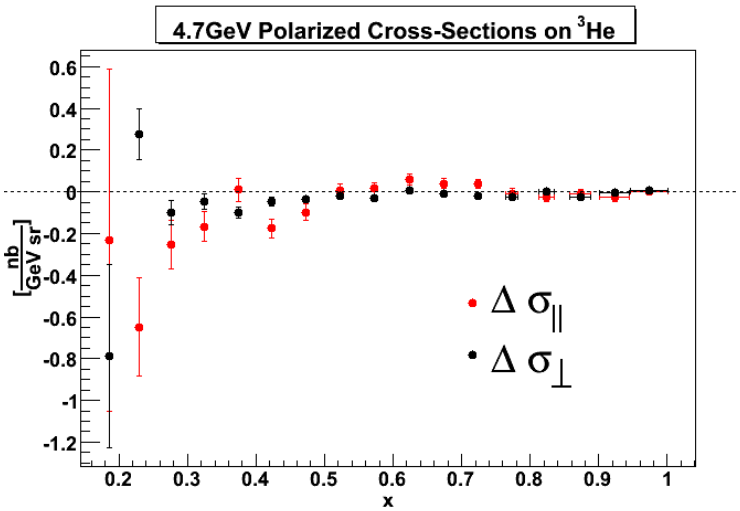


Figure: Coefficients of C_1^{g1} (red),C_2^{g1} (blue) in left plot, and C_1^{g2} (red),C_2^{g2} (blue) in right plot as a function of mean x-bin value

