LHRS Analysis for d_2^n

Scaling Cross Section Models and Radiative Corrections

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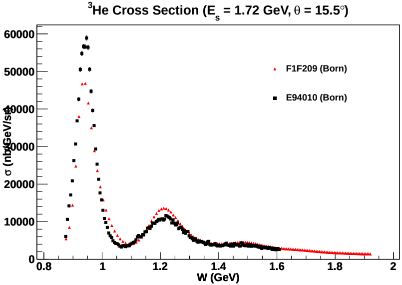
4/19/12

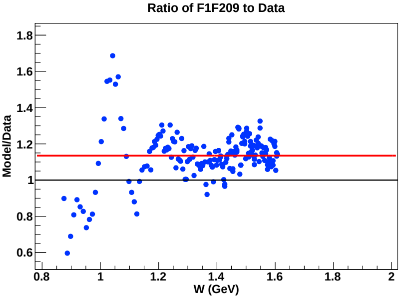
Outline

- To fit the F1F209 model to the existing data in our kinematic range (E94-010, E01-012 and our data), we plot the ratio $R =$ model/data
    - For each cross section spectrum, plot $R = R\,(E_s)$, $R = R\,(\theta)$ and see if there is a trend
    - Apply $1/R$ to the inelastic component of $F_{1,2}$ in the cross section calculation in F1F209
    - Can use multiple iterations of the procedure

Before Scaling (1)

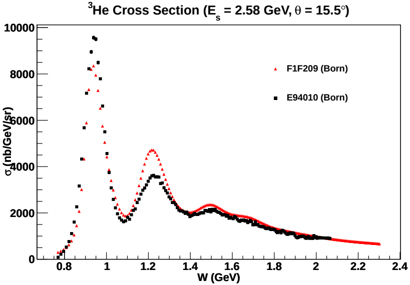
E94-010: $E_s = 1.72$ GeV

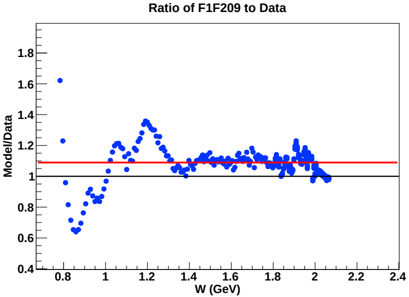




Before Scaling (2)

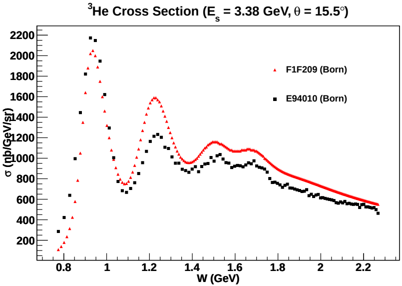
E94-010: $E_s = 2.58$ GeV

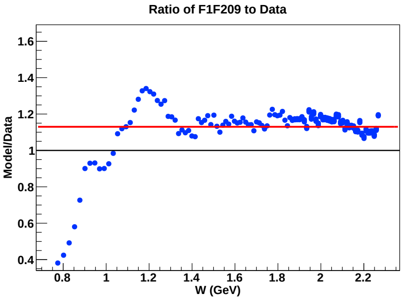




Before Scaling (3)

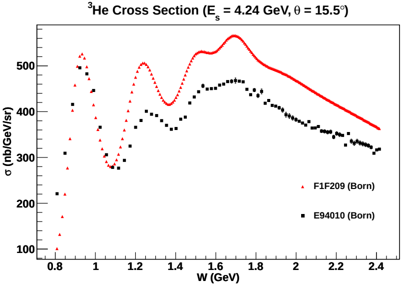
E94-010: $E_s = 3.38$ GeV

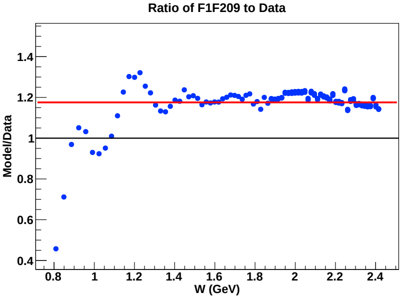




Before Scaling (4)

