

CLAS12 Simulation Studies of DV γ and DV ϕ

F.-X. Girod

Jefferson Laboratory

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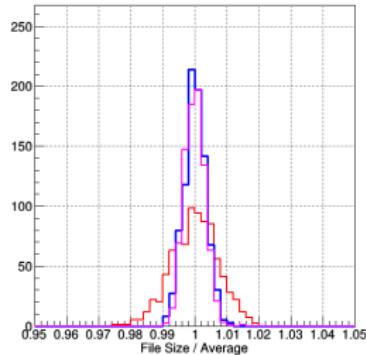
Outline

- 1 Coverage, Resolutions, Common Features
- 2 DV ϕ
- 3 DV γ
- 4 Summary and Outlook

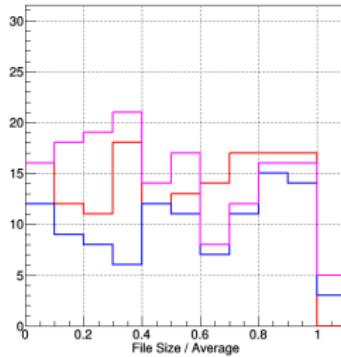
Coverage, Resolutions, Common Features

Rate of GEMC batch jobs success

Successful jobs file size



Failed jobs file size



$e\gamma$

Avg Size

244.5 MB

Fail rate

17.4%

epK^+K^-

Avg Size

308.6 MB

Fail rate

12.1%

$epK_s K_l$

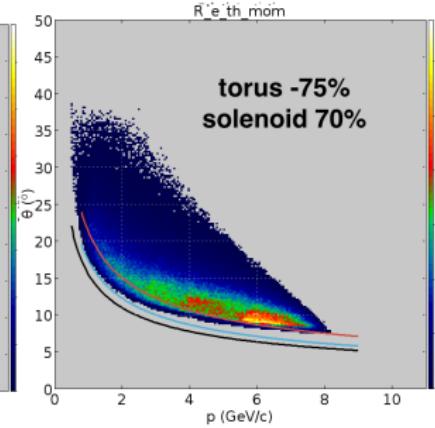
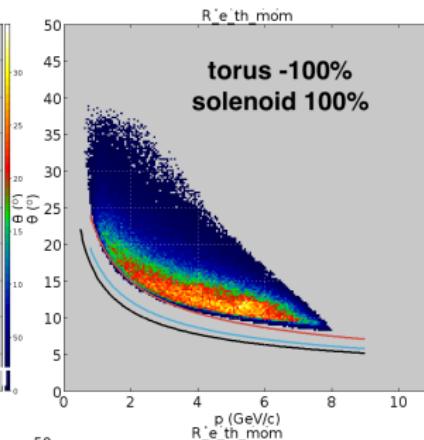
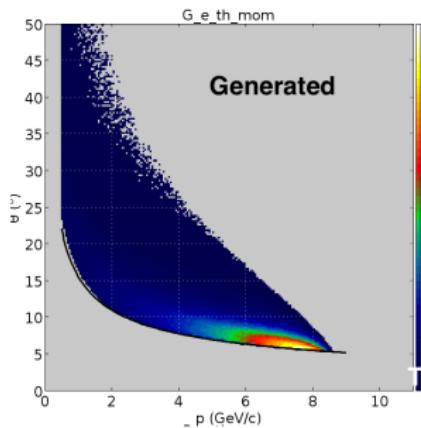
Avg Size

338.2 MB

Fail rate

19.3%

Due to overlapping volumes

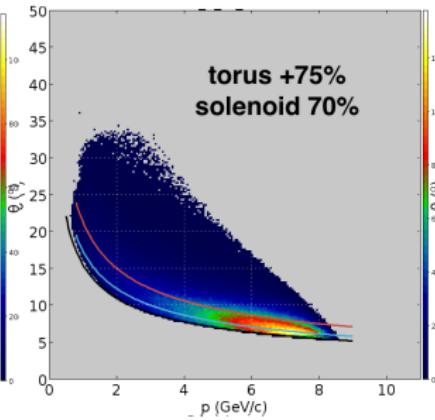
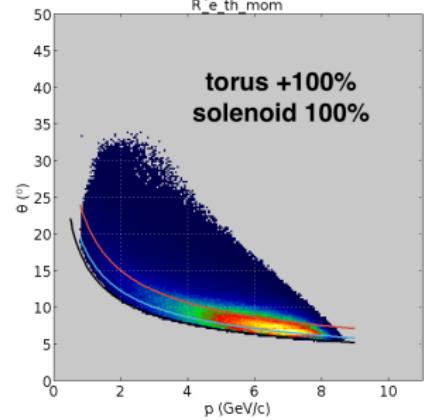


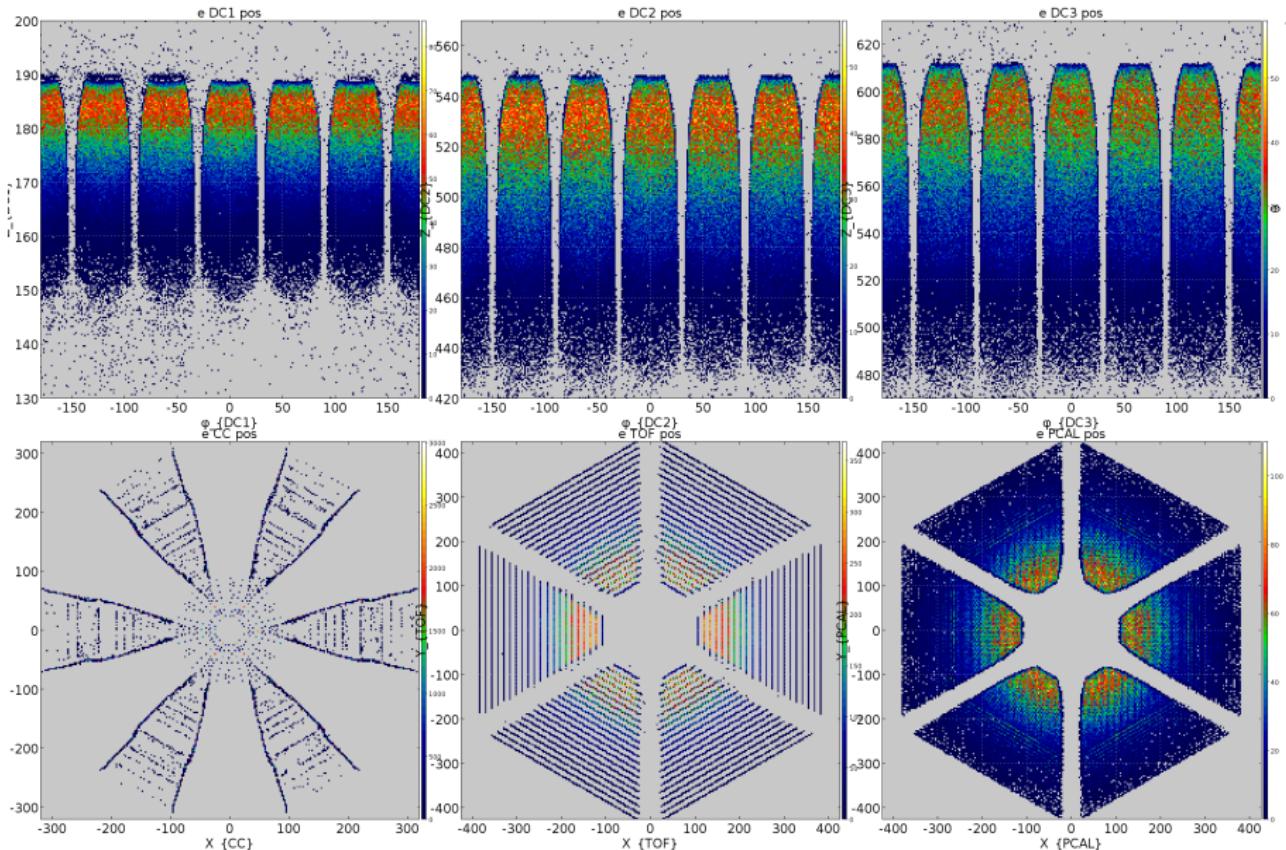
Electron reconstructed
with DC+TOF accept.

