Theory role and tasks for the inclusive reactions

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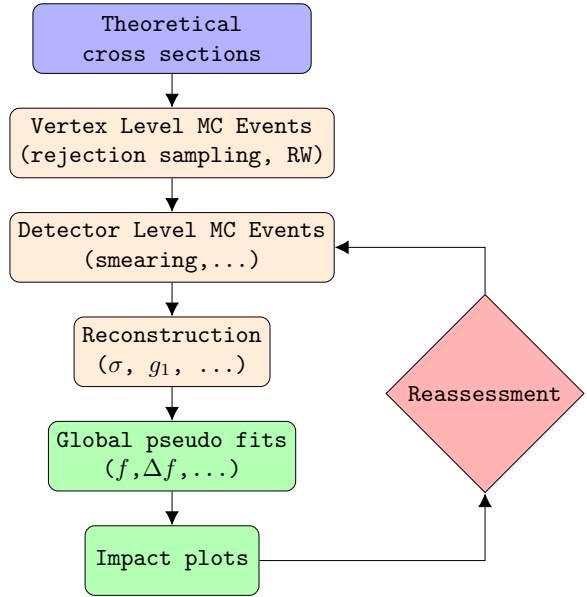
1st EIC Yellow Report Workshop at Temple University

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

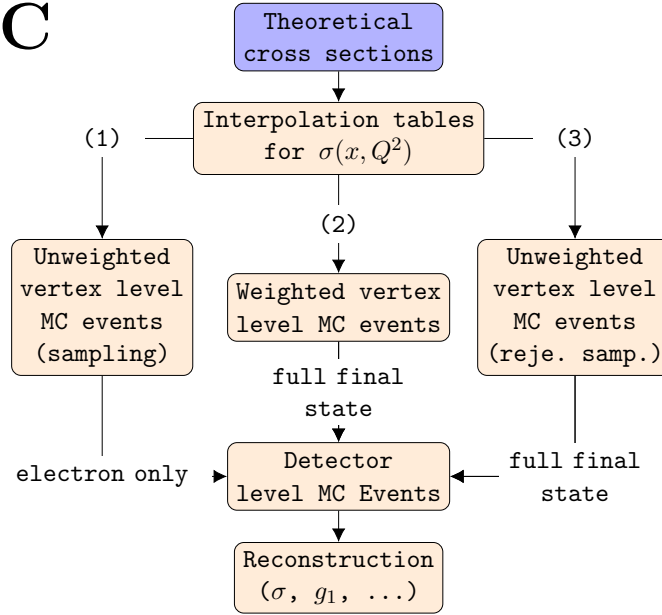


Vertex level MC

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



Pheno

1) **Global fits**:

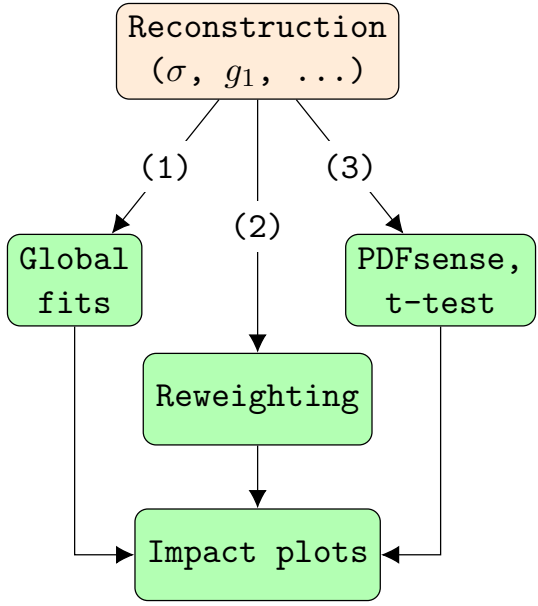
pros: more reliable,
cons: more work

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

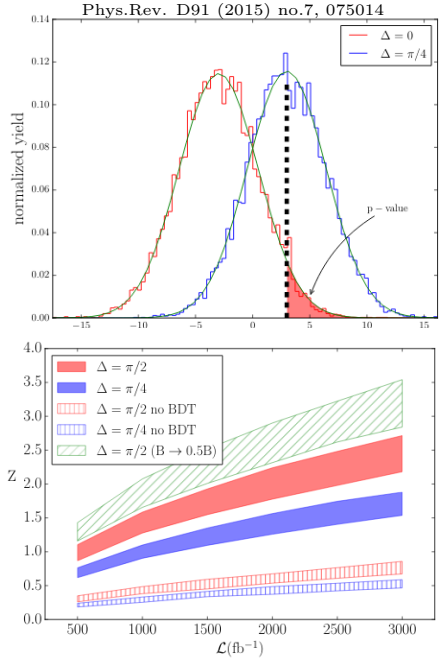
$$t = 2 \ln \frac{L(\text{PDFsetA}, \text{detector})}{L(\text{PDFsetB}, \text{detector})}$$

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

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

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

- 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