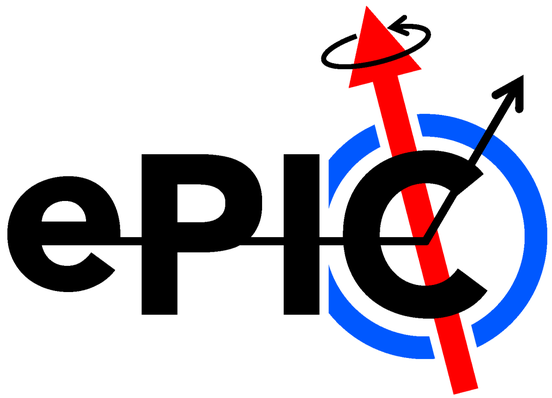
Inclusive physics update

Tyler Kutz

ePIC analysis meeting

April 12, 2024



Status of TDR tasks

- Electron ID — Shirsendu (IIT)
- Track-cluster matching — Fatma (AUC)
- Resolution-weighted electron energy reconstruction
- Bin studies (common to multiple observables):
  - Bin stability and purity
    - Repeat for each reconstruction method
  - Acceptance and bin migration correction
    - Repeat for each reconstruction method
  - Bin size optimization

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Hadronic final state incorrect in EICrecon

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- Neutral-current reduced cross sections
  - Corrections to raw yield
  - Projected statistics
  - Estimated systematics
- Double-spin asymmetries
  - Weight events by model asymmetry
  - Projected statistics (split between spin states)
  - Estimated systematics
- Systematic studies — Arpit (IIT)
  - Pion contamination
  - Resolution
  - Photoproduction background

Inclusive kinematics from hadronic final state

Problems:

- Calculation of hadronic final state variables repeated as needed
- Hadronic reconstruction algorithms (i.e., Jacquet-Blondel) neglect neutral particles
- Variables not saved to output...must be recalculated for analysis cuts

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In-progress solutions:

- New EDM4eic data type HadronicFinalState
  - Merged PR 74
- Algorithm and factory for centralized calculation (*with* neutrals!), add to PODIO output
  - Pending PR 1364
- Convert hadronic reconstruction algorithms to use factory instead of repeating calculation

```
484 +   edm4eic::HadronicFinalState:
485 +     Description: "Summed quantities of the hadronic final state"
486 +     Author: "T. Kutz"
487 +     Members:
488 +       - float             sigma             // Longitudinal energy-momentum balance (aka E - pz)
489 +       - float             pT                // Transverse momentum
490 +       - float             gamma             // Hadronic angle
491 +     OneToManyRelations:
492 +       - edm4eic::ReconstructedParticle hadrons // Reconstructed hadrons used in calculation
```

Other tasks

- Had meeting last week with IIT (Arpit and Shirsendu) on track-cluster matching and double-spin asymmetries, will check in on progress next week

- AUC (Fatma) working on tracking/calorimetry resolution maps for electron energy reconstruction

NC cross sections:

- Wanted to have plots today, but don't fully understand generated distributions used for corrections (suspect this is due to a bug in combining different minimum Q^2 samples)
- Hoping to have some preliminary results for inclusive PWG meeting on Monday
- Side note: have a table of generated cross sections from Pythia8 events used for campaigns...happy to share if this would be useful for others