$Q^2 = 0.8 \text{ GeV}^2$

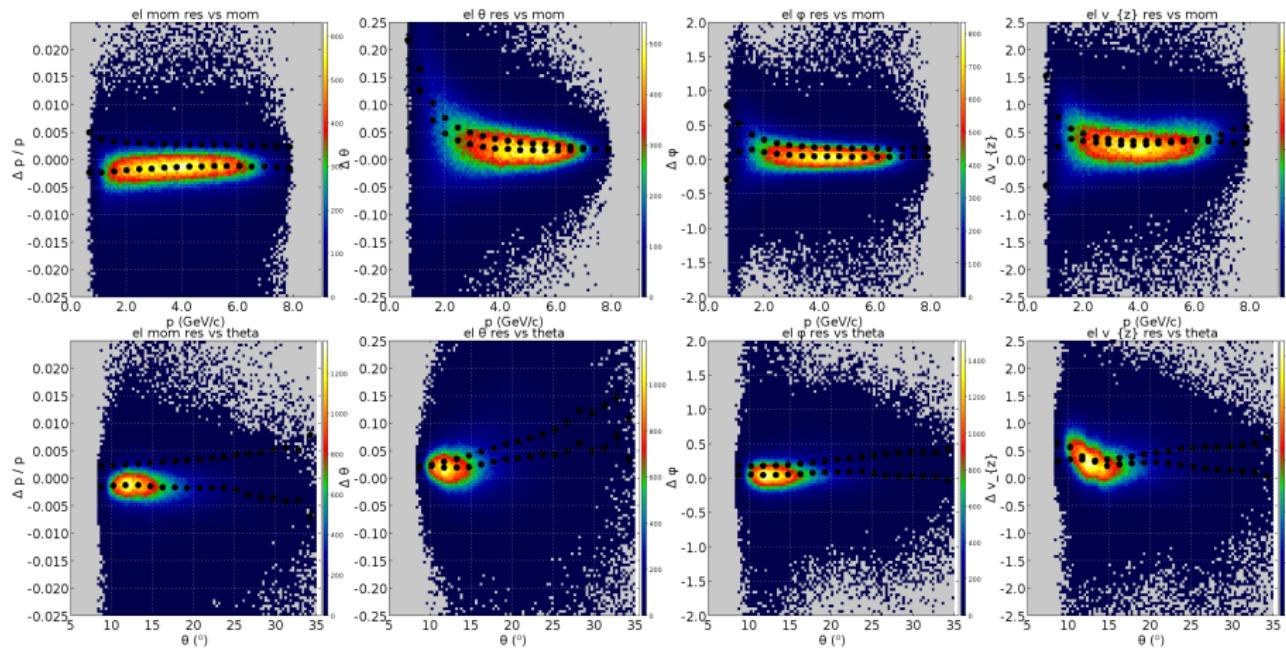
$Q^2 = 1.0 \text{ GeV}^2$

$Q^2 = 1.5 \text{ GeV}^2$



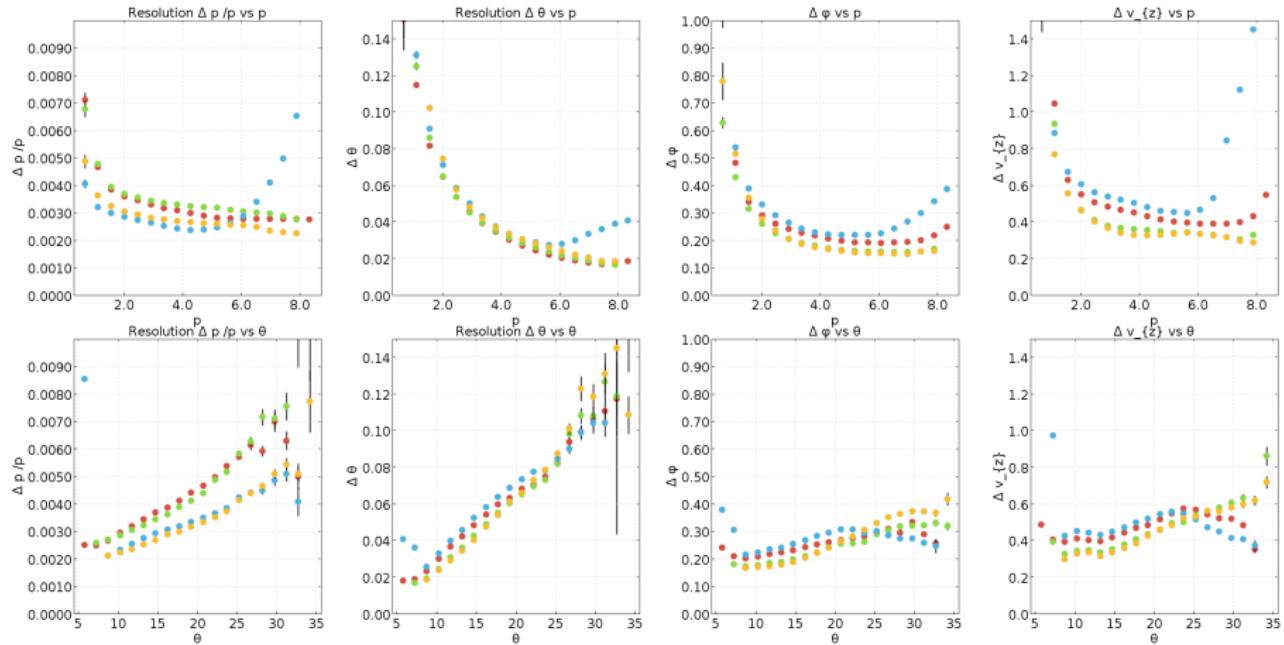


DC R1, R2, R3 local Z vs local ϕ (TOP)
local Y vs local X for CC, TOF, and ECAL (BOTTOM)



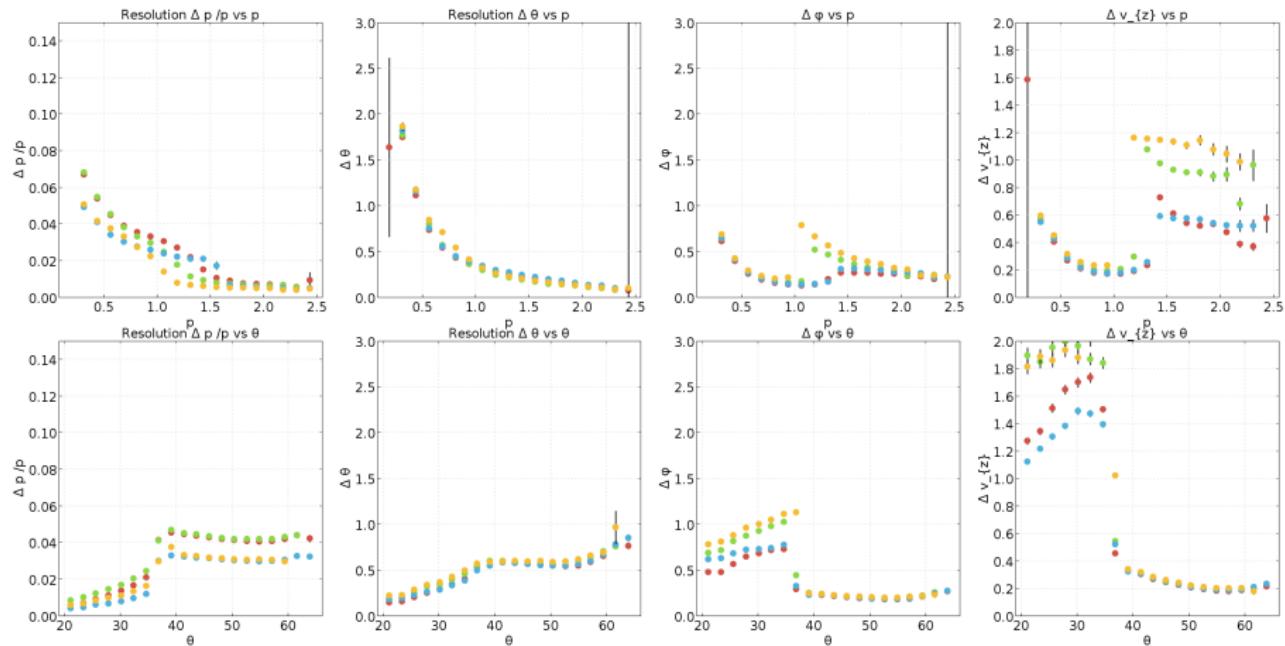
$\Delta p/p$, $\Delta\theta$, $\Delta\phi$, and Δv_z (left to right)
vs momentum (TOP) and θ (BOTTOM)
No dependence on ϕ or v_z

Electron Resolutions vs Magnetic Field



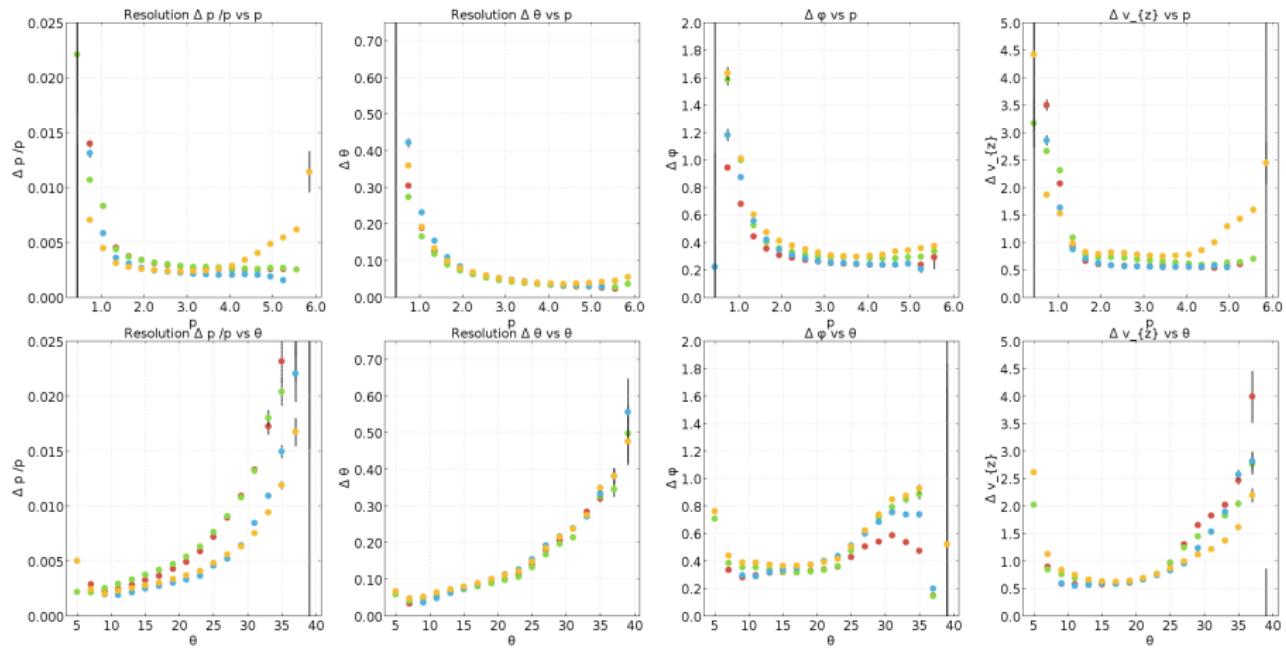
TORUS -1.0 / SOL. 1.0 TORUS -0.75 / SOL. 0.7
TORUS +1.0 / SOL. 1.0 TORUS 0.75 / SOL. 0.7

