ePIC Performance on Coherent J/ψ Diffractive Pattern with muID Smearing

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Simulation Setup

Sartre

- eAu at 18x110 GeV
- $Q^2 \geq 1$ GeV^2
- Coherent events only
- Forced $J/\psi \rightarrow l^+ l^-$
- No background

Detector

- epic-2023.10.0
- epic_craterlake_18x110_Au.xml

Data Selections and Reconstructions

Single electron selection

If the electron $\eta < -1.5$, use Ecal energy instead of momentum from tracking

Single muon selection

- **Threshold momentum >0.6GeV**
- **MuID Efficiency**

J/ψ reconstruction

- |pid| = 11
- Opposite charges cut on dilepton pair
- If the reconstructed mass is within 2 standard deviations, the e+ and e- are labeled as "J/ψ decayed" dielectrons

Q^2

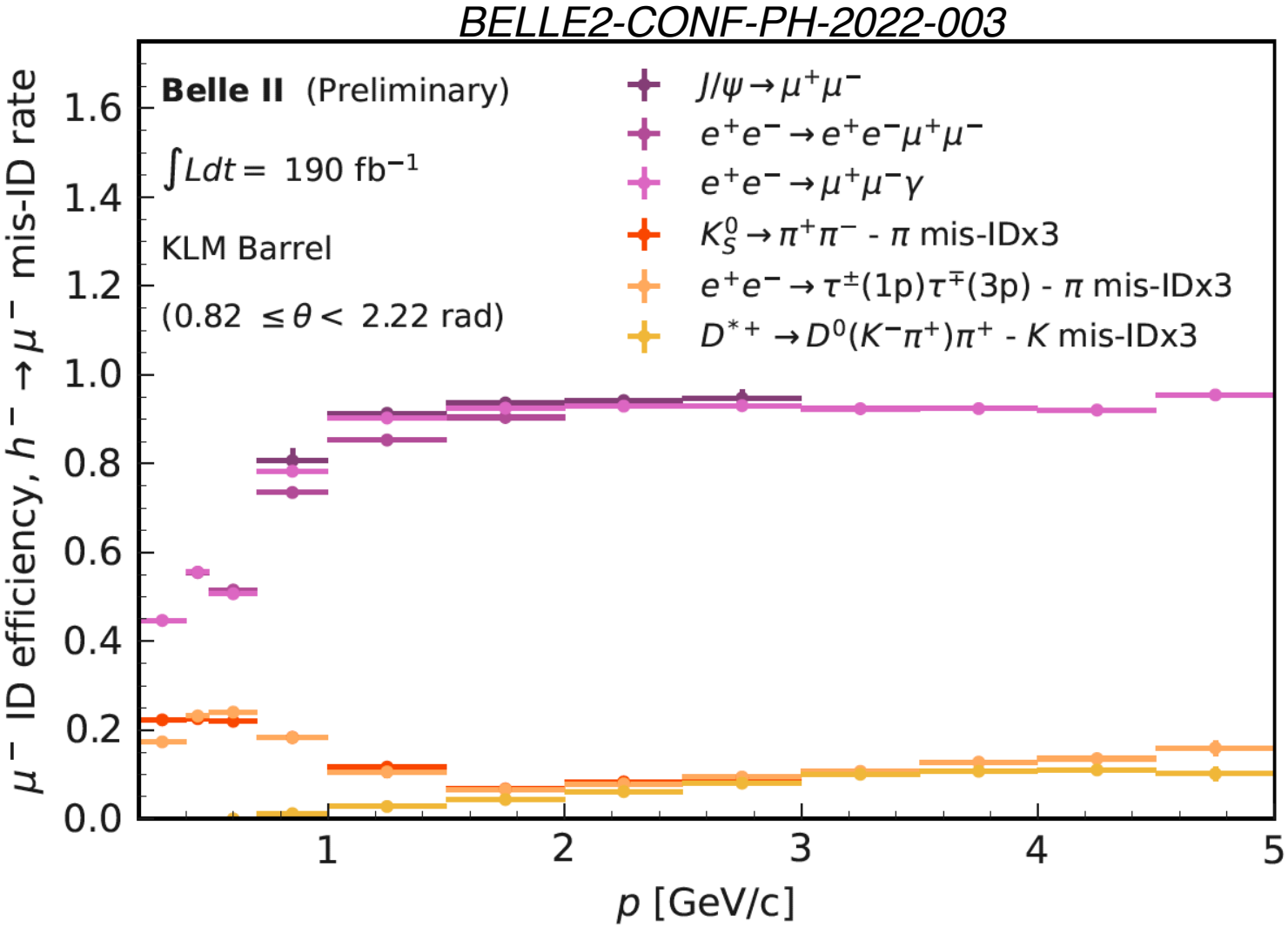
- Scattered electrons must be negatively charged
- "J/ψ decayed" electrons are excluded
- $Q^2 = -(e_{beam} - e_{scattered}).M2()$

