



ePIC Performance on Coherent J/ψ Diffractive Pattern

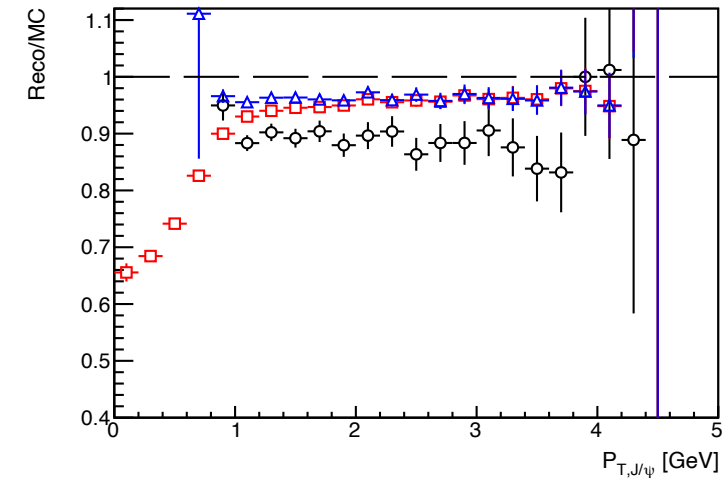
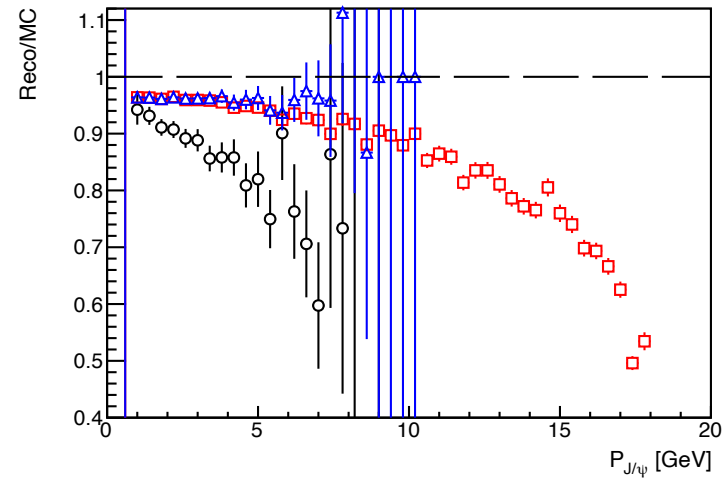
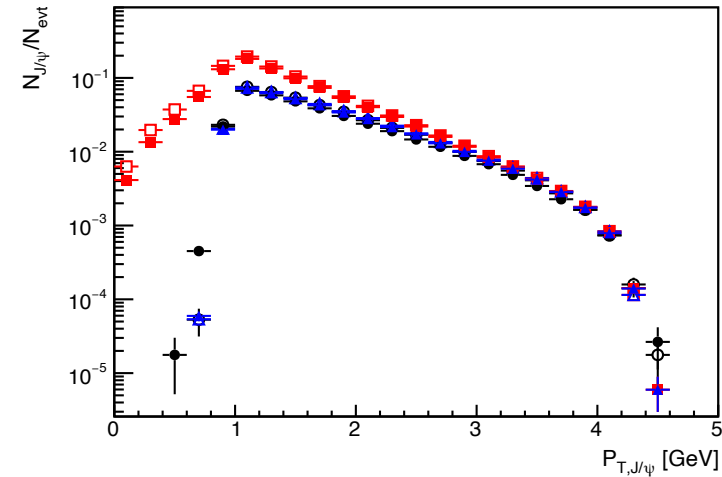
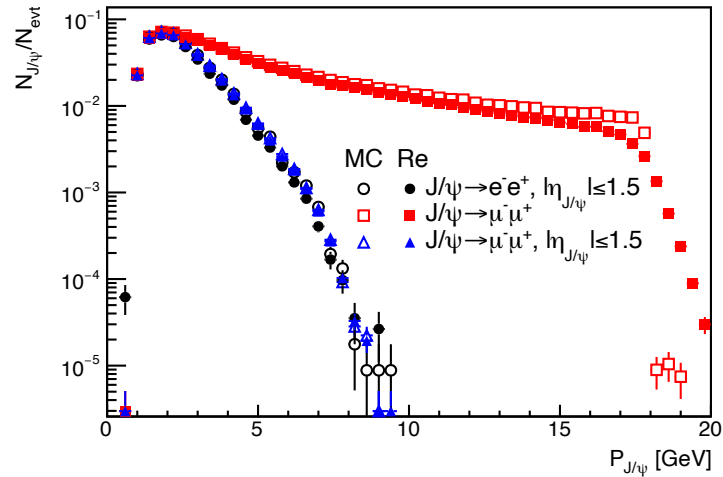
Cheuk-Ping Wong