Proton Resolutions vs Magnetic Field



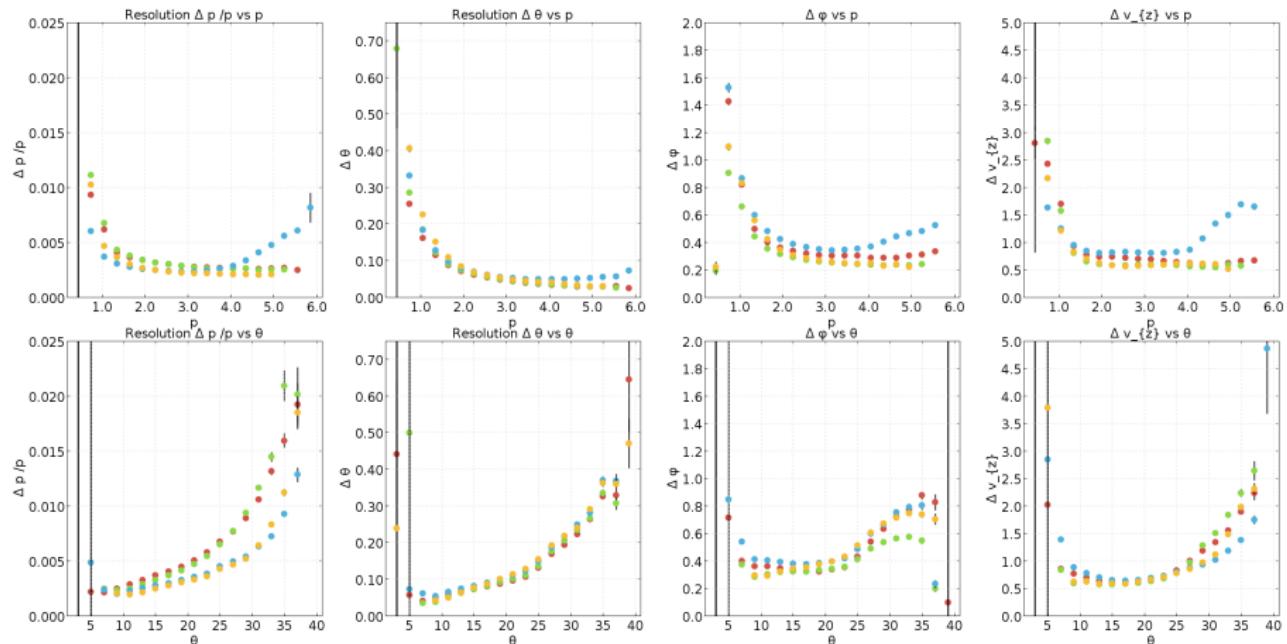
TORUS -1.0 / SOL. 1.0 TORUS -0.75 / SOL. 0.7
TORUS +1.0 / SOL. 1.0 TORUS 0.75 / SOL. 0.7

K+ Resolutions vs Magnetic Field



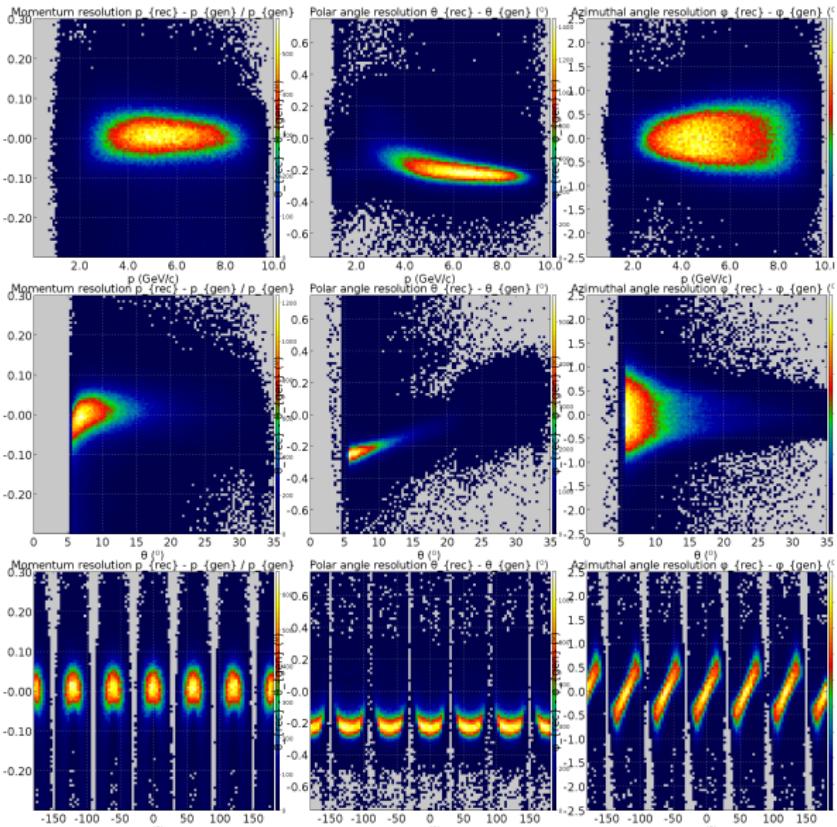
TORUS -1.0 / SOL. 1.0 TORUS -0.75 / SOL. 0.7
TORUS +1.0 / SOL. 1.0 TORUS 0.75 / SOL. 0.7

