Discussion: Machine Backgrounds in Physics Analyses

Dmitry Kalinkin (Brookhaven National Laboratory)

Today's discussion

The goal of this discussion is to identify areas where reconstruction development is needed and to prepare for the next revision of the preTDR, as well as for the papers planned for the NIMA special issue.

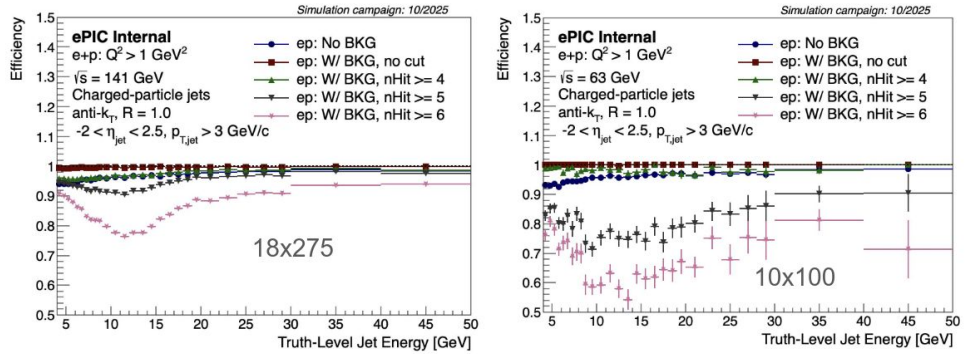
During PAC meeting on Tuesday, March 3. Each PWG is asked to provide a brief update on studies carried out so far that include background, as well as plans for future studies with background.

Main takeaways from that meeting:

- the PWGs are beginning to undertake more detailed background studies
- there are currently no major gaps, other than the completion of the March simulation campaign, which will be the input to the Early Science paper
- the main priorities for new reconstruction algorithms are particle identification and particle flow.

PWG analyses highlights from the PAC meeting

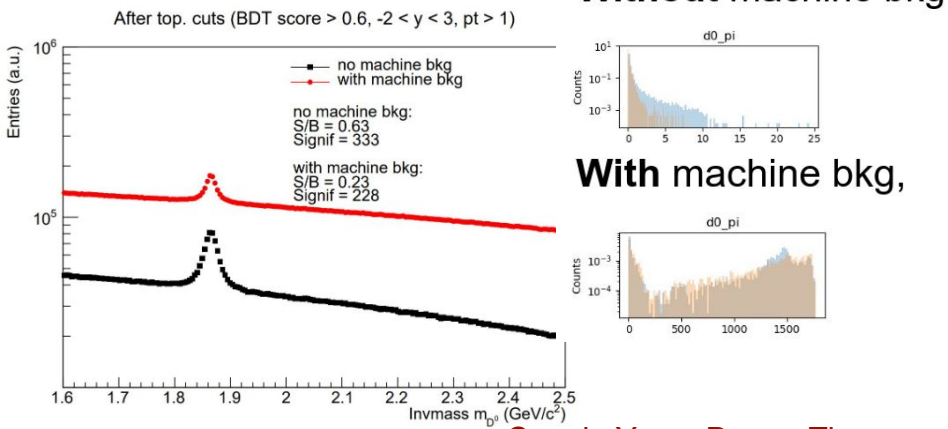
Jet finder efficiency



Efficiency is lower for 10x100 for different cuts (more bkg?)

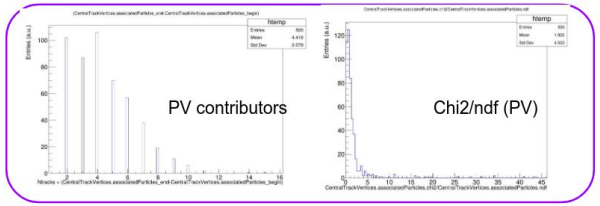
J. Gupta, B. Schmookler, D. De Souza Lemos