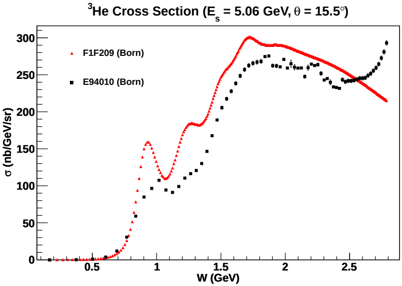
E94-010: $E_s = 4.24$ GeV

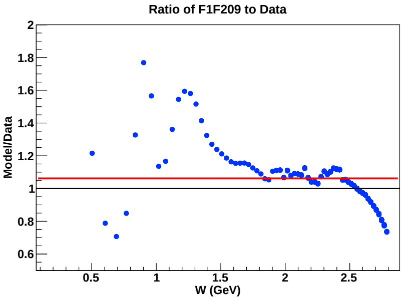




Before Scaling (5)

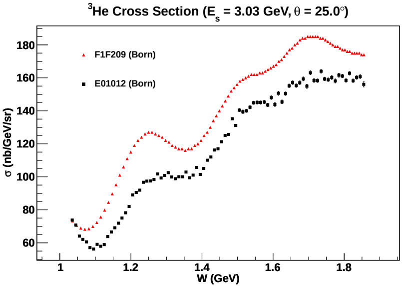
E94-010: $E_s = 5.06$ GeV

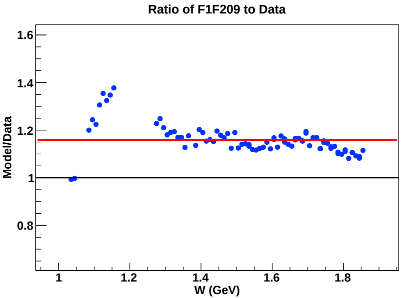




Before Scaling (6)

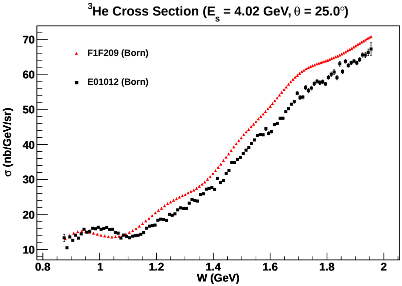
E01-012: $E_s = 3.03$ GeV

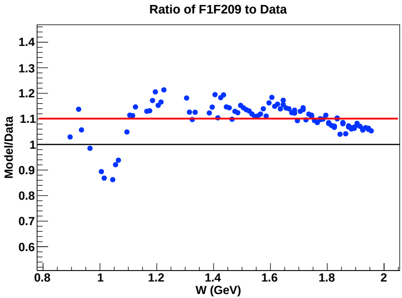




Before Scaling (7)

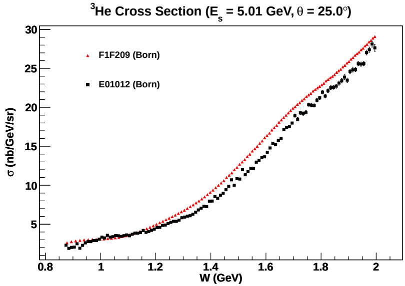
E01-012: $E_s = 4.02$ GeV

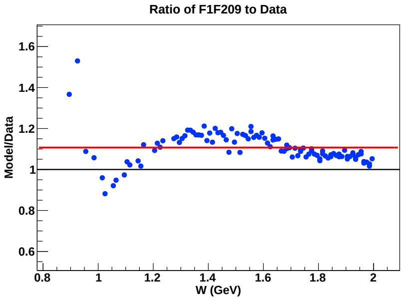




Before Scaling (8)

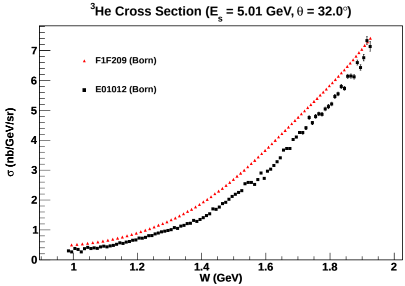
E01-012: $E_s = 5.01$ GeV, $\theta = 25^\circ$

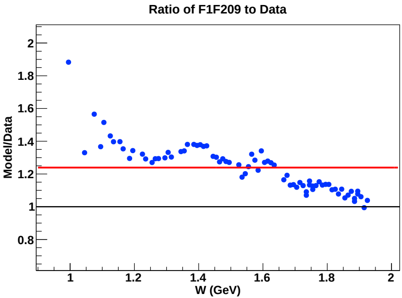




Before Scaling (9)

