

Preliminary Born Asymmetries

Analysis for d_2^n

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Outline

1 Use of Models

2 Radiative Corrections to Asymmetries

Integration Phase Space

Models

Born Cross Sections and Asymmetries

3 Discussion

4 Summary

Asymmetries From Models

Review of Equations

- First build A_1 and A_2 :

$$A_1 = \frac{g_1 - \gamma^2 g_2}{F_1}$$

$$A_2 = \gamma \frac{g_1 + g_2}{F_1}$$

$$\gamma = \frac{2Mx}{\sqrt{Q^2}}$$

- **Note:** $g_2 = g_2^{\text{WW}}$ here
- Models used:
 - DSSV for models of polarized PDFs
 - F1F209 for unpolarized SFs
 - The SLAC E143 fit for $R(x, Q^2)$

From Asymmetries to $\Delta\sigma$

- 1 The parallel and perpendicular asymmetries are given by:

$$\begin{aligned}A_{\parallel} &= D(A_1 + \eta A_2) \\ A_{\perp} &= d(A_1 - \xi A_2)\end{aligned}$$

D , η , ξ and d are kinematic factors

- 2 Form the polarized cross section differences:

$$\Delta\sigma_{\parallel,\perp} = 2\sigma_0 A_{\parallel,\perp}$$

σ_0 is the unpolarized total cross section

RCs to Asymmetries

General Procedure

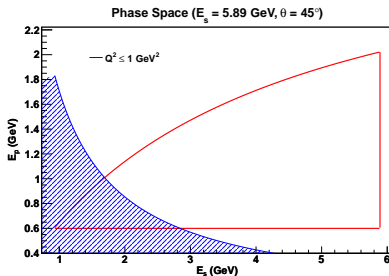
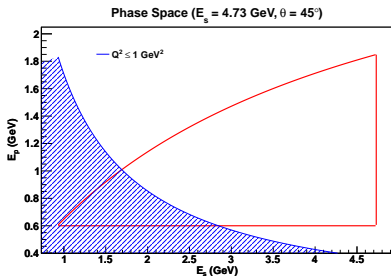
- 1 Form Born $\Delta\sigma_{\parallel,\perp}$ to cover the full phase space for 4- and 5-pass data using suitable models for $A_{1,2}$
- 2 Radiate each input spectrum using RADCOR in reverse
- 3 Generate the input file containing model and real data
- 4 Unfold the data using RADCOR
- 5 Extract the asymmetry from:

$$A_{\parallel,\perp} = \frac{\Delta\sigma_{\parallel,\perp}}{2\sigma_0}$$

Note: σ_0 in this case is the **Born** cross section

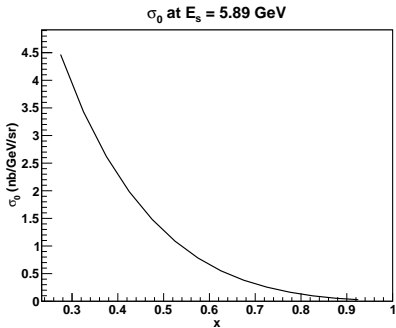
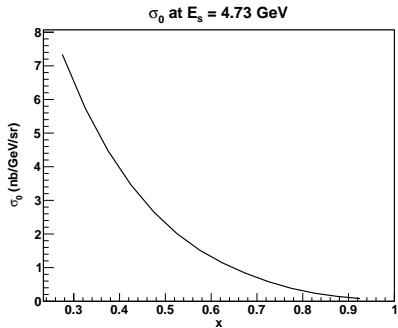
Integration Phase Space

- We use DSSV and F1F209 as our input models
 - DSSV restricts the reach in (E_s, E_p)
 - Blue-shaded region shows excluded kinematics



Unpolarized Born Cross Section

F1F209 Model



$\Delta\sigma$ From Models (1)

Longitudinal, 4-pass

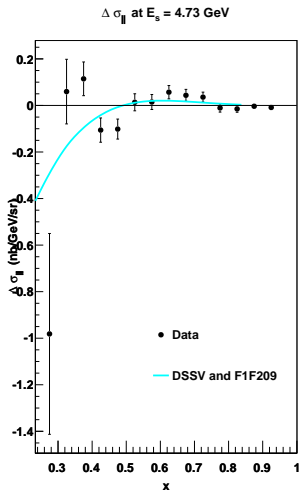
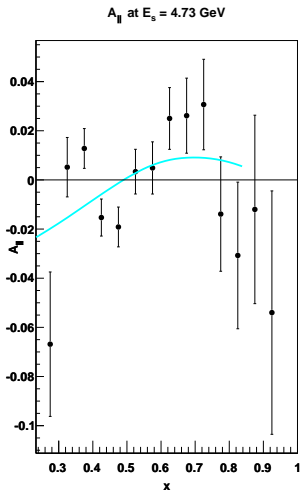


