Progress on Deeply Virtual Exclusive π^0 Production analysis

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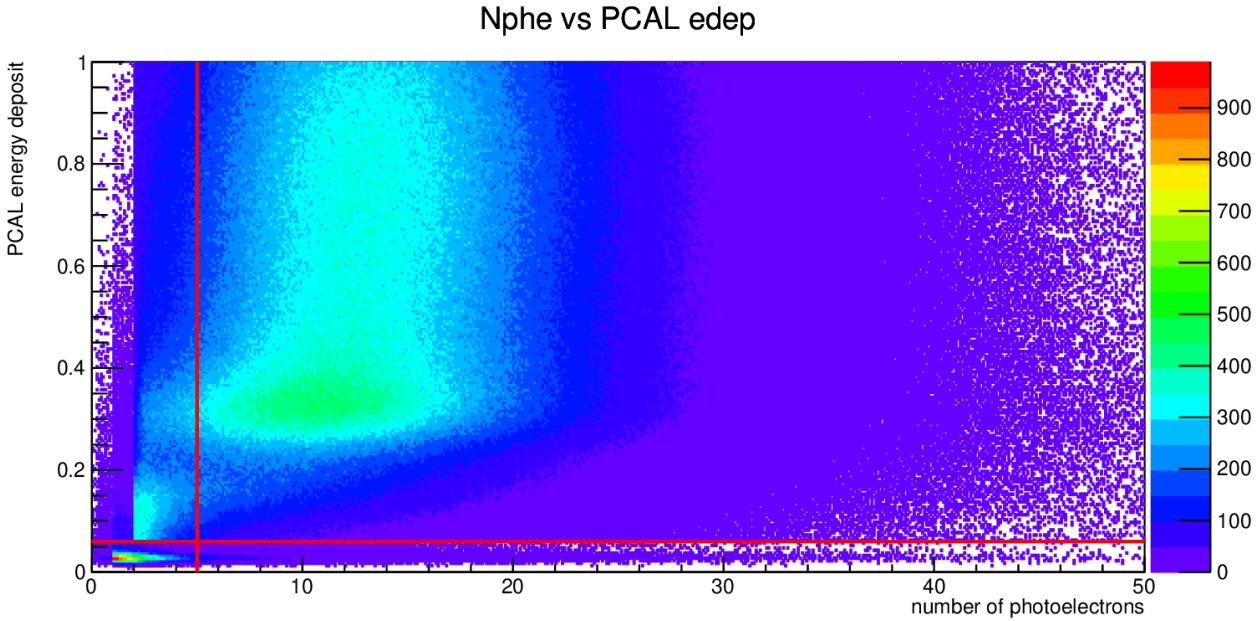
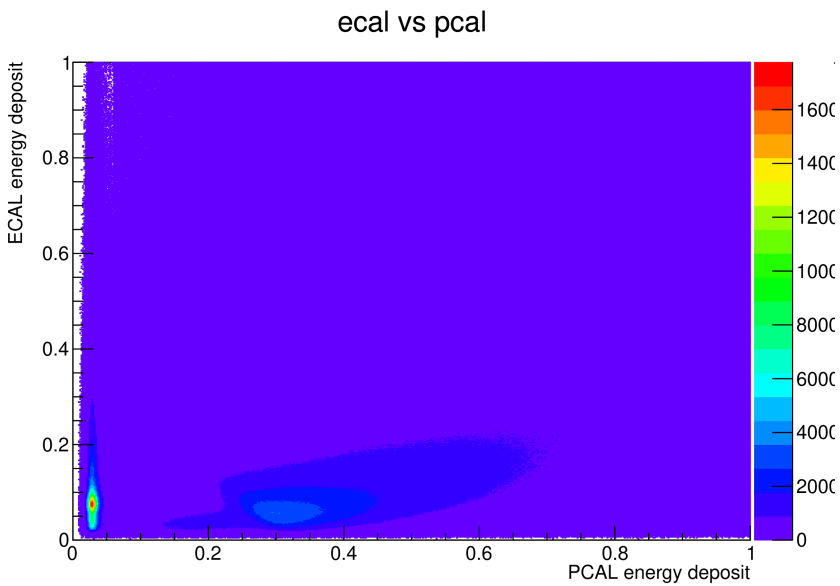
Electron cuts

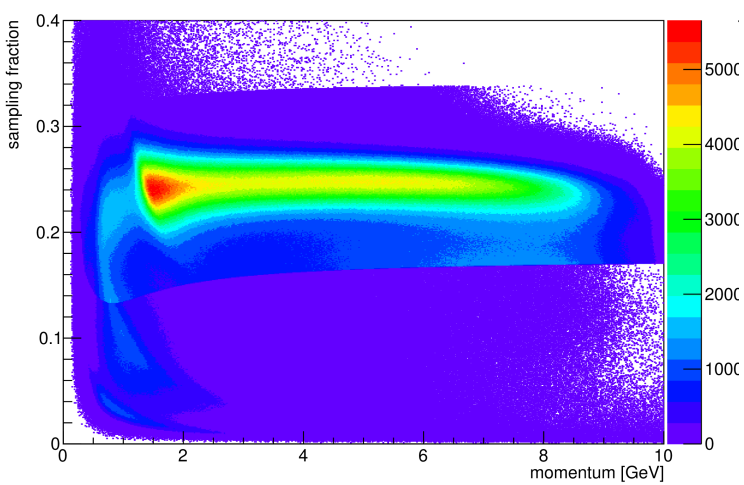




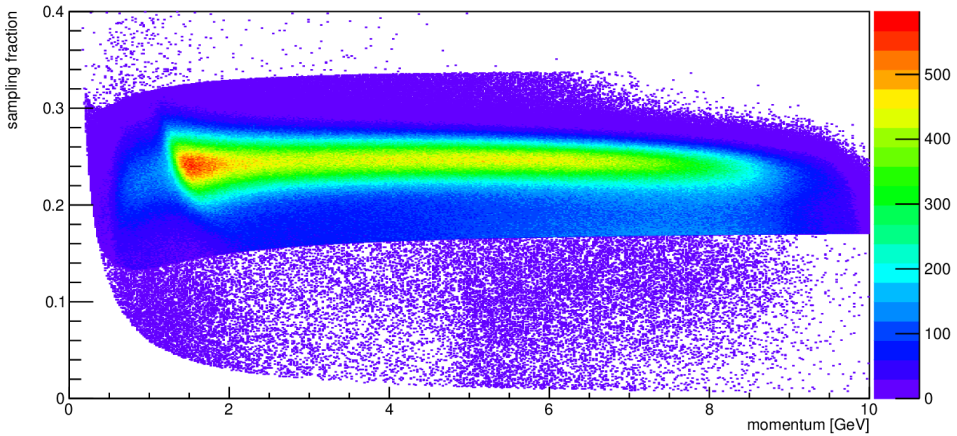
- PCAL vs ECAL energy deposits
  - $E_{pcal} > 0.06$
- PCAL vs HTCC response
  - $N_{phe} > 5$

