SLAC Proton Cross Section Data

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Overview

• Found some old SLAC proton cross section data
  – Hall C Resonance Data Archive: [https://hallcweb.jlab.org/resdata/database/](https://hallcweb.jlab.org/resdata/database/)
  – Experiments: Onen1haf and E61
    • E61 data is a 1990’s re-analysis of data taken in the 1970’s (θ = 4°)
    • Can’t find anything on Onen1haf (θ = 1.5°, hence the name)

• Useful to g2p because some of it is at low $Q^2$
  – Goes as low as $Q^2 = 0.016$ GeV$^2$

• Can make comparisons to Bosted model to give an idea of the systematic uncertainty from using the model for now
  – Lowest data $Q^2$ used in Bosted’s fit is approximately 0.3 GeV$^2$ (at the Delta)
  – Bosted claims he fits data down to 0.06 GeV$^2$ which is technically true but this is at large $W$ and not in the resonance region
  – Fit constrained with photoproduction data at $Q^2 = 0$. 
Data/Model Comparison

- Take ratio of data to model at each kinematic point at an energy setting and then take average weighted by statistical uncertainty to get the points shown below.

- Error bars are standard deviation of that average.
- $Q^2$ value is from the Delta-resonance.
Data/Model Comparison

\[ \frac{d\sigma}{dE\Omega} \] (nb/MeV/sr)

SLAC E61, \( E_0 = 4.499 \) GeV, \( Q^2 \approx 0.09 \) GeV^2

Bosted model

\( W (\text{GeV}) \)

\( W (\text{GeV}) \)
Data/Model Comparison

![Graph showing data and model comparison. The upper graph plots $d\sigma/dE_{\text{miss}}$ (nb/MeV sr) against $W$ (GeV), with data points and a dashed line representing the Bosted model. The lower graph shows the ratio against $W$ (GeV).]
Going Forward

- Bosted model uncertainty on the order of 15-20% at our kinematics for 5T based upon SLAC data
  - But worse for the 2.5T settings!!
- Also looking into how results change if I scale Bosted up for 15% to center the deviation around 1 (spread is still +\- 15%)
- Questions/Comments/Concerns?