K- Resolutions vs Magnetic Field

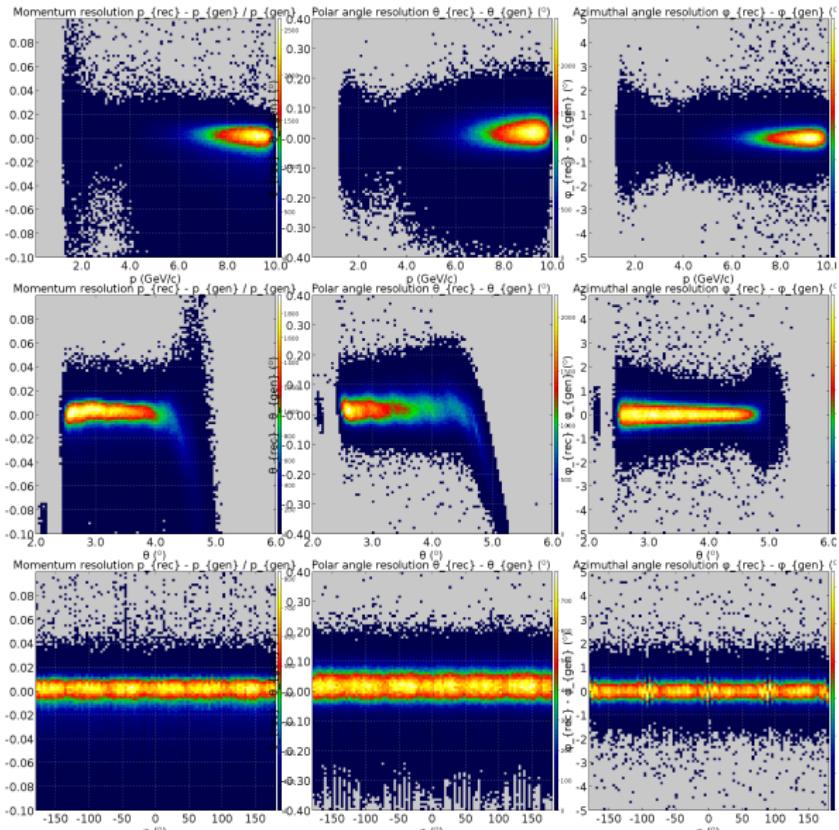


TORUS -1.0 / SOL. 1.0 TORUS -0.75 / SOL. 0.7
TORUS +1.0 / SOL. 1.0 TORUS 0.75 / SOL. 0.7

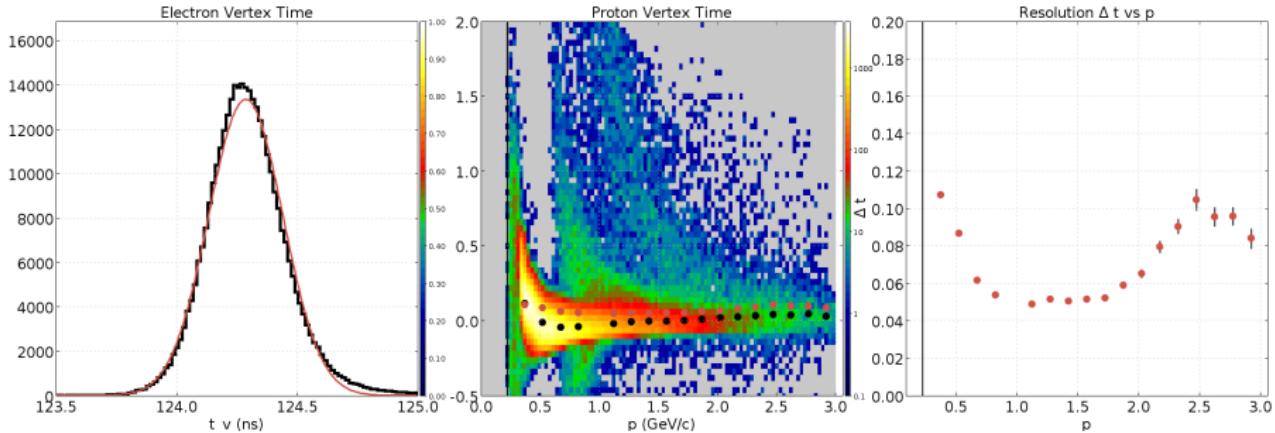
ECAL Photon Resolutions



FTCAL Photon Resolutions

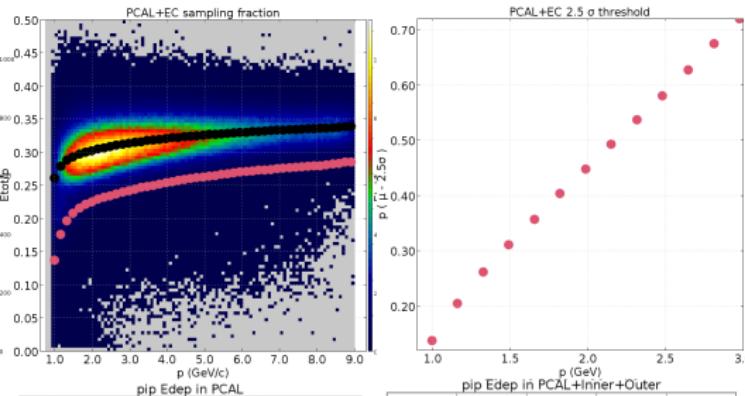


Electron Proton FTOF Coincidence



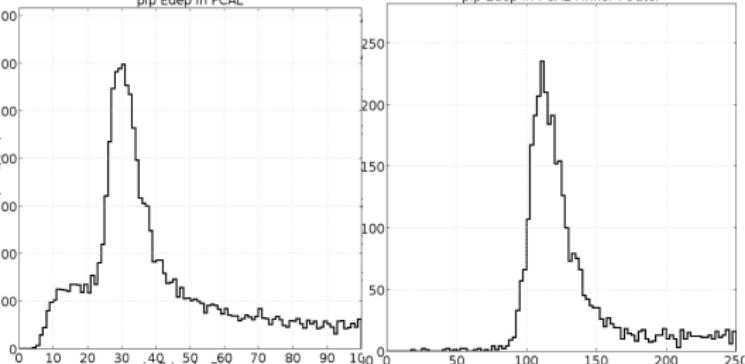
Electron Vertex Time $\sigma = 150$ ps
Proton Vertex Time Subtracted from Electron Time
FTOF intrinsic resolution ≈ 60 ps

Electron Identification in the Calorimeter



Electron in ECal:
Sampling Fraction vs momentum (left)
Mean and 2.5σ in momentum slices

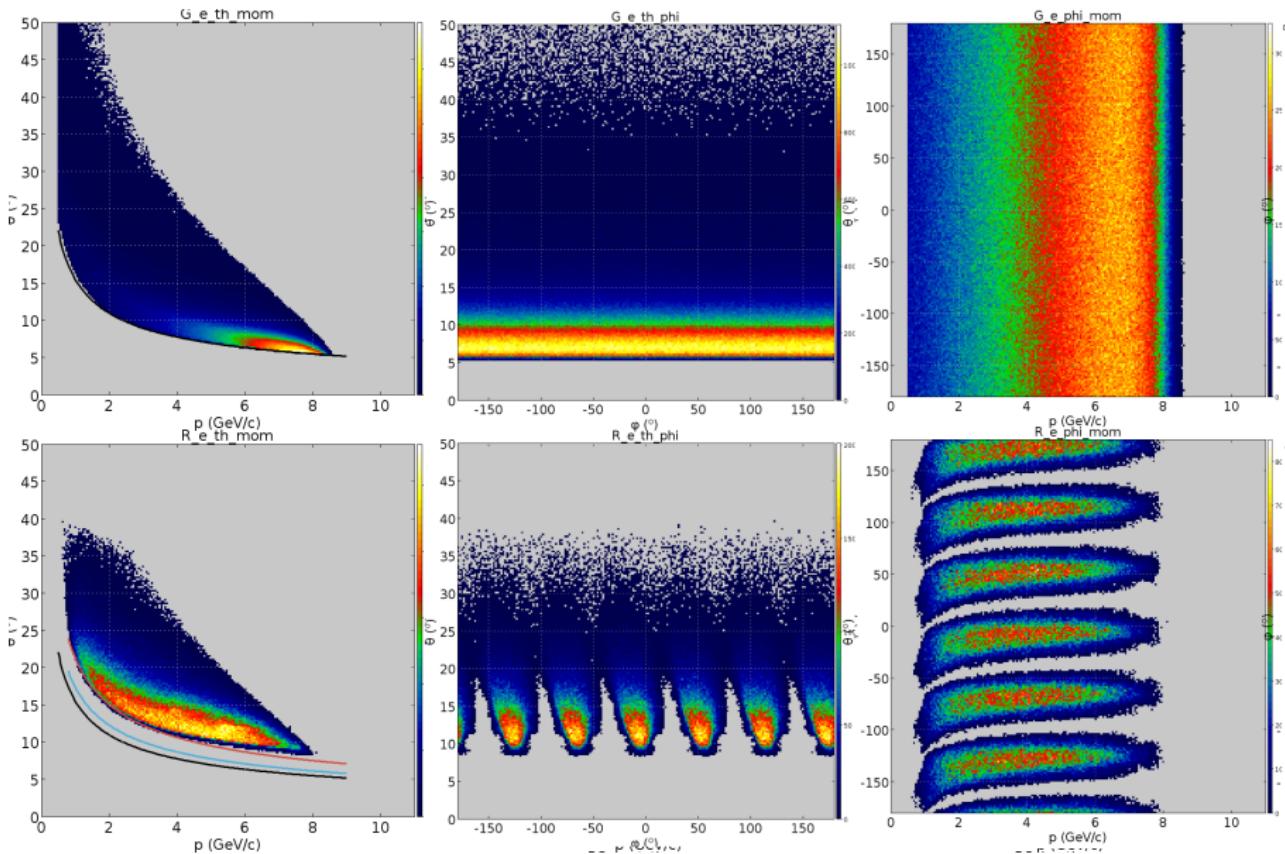
Corresponding 2.5σ Energy Threshold (right)



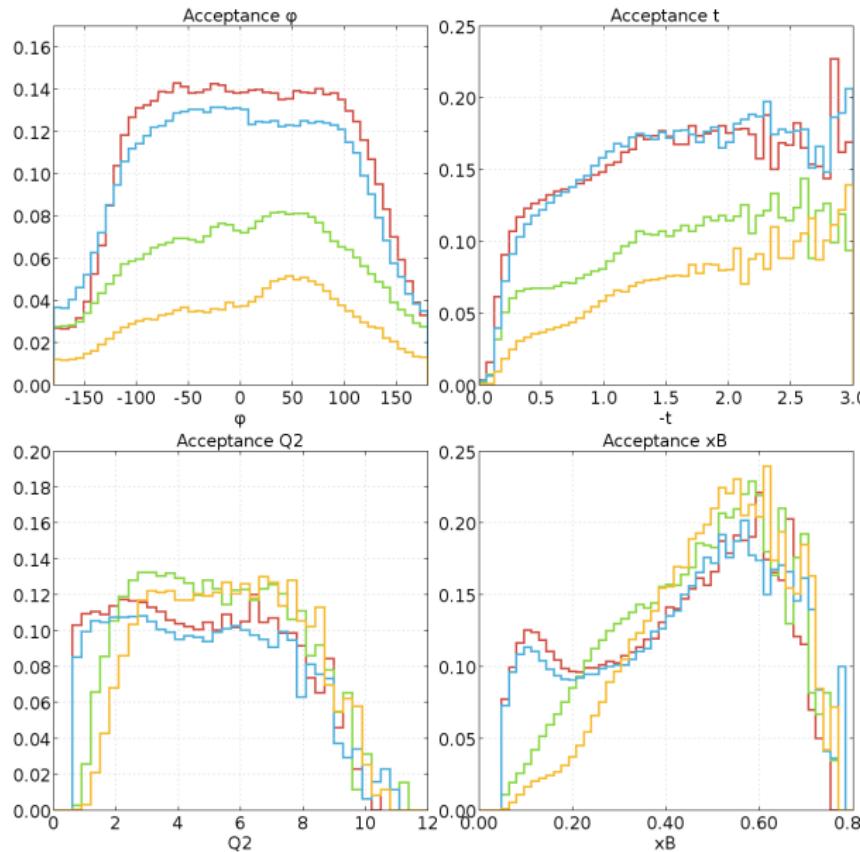
Pion Energy deposition in PCAL (MeV)
Deposition in PCAL+Ein+Eout (MeV)
MIP at 30 and 120 MeV + tail

DV ϕ





Generated (TOP) and Reconstructed(BOTTOM)
 θ vs momentum (left), θ vs ϕ (middle), ϕ vs momentum (right)