Electron sampling fraction

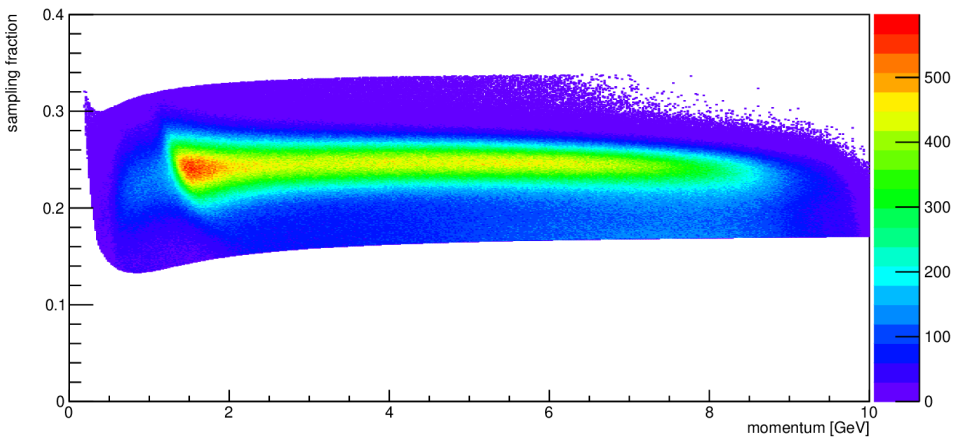
negative particles



after PCAL and HTCC cuts

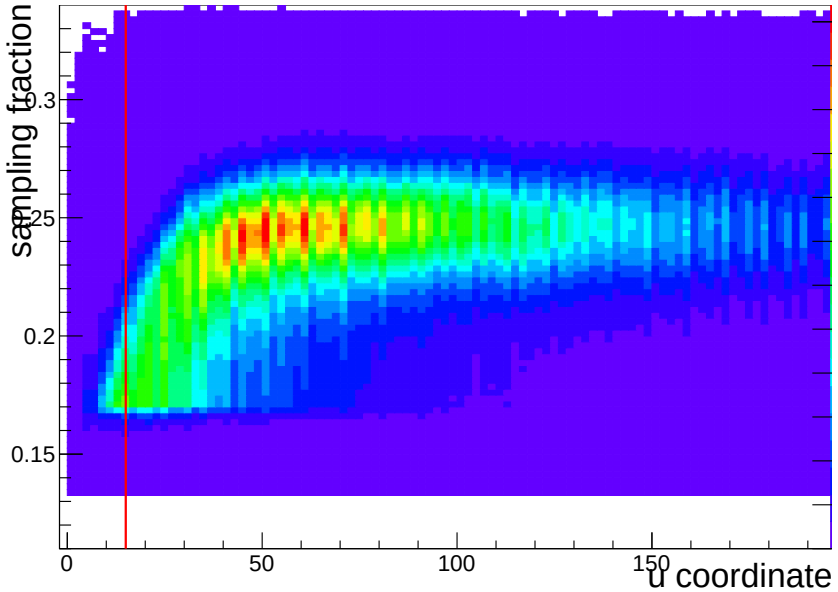


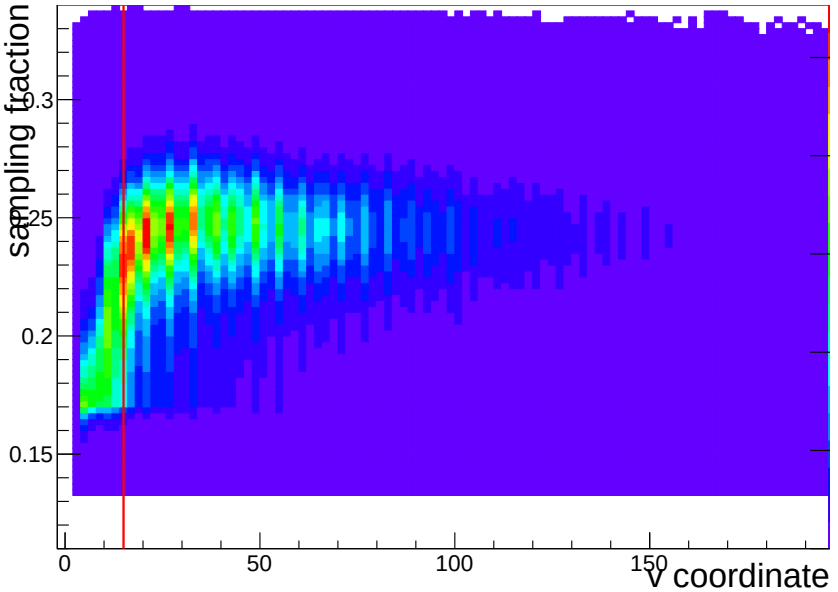
after PCAL and HTCC and SF cuts

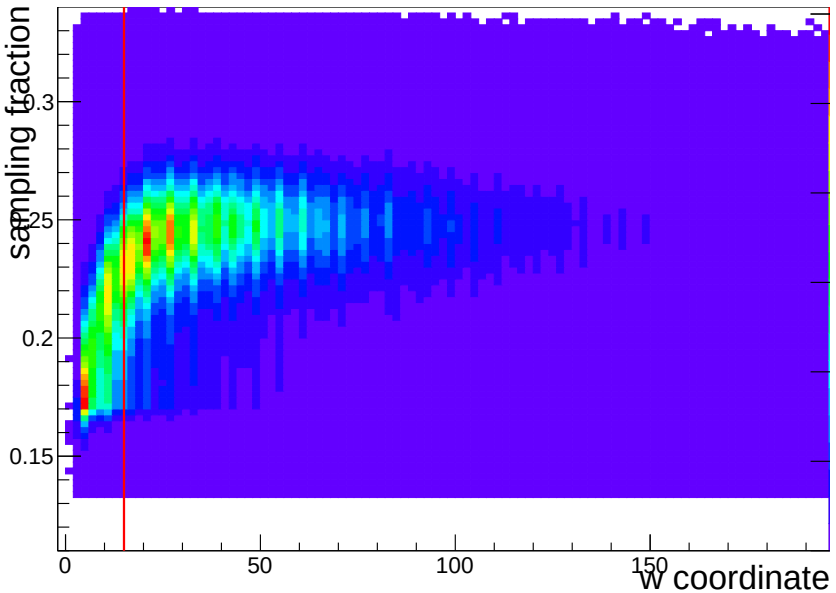


- electron sampling fraction after other PID cuts

PCAL fiducial cuts



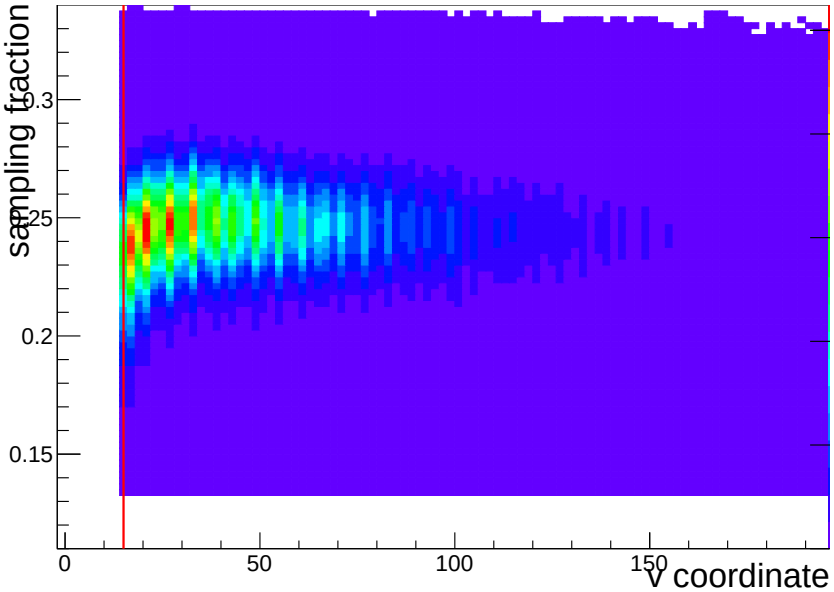


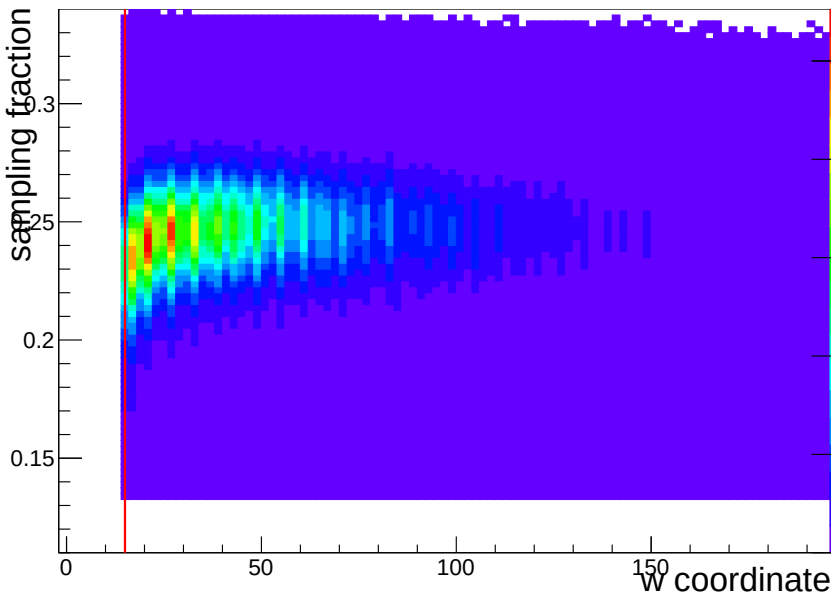


- sampling fraction as a function of U,V,W coordinate

PCAL fiducial cuts

[page=5,width=0.95]figures/pcalFidu

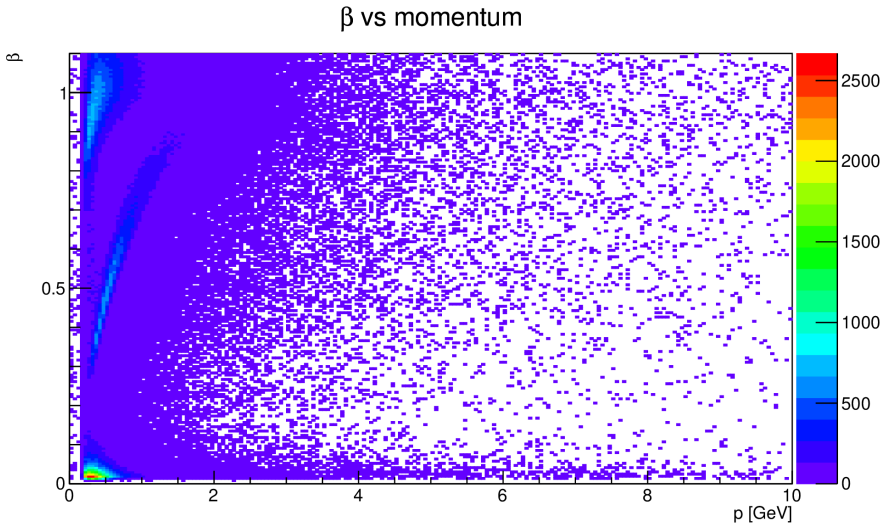


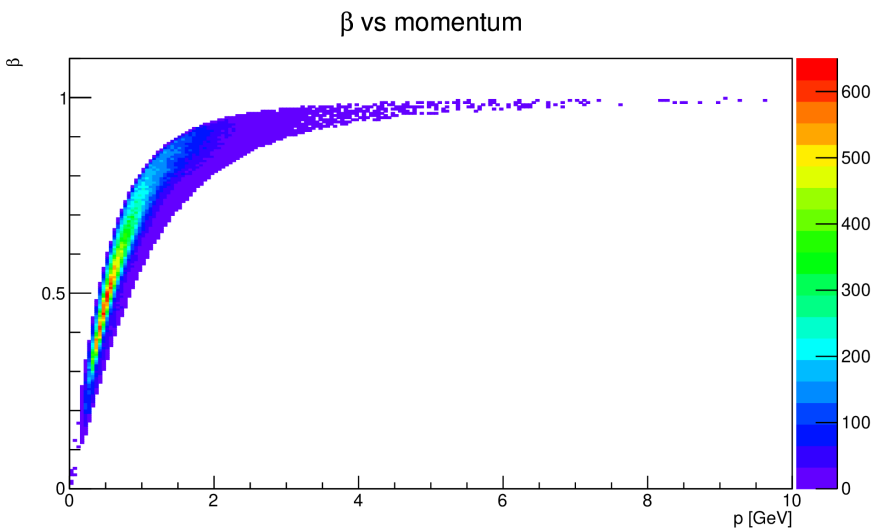


- sampling fraction as a function of U,V,W coordinate

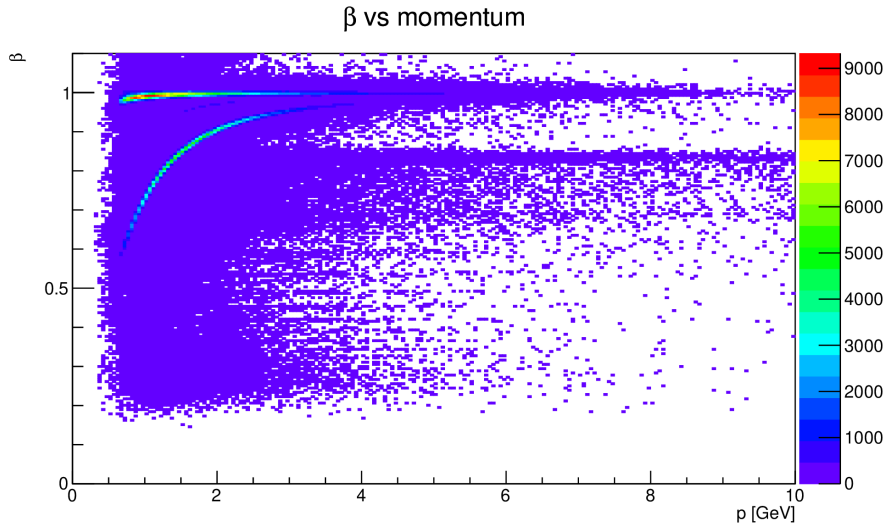
Proton PID

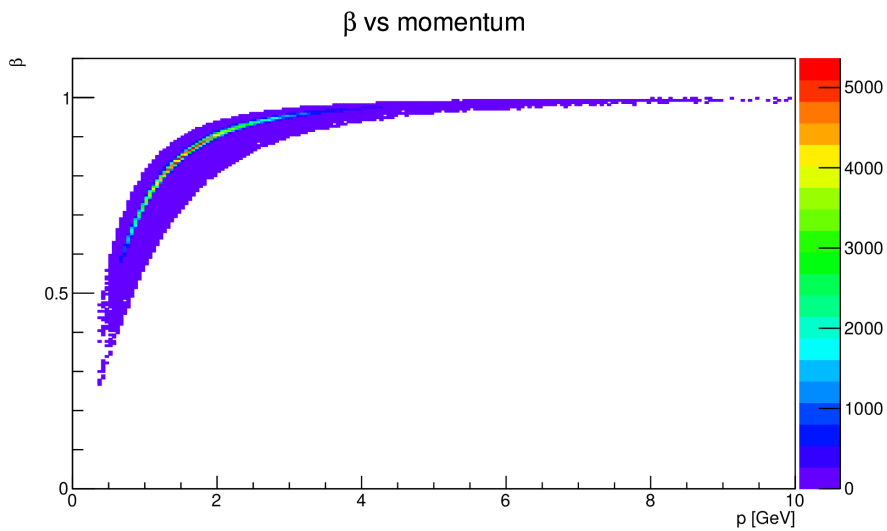
Central Detector





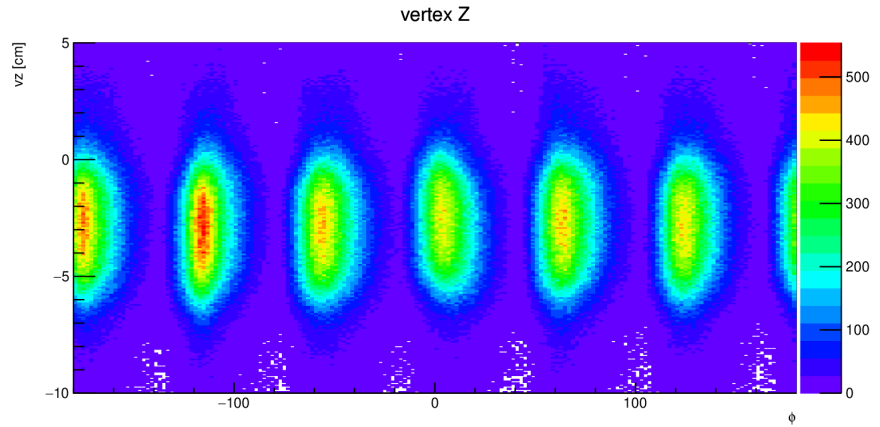
Forward Detector



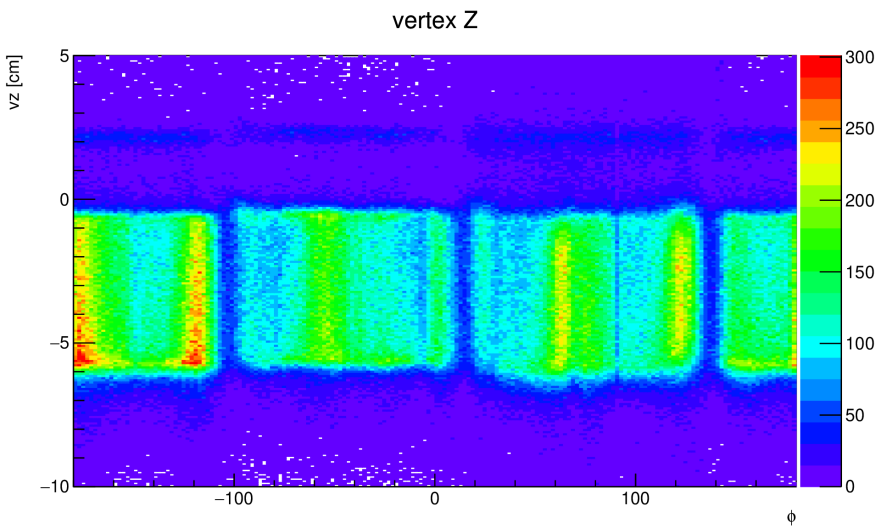


Vertex distributions

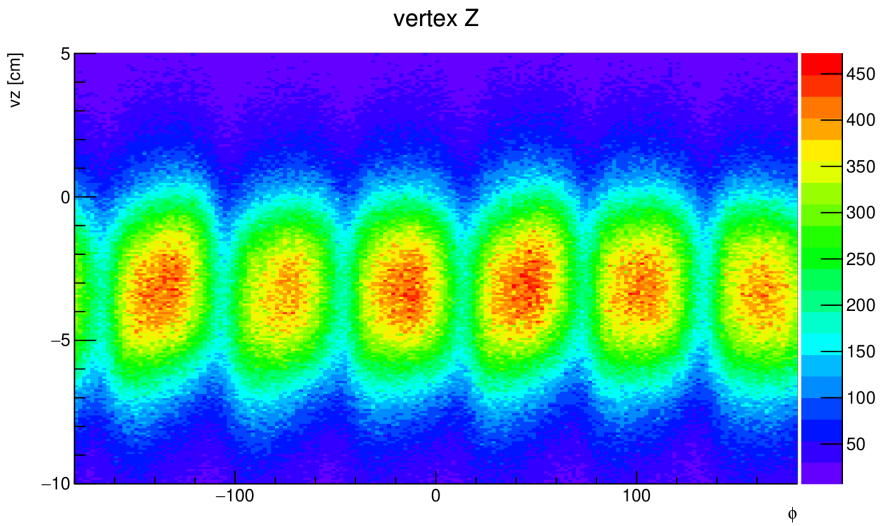
Electron vertex vs ϕ



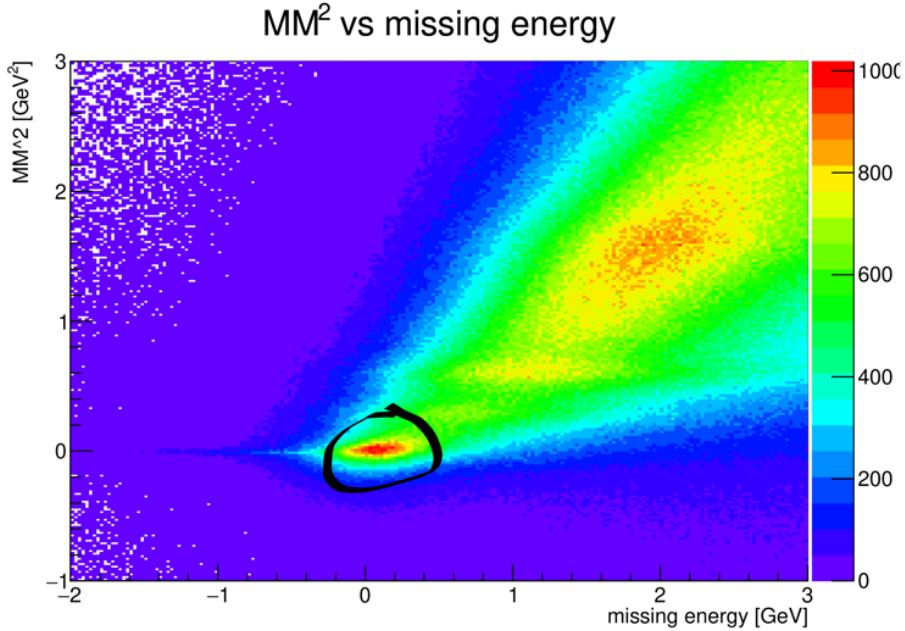