Summary and outlook



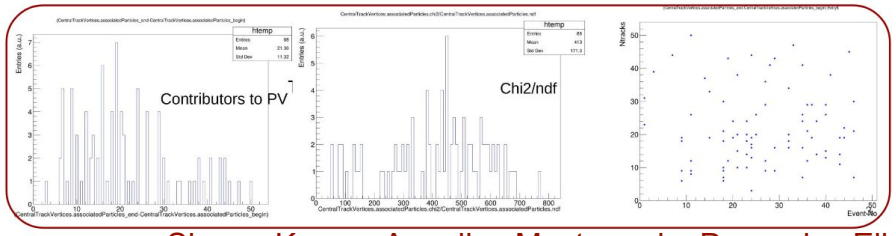
Connie Yang, Deepa Thomas

Background Studies (e+p, 10x100, NCDIS Q^2>1 GeV^2) October campaign



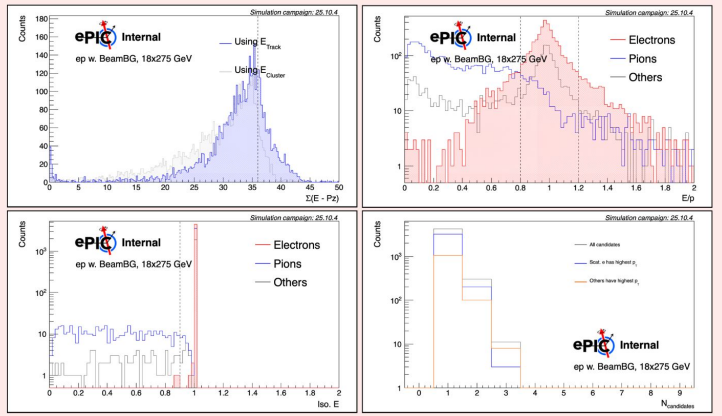
(w/o Bkg) (w Bkg)

Events 591
Events = 48
Average Chi2/ndf ~2
Average Chi2/ndf is larger
PV Contributors larger in case of machine bkg
More than one vertices per event



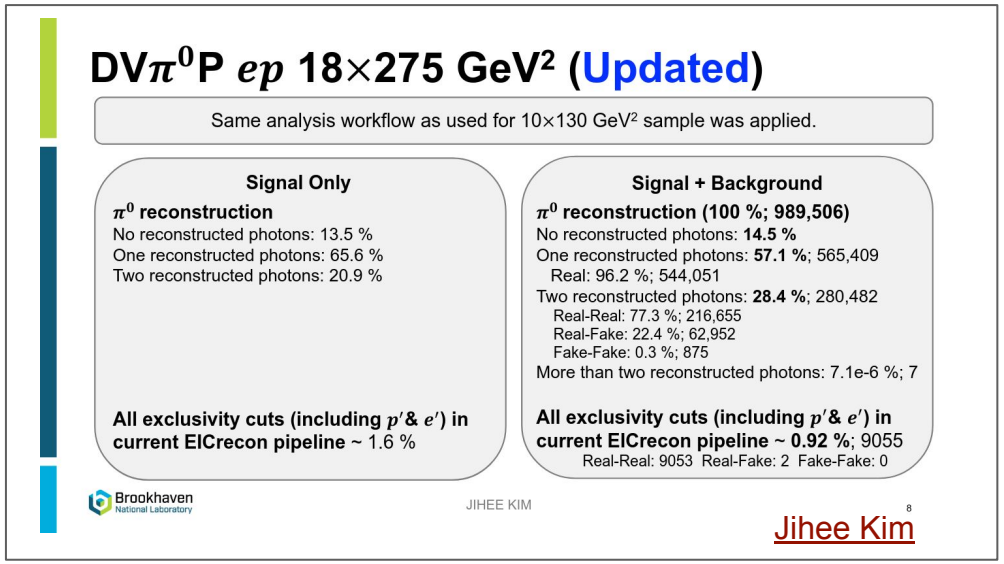
Shyam Kumar, Annalisa Mastroserio, Domenico Elia

eID with beam background - 1 DIS events, > 4 track points



Win Lin

PWG analyses highlights from the PAC meeting



More analyses needed!

See previous talk by D. Romanov for guidance on data analysis and visualization with backgrounds

Communication

Early reporting of issues/needs helps us plan and prioritize development and integration work.

A good way to **report a concern about reconstruction** is to file an issue to EICrecon

Example: primary vertex reconstruction with machine backgrounds (#2405)

- In addition to “PrimaryVertices” (3 hits tracks), a “Primary4HitCutVertices” (4 hit tracks) was added - available in the March campaign
- Appropriate discussion involving PWGs is needed to make 4 hit cut the default

Any **simulation requests** should be communicated to Production WG and Operations Deputy within deadlines (see slide 3 for guidelines)

Example: source-by-source background simulation request (from SVT DSC):

- one merged event has one forced signal plus only one specific background source
- possibly forcing one background event for low-rate sources (for example Coulomb or Touschek)

Cases to consider

Strawman points:

- Reconstruction with 3 hit tracks (discussed in the previous talk by Shujie)
  - A cut can be implemented in analysis
    - can become the default for "ReconstructedChargedParticles" - need discussion and decision
  - However, these tracks enter at reconstruction time into
    - primary vertex fitter (see previous slide)
    - "ReconstructedJets" (see slide 3 study by J. Gupta et al.)
    - used to combine tracks and clusters for "ReconstructedParticles" - should become obsolete with implementation of the Particle Flow
    - "HadronicFinalState" (definition) feeds into some of the "InclusiveKinematics…"
- Calorimetry
  - Currently a challenge question to DSCs
  - Question for us what can be done on the side of the reconstruction? Clustering algorithms should be "robust" against backgrounds.
- PID (in works by SIDIS and DSCs with current EICrecon integration)
- FF/FB