t from method L

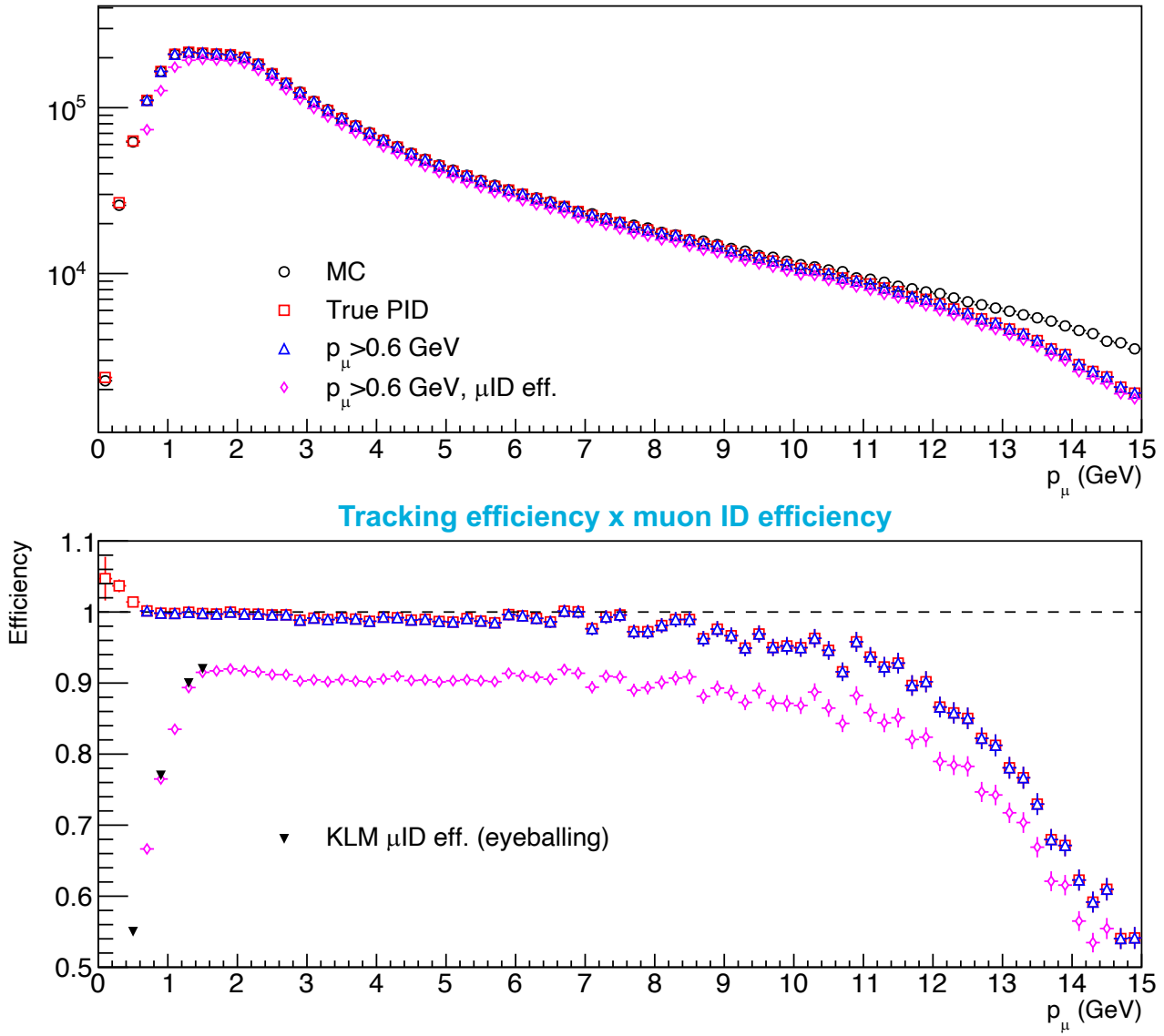
- Removed events with a mis-reconstructed $Q^2 < 1$ GeV^2
- Reconstructed J/ψ $|\eta| < 1.5$
- Require information of the proton beam
- Better t resolutions