Figure: Note that the model is Born

$\Delta\sigma$ From Models (2)

Transverse, 4-pass

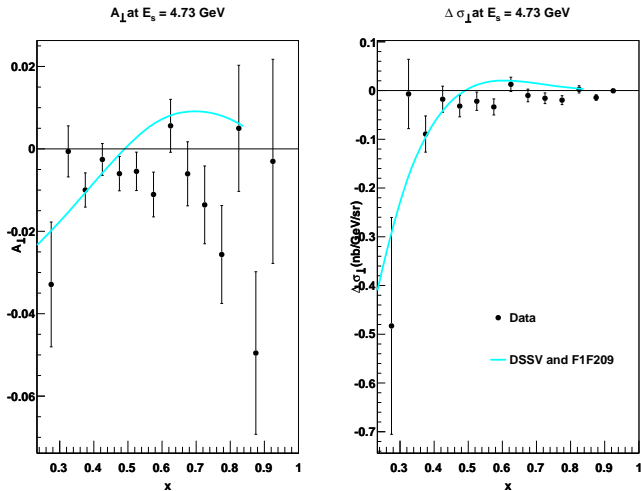


Figure: Note that the model is Born

$\Delta\sigma$ From Models (3)

Longitudinal, 5-pass

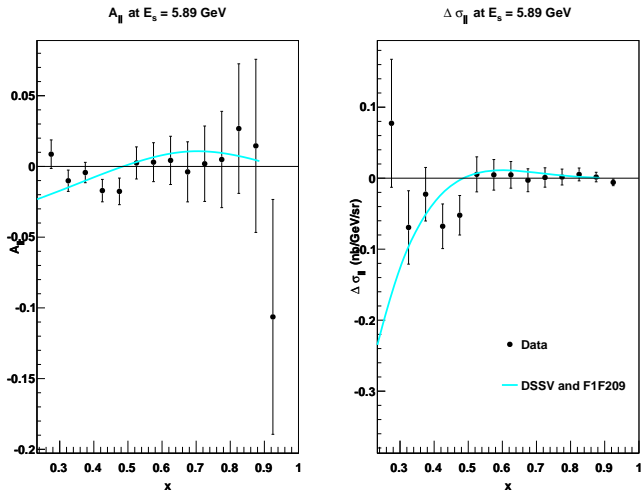


Figure: Note that the model is Born

$\Delta\sigma$ From Models (4)

Transverse, 5-pass

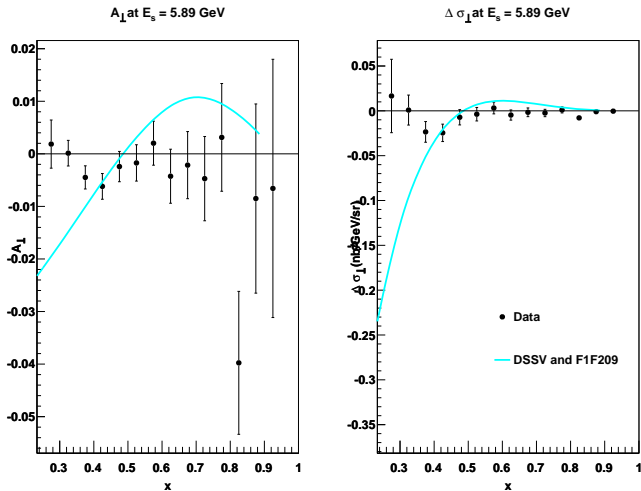
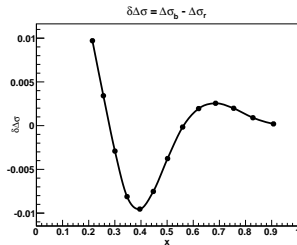
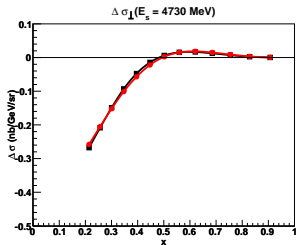
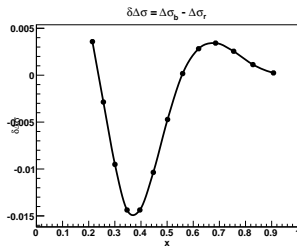
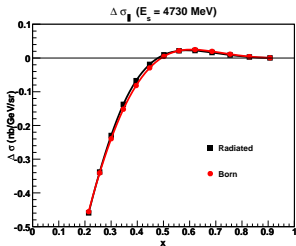