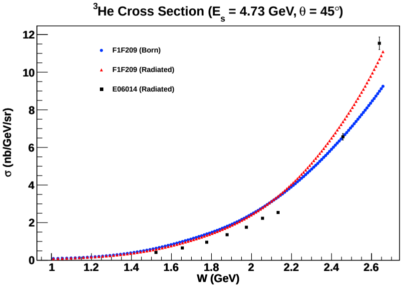
E01-012: $E_s = 5.01$ GeV, θ = 32°

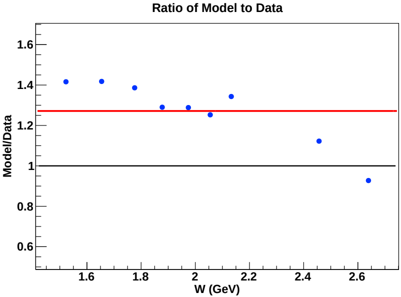




Before Scaling (10)

E06-014: $E_s = 4.73$ GeV





Before Scaling (11)

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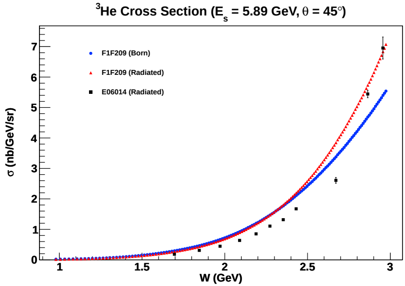
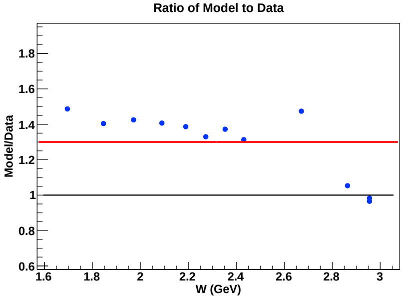
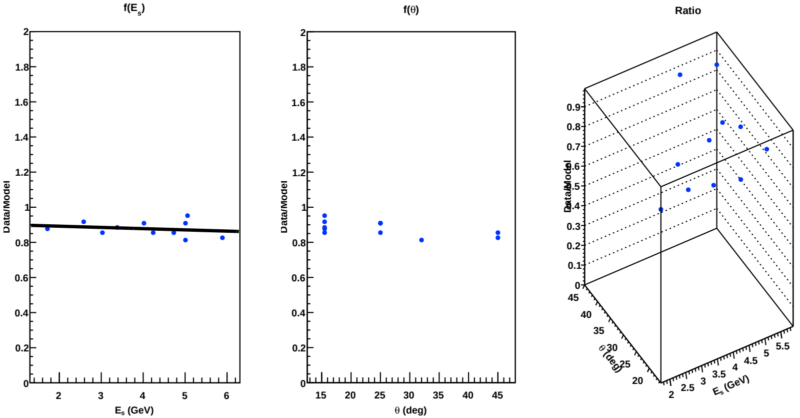




Determining the Scale Factor

- Take an average of the ratio R and fit a line to it:

$$R\left(E_s\right) = 0.906 - 0.00699 E_s$$



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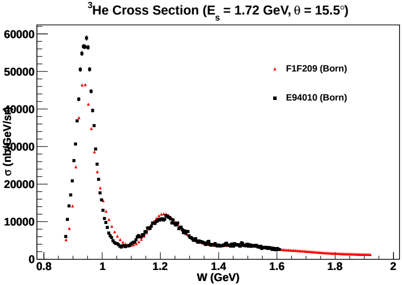

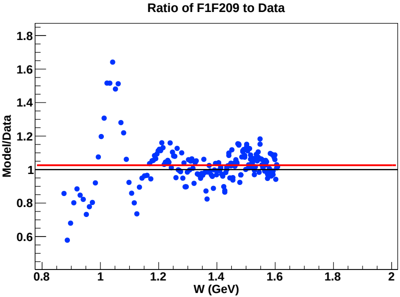

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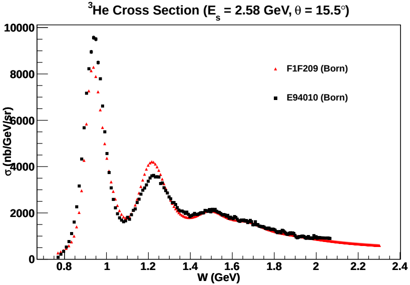