Brookhaven National Laboratory

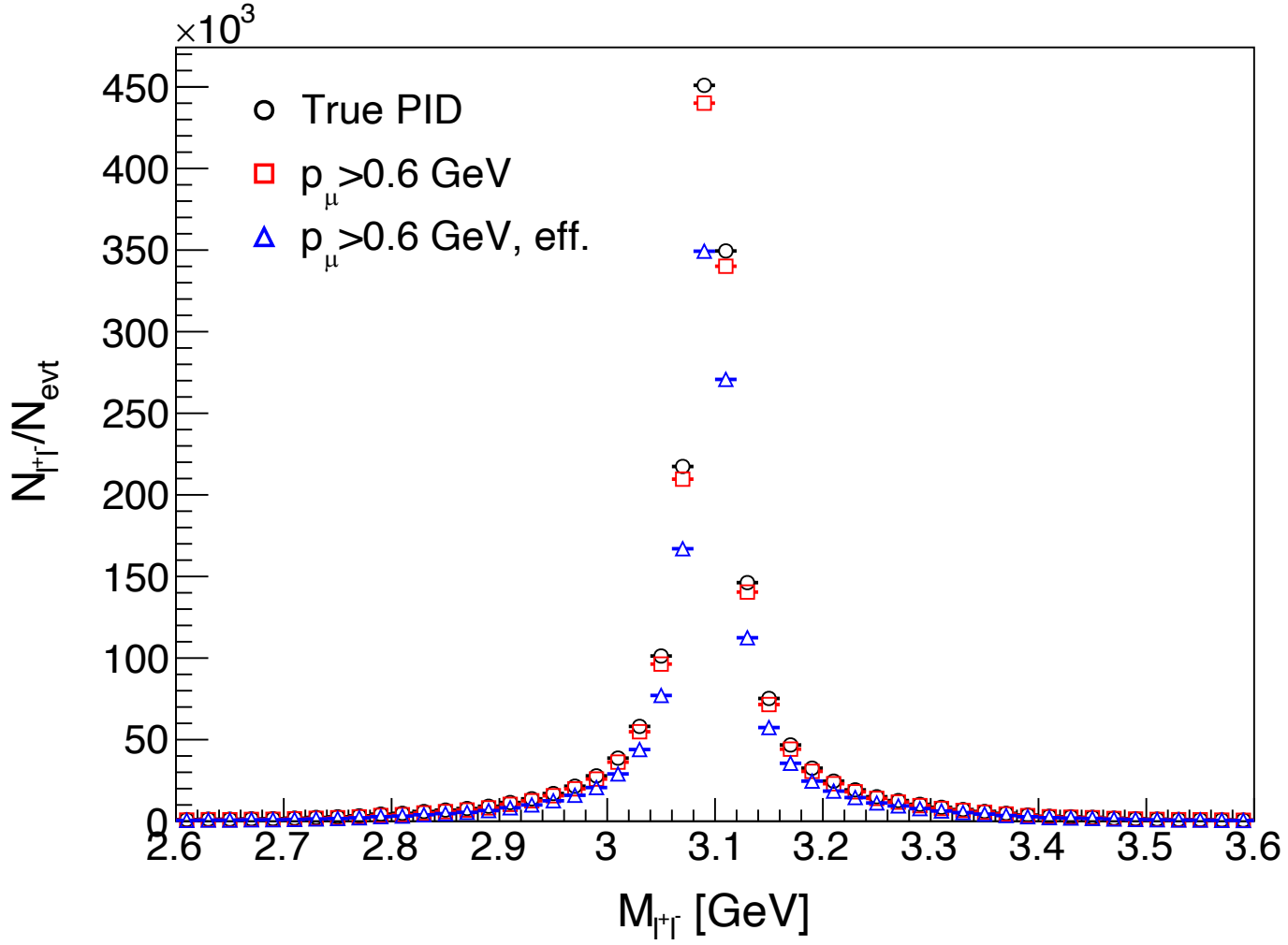
BELLE II KLM Performance



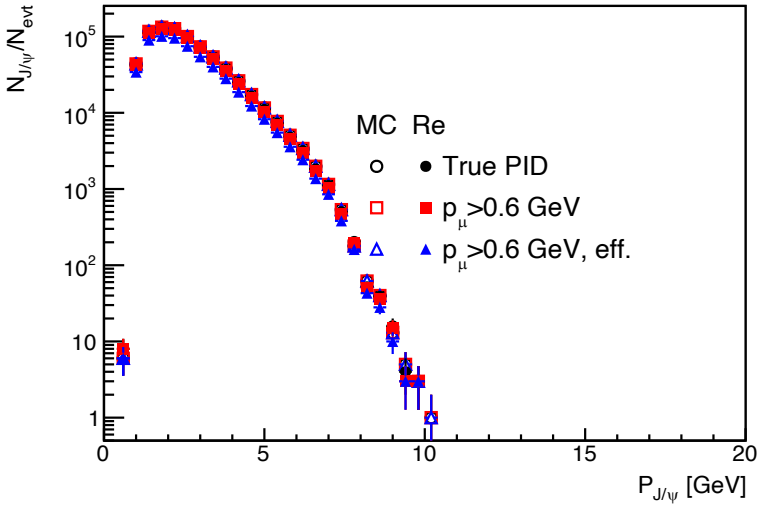