11-06-2023

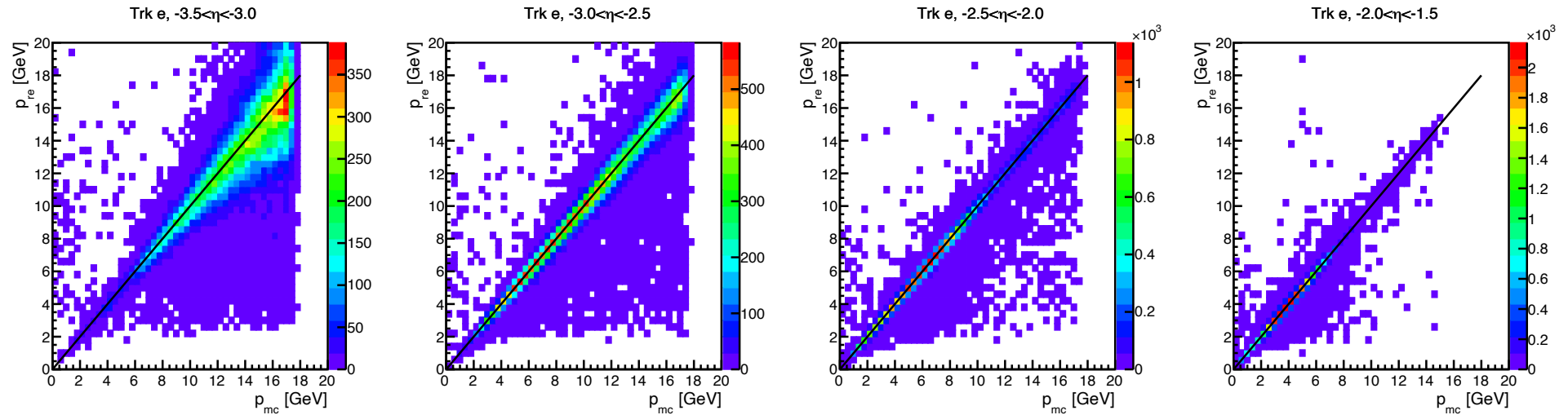


Last Update

Big difference in J/ψ efficiency between dimuon and dielectron channels

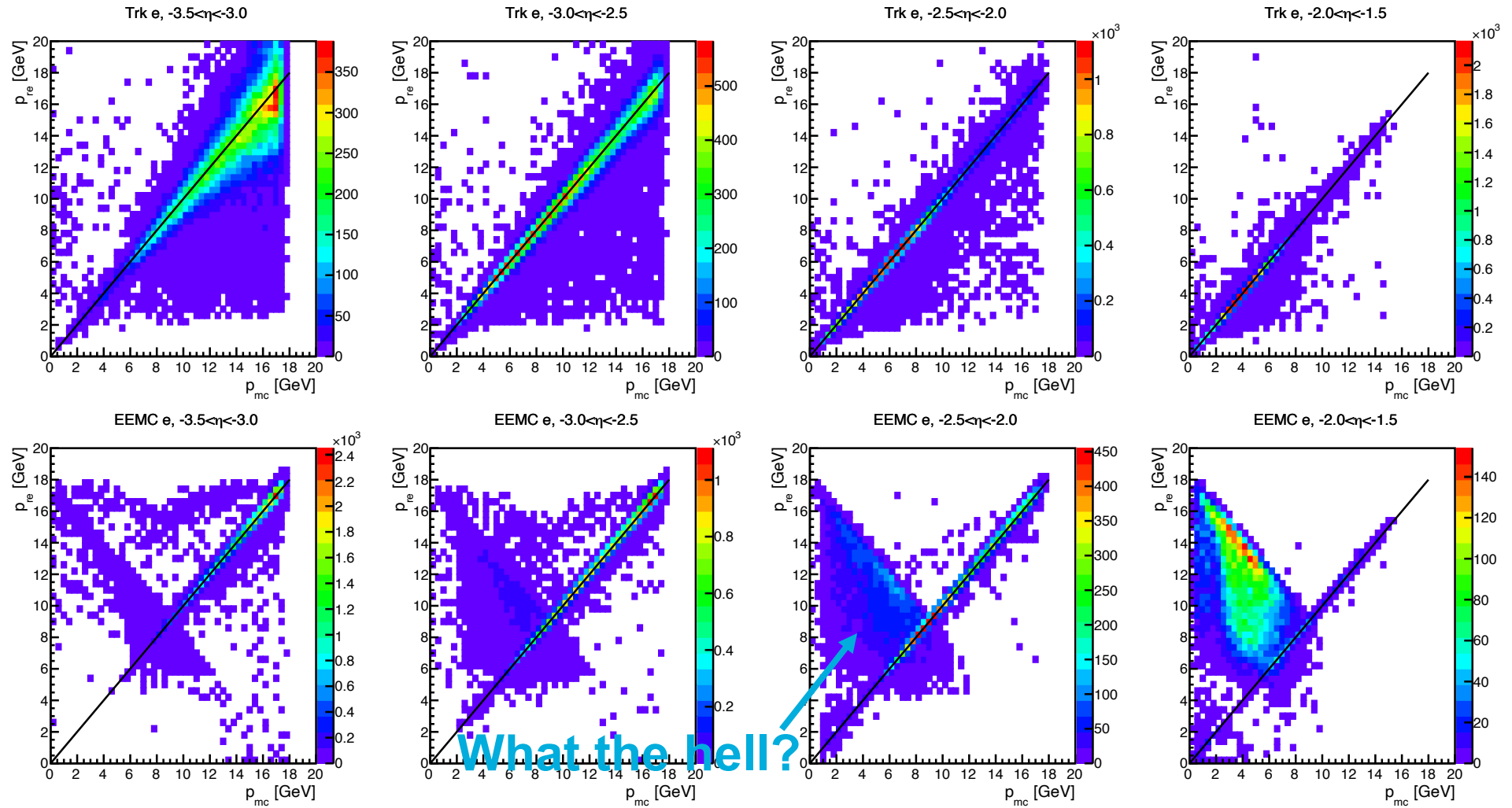


Reconstructed Backward Electron Momentum

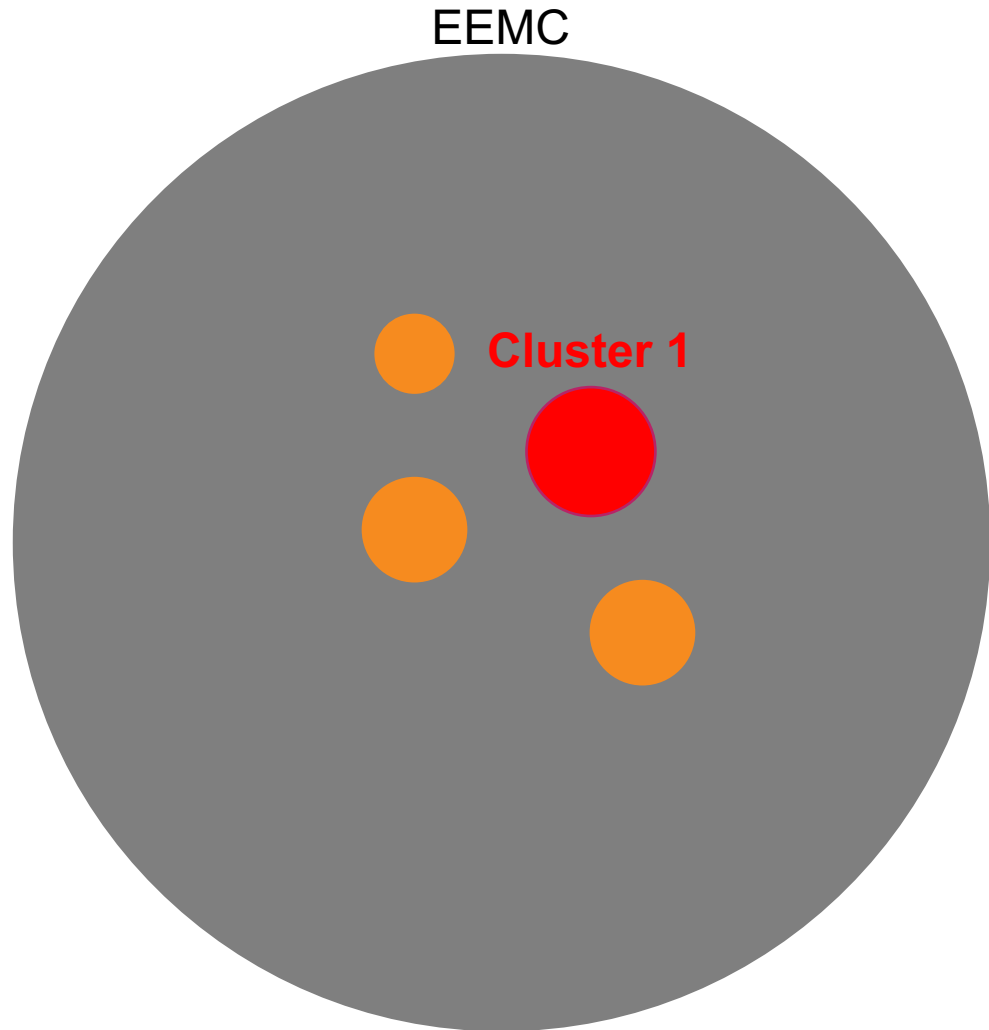


Backward tracks look reasonable

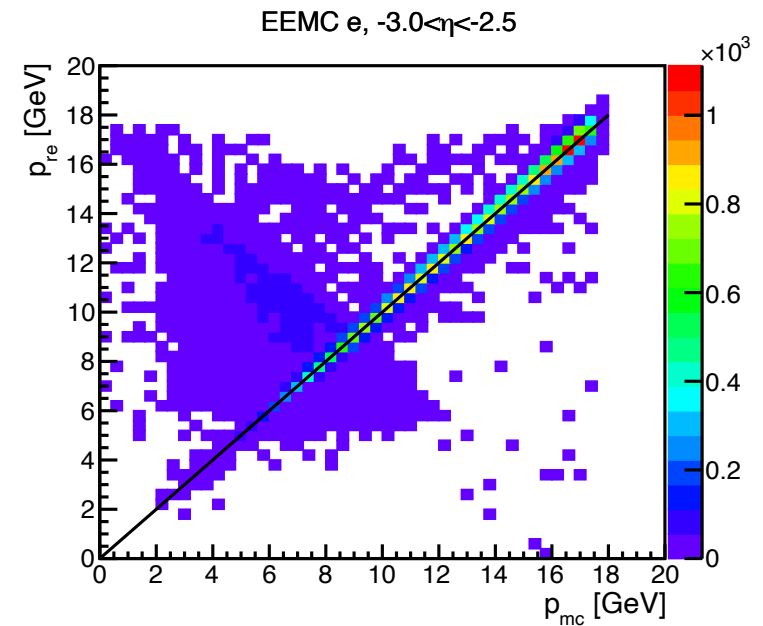
Reconstructed Backward Electron Momentum