Very Preliminary Polarized Cross-Section Differences



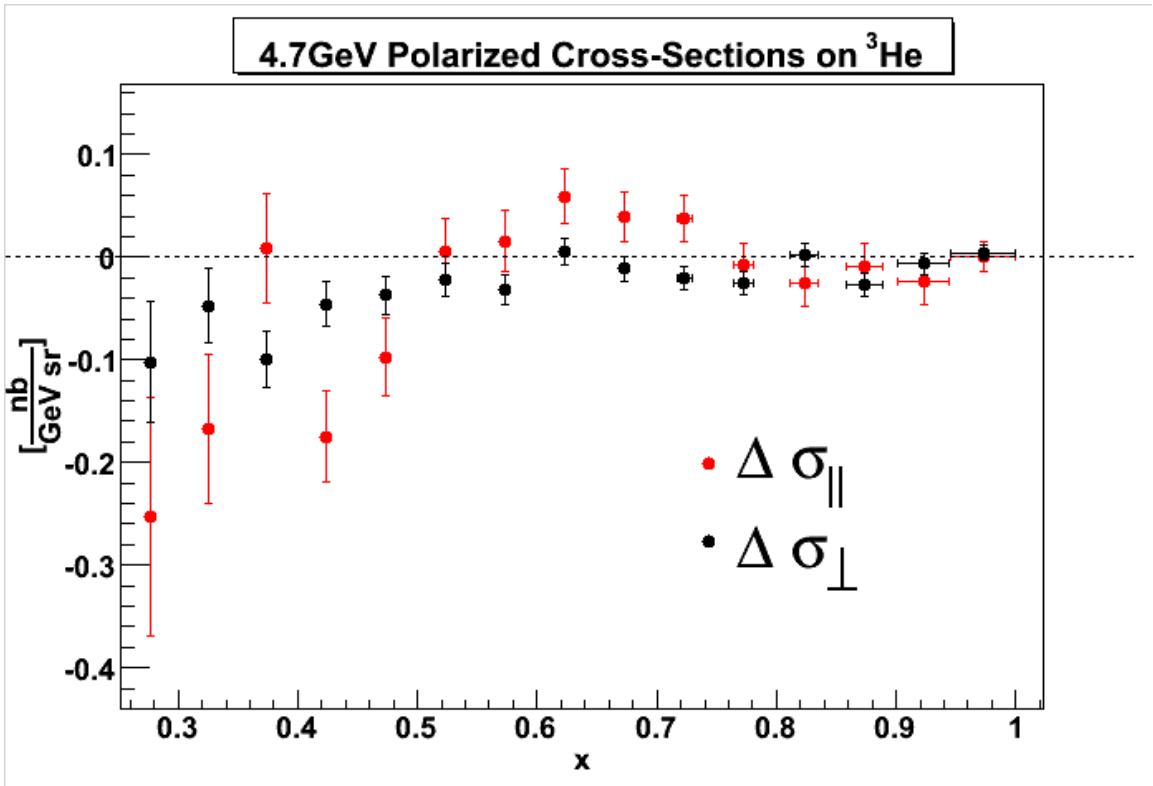


Figure: Polarized cross-section differences

Very Preliminary 4.7GeV g_1 on ^{3}He