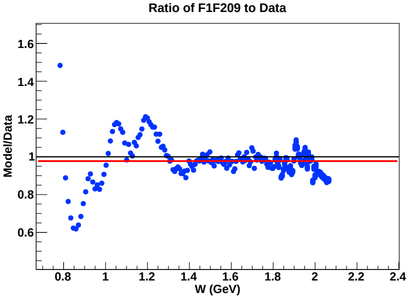

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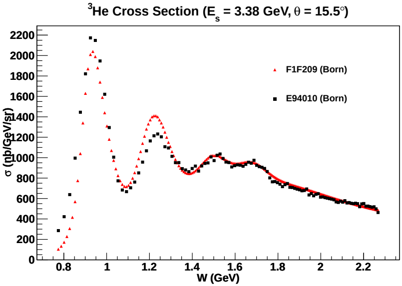

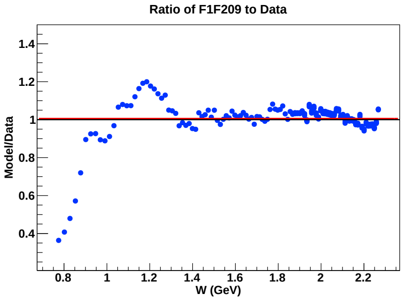

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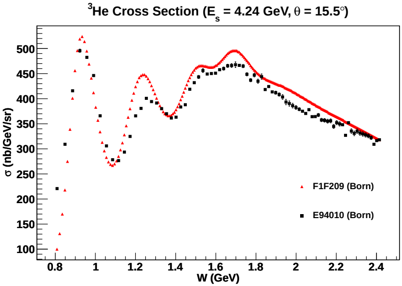

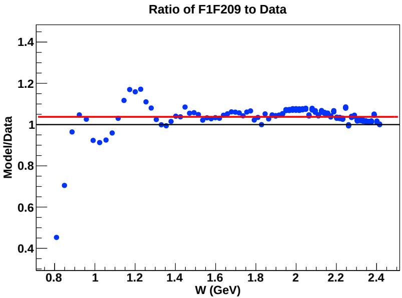

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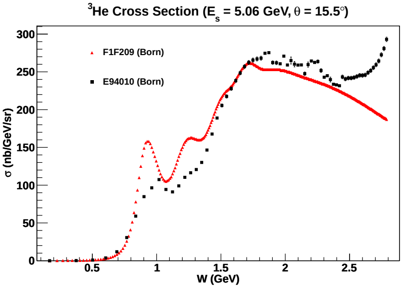

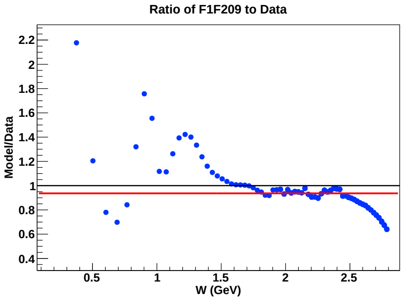

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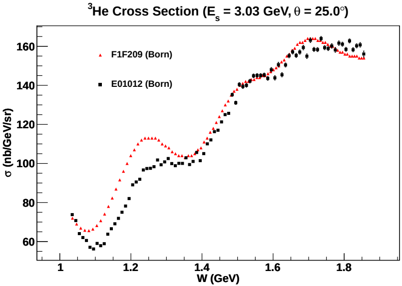

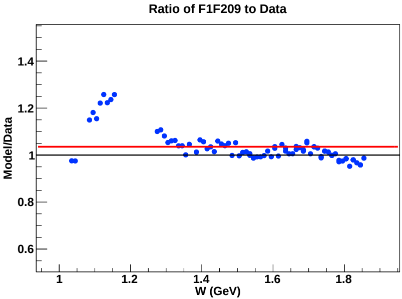

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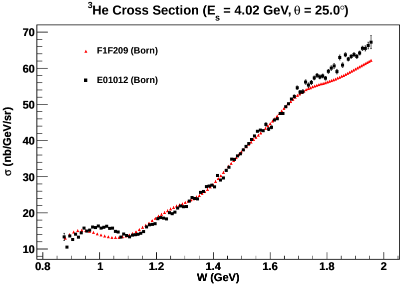