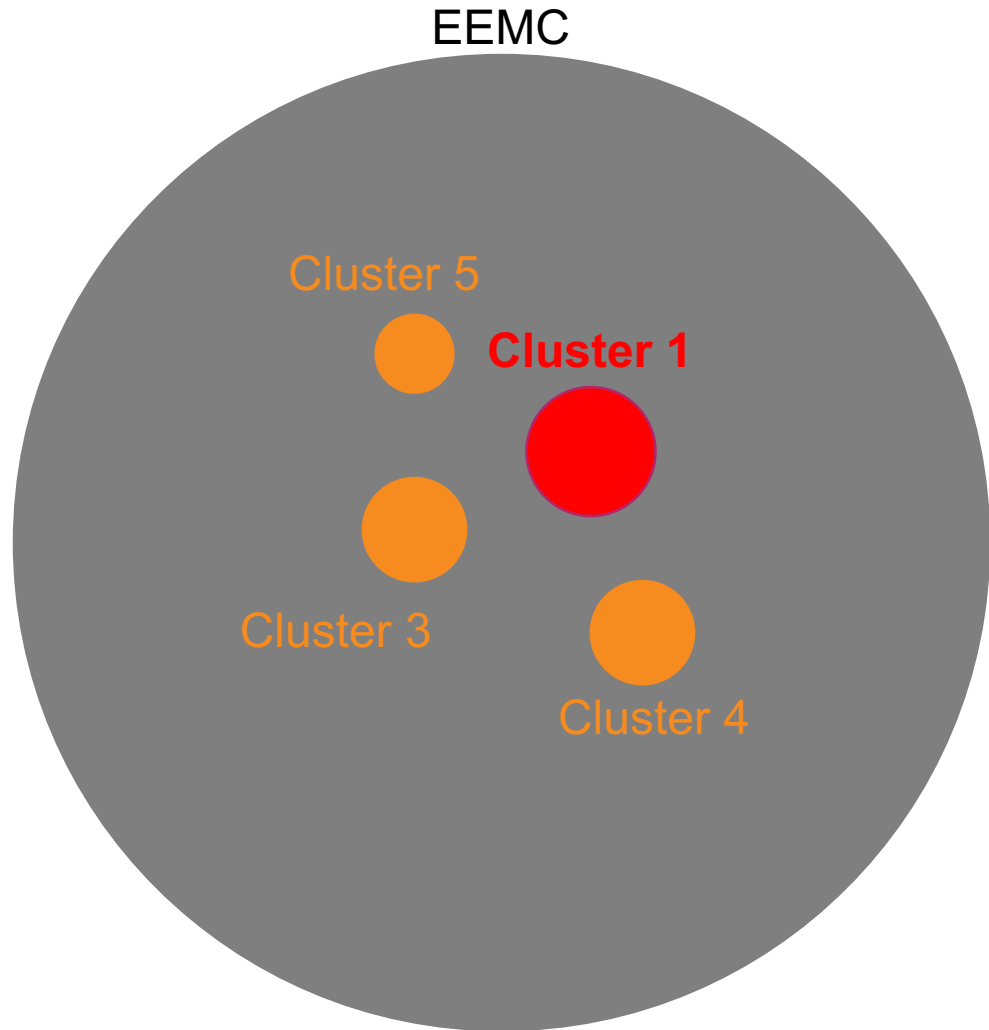
EEMC Clustering



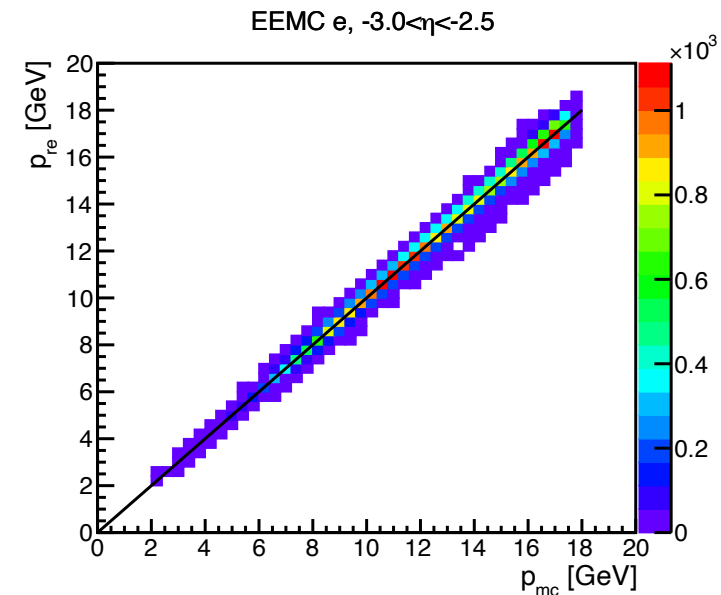
- For each event, find the hottest tower, and form a cluster around it
- But I have more than one backward electron per event
→ they all share the same energy of that hottest cluster



EEMC Clustering -- Correction

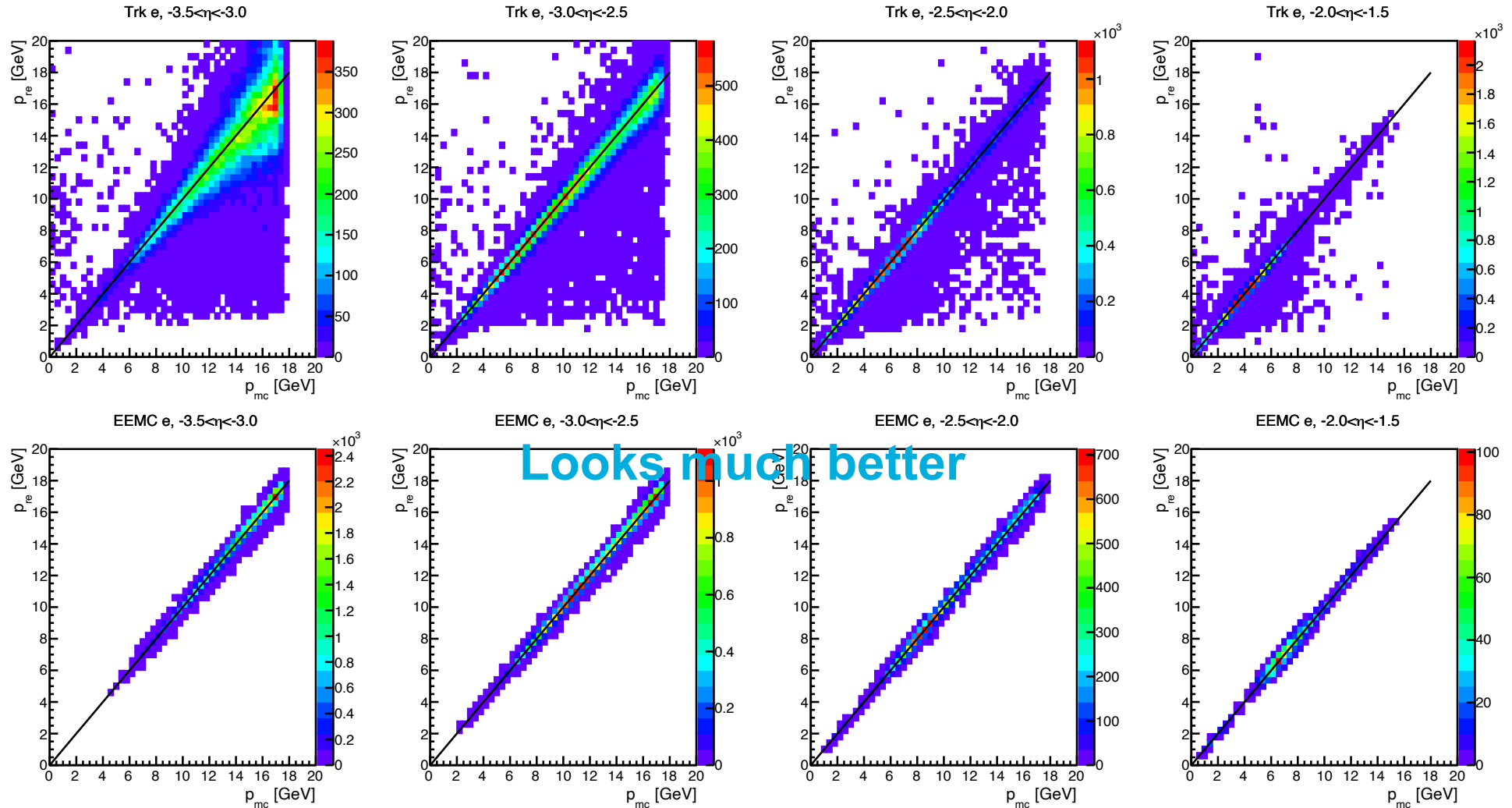


- For each event, find the number of backward electrons, n_{BkElec} .
- Find the n_{BkElec} hottest towers and form the clusters
- Pair the clusters with the backward electrons
 - If $(E_{clus}-E_{MC})/E_{MC} < 10\%$ and
 - The assigned cluster is the one that gives minimum $(E_{clus}-E_{MC})/E_{MC}$