1D Integrated Acceptances

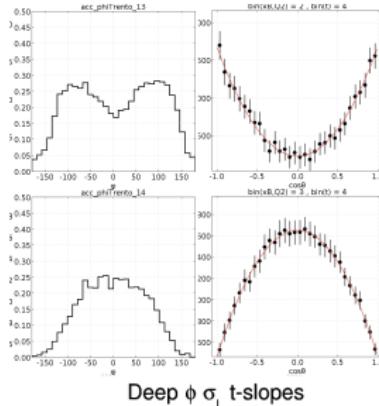
Torus 0.75 / Sol 0.7

Torus 1 / Sol 1

Torus -0.75 / Sol 0.7

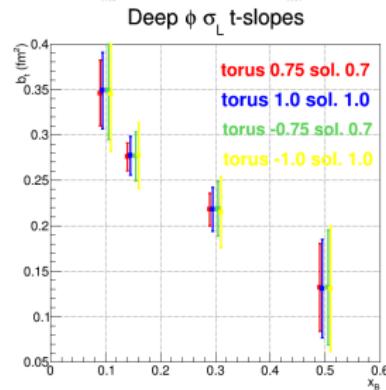
Torus -1 / Sol 1

Projected Results for Deep ϕ t-slopes



Left column : ϕ acceptances
used for amplitude extraction in **SCHC test**

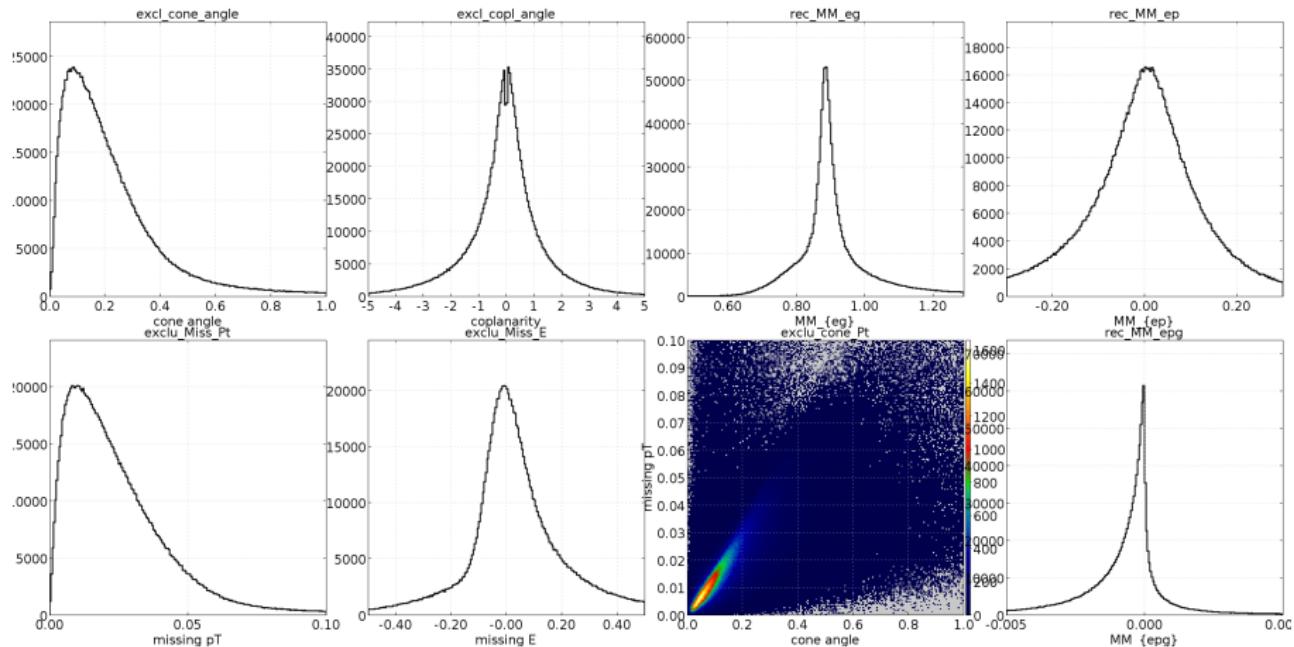
Right column : $\cos\theta_{CM}$ of meson decay
allows **separation of σ_L and σ_T** under SCHC

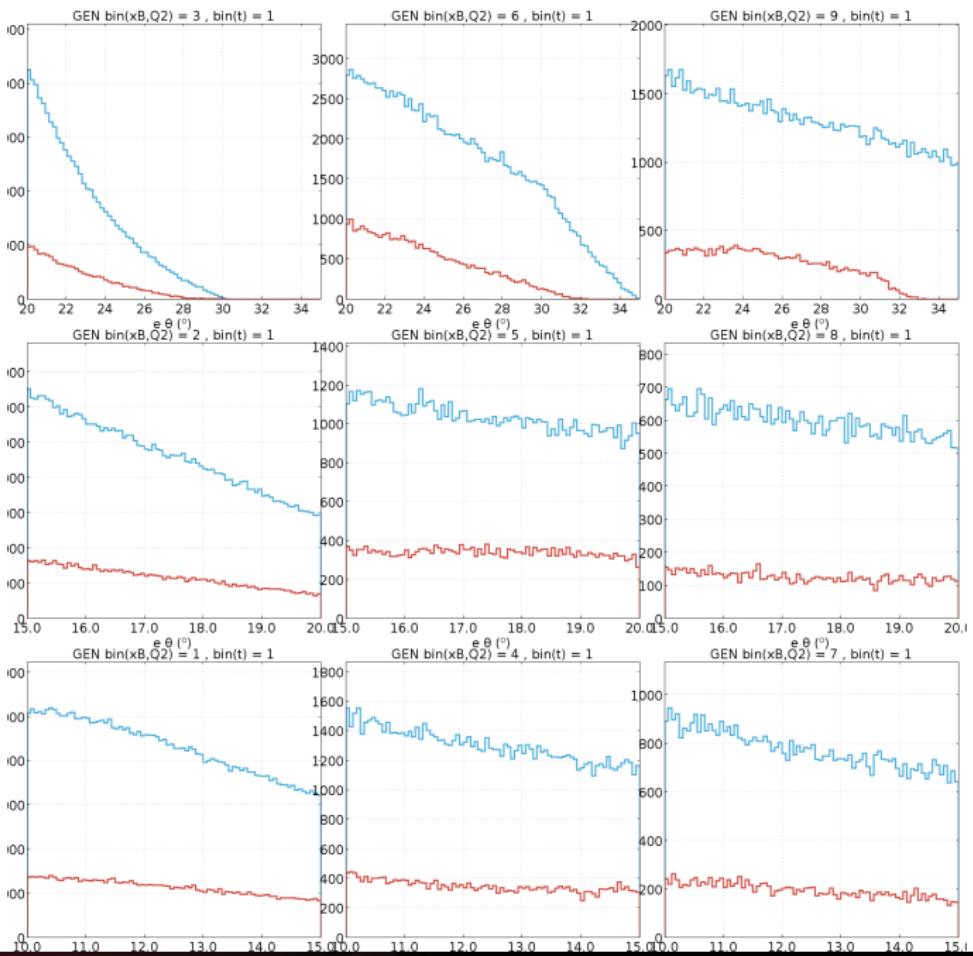


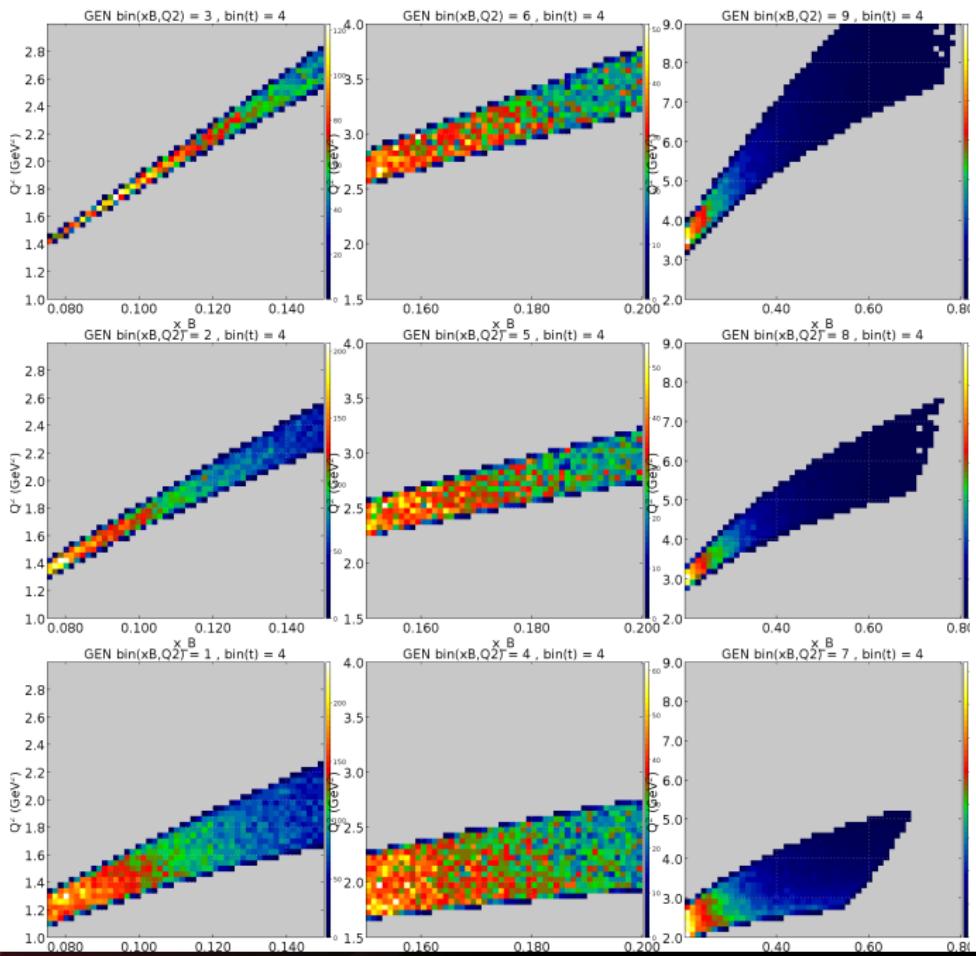
σ_L t-slopes extracted for different magnetic fields
Lower field and negative outbending torus are preferred