Muon ID Smearing Implementation

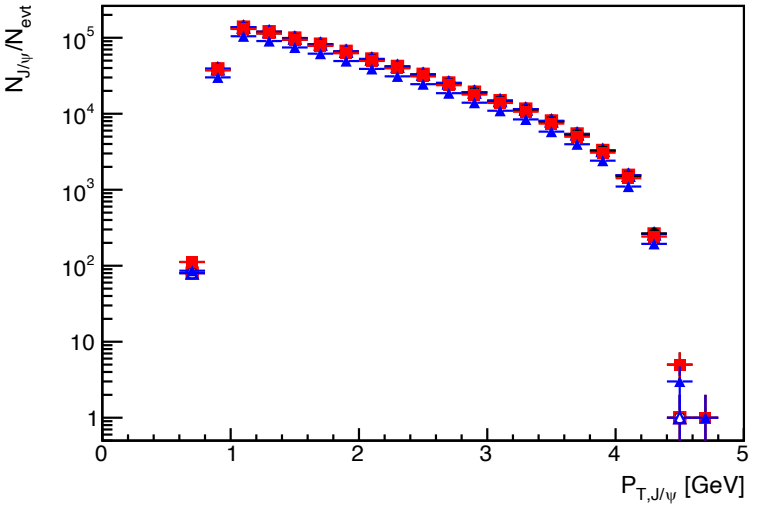


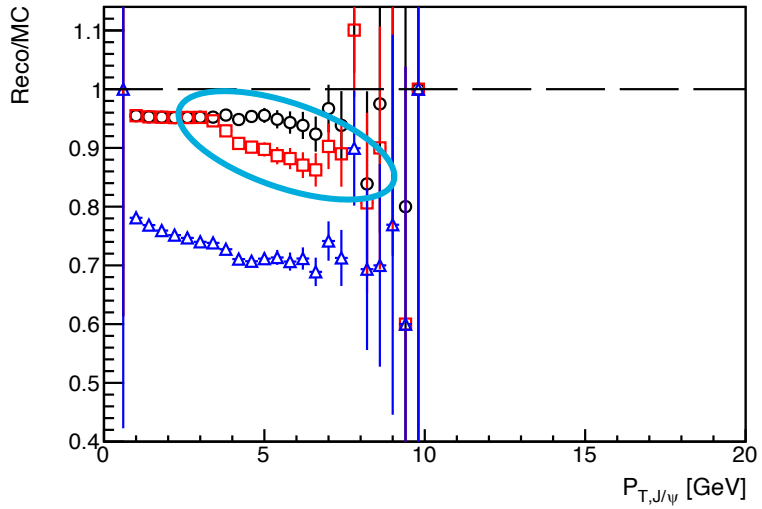
Invariant Mass

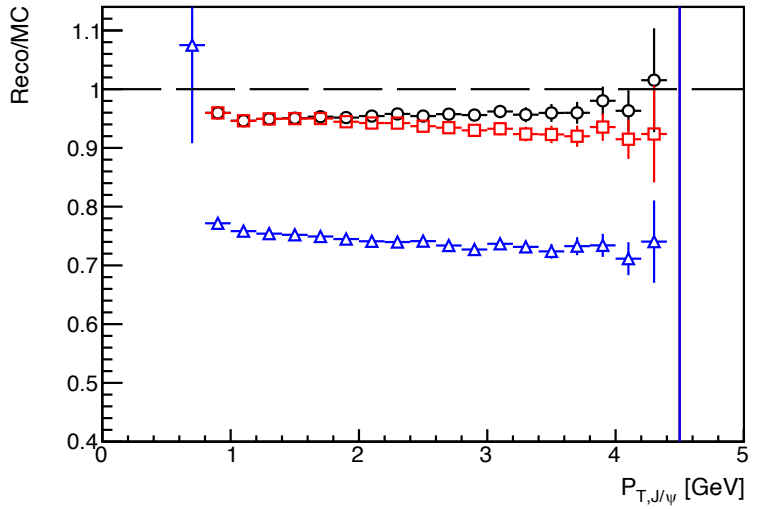