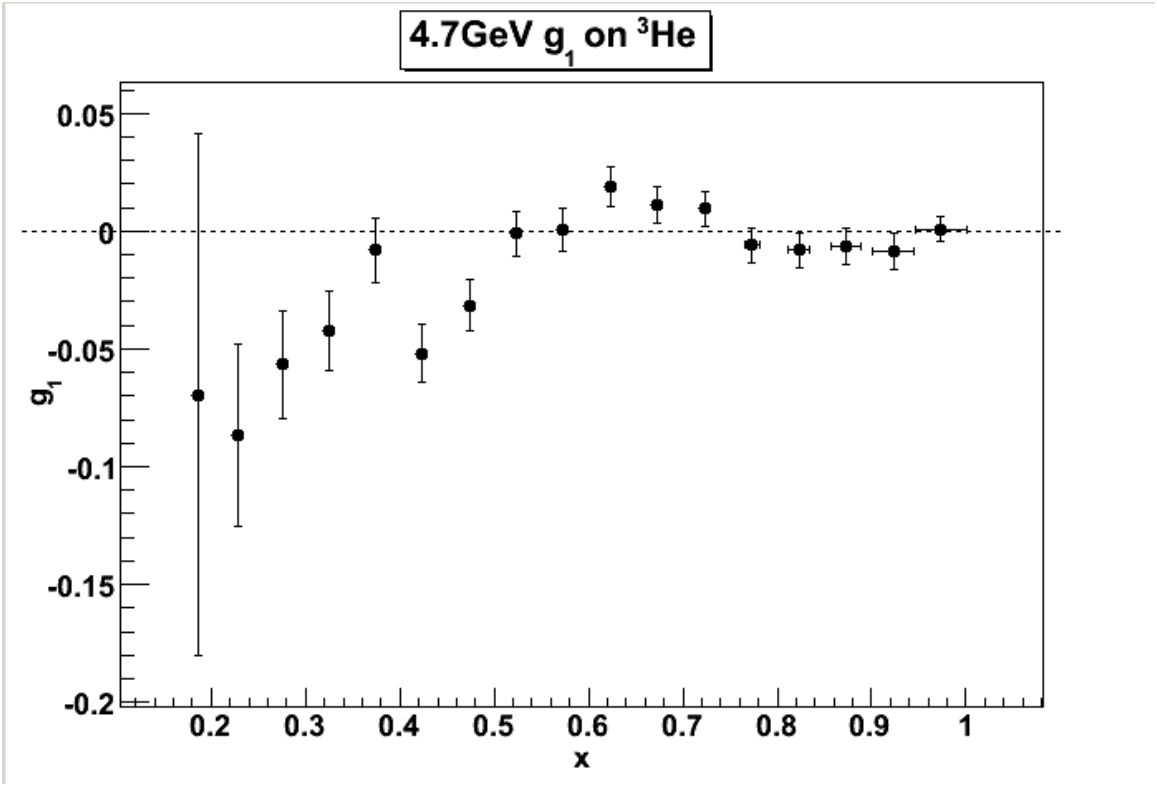


Figure: g_1 Structure function at 4.7GeV on ^{3}He

Very Preliminary 4.7GeV g_1 on ^{3}He World Data

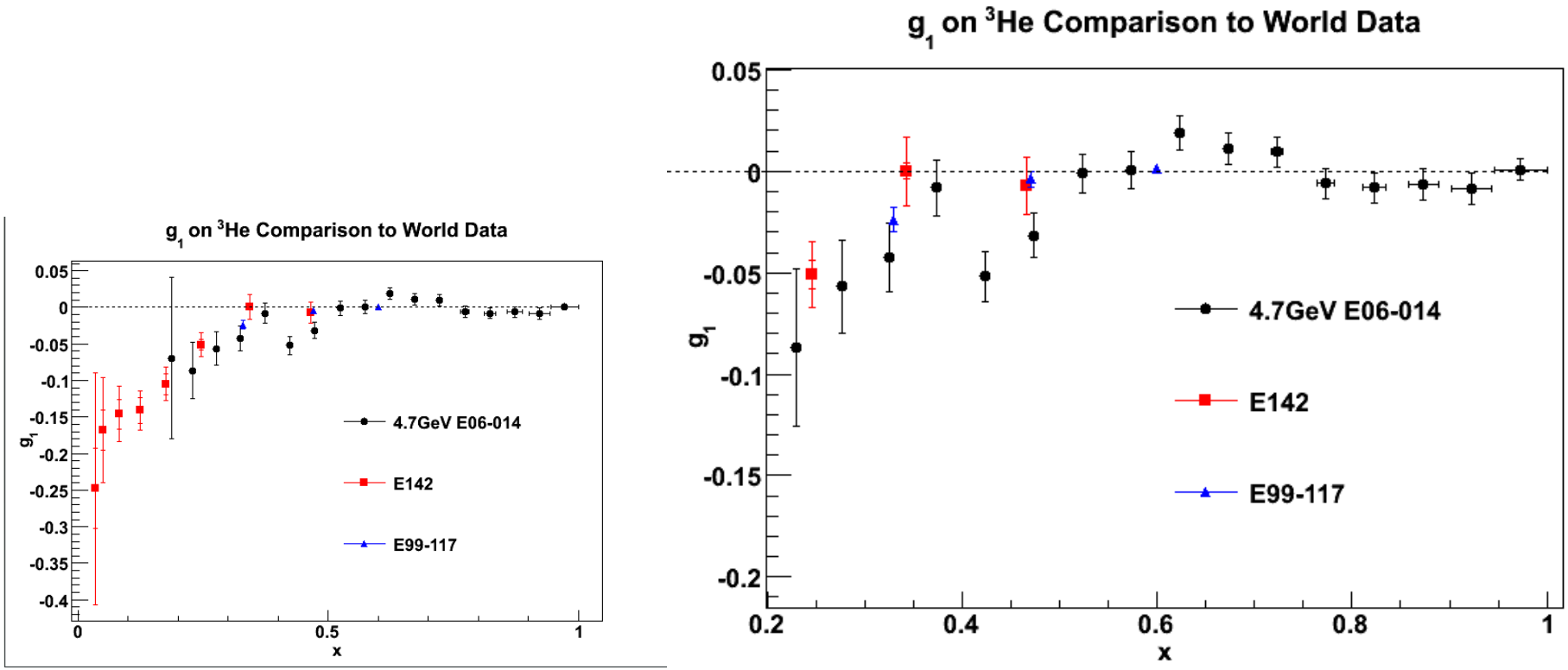