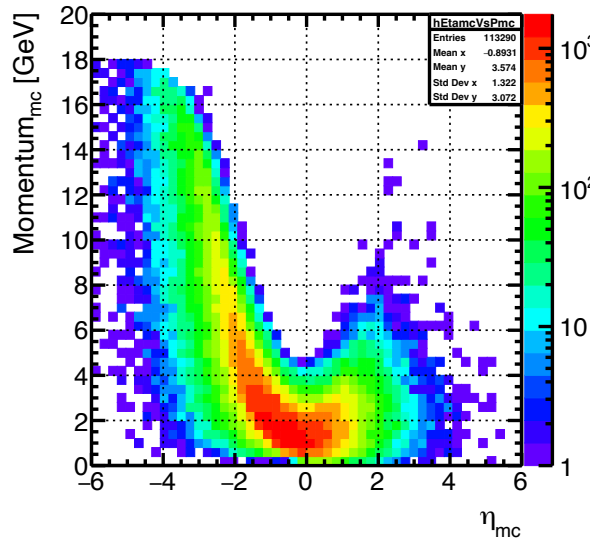
Reconstructed Backward Electron Momentum

with Corrected EEMC clustering

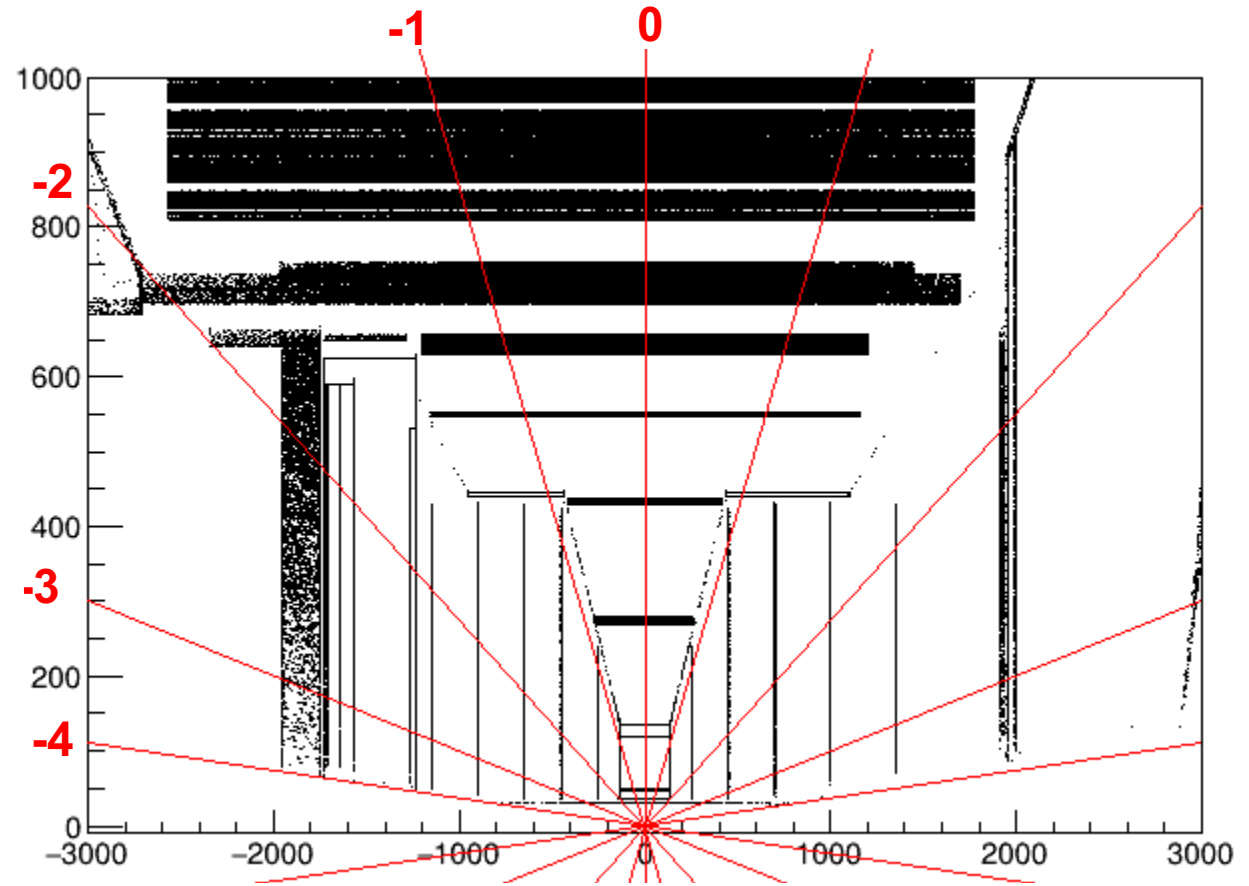
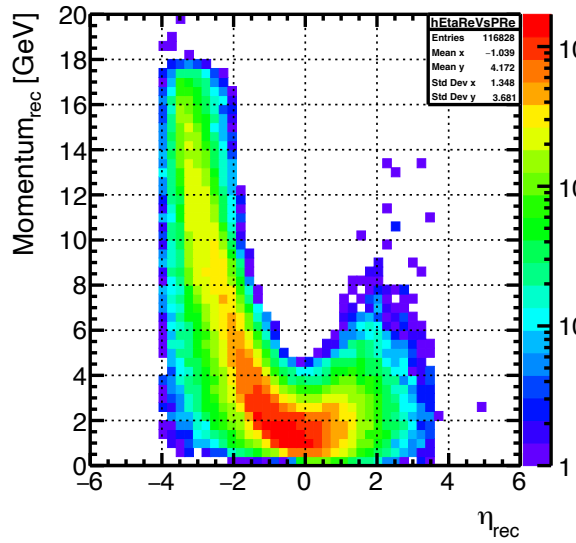