Proton vertex in Central Detector vs ϕ

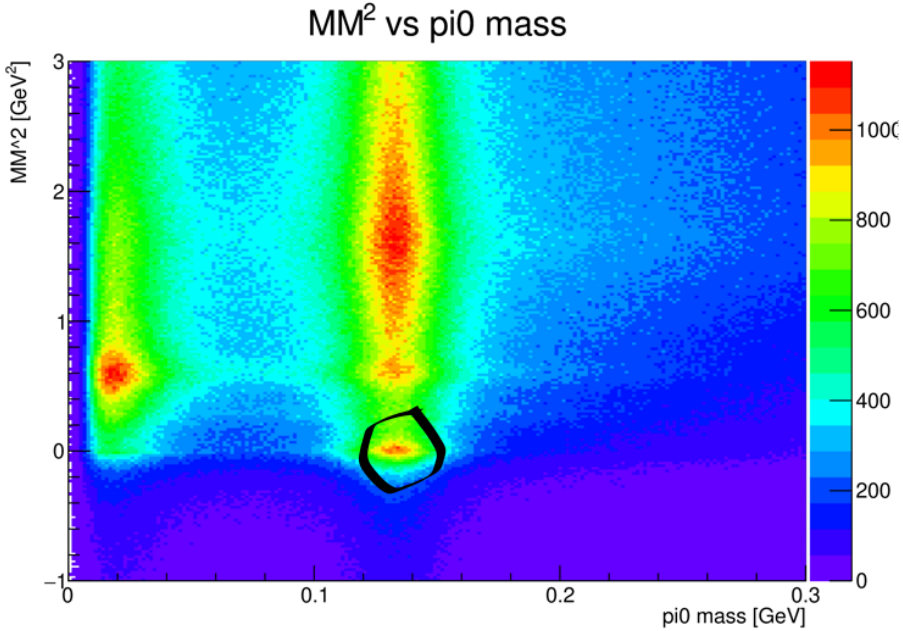


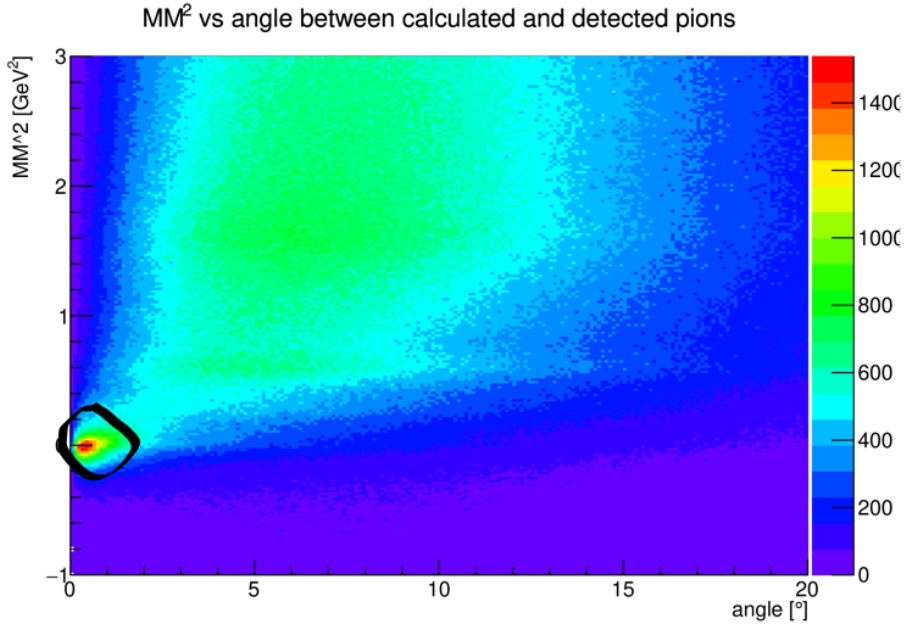
Proton vertex in Forward Detector vs ϕ



Particle Identification and Exclusive Selection

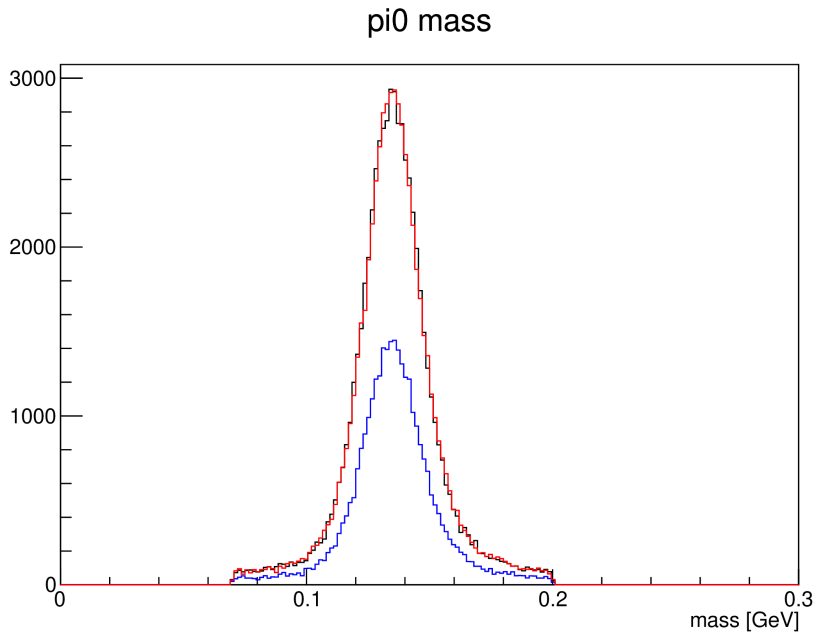


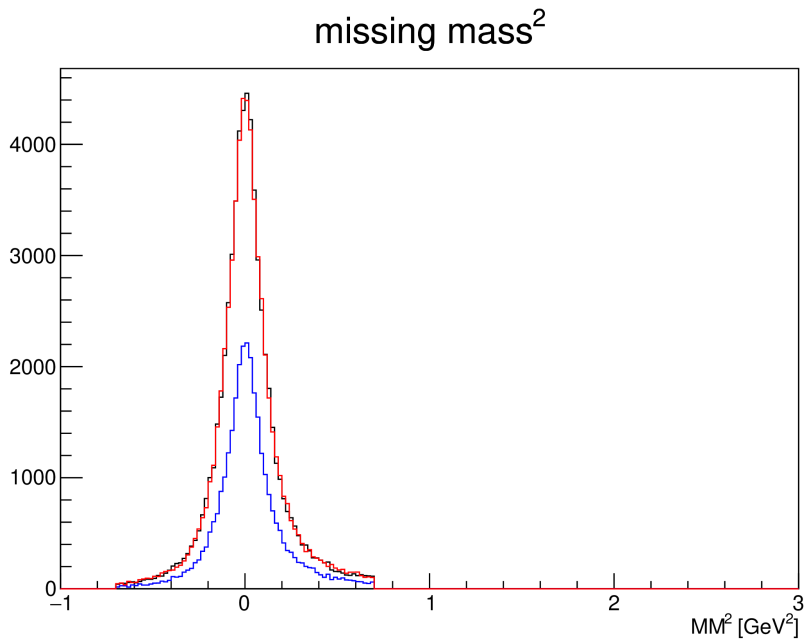




- e^-, p, γ, γ using Event Builder pid code
- ban photons along electron direction: $\theta_{e\gamma_1} > 5°$, $\theta_{e\gamma_2} > 5°$
- opening angle between two photons: $\theta_{\gamma_1\gamma_2} > 2$

Particle Identification and Exclusive Selection

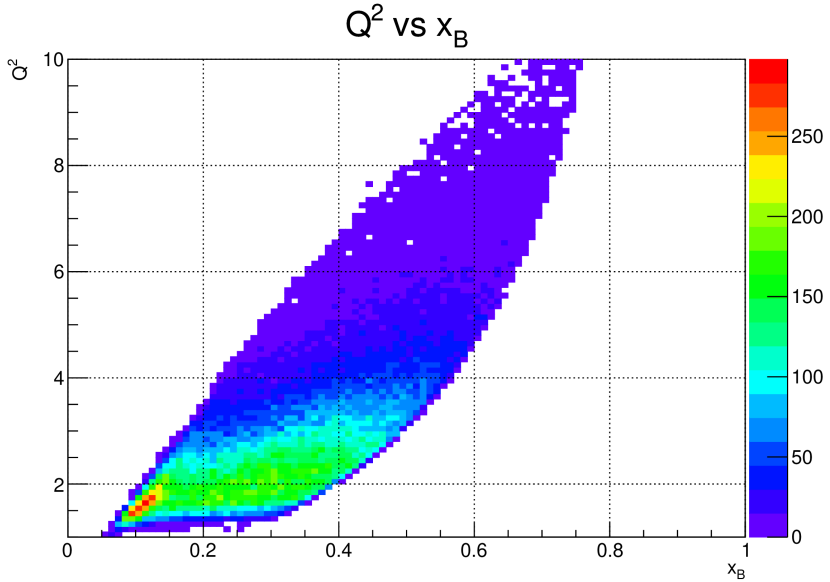


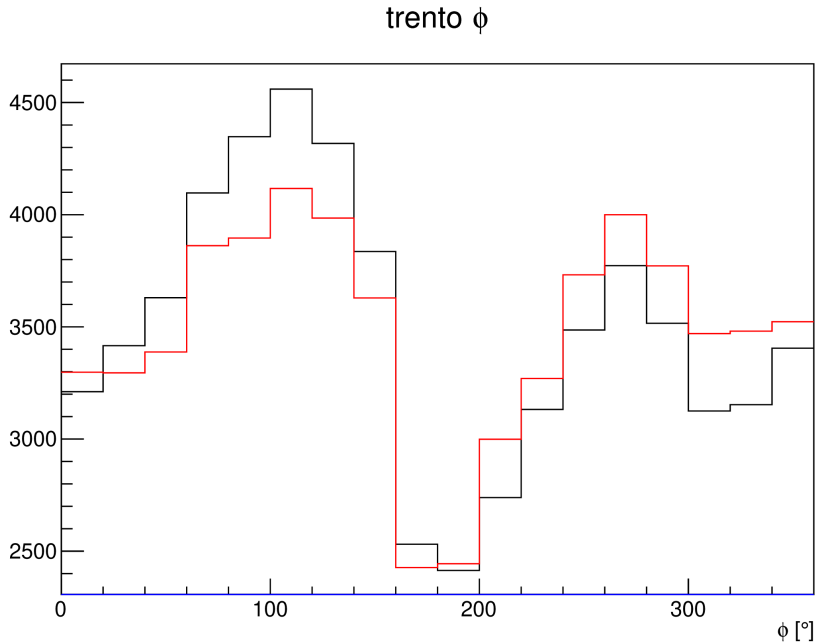


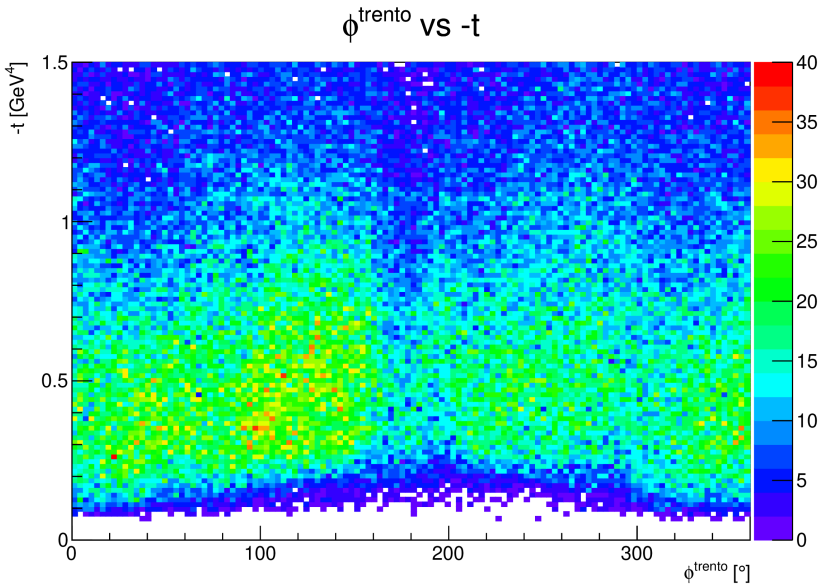
- Cut for DIS region: $Q^2 > 2$
- Angle between expected and reconstructed pions: $\theta_{X\pi^0} < 2$
- Missing energy of $(ep \rightarrow e'p'\gamma\gamma X$ system: $E_{ep\gamma\gamma X} < 0.5$
- Pion mass: $0.07 < M_{\pi^0} < 0.2$
- Missing mass squared of $(ep \rightarrow e'p'X$ system: $\left|MM^2_{epX}\right| < 0.7$

