

LHRS Analysis for d_2^n

Carbon Cross Section and Fit Errors

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6/12/12

Outline

1 ^{12}C Cross Section

Comparison to World Data and F1F209

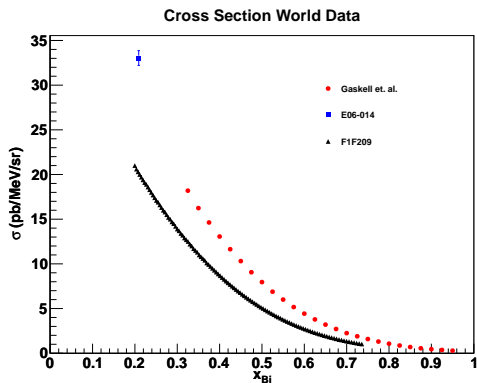
2 Cross Section Fits

Systematic Errors

3 Summary

^{12}C Cross Section

Comparison to World Data and F1F209



- Gaskell *et. al.*: $E_s = 5.9$ GeV, x down to 0.325, $\theta = 40^\circ$
- E06-014: $E_s = 5.89$ GeV, $x \sim 0.2$, $\theta = 45^\circ$
- F1F209: $E_s = 5.89$ GeV, $\theta = 45^\circ$
- **No scaling of cross section data!**

Fit Systematic Errors

Description

- When computing the **experimental** cross section, we calculate:

$$\sigma_{\text{exp}} = \sigma_{\text{raw}} - \sigma_{\text{N,dil}}^- - \left(\sigma_{e^+} - \sigma_{\text{N,dil}}^+ \right)$$

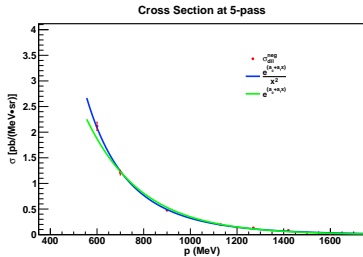
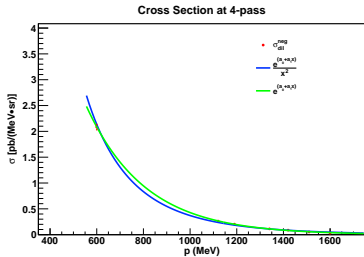
- When we do not have a σ_i for a given E_p bin, we use a fit:

$$f(x) = \frac{1}{x^2} e^{(p_0 + p_1 x)}$$

- How to estimate the error incurred by using this fit?
 - Try a pure exponential: $f(x) = e^{(p_0 + p_1 x)}$

Fit Systematic Errors

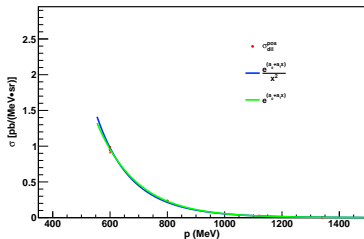
Diluted Nitrogen (Negative Polarity)



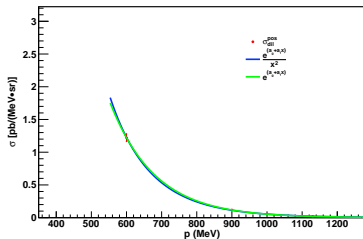
Fit Systematic Errors

Diluted Nitrogen (Positive Polarity)

Cross Section at 4-pass

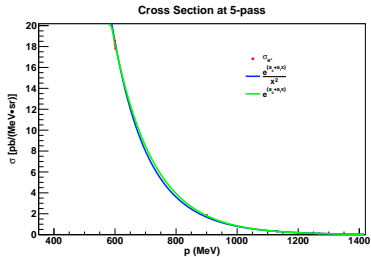
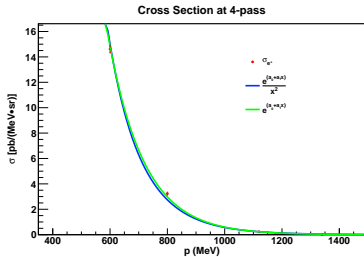


Cross Section at 5-pass



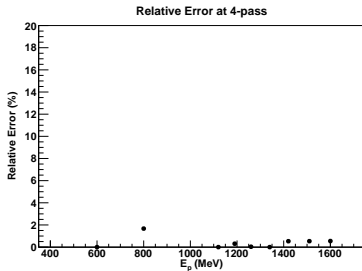
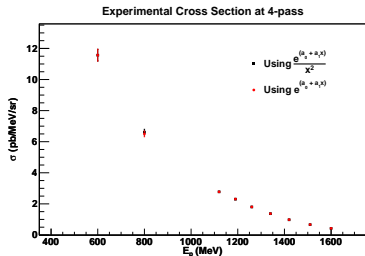
Fit Systematic Errors

Positrons



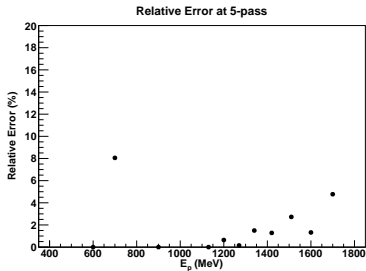
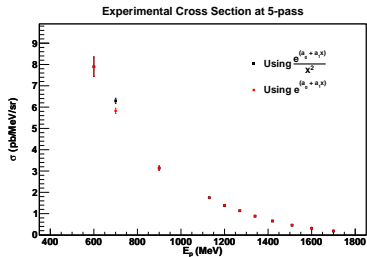
Fit Systematic Errors

4-pass Results



Fit Systematic Errors

5-pass Results



Summary

- ^{12}C cross sections are in reasonable agreement with world data
- Systematic errors of fits seems small at 4-pass ($\sim 2\%$), a bit larger at 5-pass ($\sim 3\text{--}5\%$ on average)

What's Next?

- Revisit SAMC using multiscattering and F1F209
 - Vince has a fortran-based version with F1F209
- Finite acceptance
 - Bin our cross section data in W , ν and x to obtain more bins (we may be statistically limited. . .)
- $\pi^{+,-}$ cross sections compared to Wiser code
 - Are there protons or other garbage contaminating the π^{+} data?
 - Using our cross sections may be better for the Geant4 simulation of BigBite (?)