J/ψ Decayed e^+e^- Kinematics

J/ψ decayed e^\pm



J/ψ decayed e^\pm

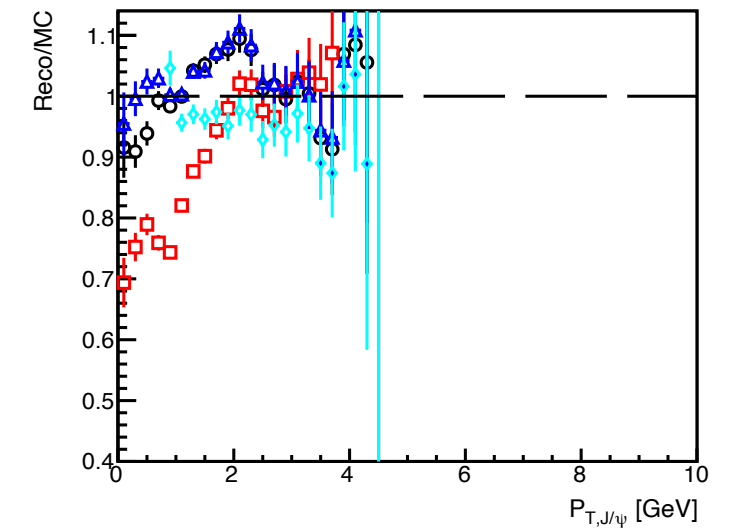
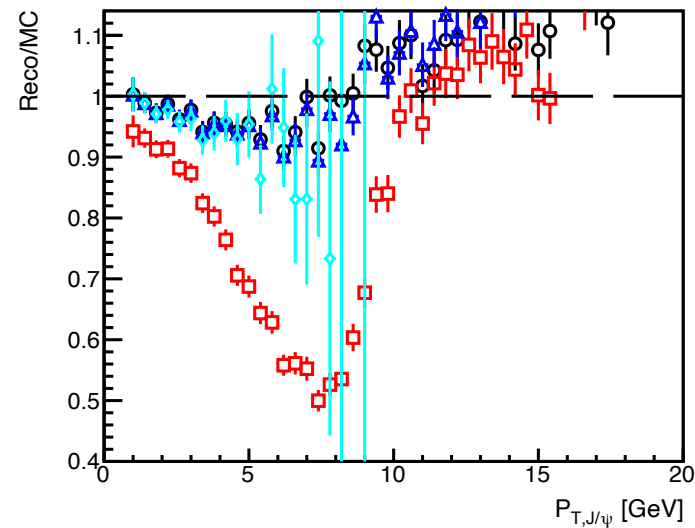
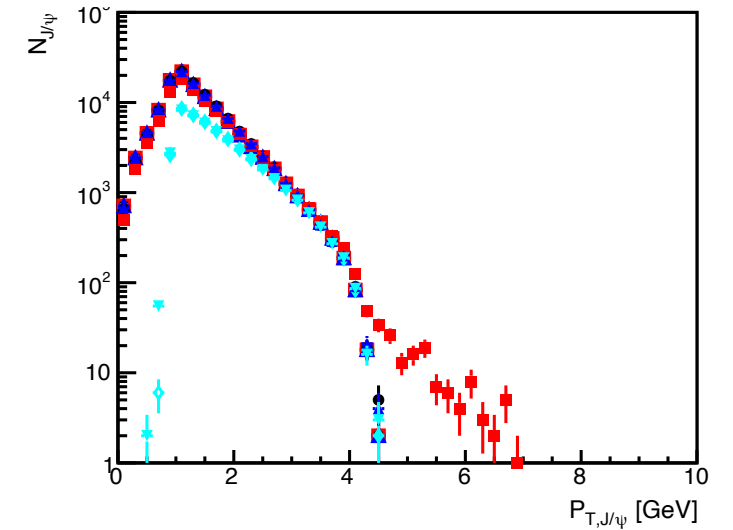
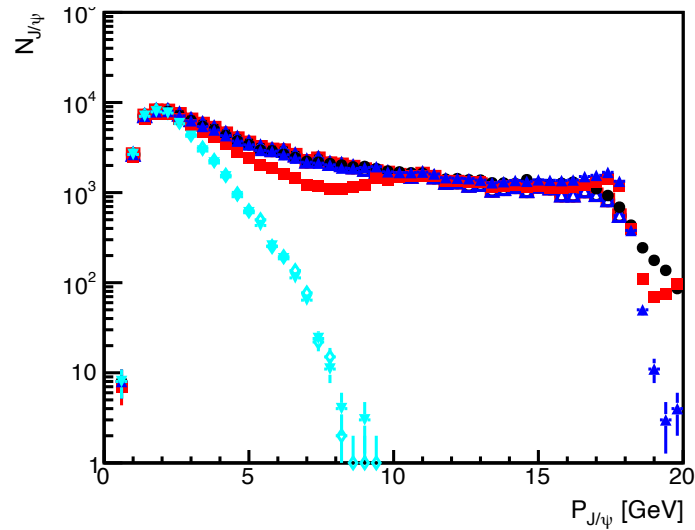
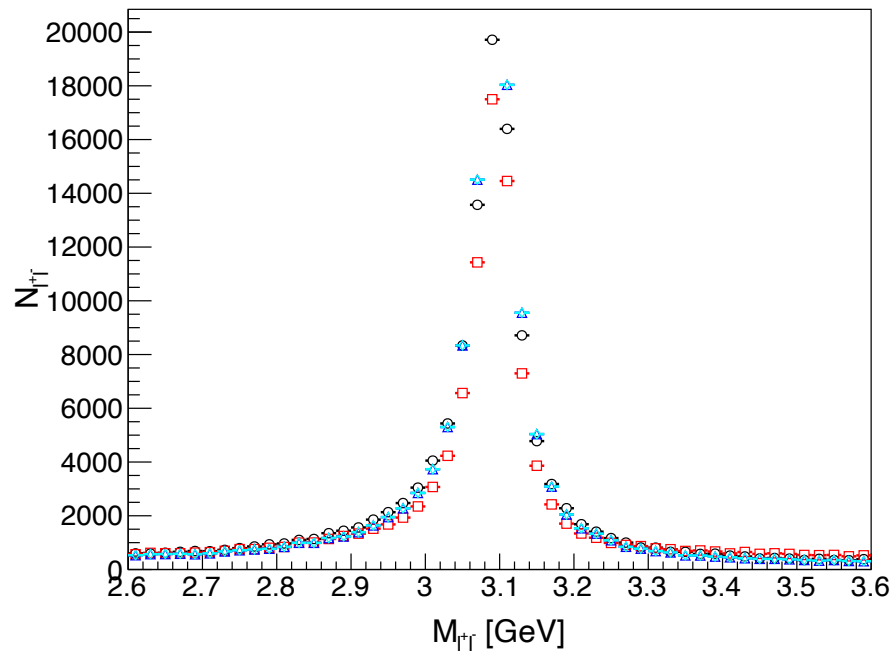