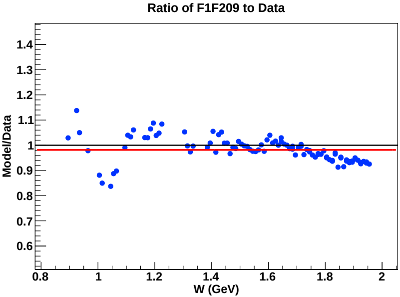

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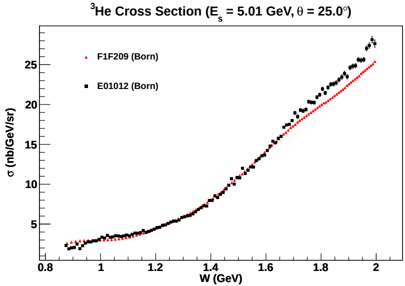

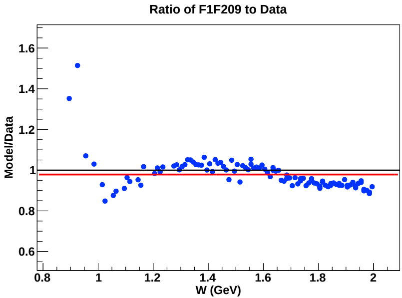

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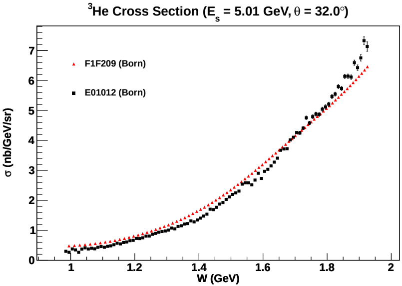

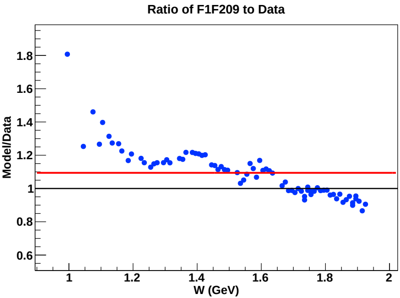

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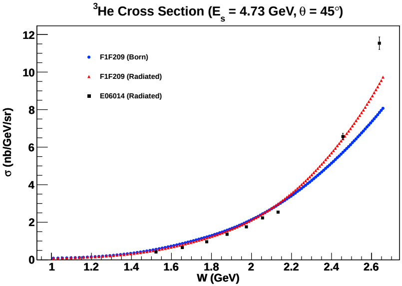

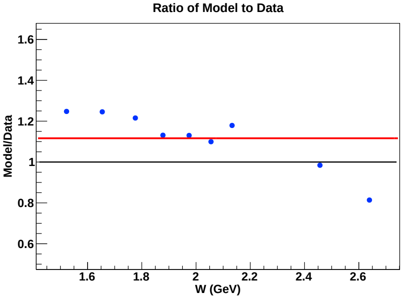

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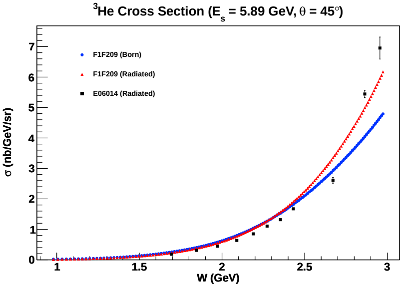
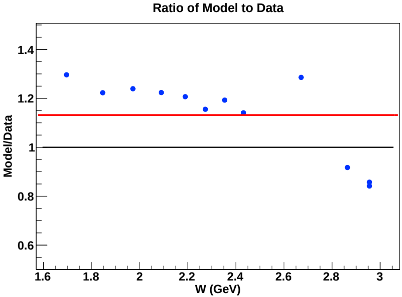




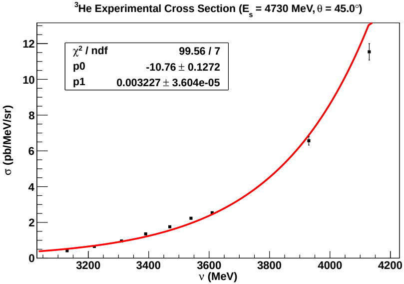
RC's to Real Data (1)
Method

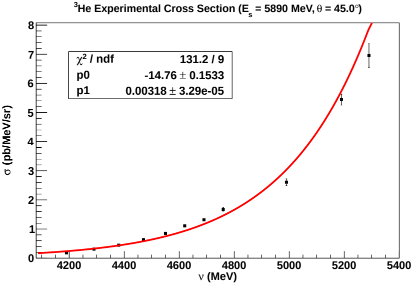
1. Utilize the F1F209 model to fill in the phase space required at our kinematics (E_s = 1.5, 2 and 3 GeV)
2. Use an exponential fit for our real data
3. Unfold the Born cross sections
4. Calculate a scaling ratio from the unfolding to apply to the actual data:

$$f = \frac{\sigma^m_{\text{born}}}{\sigma^m_{\text{rad}}}$$

RC's to Real Data (2)