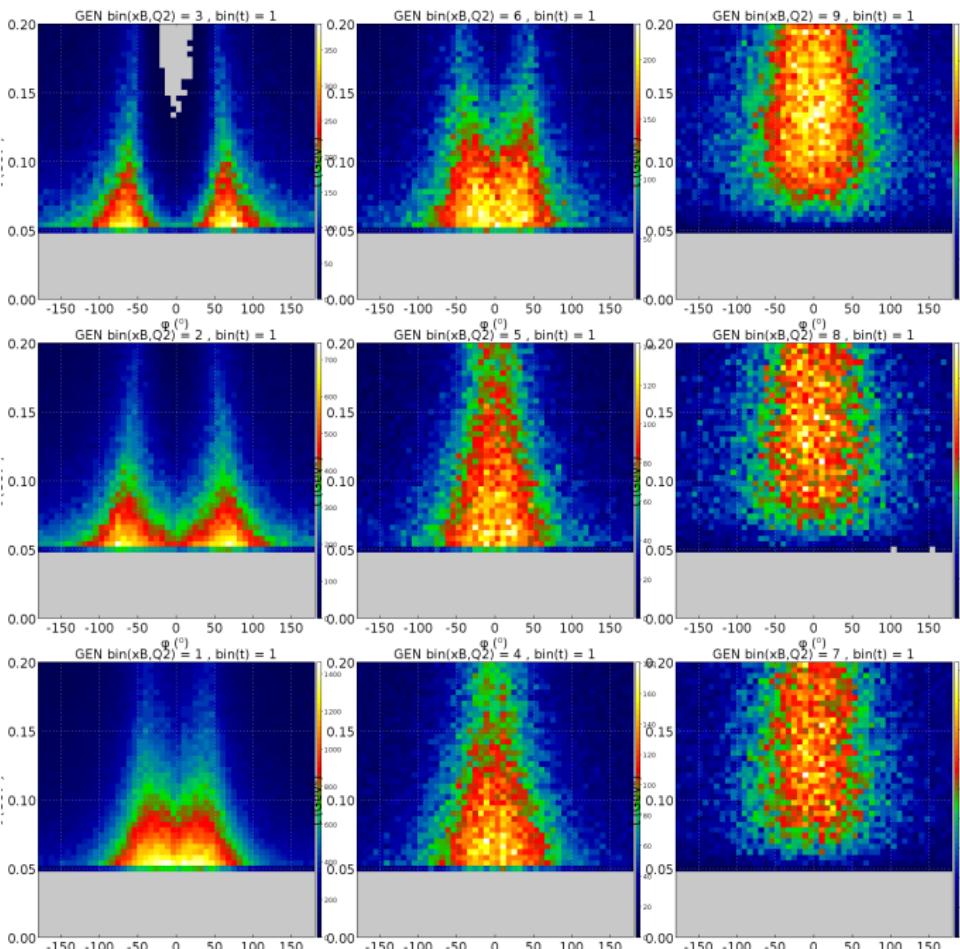
DV γ

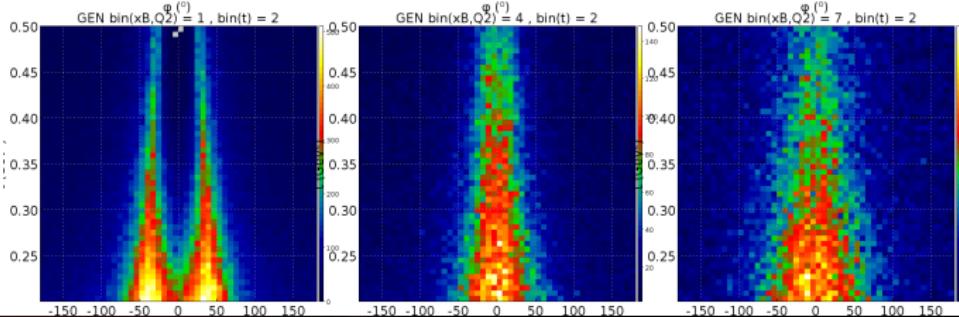
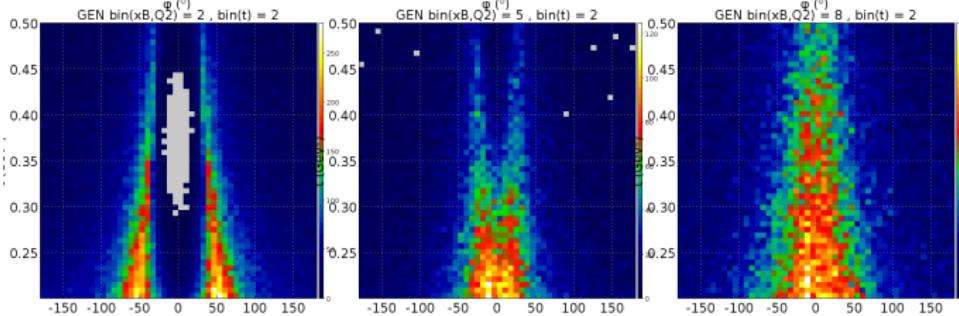
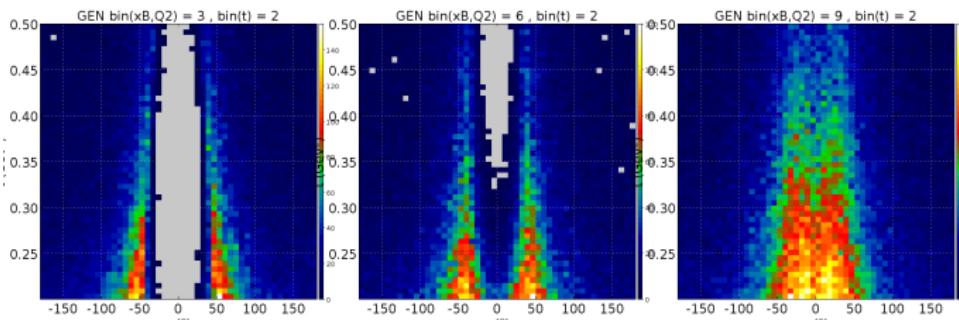