Figure: Note that the model is Born

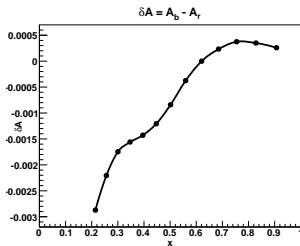
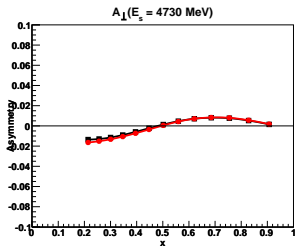
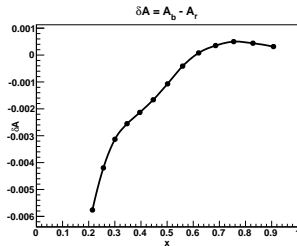
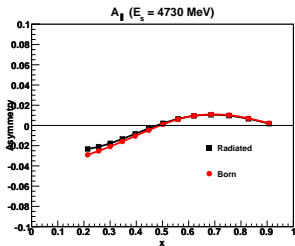
Preliminary Born Spectra (1)

$\Delta\sigma$, 4-pass (models only)



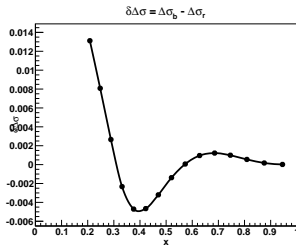
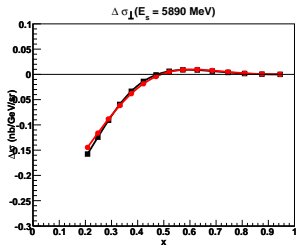
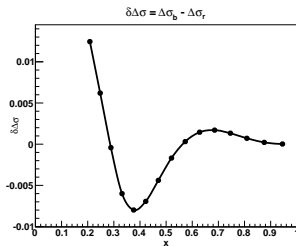
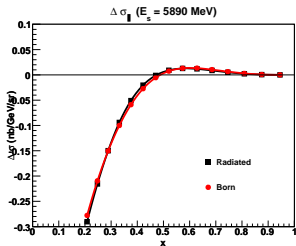
Preliminary Born Spectra (2)

Asymmetries, 4-pass (models only)



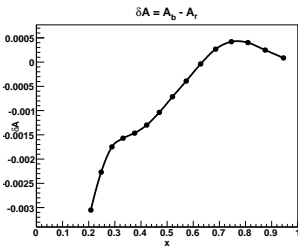
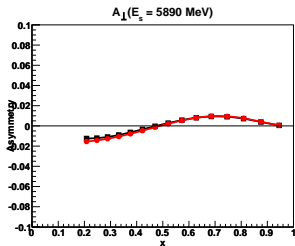
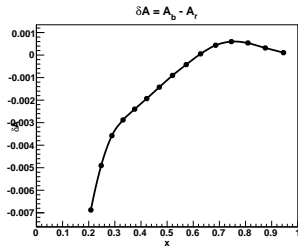
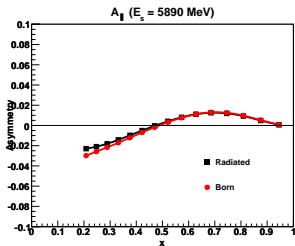
Preliminary Born Spectra (3)

$\Delta\sigma$, 5-pass (models only)



Preliminary Born Spectra (4)

Asymmetries, 5-pass (models only)



Discussion

Points of Interest

- Due to DSSV limitations, phase space covered is only for $Q^2 > 1$
 - Limits input spectra to $E_s > 2$ GeV
 - Examine different polarized PDF models
 - Switch to a different model at $Q^2 < 1$?
- Number of input spectra used: 40 total
 - 28 + 1 for 4-pass, 39 + 1 for 5-pass
- No subtraction of polarized elastic and/or quasi-elastic tail
 - Still need to look into this
- Try to get POLRAD running (?)

Summary and To-Do

- Preliminary Born asymmetries have been computed for model input spectra
 - All code has been written to generate models, build input files, etc. which makes new calculations fast and easy
- To-Do
 - Q^2 dependence of models
 - Do we switch to a different polarized PDF model at low Q^2 ?
 - Will we **need** the excluded region in the integration? (recall σ_0 analysis)
 - Investigate polarized tails (elastic and quasi-elastic)