Material map of epic_full.xml

Reconstructed J/ψ Momentum

MC Re

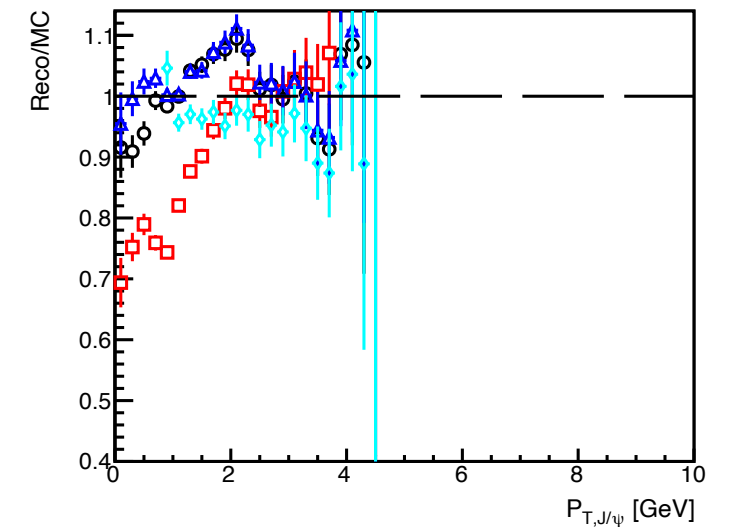
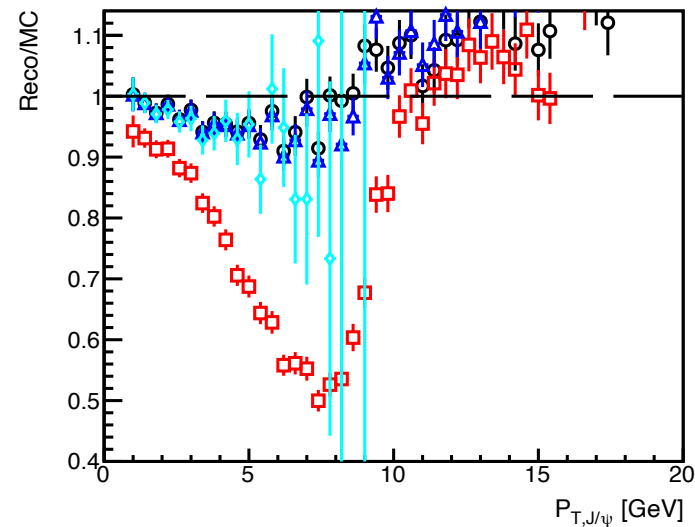
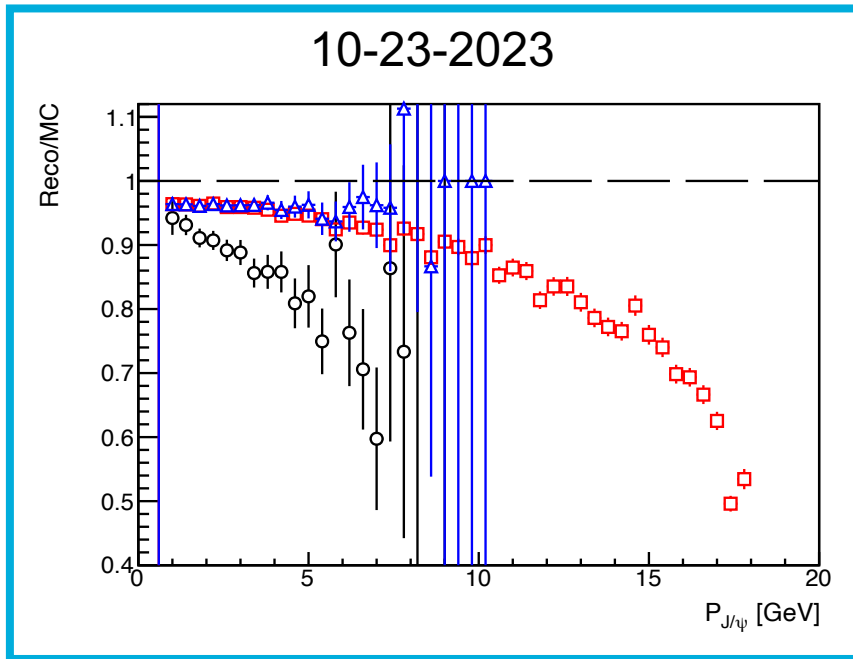
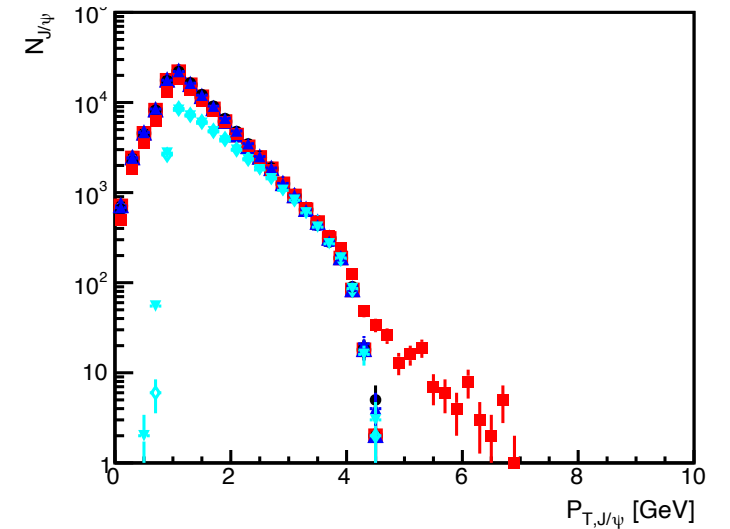
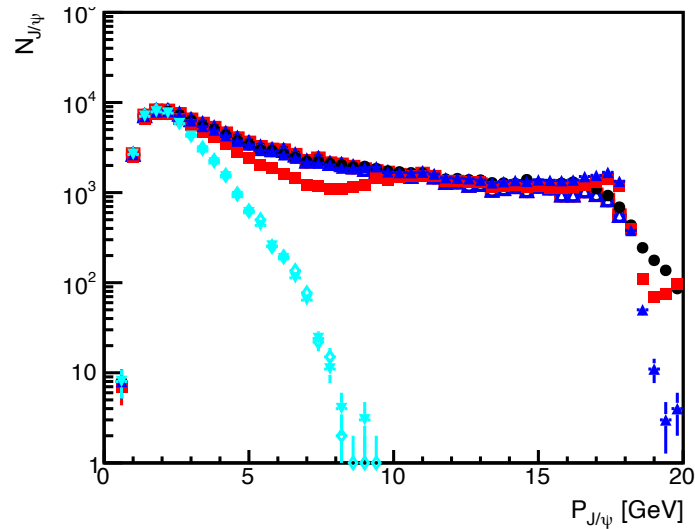
- ● trk e^\pm
- ■ trk e^\pm , EEMC e^\pm wrong clustering
- △ ▲ trk e^\pm , EEMC e^\pm corrected clustering
- ◇ ◆ trk e^\pm , EEMC e^\pm corrected clustering, $|\ln_{J/\psi}| < 1.5$



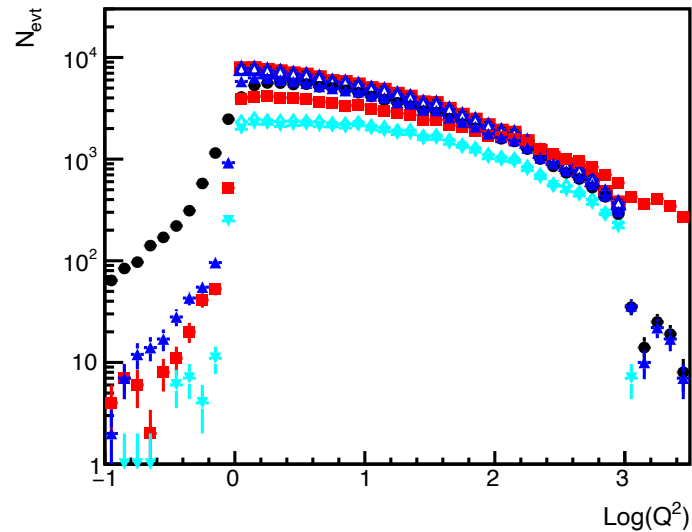
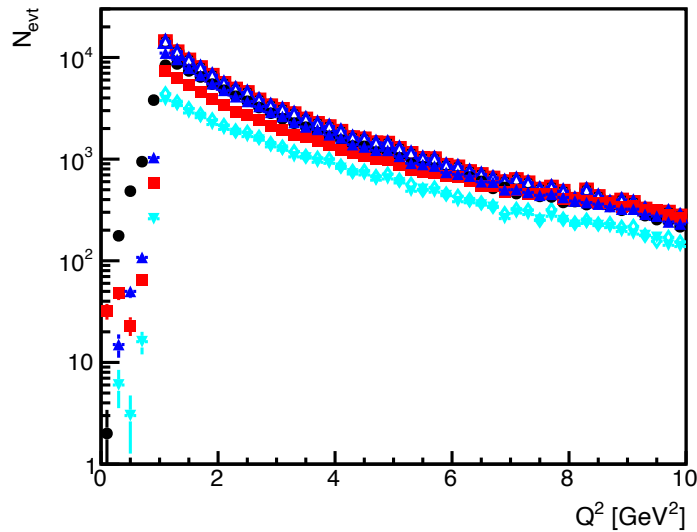
Reconstructed J/ψ Momentum

