

# Tracking working group - charges

## Tracking Working Group

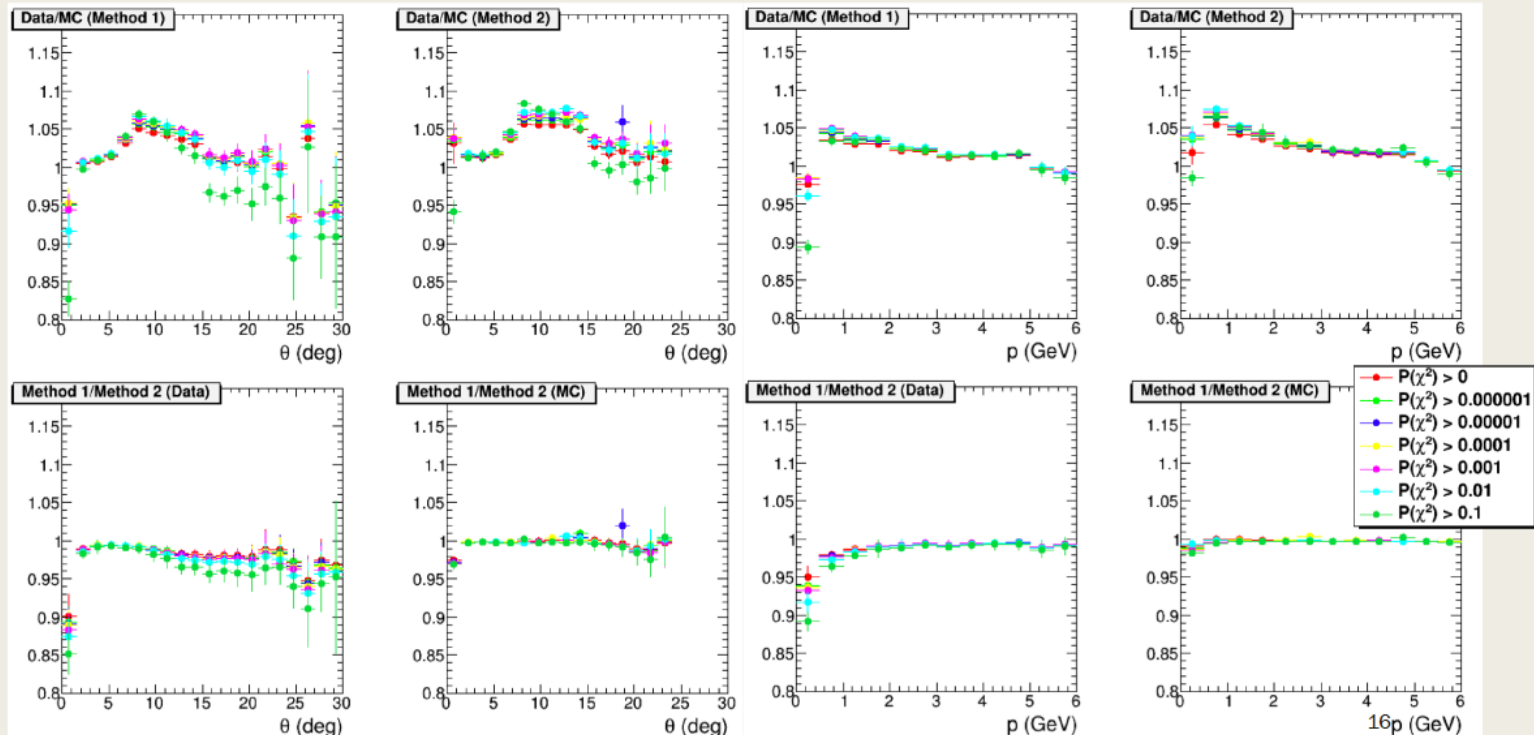
1. Determine preliminary charged pion and ~~proton~~ reconstruction efficiencies as function of  $p$ ,  $\phi$  and  $\theta$  in data and simulation with a point-to-point precision of at least 5%.
2. Measure systematics of invariant mass calibration as a function of  $\phi$  and  $\theta$  to a precision of at least 5 MeV.
3. Demonstrate agreement of charged pion and ~~proton~~ reconstruction efficiency and invariant mass resolution between data and simulation as a function of  $p$ ,  $\phi$  and  $\theta$  to within 5%.