Reconstructed J/ψ Momentum

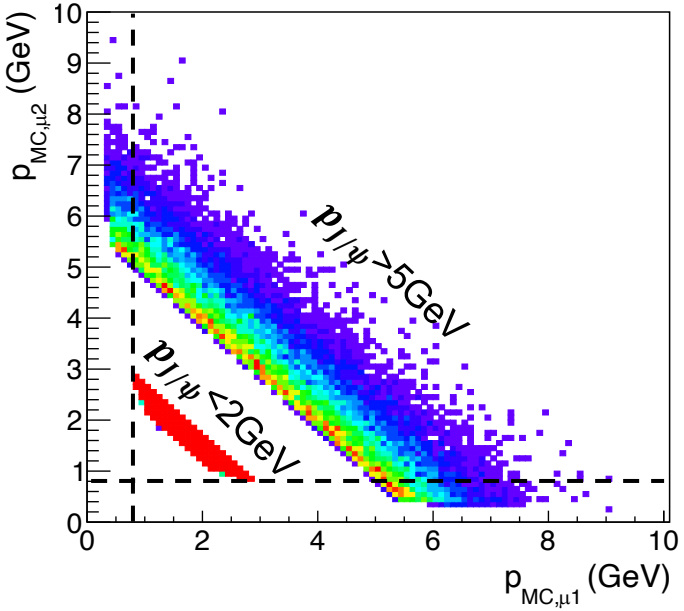






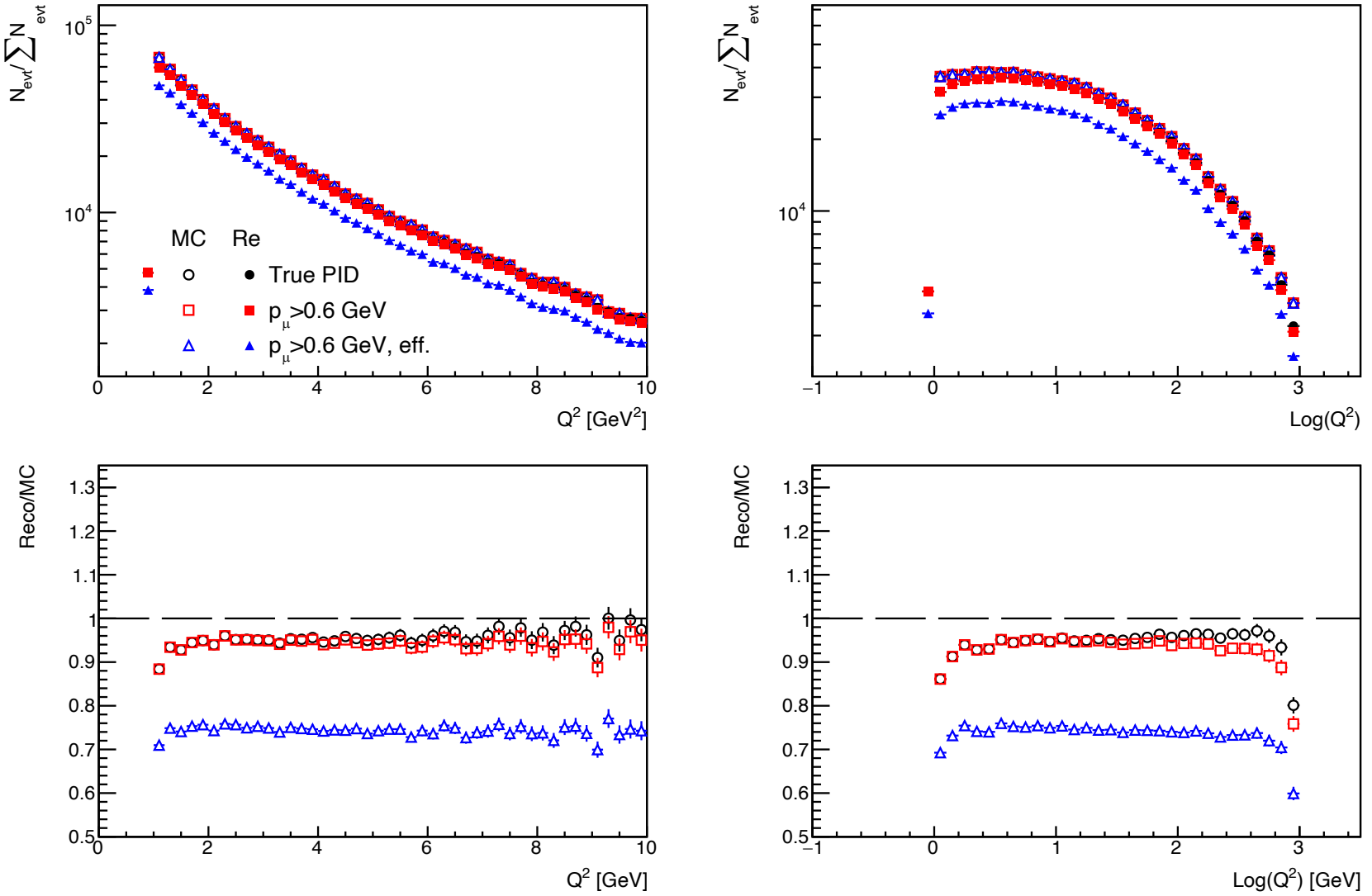


- Low momentum muon is important