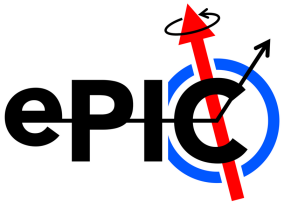


Tracking Challenges* in ePIC

Matt Posik
Temple University

* Many tracking related challenges currently in progress

MPGDs

Short Term

- Work is progressing on the implementation of a more realistic MPGD-ECT. The detector has been tested in DD4HEP and work is underway integrating it into ACTS for inclusion in reconstruction.
- Work is continuing to switch from pixelated readout to a strip readout. Currently working through technical issue related to DD4HEP/ACTS interpretation.
- MPGD requirements are still fairly general. With background embedded physics events now available, needed spatial and timing resolutions can be better assessed.
  - Could be studied within the framework of pattern recognition studies.
  - Will guide final selection of readout and gas mixture
- Position dependent (e.g. R, Z) occupancy/background rates in MPGDs need to be evaluated.

MPGDs (Cont'd)

Medium Term

- A design change to the CyMBaL detector was proposed to aide in servicing the detector. This change is currently being assessed.
  - **See *Status of CyMBaL Detector Design* by Audrey Francisco (Today 11AM)**
- Parameterized data from recent test beam results can be implemented into ePIC simulation to provide more accurate detector performance.
- Define a list of relevant tests needed for MPGD engineering articles to help identify critical aspects.
  - Can also include measurements which can be used in simulation to allow more accurate detector response in simulation (e.g. charge distribution across readout strips)

Long Term

- Refine detector response parameterization based on engineering article tests

SVT

Short Term

- The last disk in z (furthest from IP) needs to be moved to deal with the interface between last Si-disk and the MPGD disk. Should only the last Si-disk be moved or should the spacing between the Si-disks also be adjusted?

Long Term

- Implement curved SVT Si sensors into simulation (started)

Tracking: Pattern Recognition and Backgrounds

- For more details see the presentation ***Tracking Studies for the preTDR*** **by Barak Schmookler (Today 10:30AM)**

Short Term

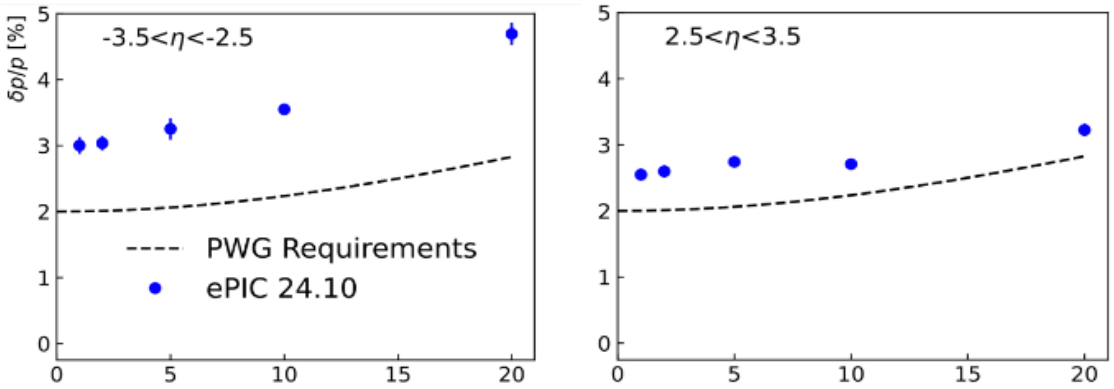
- Track efficiencies vs track purity. How often does a track contain a hit that did not come from the dominate contributor to the track? How is performance impacted?
- How well can we separate DIS events from backgrounds
  - The above two points have started (https://indico.bnl.gov/event/28743/)
- How well does ePIC reconstruct low Q^2 events? How often are low-Q2 events misidentified, e.g. as higher-Q2 event due to picking up electron from beam+gas event?
- How often do we misidentify pure background as DIS event?
- Simulation studies should make use of two critical beam configurations: 10/18 GeV x 275 GeV, representing the highest luminosity and energy settings, to *stress* test ePIC.

Tracking Performance Requirements

Short Term

- The ePIC tracking system alone doesn't meet performance requirements in forward and backward regions.
  - Can calorimeter /PID be used to meet physics requirements?
  - Can physics requirements be presented in a more granular way, e.g. finer binning in η?

Relative Momentum



EIC DAC Meeting June 2025

Tracking Performance Requirements (Cont'd)

Short Term

- Angular resolutions of tracks projected into hpDIRC do not meet current physics requirements for hpDIRC.
  - Ongoing progress being made to assess impact of 1st BIC imaging layer on angular resolutions at hpDIRC
  - Current requirement is 0.5 mrad @ p = 6GeV
    - Can physics requirements be made more realistic (e.g. eta,p dependent) and/or relaxed?

Medium Term

- Assess angular resolution of tracks projected into hpDIRC within background embedded environment