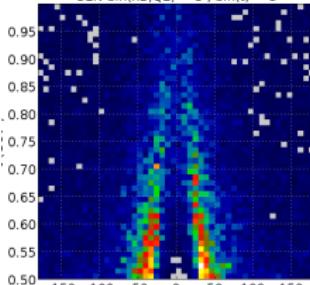




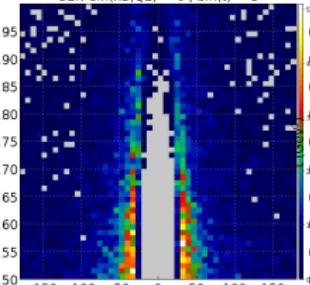




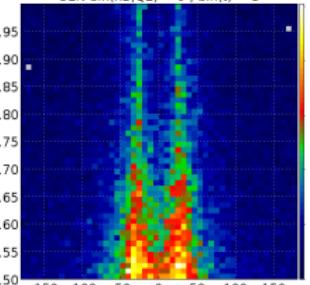
GEN bin(xB,Q2) = 3 , bin(t) = 3



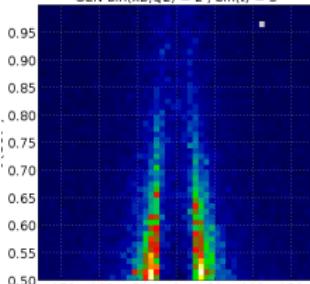
GEN bin(xB,Q2) = 6 , bin(t) = 3



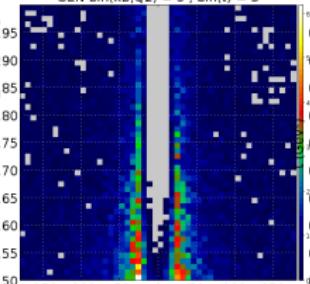
GEN bin(xB,Q2) = 9 , bin(t) = 3



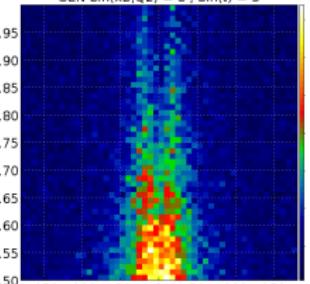
GEN bin(xB,Q2) = 2 , bin(t) = 3



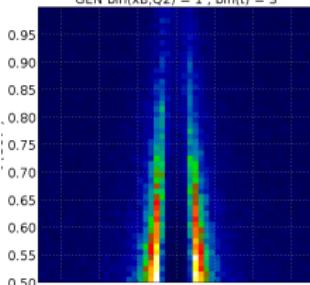
GEN bin(xB,Q2) = 5 , bin(t) = 3



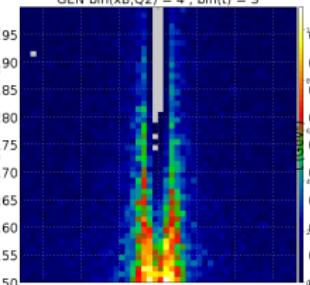
GEN bin(xB,Q2) = 8 , bin(t) = 3



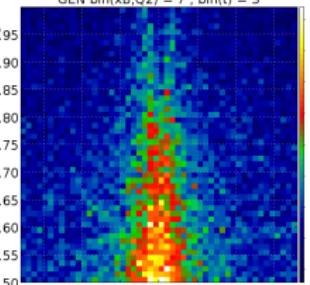
GEN bin(xB,Q2) = 1 , bin(t) = 3

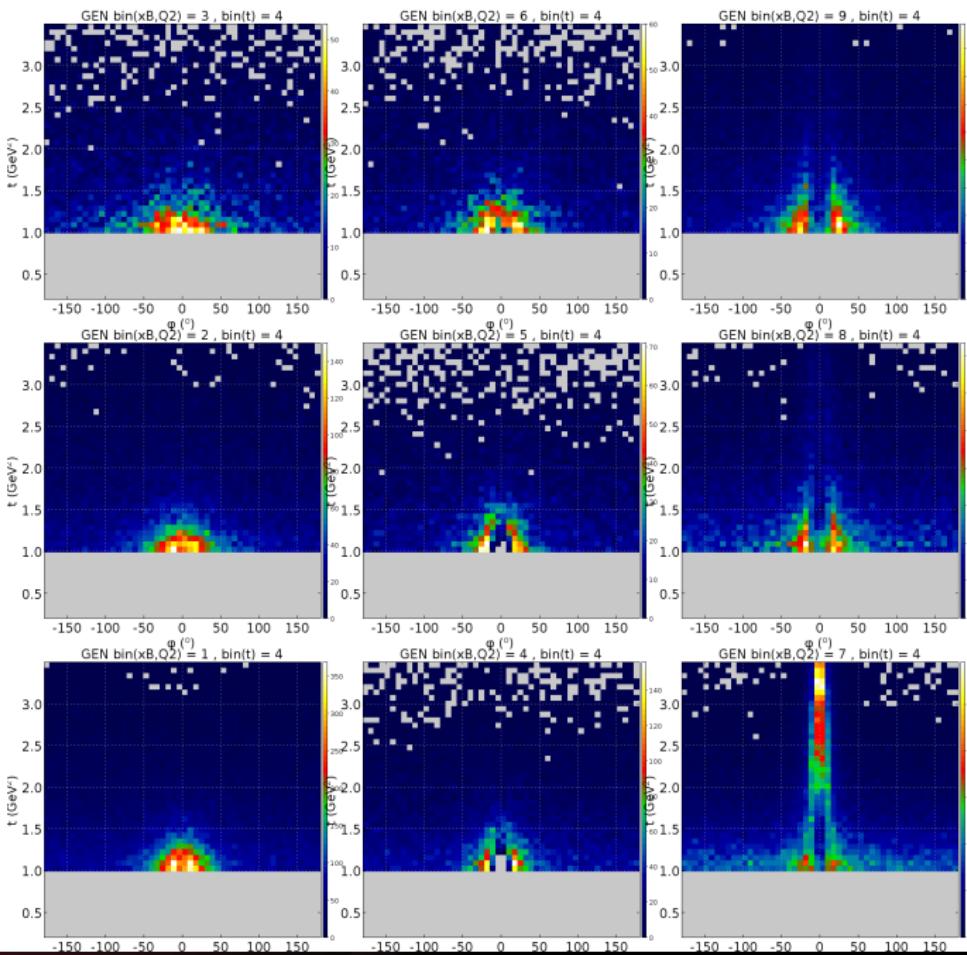


GEN bin(xB,Q2) = 4 , bin(t) = 3

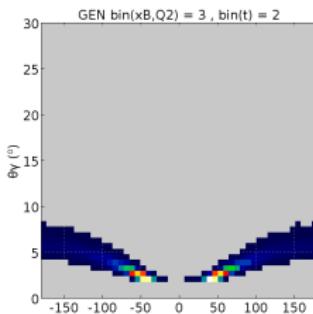


GEN bin(xB,Q2) = 7 , bin(t) = 3

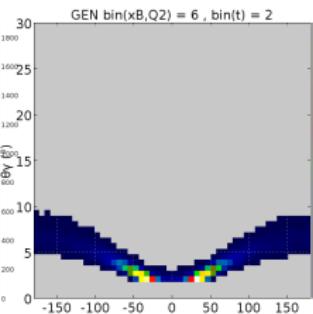




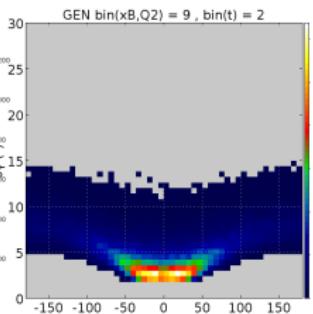
GEN bin(xB,Q2) = 3 , bin(t) = 2



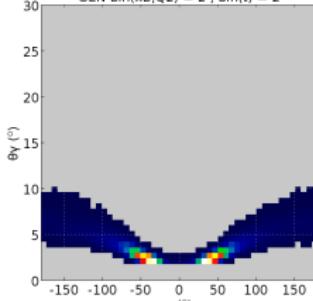
GEN bin(xB,Q2) = 6 , bin(t) = 2



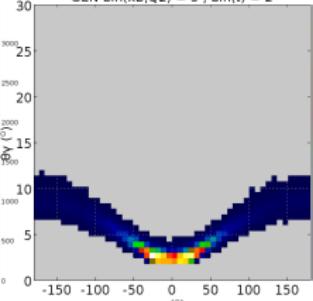
GEN bin(xB,Q2) = 9 , bin(t) = 2



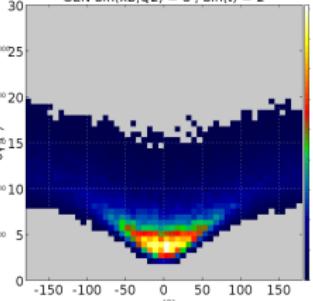
GEN bin(xB,Q2) = 2 , bin(t) = 2



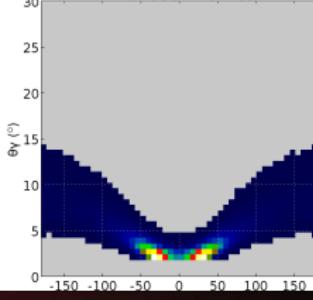
GEN bin(xB,Q2) = 5 , bin(t) = 2



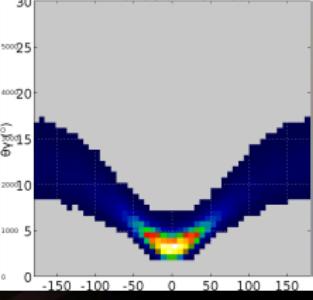
GEN bin(xB,Q2) = 8 , bin(t) = 2



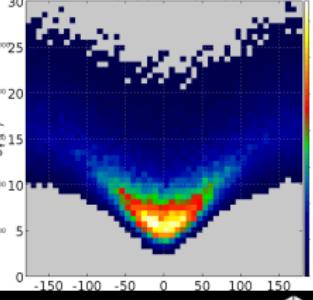