to high momentum J/ψ reconstruction



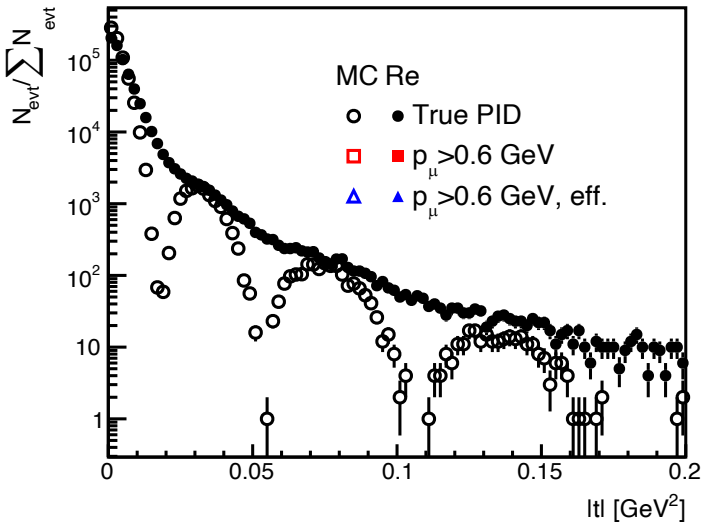
- Statistics are reduced by 15-20% after μID efficiency implementation