- The only work so far done by W&M: Amy Schertz and Justin Stevens for charged pions
- Simon is studying proton efficiency with MC only
- Some input from Bethe-Heitler and  $J/\psi$  efficiency studies but it is not only “tracking efficiency”

# Studies with controlled sample of charged pions from $\omega$ decay (W&M group)

- $\omega \rightarrow (\pi^\pm)\pi^\mp\pi^0$
- How to define cuts on the tracking quality, to be similar to the one of the tracks surviving certain reaction filter

## Efficiency Ratios for $P(\chi^2)$ Cuts

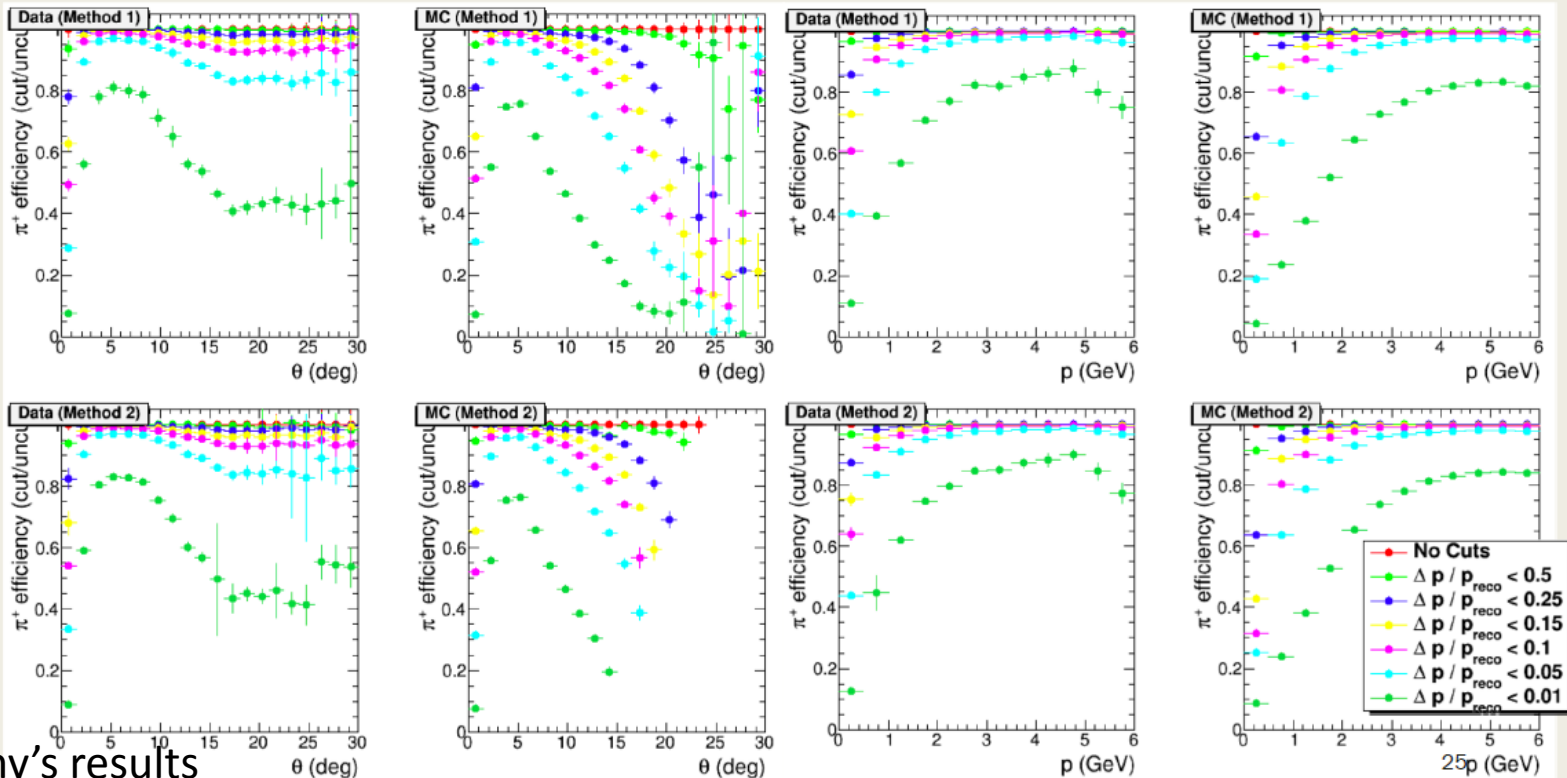


Amy's results

# Studies with controlled sample of charged pions from $\omega$ decay (W&M group)

The method doesn't work when applying cut on track resolution, due to bad reconstruction of missing momentum at big  $\omega$  angles

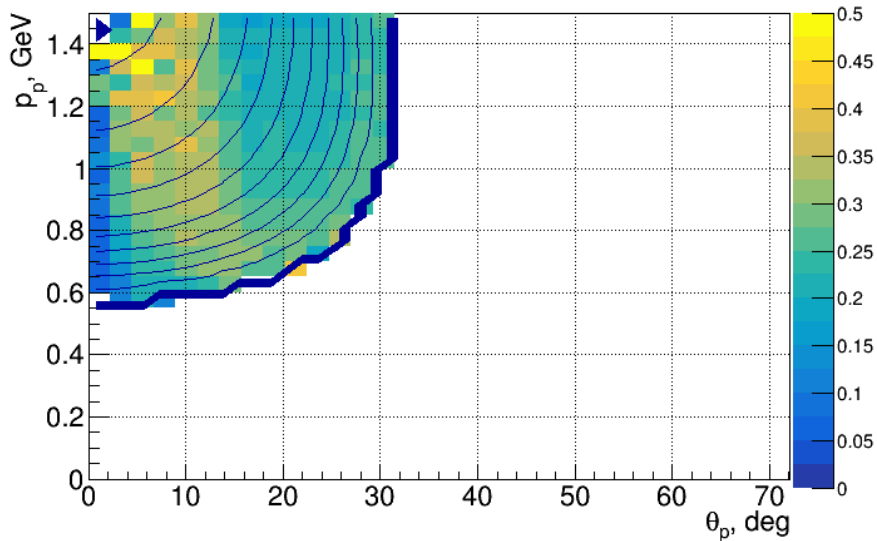
## Efficiency Ratios (cut/uncut) for $\Delta p/p_{reco}$ Cuts



