E06-014 Analysis Update
Radiative Corrections and A_1^n

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Outline

1. Radiative Corrections Update
2. A_1^n Extraction

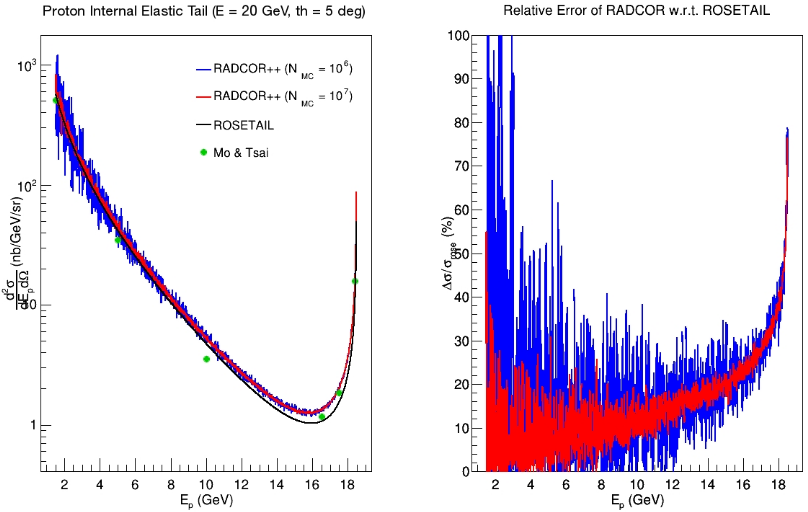
Radiative Corrections Update (1)

Details: Integration Method

- Moved to Monte Carlo integration to speed things up
  - Method: Sample Mean (so far)
  - External radiation: 4D integral would not finish over many days of running; will be 5D for inelastic tail
  - With MC, can finish a full spectrum in a matter of a few hours (at 10^7 MC events)
- In the middle of tuning the importance sampling, accept/reject methods (should make things even faster)

Radiative Corrections Update (2)

Example Run/Test: Internal Elastic Tail on Proton



A_1^n: First Calculation (1)

Method and Details

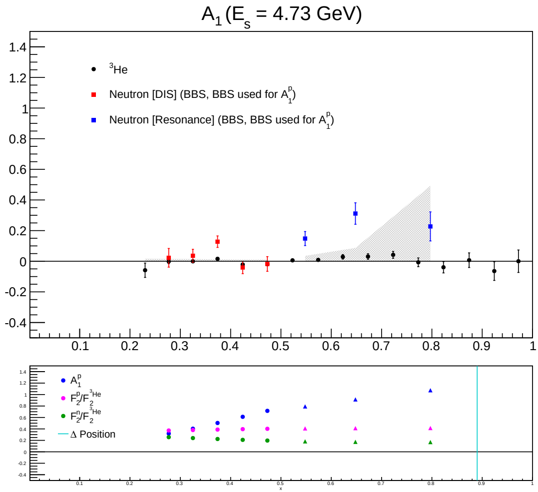
- Utilize the effective polarization method:

$$A_1^n = \frac{F_2^{^3\mathrm{He}}}{\tilde{P}_n F_2^n}\left[A_1^{^3\mathrm{He}} - \tilde{P}_p\left(\frac{F_2^p}{F_2^{^3\mathrm{He}}}\right)A_1^p\right]$$

- Assume duality and re-bin resonance data into 3 (4-pass) and 2 bins (5-pass)
- $\tilde{P}_i$ terms include off-shell effects:
  - $\tilde{P}_n$ = 0.879 + 0.056
  - $\tilde{P}_p$ = 2(-0.021) - 0.014
- Used a number of model combinations (unpolarized, polarized) for systematic studies
  - Unpolarized: BBS, CTEQ6
  - Polarized: BBS, BB, DNS, GS, DSSV, LSS
  - Data shown in slides uses BBS for both unpolarized and polarized models

A_1^n: First Calculation (2)