$ihel = -1, 0, 1$ for black, blue and red lines respectively

Kinematic coverage



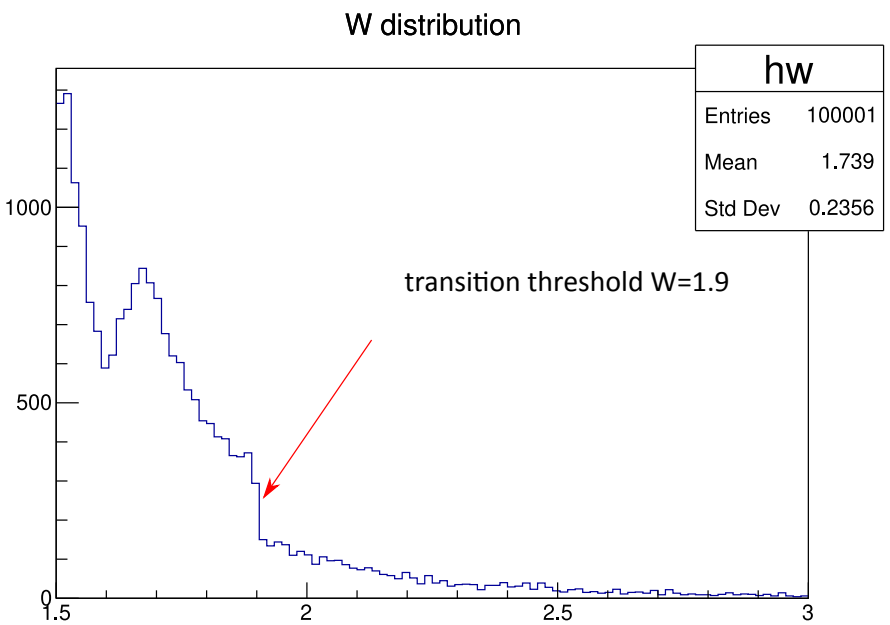




- $Q^2 > 2$
- ϕ^{trento} - angle between lepton and hadron planes
- $t = (p' - p)^2$

ihel $= -1, 0, 1$ for black, blue and red lines respectively

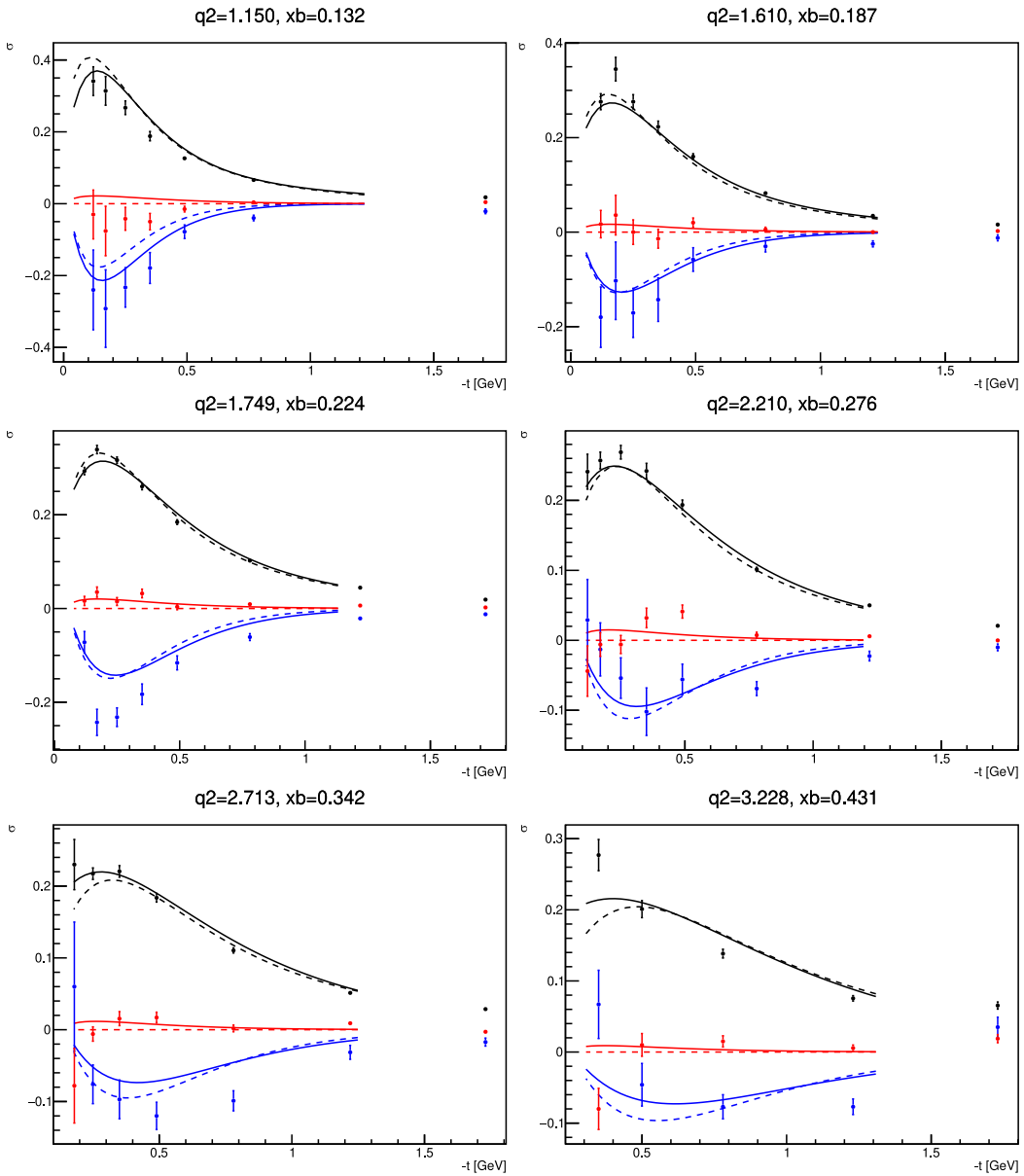
π^0/η generator



- π^0 and η generators:
  aao_norad
- Cross sections calculations:
  - $W < 1.9$: MAID calculation
  - $W > 1.9$: Deeply Virtual π^0 Production parameterization
- Output: LUND file for CLAS12 GEMC simulation

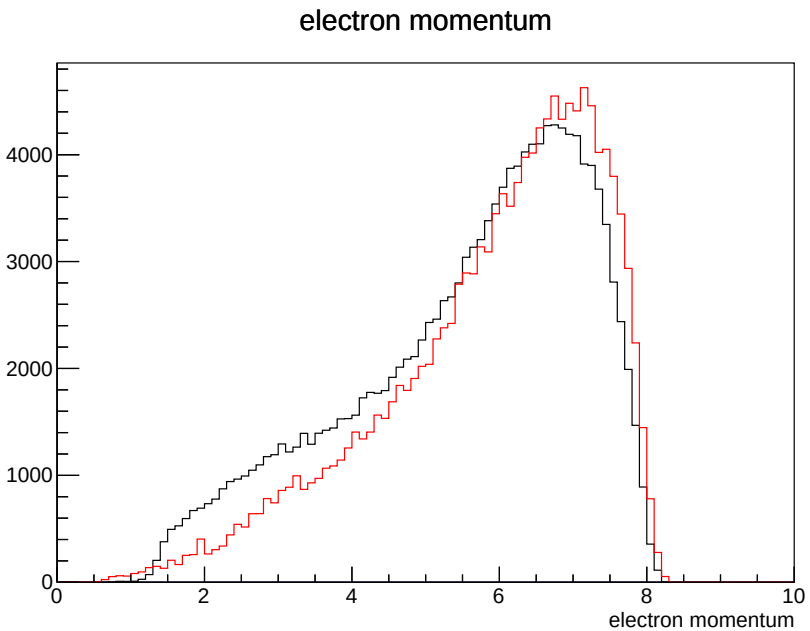
- need further improvement
- additionally, future efforts to use CLAS12 database for parameterizations

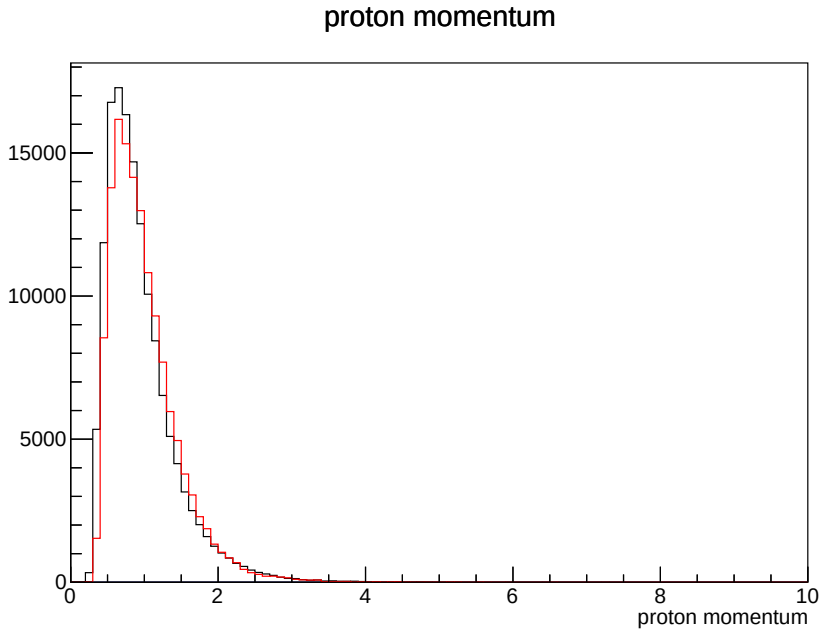
DVπ^0P structure function parameterizations

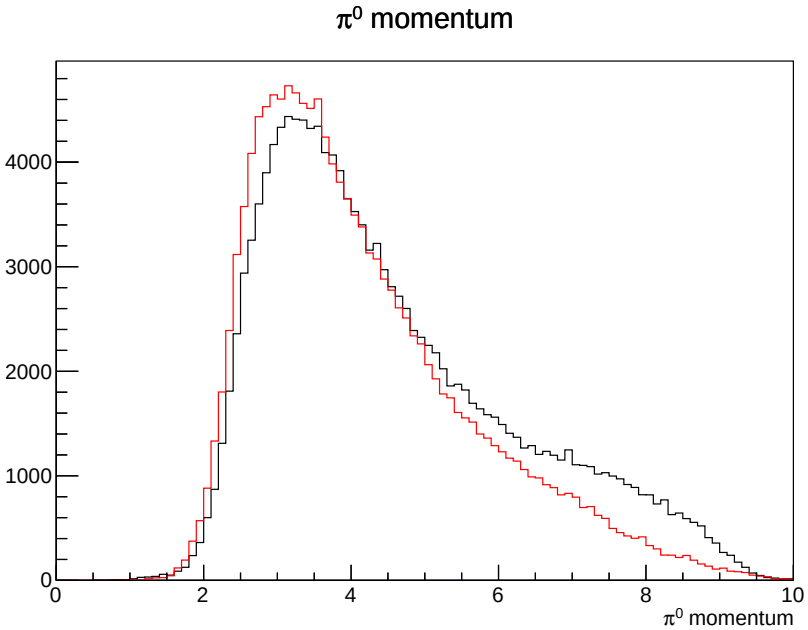


- Valery's recent fit of existing CLAS6 measurements of structure functions for $ep \to e'p'\pi^0$
- Comparison of parameterizations from old (dashed line) and new (solid line) fit

Comparison with simulation (momenta)

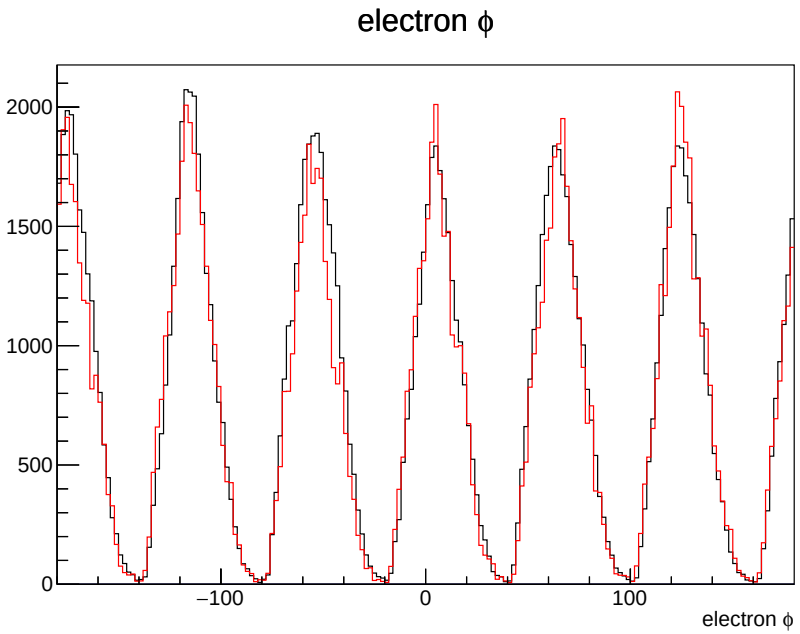


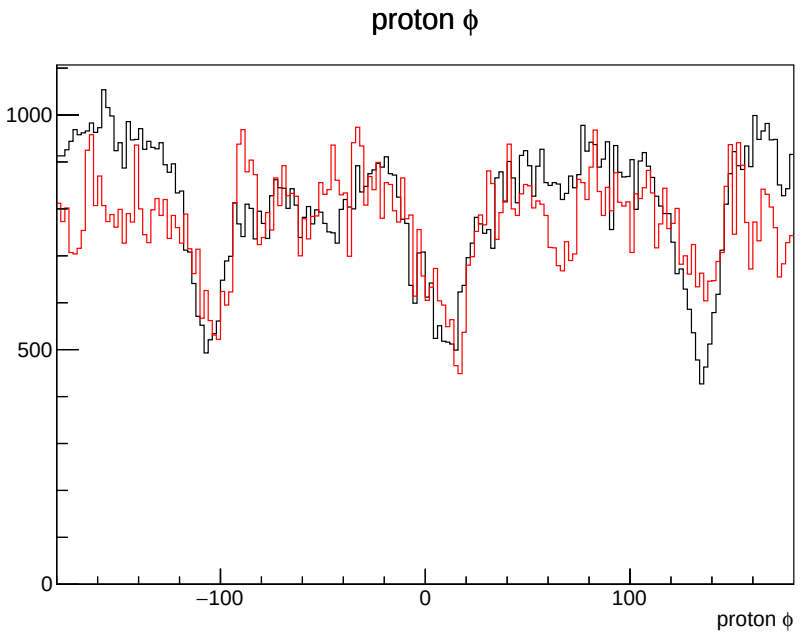


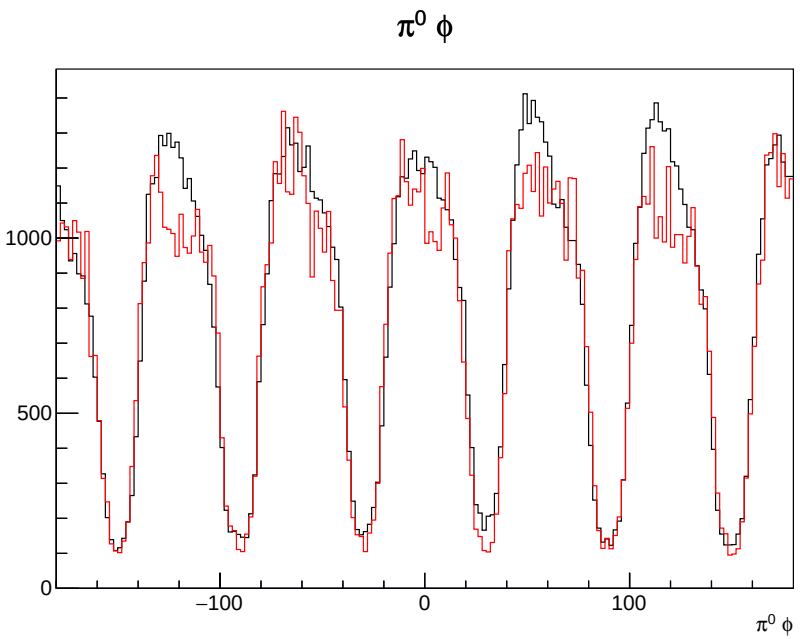


- **MC** and **DATA**

Comparison with simulation (azimuthal angle ϕ)