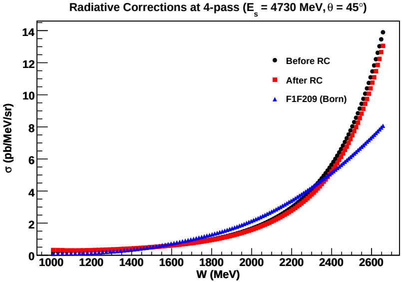
Exponential Fit to Our Data

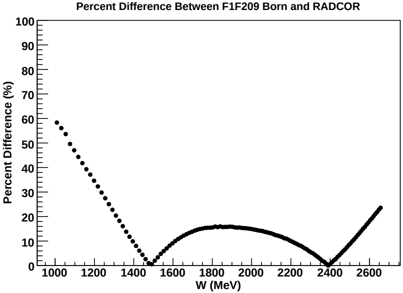




RC's to Real Data (3)

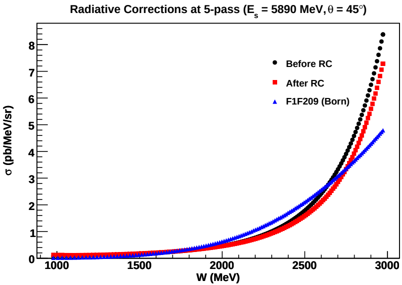
Results at E_s = 4.73 GeV (Using an Exponential Fit)

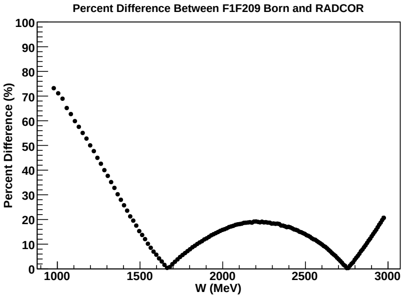




RC's to Real Data (4)

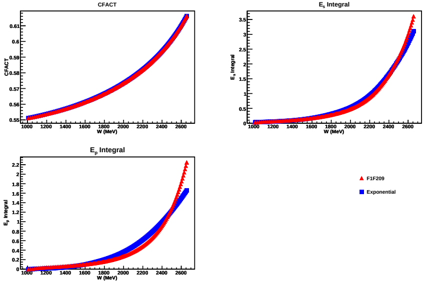
Results at E_s = 5.89 GeV (Using an Exponential Fit)

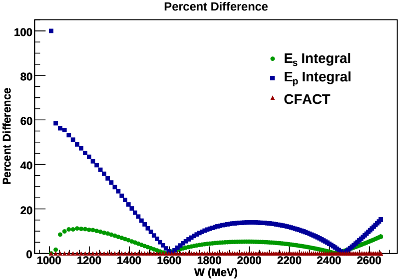




RC’s to Real Data (5)

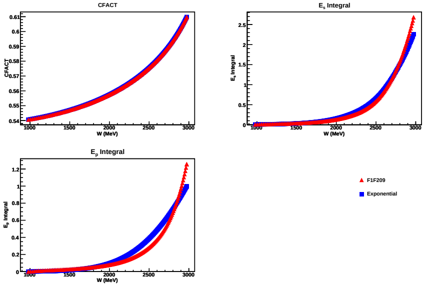
Integrals at E_s = 4.73 GeV

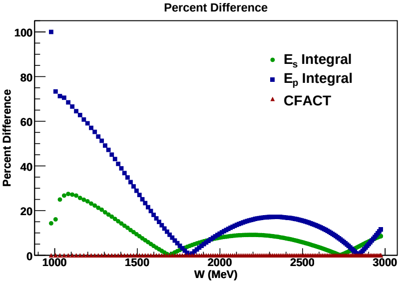




RC's to Real Data (6)

Integrals at E_s = 5.89 GeV





Summary

- Scaling the inelastic component of the F1F209 fit to the data gives improved radiated results of the model for our kinematics
- Using F1F209 to fill out the phase space and using exponential fits to our data yields very different Born cross sections
  - ‘Mixing’ models seems to complicate matters

What's Next?

- Fine-tune scaling of F1F209
- Proper way to apply radiative corrections to the real data