MC Re

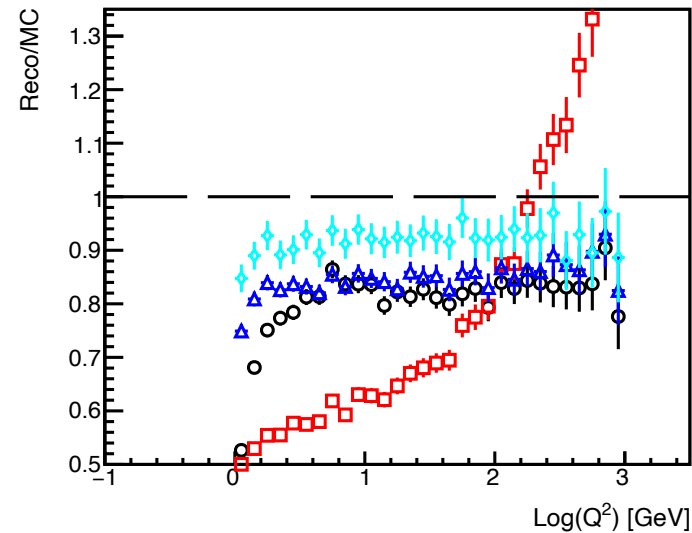
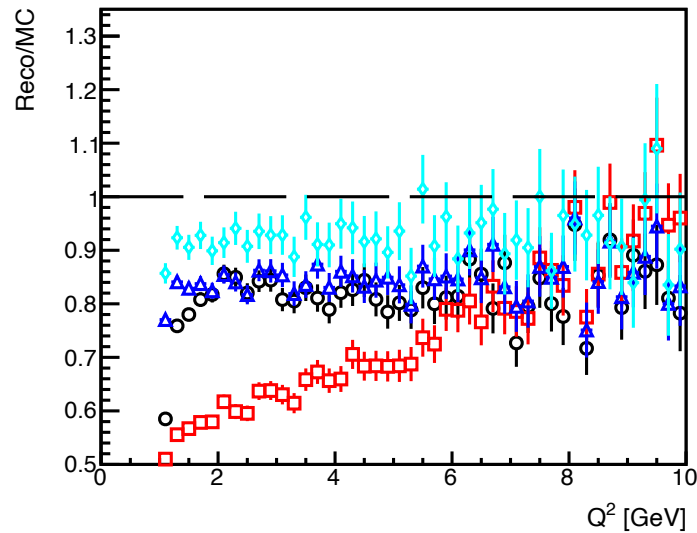
- ● trk e^\pm
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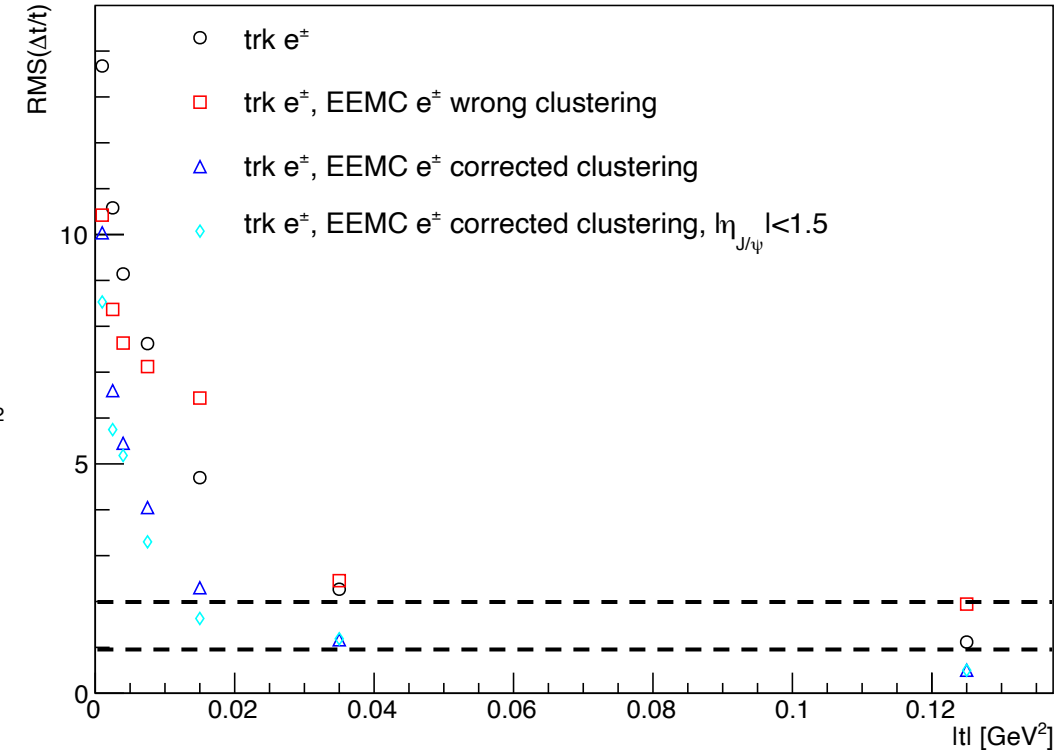
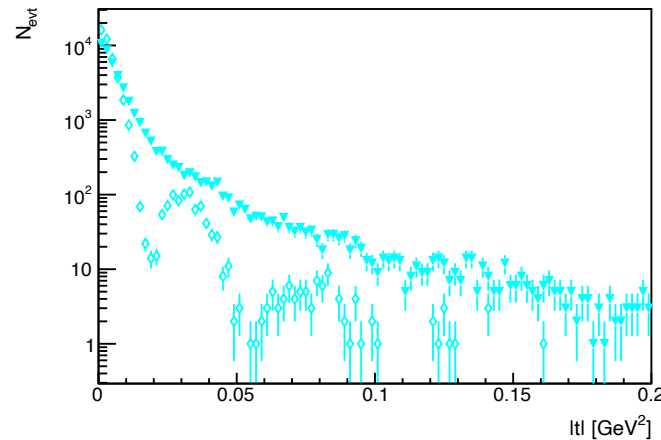
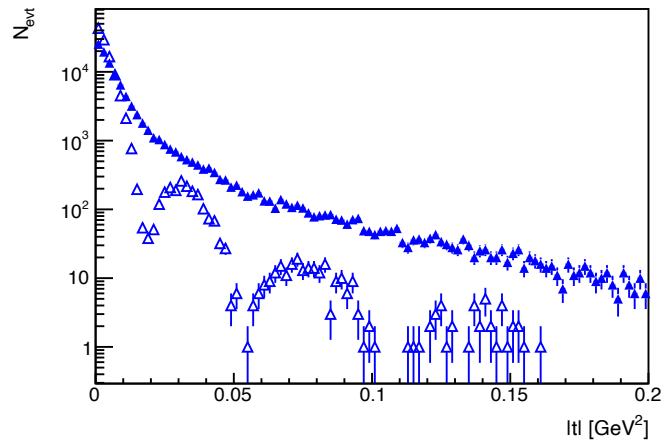
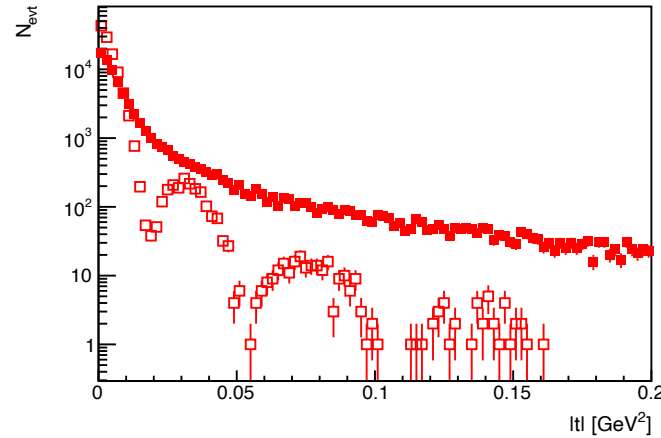
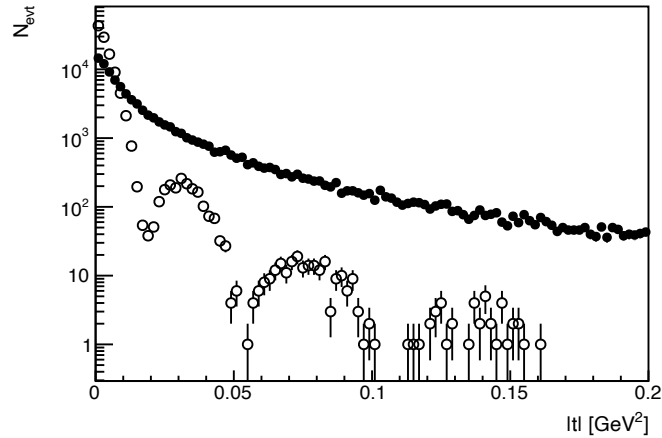
Q Distributions



- MC Re
- ● trk e^\pm
 - ■ trk e^\pm , EEMC e^\pm wrong clustering
 - △ ▲ trk e^\pm , EEMC e^\pm corrected clustering
 - ◇ ◆ trk e^\pm , EEMC e^\pm corrected clustering, $\ln_{J/\psi} | < 1.5$