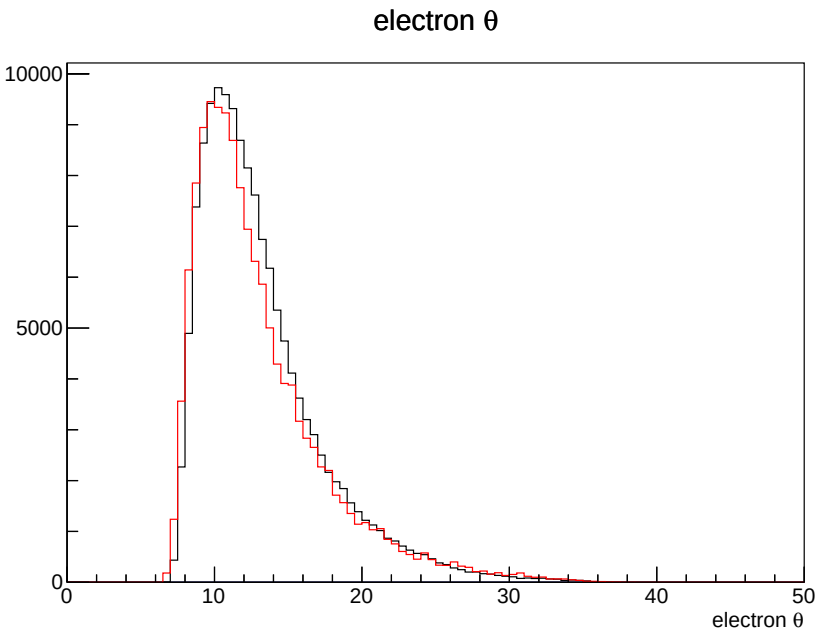


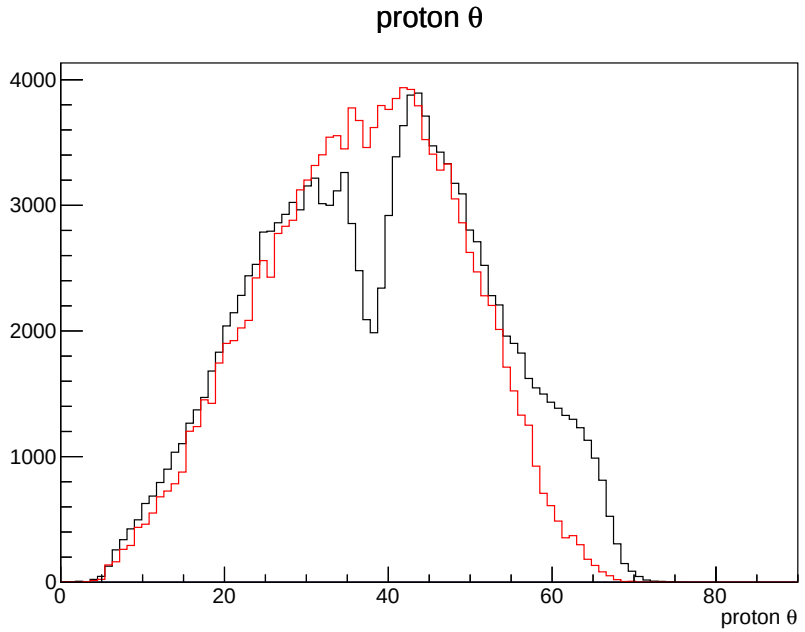


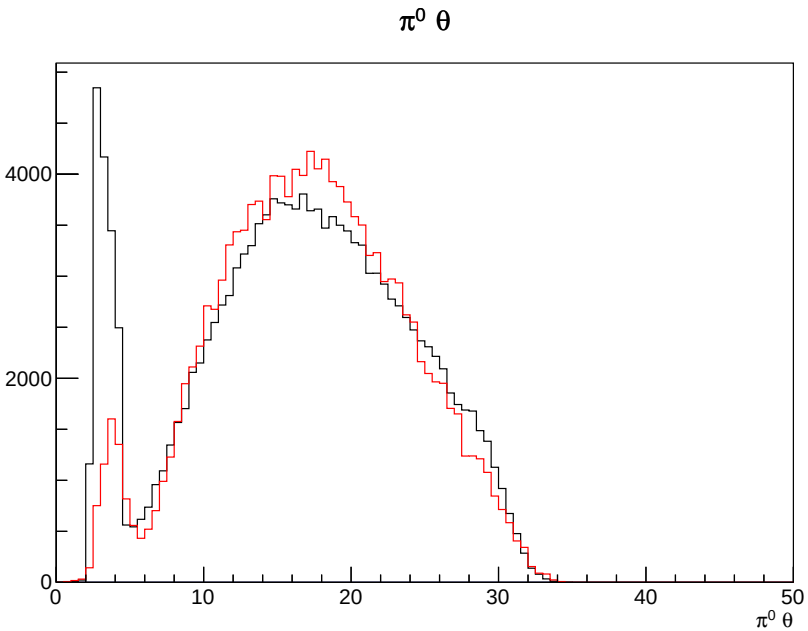


- **MC** and **DATA**

Comparison with simulation (polar angle θ)

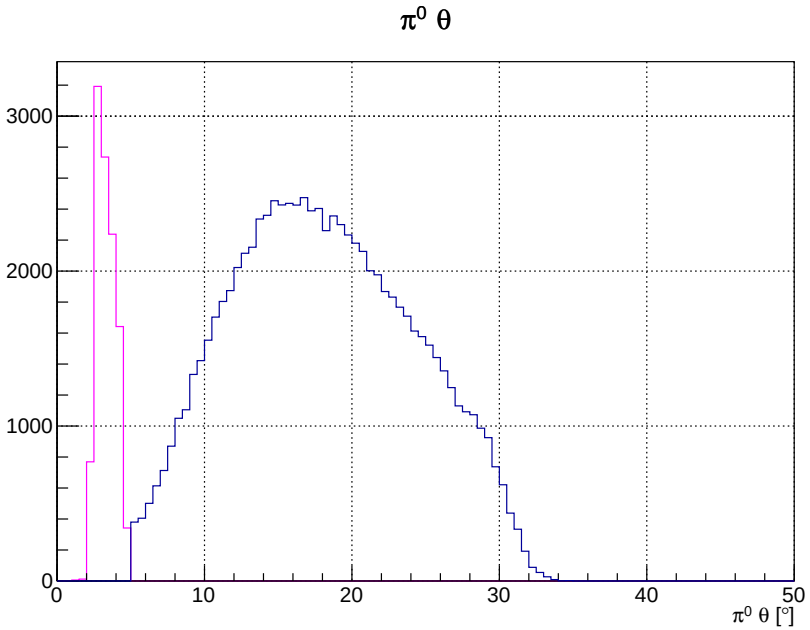


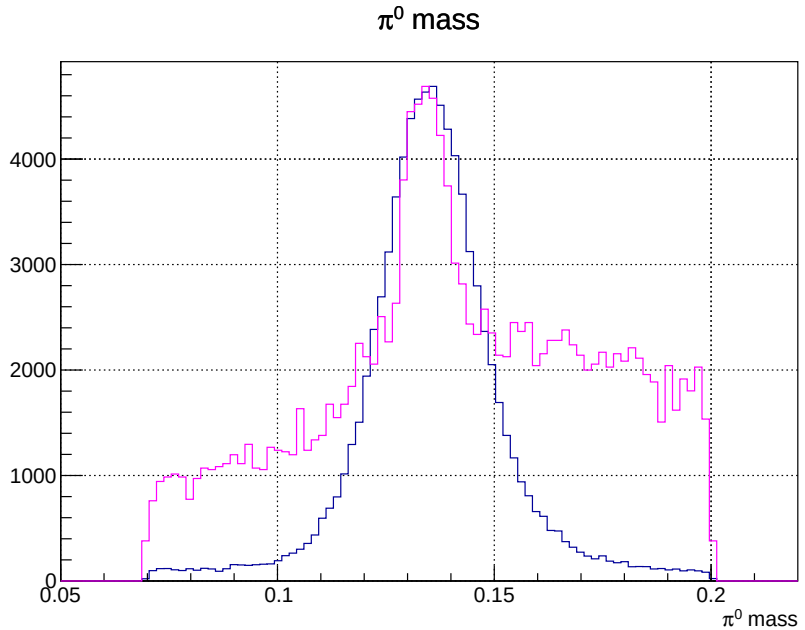




- **MC** and **DATA**

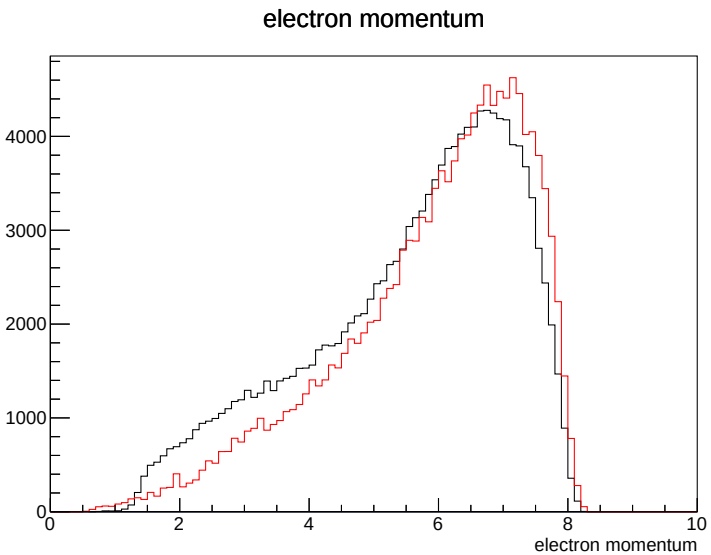
π^0 reconstruction



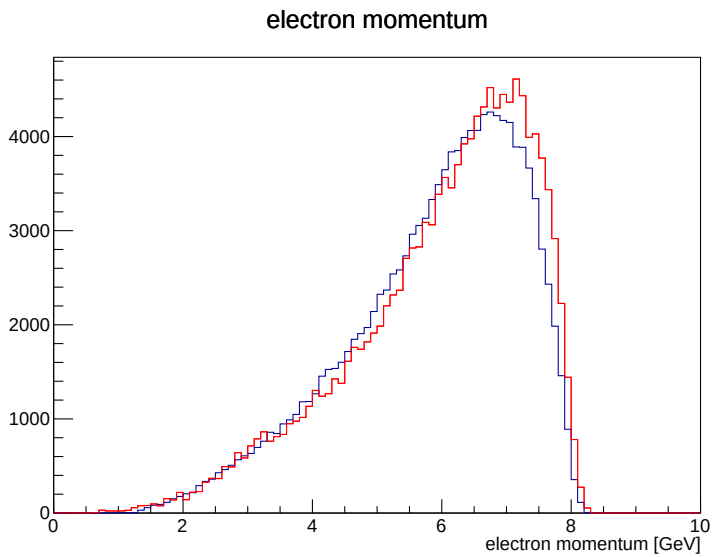


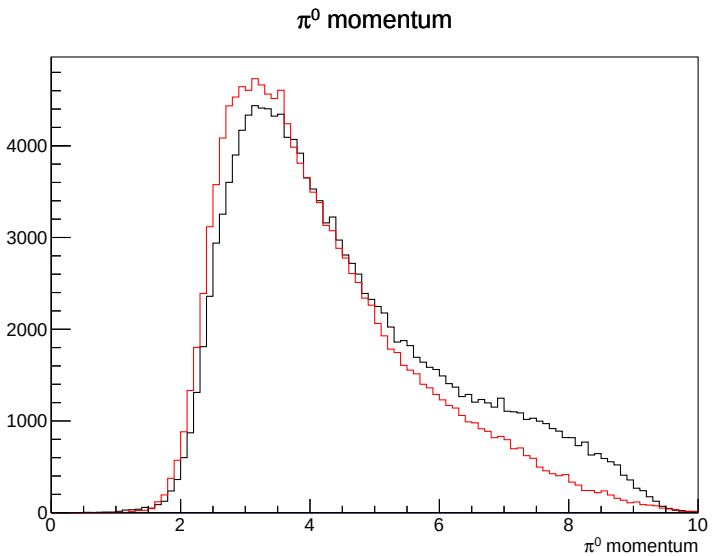
- **low angle π^0**
- **high angle π^0**

Comparison with simulation (improvements)