Figure: g_1 structure function compared to ^{3}He world data

Very Preliminary 4.7GeV g_2 on ^{3}He

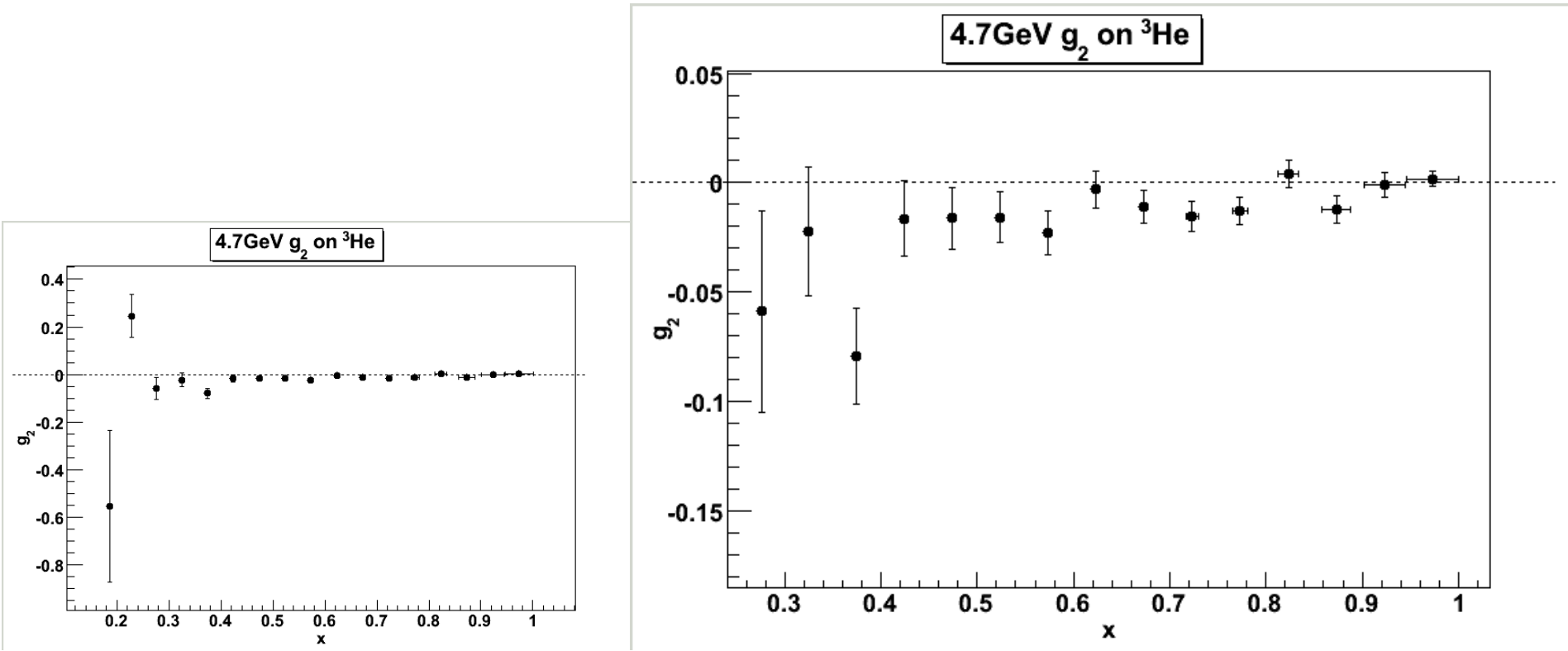
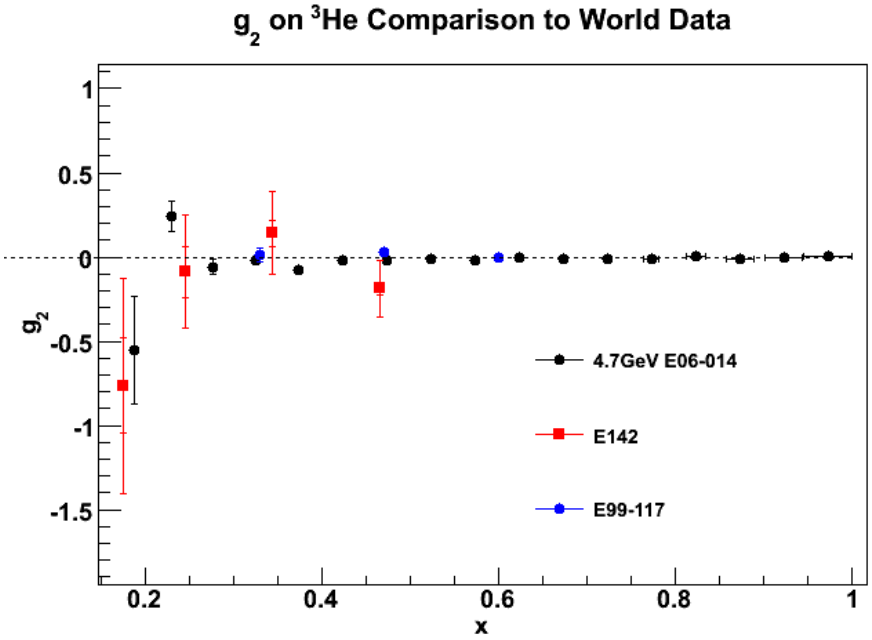