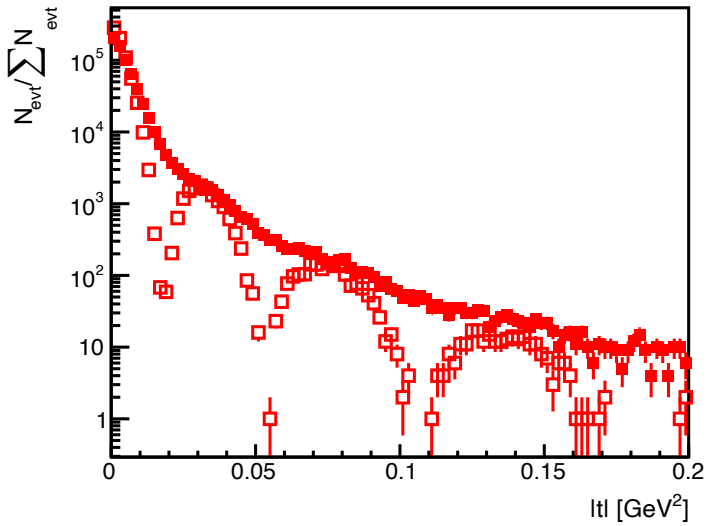
Reconstructed Q^2

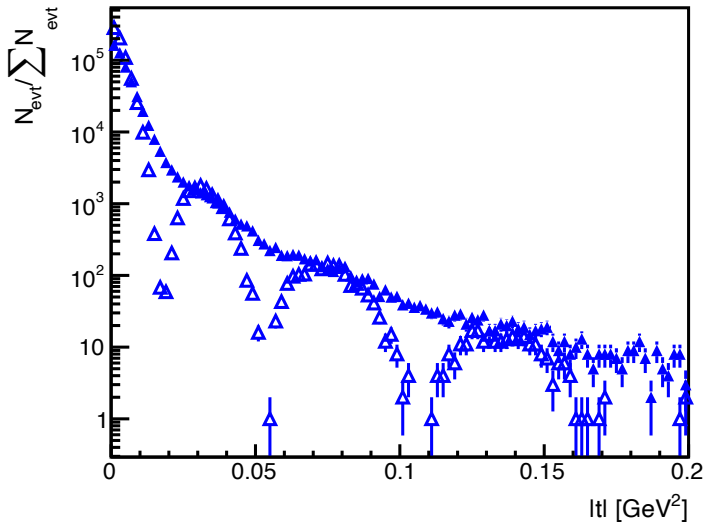


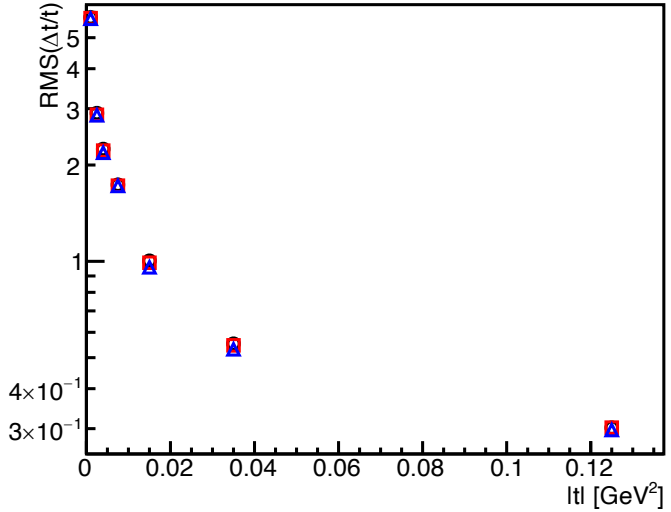
I required a reconstructed J/ψ when reconstructing Q^2

Reconstructed t









No significant changes in t resolutions

Summary

- Implement muID smearing using BELLE II KLM performance
  - The exact numbers of the performance is not given
    →Eyeballing most of the performance plots

- No significant changes in t resolution from muID smearing
- But muID smearing reduces statistics by 15-20%