$\theta_\pi > 5^\circ$





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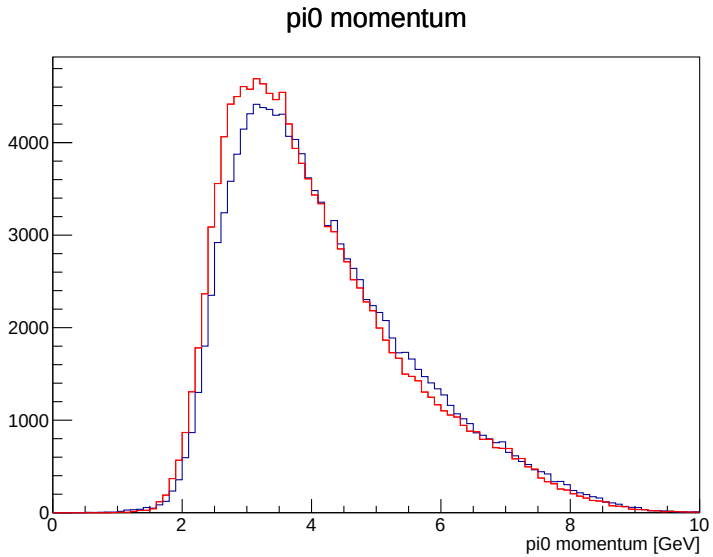
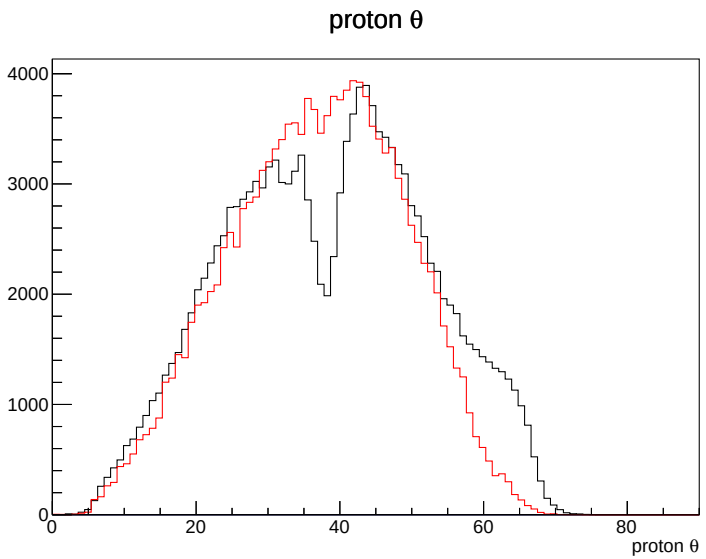
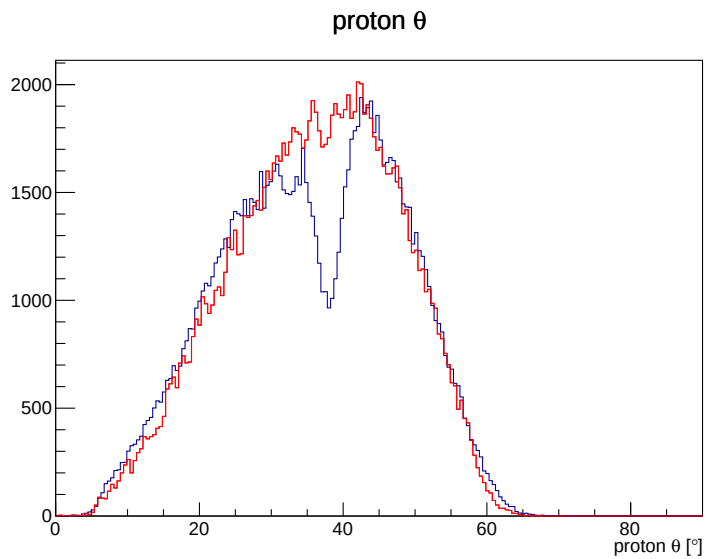
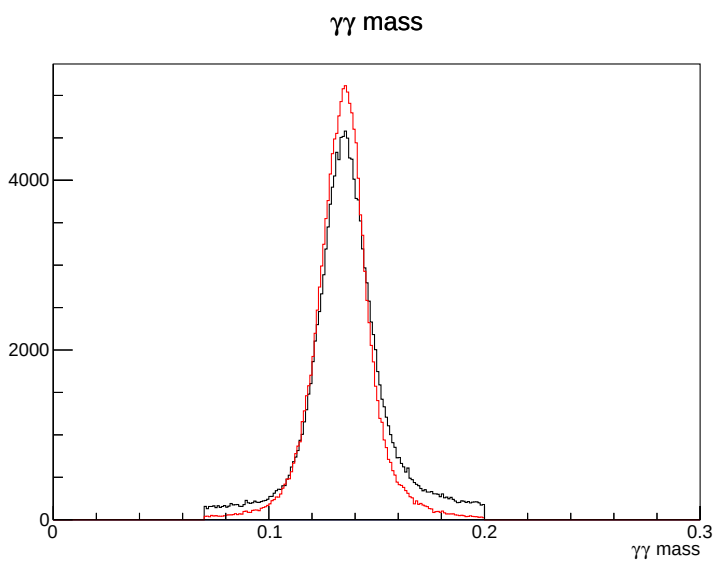


Comparison with simulation (improvements)