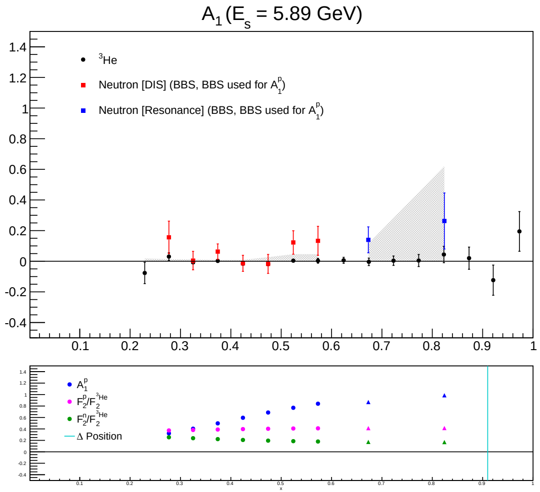
Extracting A_1^n: E = 4.73 GeV Data



- Grey band shows systematic error due to model dependence

A_1^n: First Calculation (3)

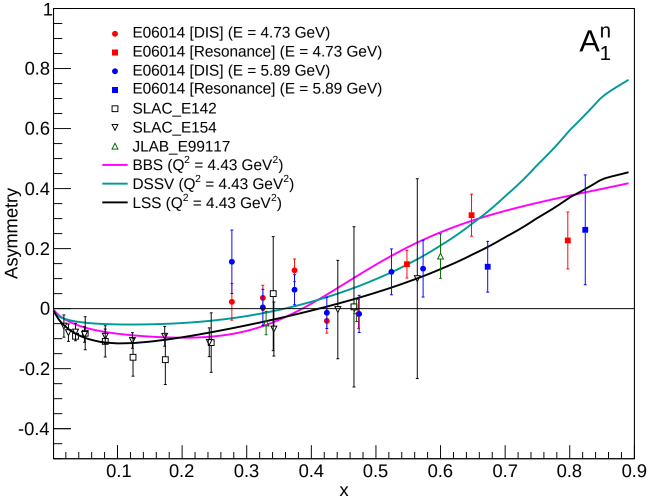
Extracting A_1^n: E = 5.89 GeV Data



- Grey band shows systematic error due to model dependence

A_1^n: First Calculation (4)

Compared to World Data

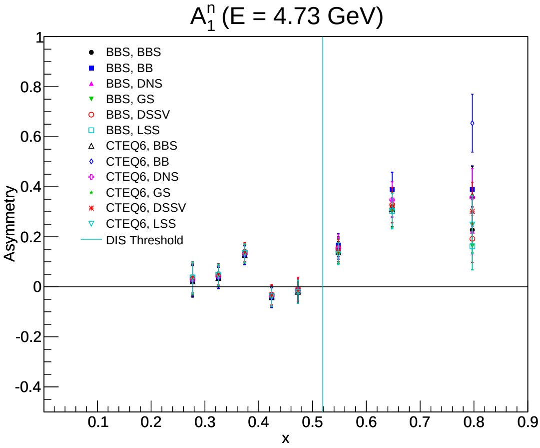


Summary

- Radiative Corrections
  - MC integration techniques seems to be the best way to go with multi-dimensional integration
  - Fine-tune importance sampling, accept/reject methods (in d-dimensions)
  - Finish debugging POLRAD++
- A_1^n Extraction
  - Computed A_1^n using the effective polarization method
  - Utilizing different combinations of input models, model dependence is found to be small in the DIS region
  - Consistent with world data, but precision is not as good as some other experiments (e.g., E99-117)

Backup (1)

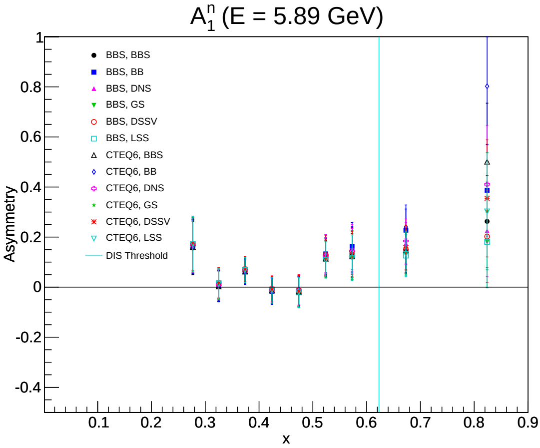
A_1^n: Model Dependence for E = 4.73 GeV Data



- Error taken as the difference between the largest and smallest values per bin

Backup (2)

A_1^n: Model Dependence for E = 5.89 GeV Data



- Error taken as the difference between the largest and smallest values per bin