Theory role and tasks for the inclusive reactions

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General Plan

- Theorists will produce theoretical cross sections
- Event level MC events (full final state) will be produced to match theory cross section
- Detector level MC event will be generated (acceptance, resolution, PID efficiencies)
- Target cross sections/asymmetries will be reconstructed
- Pheno groups (CJ, JAM, NNPDF,...) will carry out global fits using pseudo EIC data
Vertex level MC

1) electron only:
   - **pros**: simple and fast,
   - **cons**: missing PI miss identification

2) full final state:
   - **pros**: simple, higher realism
   - **cons**: mismatch of pQCD accuracy ie LO+PS vs Fixed order NLO

3) full final state:
   - **pros**: consistent with theory input
   - **cons**: more challenging to implement
1) Global fits:
   pros: more reliable,
   cons: more work

2) Reweighting:
   pros: quick and fast
   cons: less reliable than global fits

3) PDFsense, t-test:
   pros: complementary information
   cons: not clear how to translate into quantitative impact on PDFs
t-test

- The basics

\[ t = 2 \ln \frac{L(\text{PDFsetA, detector})}{L(\text{PDFsetB, detector})} \]

\[ L(\text{PDFset}) = \prod_{i=1}^{N} f(\theta_i | \text{PDFset}) \]

\[ f(x_i, Q_i^2 | \text{PDFset}) = \frac{\epsilon(x_i, Q_i^2)}{\sigma_{\text{tot}}} \frac{d\sigma}{dx dQ^2}(x_i, Q_i^2 | \text{PDFset}) \]

\[ Z = \sqrt{2} \text{erf}^{-1}(2p - 1) \]

- Very simple to implement
- No need for PDF fits
Next Steps (goals for Pavia’s meeting)

- **Vertex level MC (VLMC):**
  - theory cross section interpolators
  - MC samples

- **Pheno:**
  - impact studies using reconstructed observables from detector level MC