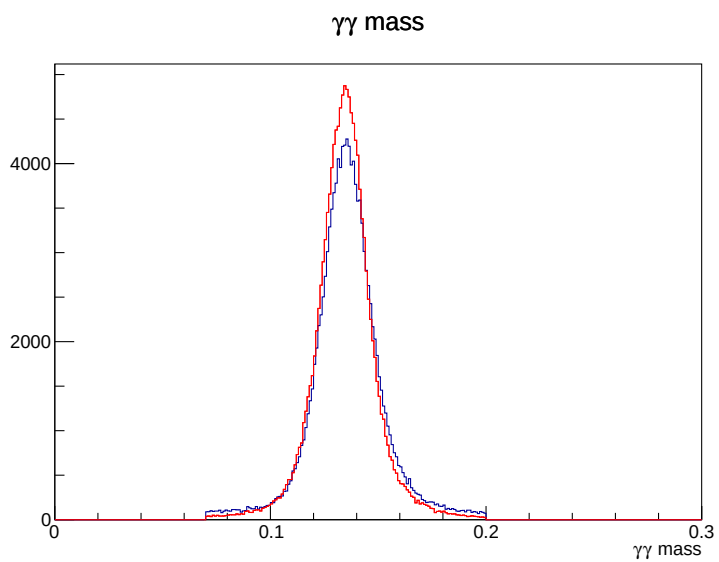


$\theta_\pi > 5^\circ$

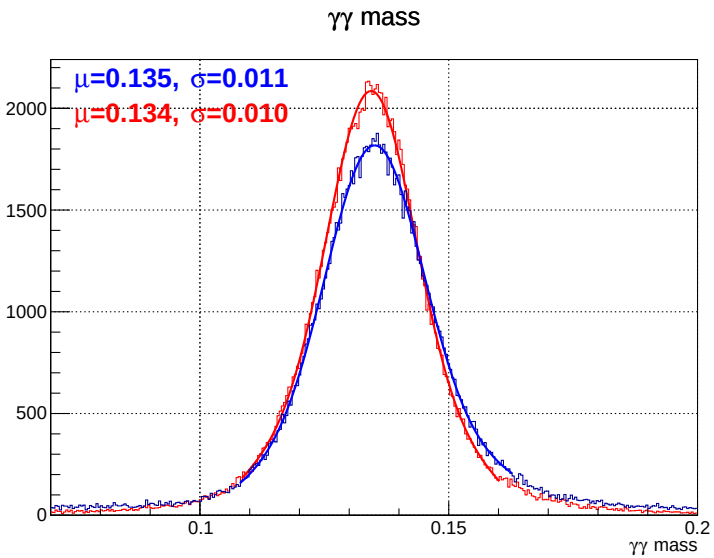


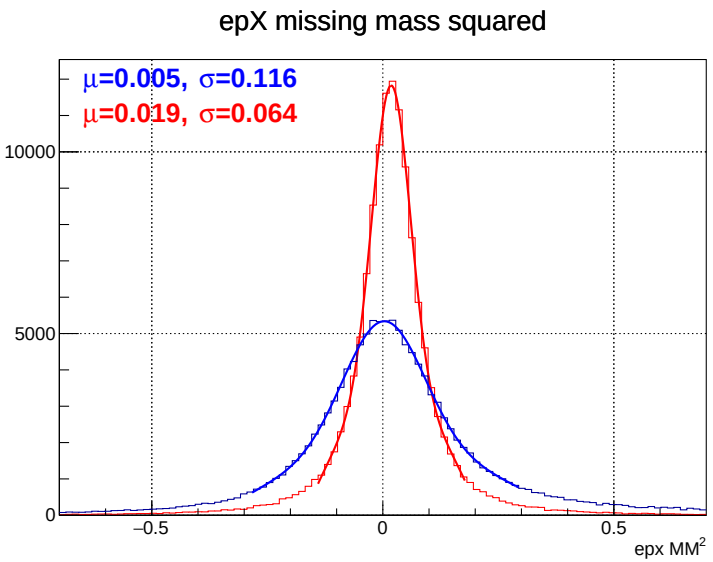


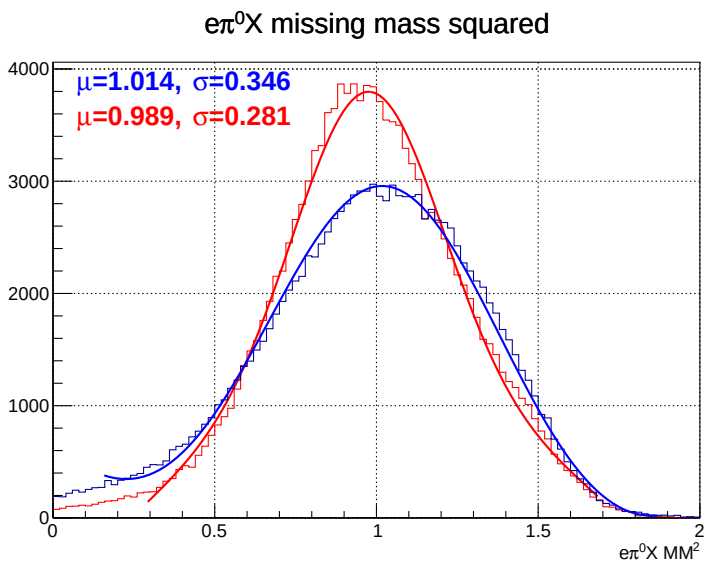
$\theta_\pi > 5^\circ$



Comparison with simulation

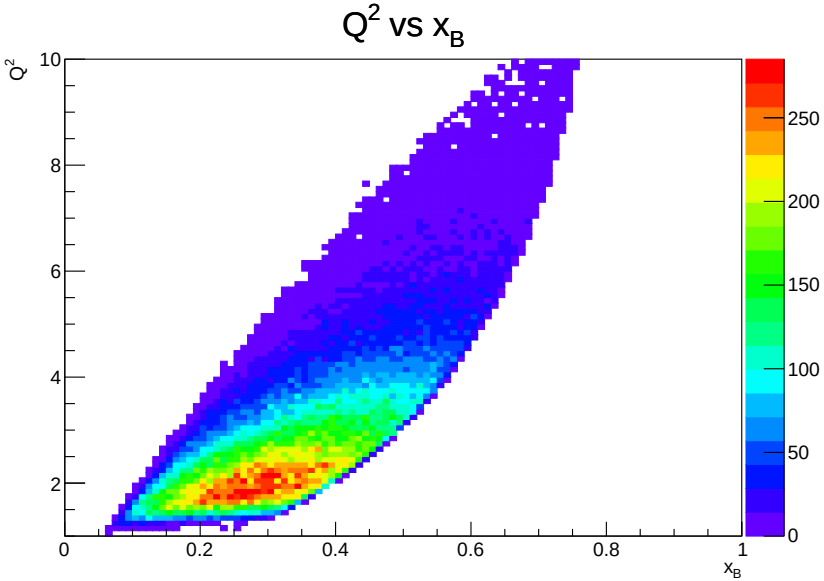




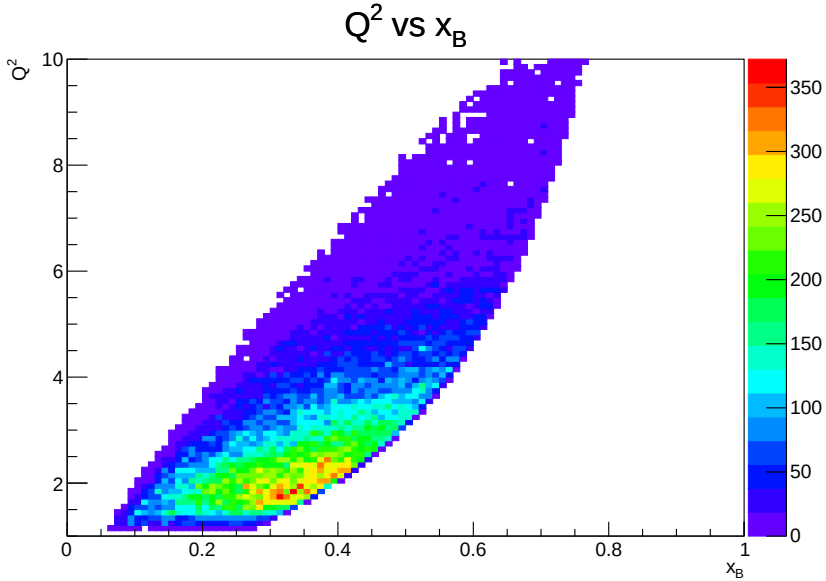


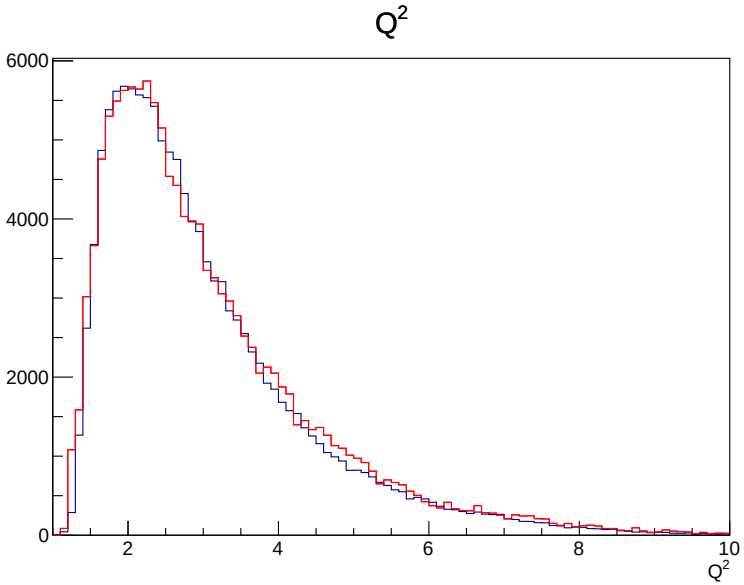
Kinematic coverage

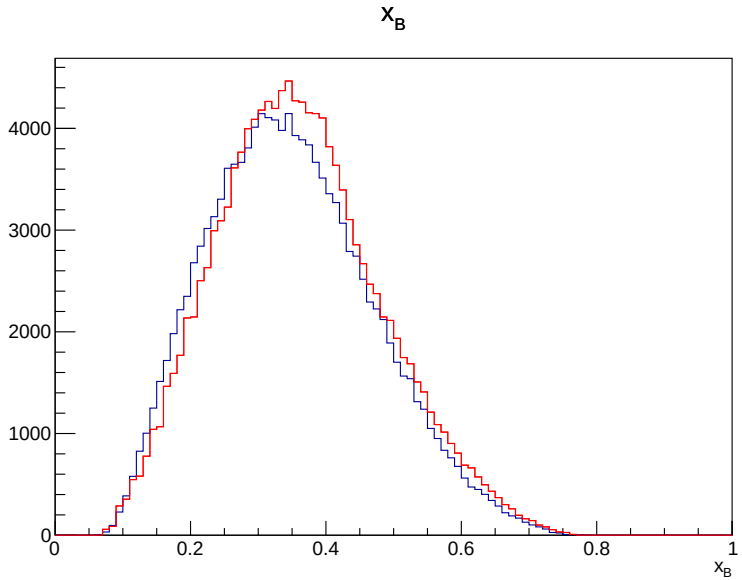
DATA



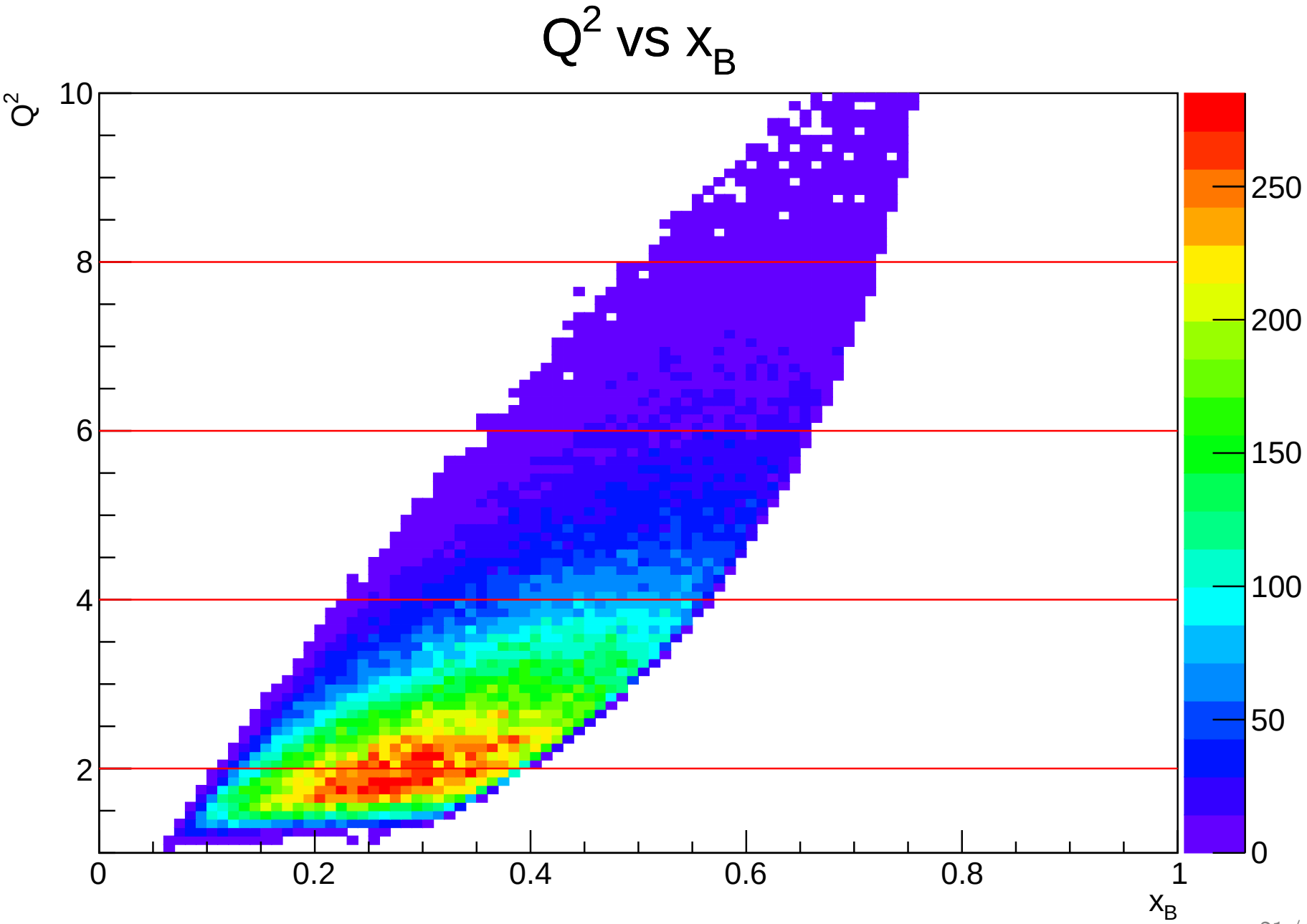
MC



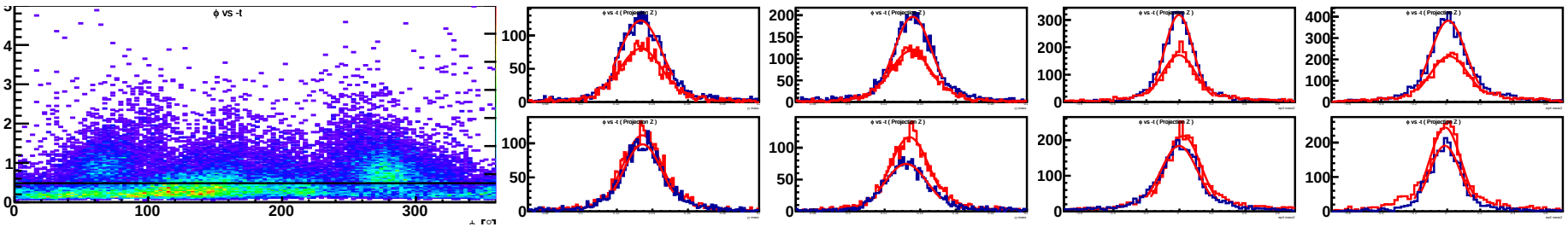


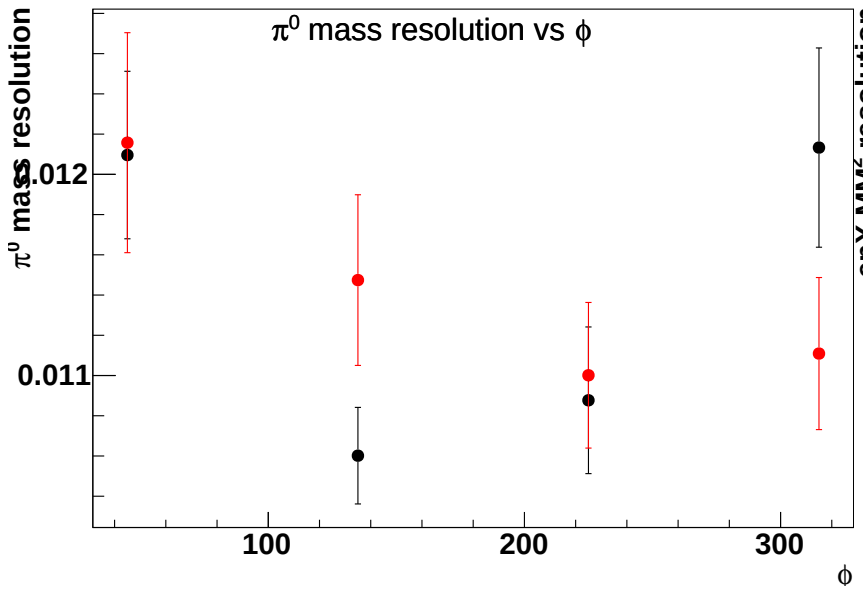


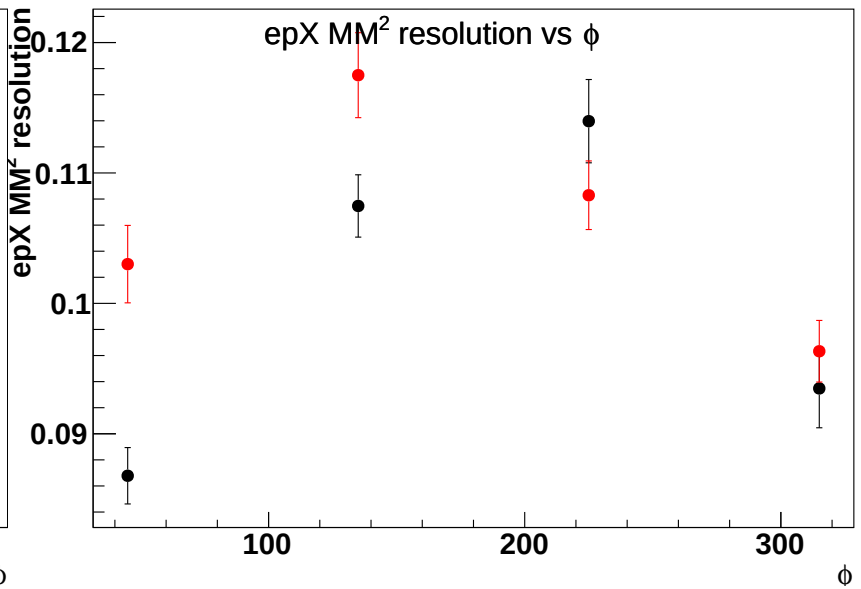
Kinematic coverage



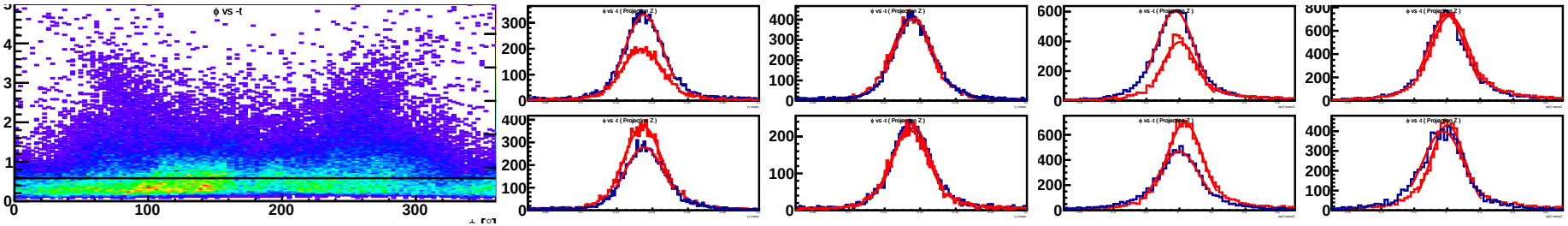
Kinematic dependence (bin = 1)

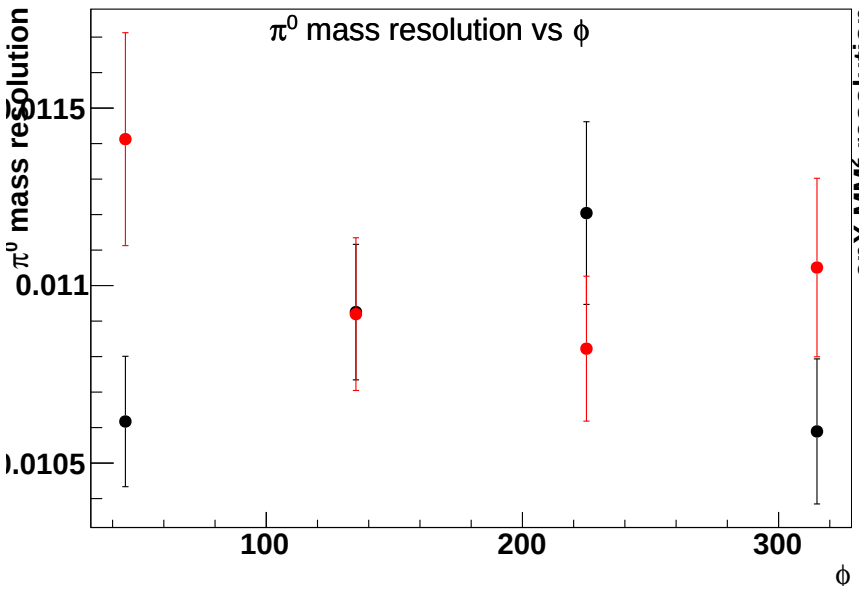


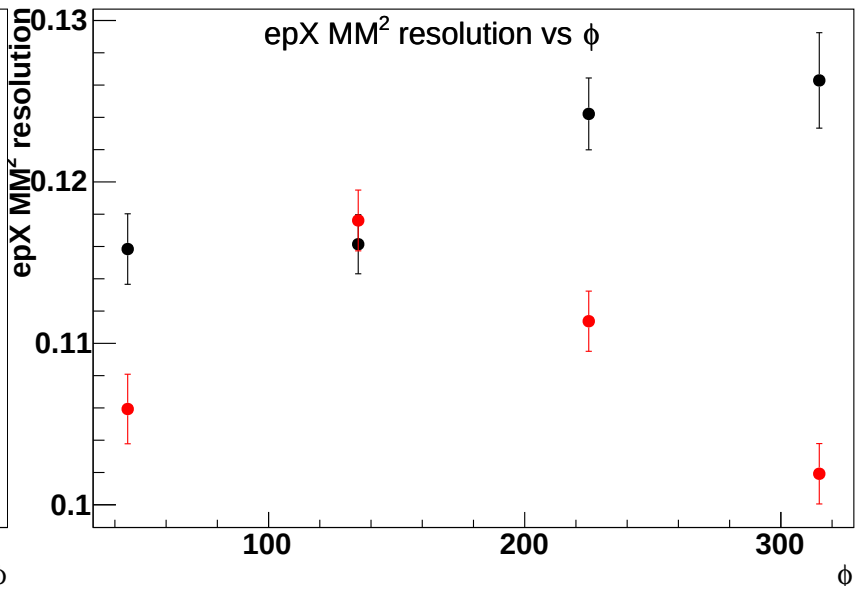




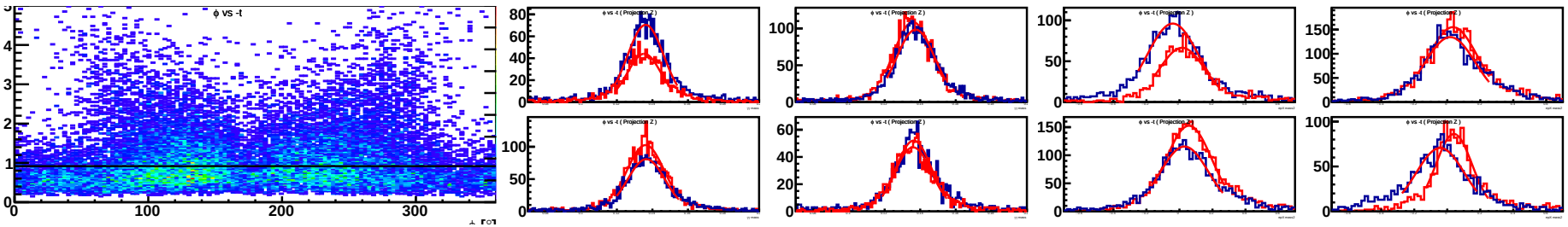
Kinematic dependence (bin = 2)