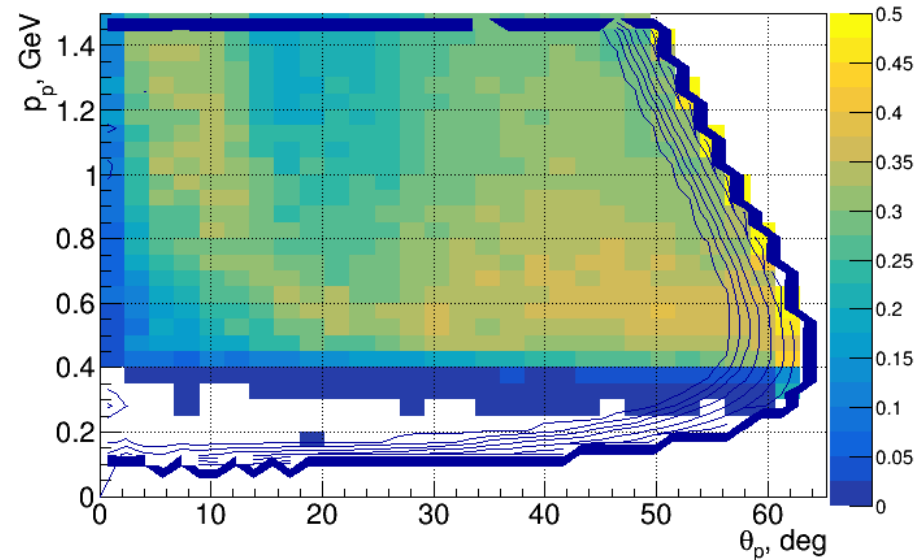
Amy's results

# Bethe-Heitler and $J/\psi$ efficiencies

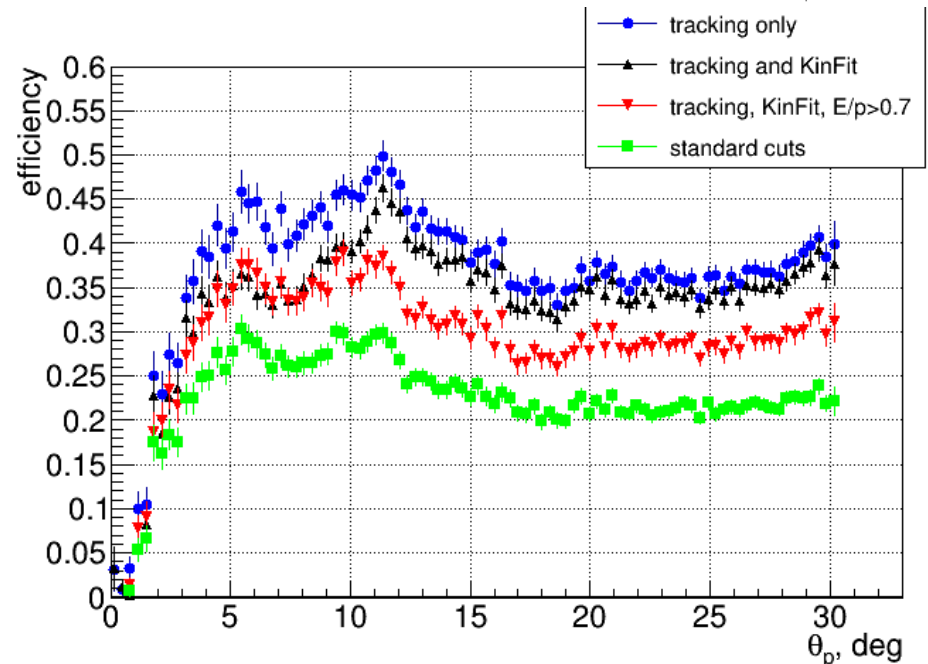
$J/\psi$



BH  $M > 1.5$  GeV




- Proton efficiency critical in comparing BH vs  $J/\psi$
- Can use BH at high  $M(e^+e^-)$  but very low statistics
- Can we use pion tracking efficiency instead? (Simon's studies)



# Tracking working group

Tracking [\[edit\]](#)

Status	Time Estimate	Supervisor	Worker	Description	Reference Materials
In progress	6 months	Justin Stevens	Amy Schertz	Determine $\pi^{+/-}$ efficiency as function of momentum and theta	<a href="#">[1]</a> 
	3 months			Determine $K^{+/-}$ efficiency as function of momentum and theta	
	6 months	Sean Dobbs	Shankar Adhikari	Determine proton efficiency as function of momentum and theta	
	6 months	Sean Dobbs	Nilanga Wickramaarachchi	Determine $K_S$ efficiency of function of momentum and theta	
	6 months			Determine $\Lambda^0$ efficiency of function of momentum and theta	
In Progress	3 months	Sean Dobbs	Gabriel Rodriguez	Determine $K_S$ mass and resolution as function of momentum and theta	
	3 months			Determine $\Lambda^0$ mass and resolution as function as functions of momentum and theta	

## Tracking - conclusions

- The only work done so far by W&M – promising results with charged pions (data/MC agreement within 5%)
- Difficulties with protons in covering forward angles
- Deeper MC analysis needed to understand the tracking for pions and protons
- Need studies with other reactions and **more people actively working**