DPDFs Update and Clarifications

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Introduction and Apology

- Apologies for missing diffraction meetings.
- Fully back on track and focused on inclusive diffractive DIS analysis.
- Encountered some issues in steering files RAPGAP, but they seem resolved.
- Requested a slot on August 25 for a full update including reconstructed-level cross sections.

Radiative Corrections: QED vs Full Electroweak

- Noticed different steering files for radiative corrections (Jung vs Paul).
- Jung includes LPIN parameters for weak/electroweak corrections, Paul only QED.
- Clarification needed: Are we applying purely QED radiative corrections or full electroweak?
- Enrico's recommendation: Generate two samples
  - One with QED only
  - One with full electroweak corrections
- This allows quantifying the impact of non-QED contributions.

Sample Generation Plan

- Generating multiple samples at truth level is feasible and quick.
- Question posed: Should comparison also be done at reconstructed level?
- Plan: Start with truth-level comparison, then extend to reconstructed level if needed.

Clarification on Beta Calculation

- Identified discrepancy in β values: sometimes $\beta > 1$.
- Cause traced to older code approximating x_B using $Q^2 = sxy$ with simplified $s = 4E_eE_p$.
- Small errors in x_B cause large errors in $\beta = \frac{x_B}{x_{\mathbb{P}}}$.
- Attached detailed PDF explains the exact and approximate formulas for β.

Relation Between β, x_B, and $x_{\mathbb{P}}$

$$x_B = \frac{Q^2}{2P \cdot q}$$

$$x_{\mathbb{P}} = \frac{(P - P') \cdot q}{P \cdot q}$$

$$\beta = \frac{x_B}{x_{\mathbb{P}}} = \frac{Q^2}{2(P - P') \cdot q}$$

Invariant Mass of Hadronic System X

$$M_X^2 = (q + P - P')^2 = q^2 + (P - P')^2 + 2q \cdot (P - P')$$

where

$$q^2 = -Q^2, \quad (P - P')^2 = t, \quad 2q \cdot (P - P') = \frac{Q^2}{\beta}$$

Thus,

$$M_X^2 = -Q^2 + t + \frac{Q^2}{\beta}$$

Beta Formula Rearranged

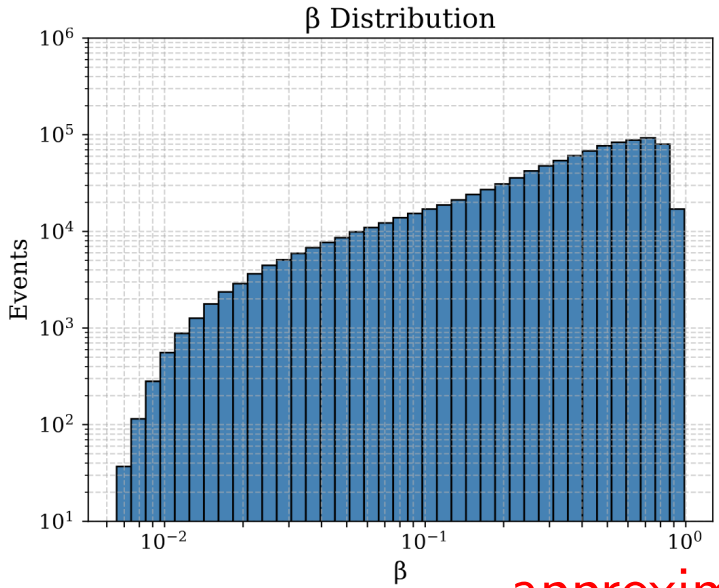
$$\Rightarrow \beta = \frac{Q^2}{Q^2 + M_X^2 - t}$$

Approximate for small $|t|$:

$$\beta \approx \frac{Q^2}{Q^2 + M_X^2}$$

Summary

- First and third forms of β are exact.
- Second form is an approximation valid when $|t| \ll 1$.



approximate ↓

- Defined as:

$$\beta = \frac{Q^2}{2(P - P') \cdot q} = \frac{Q^2}{Q^2 + M_X^2} = \frac{x_B}{x_{\mathbb{P}}}$$

- Sensitive to the substructure of the diffractive exchange.

exact ↑ exact ↑

Steering File Debugging and Parameter Choices

- After detailed review and discussions, concluded most parameters should follow Paul's steering file.
- Encountered a major issue: Paul's steering file includes a very different proton structure (PDF) section.
- Directly copying Paul's steering file led to RAPGAP errors.
- Significant time spent debugging and adapting the steering file to avoid errors.
- This effort is crucial for generating consistent and stable samples?

Next Steps

- Generate and analyze samples including all the cross section, with QED-only and full electroweak corrections and no rad. corrections. (Thursday, via mail)
- Given the above, ready to proceed towards generating reconstructed-level samples?
- Move to recon lvl, prepare reconstructed-level cross sections and QA/control plots.
- Continue investigating radiative corrections impact at recon lvl.
- Present full update on August 25 meeting.