Figure: g_2 Structure function at 4.7GeV on ^{3}He

Very Preliminary 4.7GeV g_1 on ^{3}He World Data



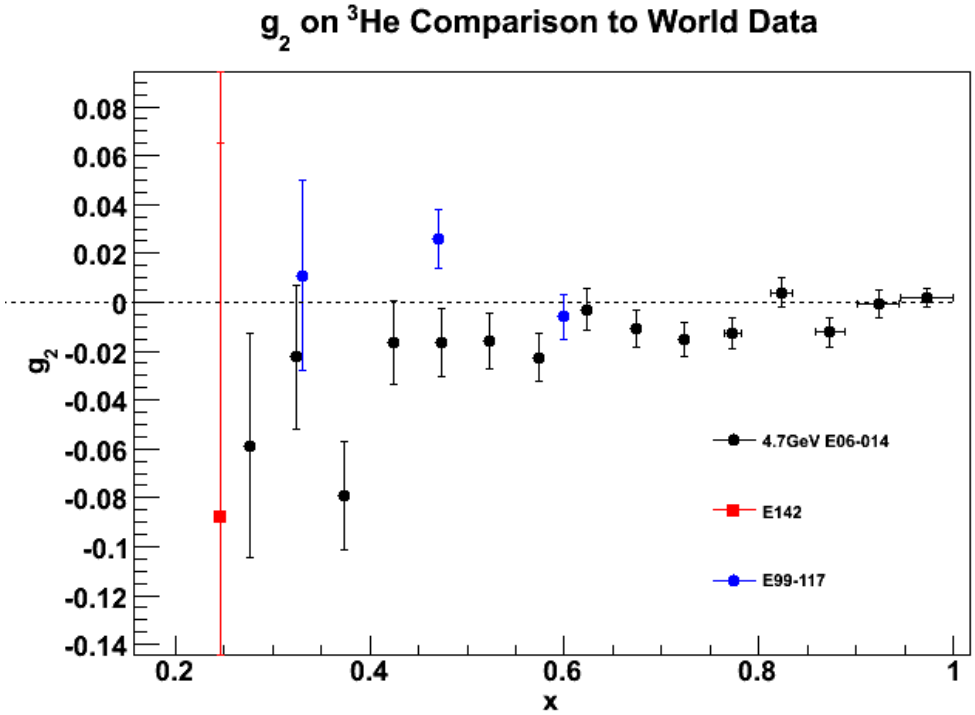
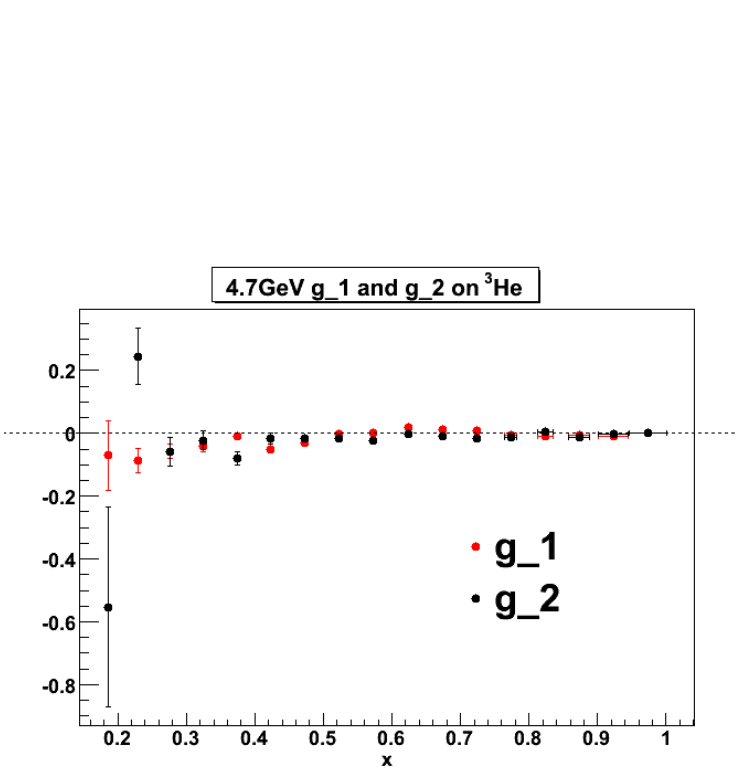