t Distributions & Resolutions



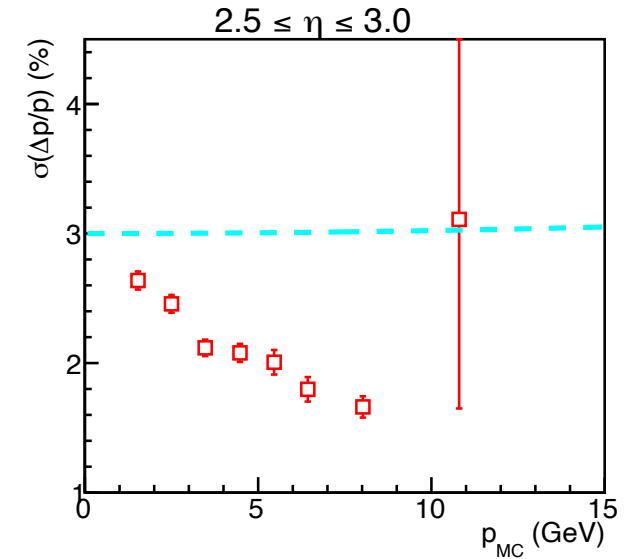
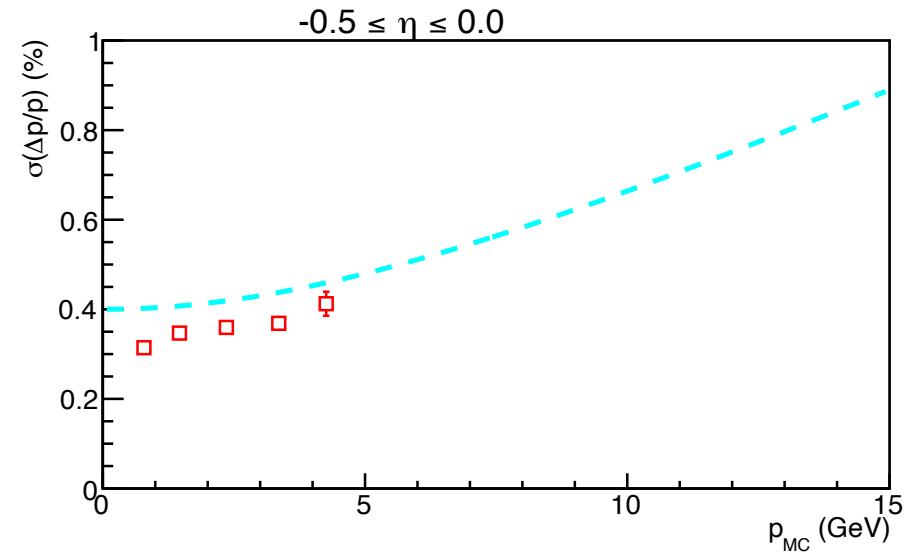
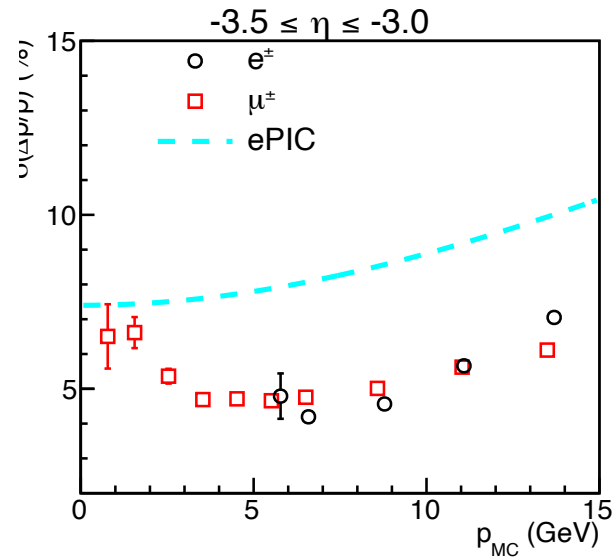
The $\eta_{J/\psi}$ cut reduces events with more than one electron (scattered and decayed electrons) hitting the EEMC

Summary

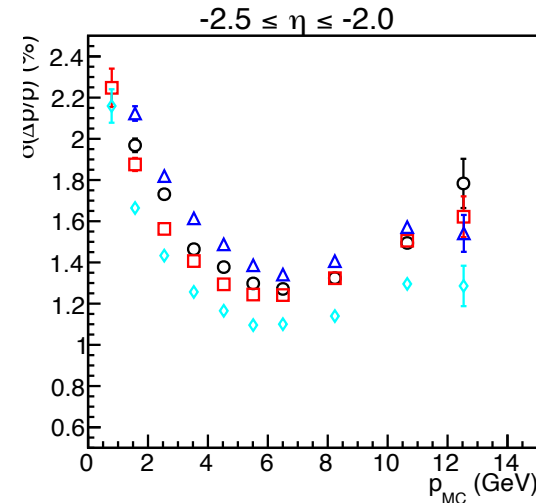
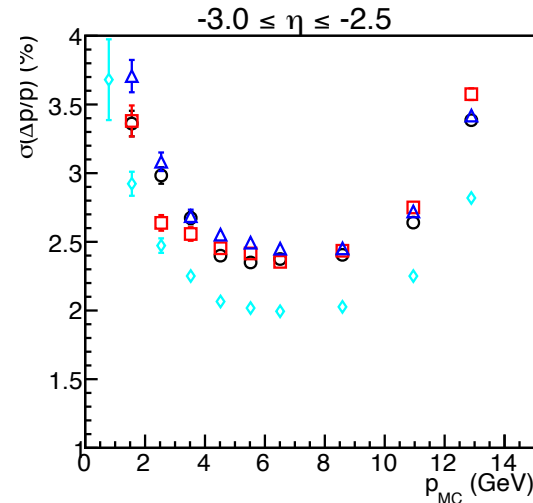
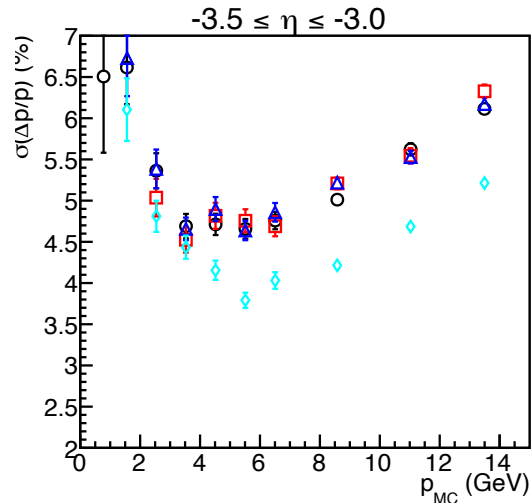
The low efficiency of J/ψ reconstruction from using dielectrons is due to mis-clustering with the EEMC

Quick Update on Backward Tracking Performance with Various Silicon Thicknesses

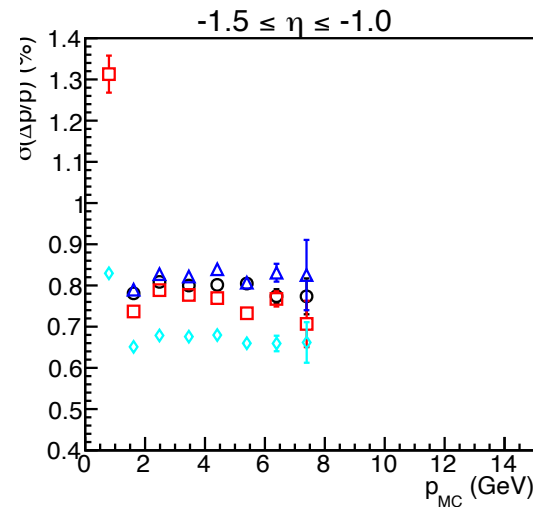
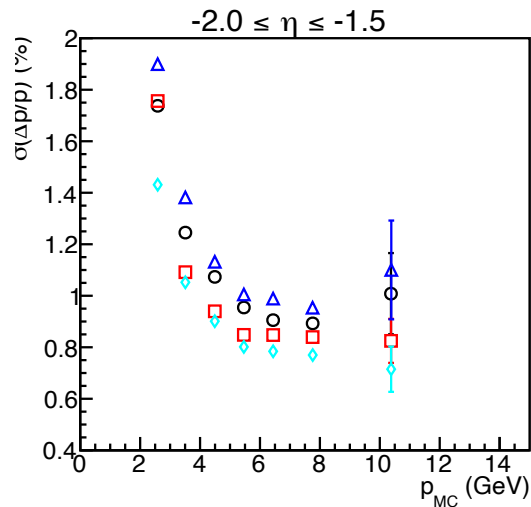
Momentum Resolution with ePIC Craterlake



Momentum Resolutions of the Backward Tracking Detector



- ePIC
- ePIC, $t_{\text{backward silicon}} = 5\mu\text{m}$
- △ ePIC, $t_{\text{backward silicon}} = 100\mu\text{m}$
- ◇ ePIC, B=2T



- Created material maps before running npsim
- The differences in momentum resolutions is small between different silicon wafer thickness
 - Speculation 1: I did something wrong in the creation of the material maps
 - Speculation 2: the supporting structure/electric component of the tracker has a dominant effect in momentum resolutions

Backup

Simulation Setup

Sartre

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

Data Selections and Reconstructions

Single electron selection

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

J/ψ reconstruction

- $|\text{pid}| = 11$
- 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
- $Q^2 = -(e_{\text{beam}} - e_{\text{scattered}}) \cdot M2()$

t from method L

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