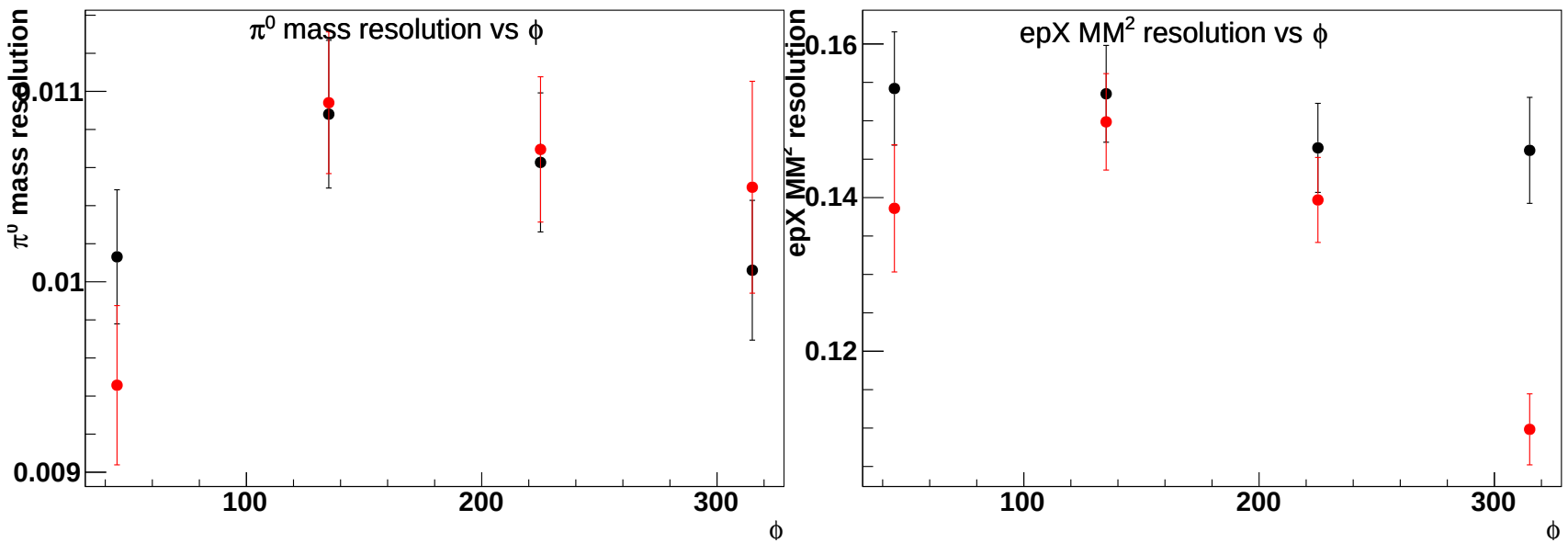




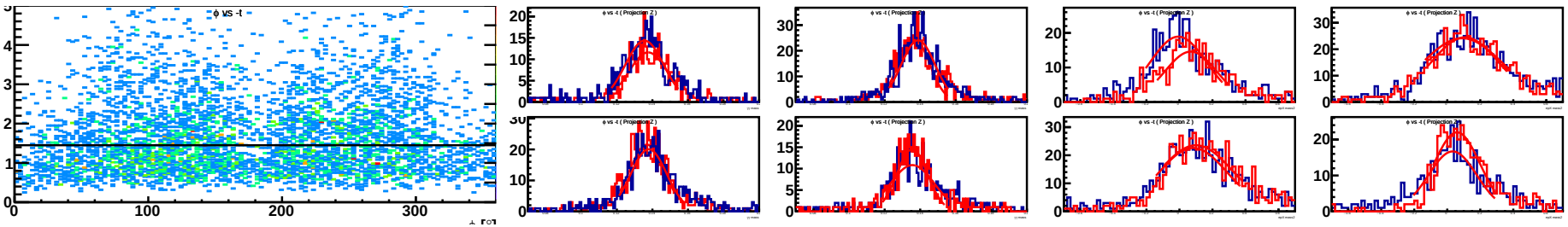


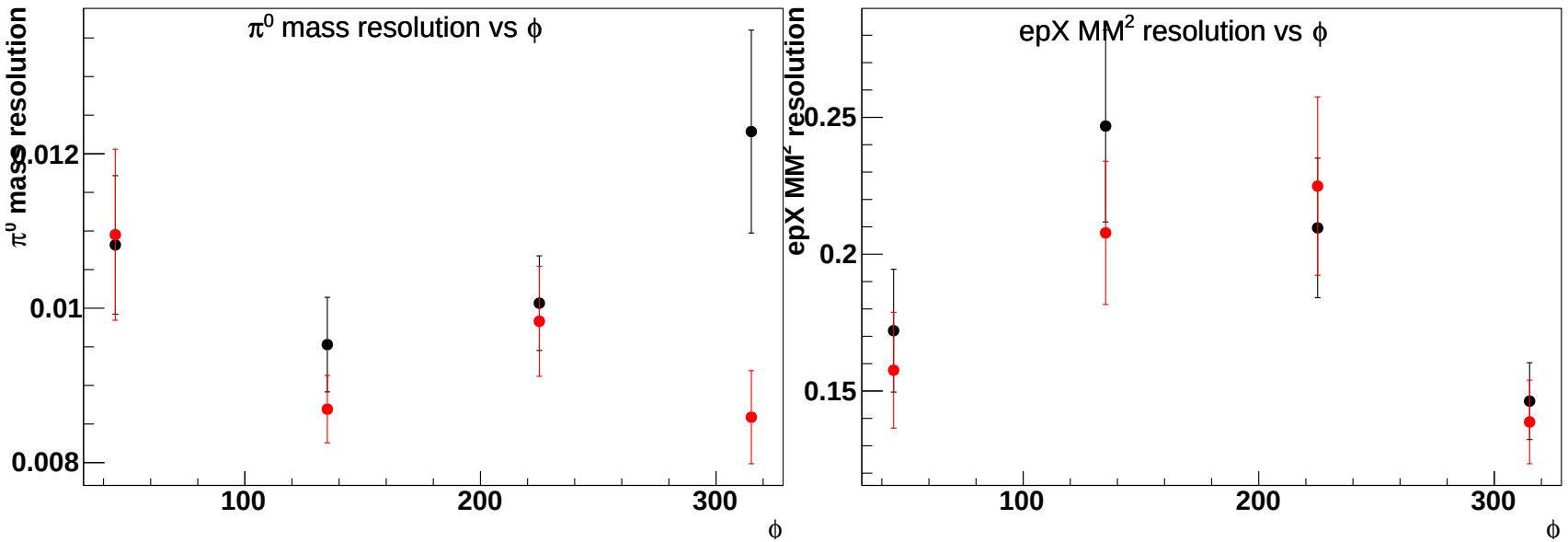
Kinematic dependence (bin = 3)



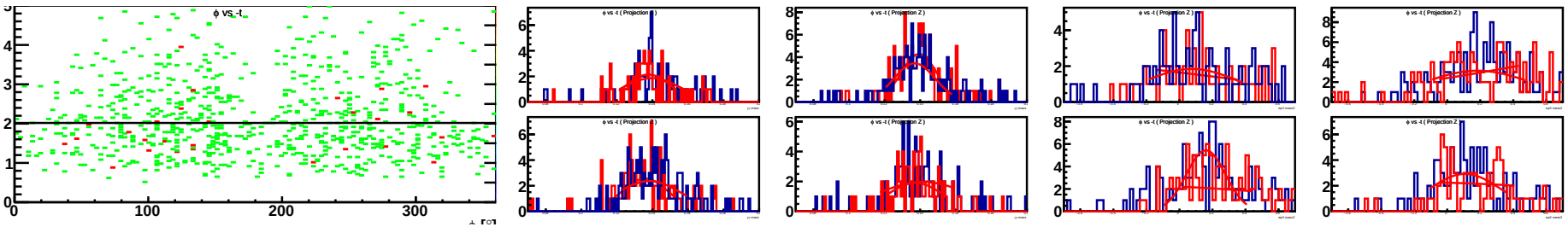


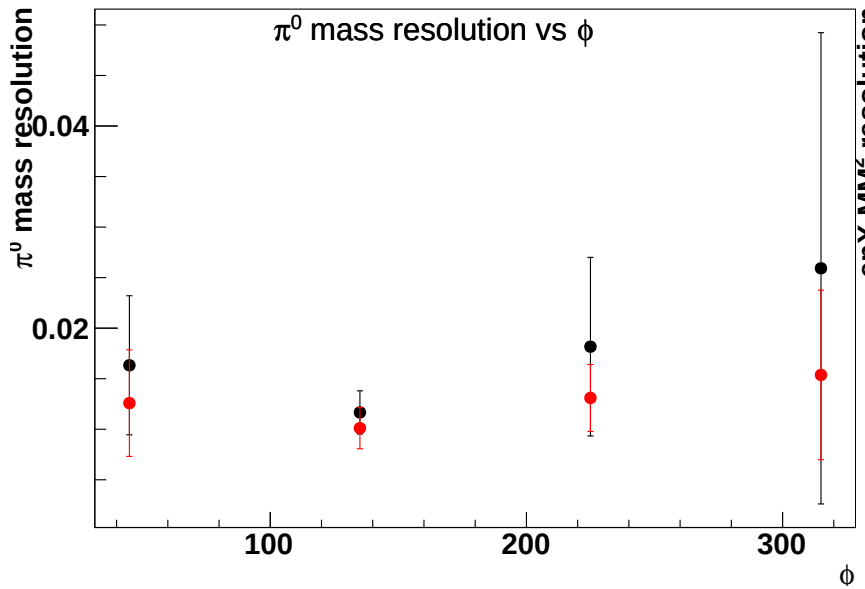
Kinematic dependence (bin = 4)

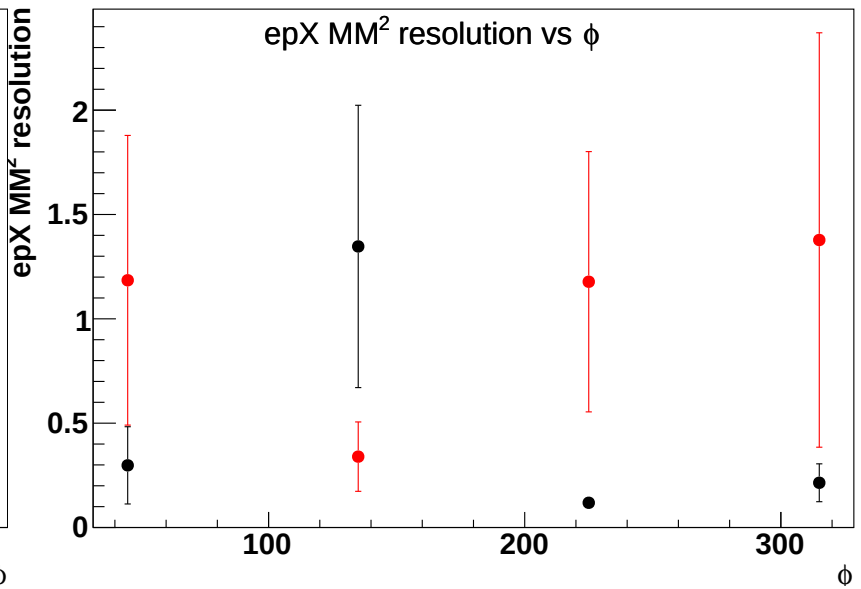
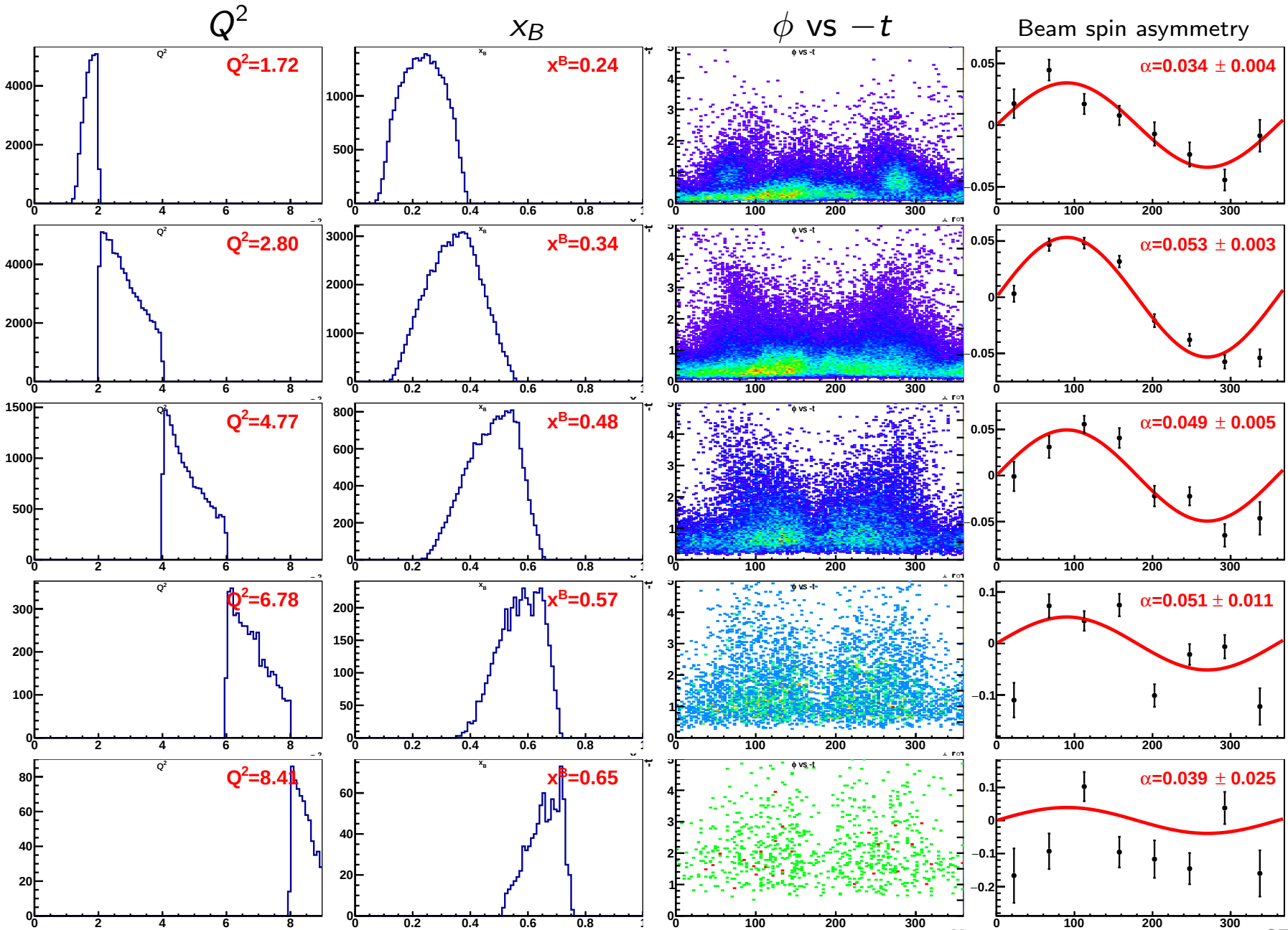




Kinematic dependence (bin = 5)







Kinematic coverage