Figure: g_2 structure function compared to ^{3}He world data

Very Preliminary 4.7GeV g_1 Compared g_2 on ^{3}He



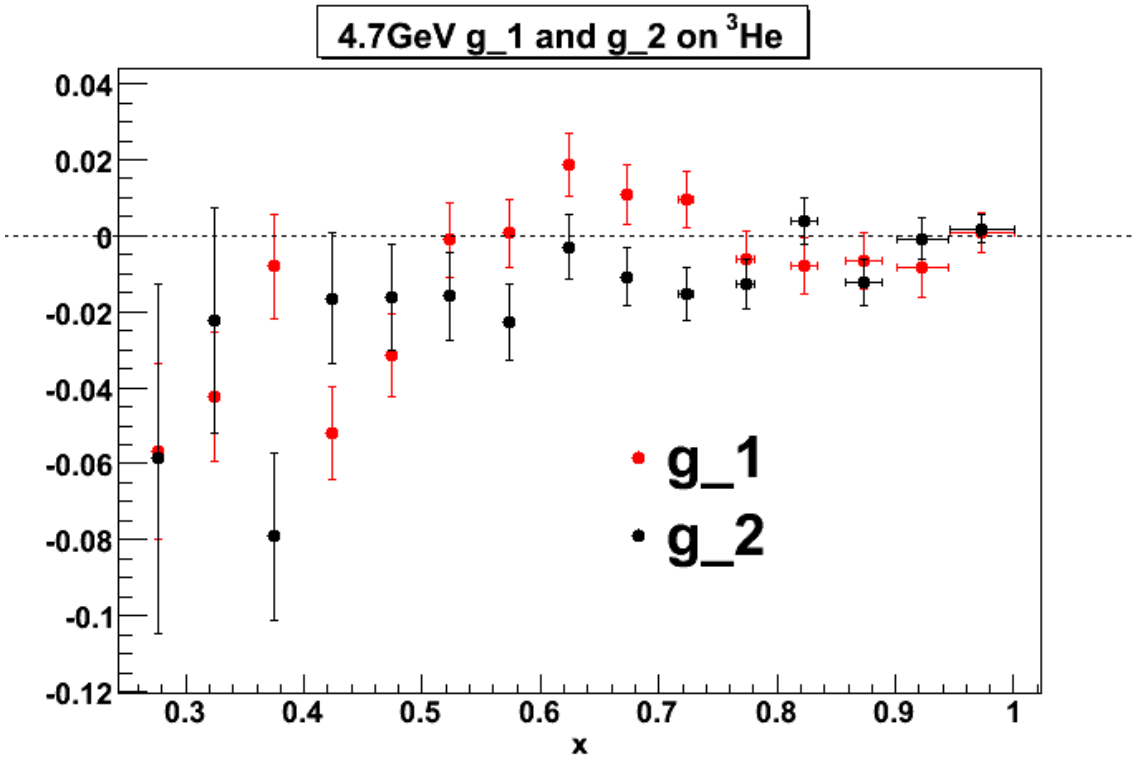


Figure: g_1 and g_2 structure functions on ^{3}He compared to each other

Disk Space for 5.9GeV Data

- A 5.9GeV run (run 1665) had a file size of 15 G
- There are about 302 5.9GeV production runs
- So the whole 5.9GeV production set should take up about 4.635 T
- Multiply by 2, to account for raw and skim ROOT files
- /data1 has 842 G free and
- /w/halla/e06014/ has 763 G free
- So we currently have 1.605 T free
- We will need about 8 T more disk space to have our entire 5.9GeV data set replayed

What's Next...

- Compute g_2^{WW} for 4.7GeV ^{3}He
- Start processing at 5.9GeV data
  - At least get data quality running
  - First half may be a little involved since a summing mod. was down
  - Pion asymmetry
- Radiative Corrections on Asymmetries(A_1,A_2), using POLRAD
- Compute systematic errors on kinematic variables/factors