GEN bin(xB,Q2) = 1 , bin(t) = 2

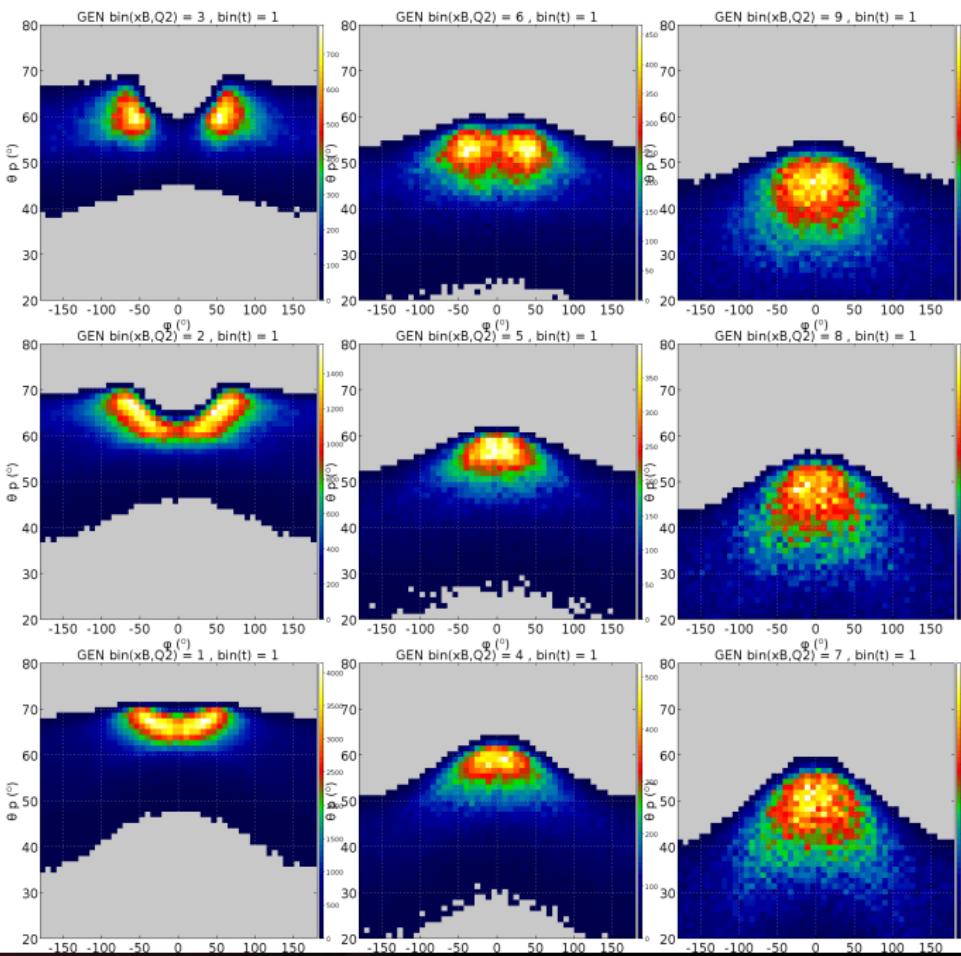


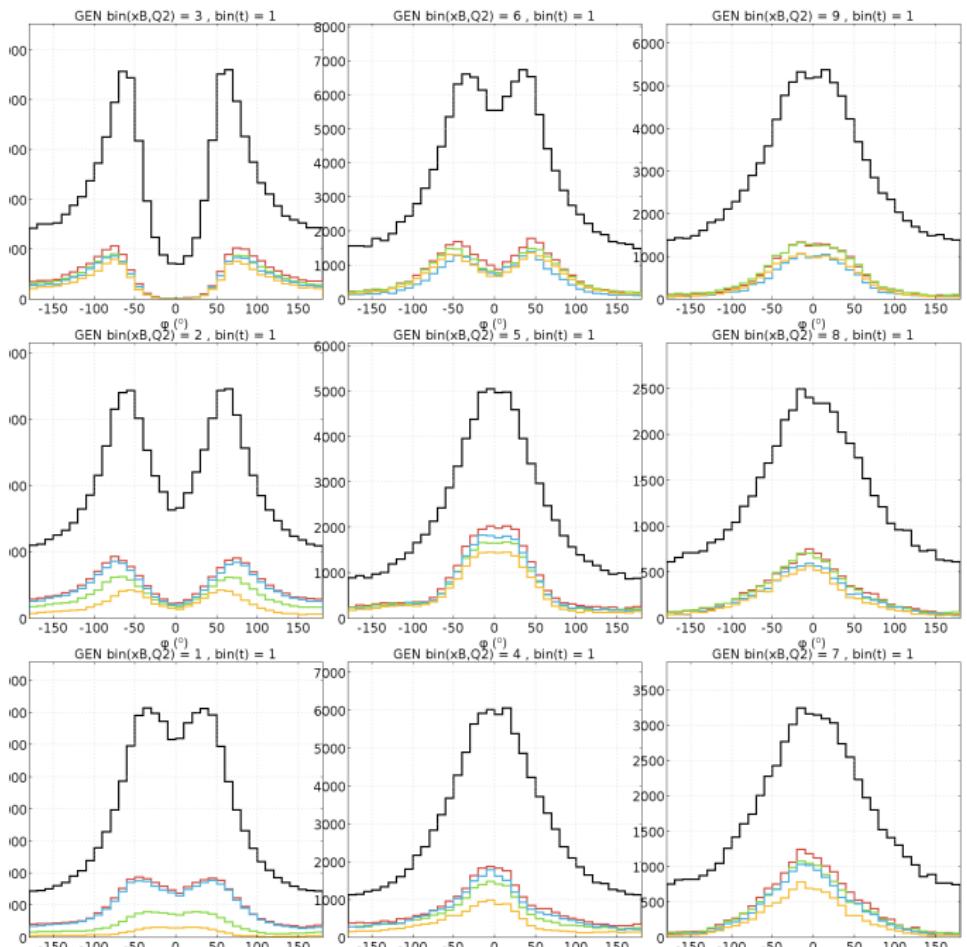
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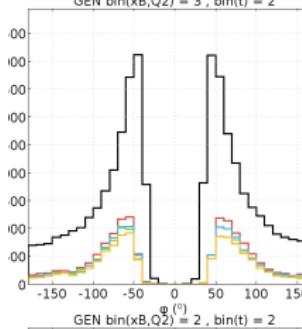
GEN bin(xB,Q2) = 7 , bin(t) = 2



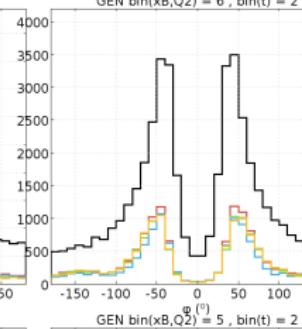




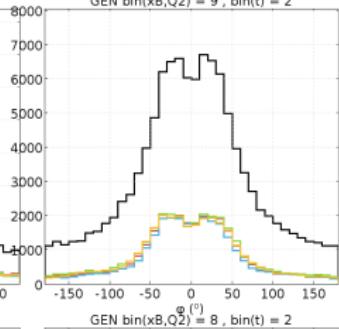
GEN bin(xB,Q2) = 3 , bin(t) = 2



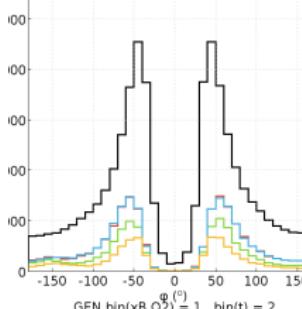
GEN bin(xB,Q2) = 6 , bin(t) = 2



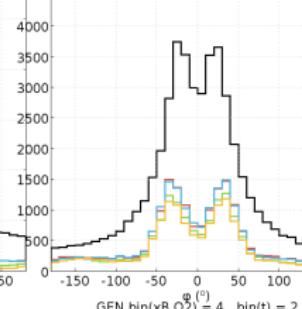
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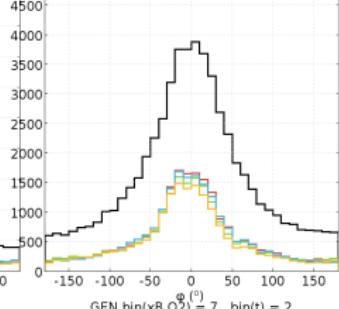
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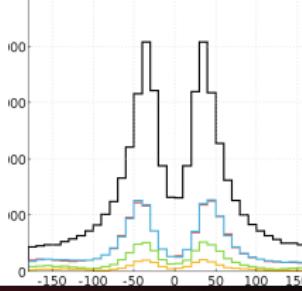
GEN bin(xB,Q2) = 5 , bin(t) = 2



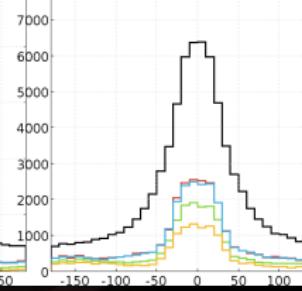
GEN bin(xB,Q2) = 8 , bin(t) = 2



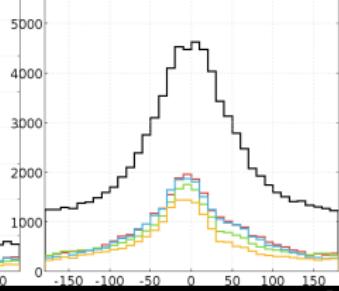
GEN bin(xB,Q2) = 1 , bin(t) = 2



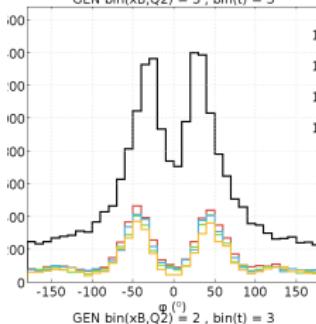
GEN bin(xB,Q2) = 4 , bin(t) = 2



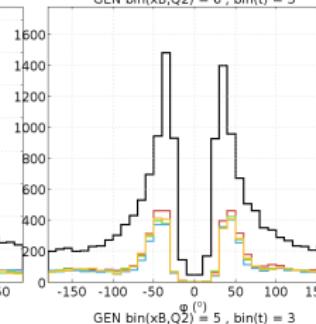
GEN bin(xB,Q2) = 7 , bin(t) = 2



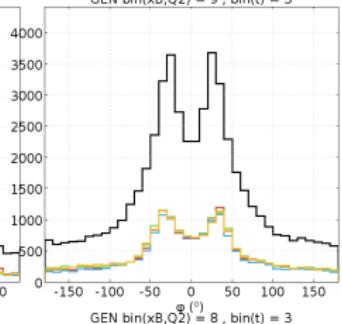
GEN bin(xB,Q2) = 3 , bin(t) = 3



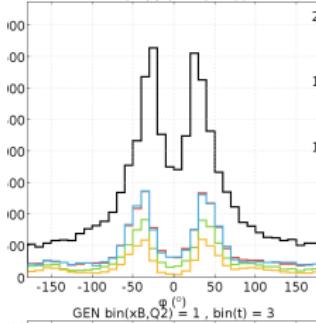
GEN bin(xB,Q2) = 6 , bin(t) = 3



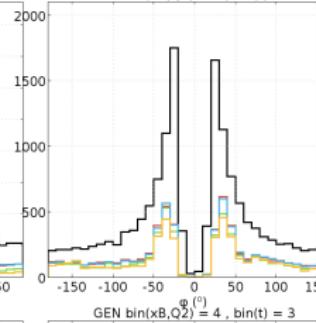
GEN bin(xB,Q2) = 9 , bin(t) = 3



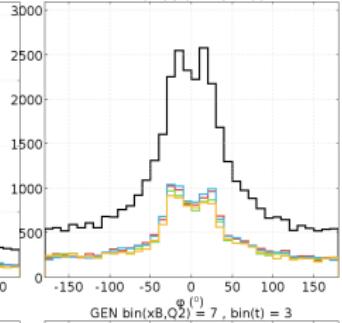
GEN bin(xB,Q2) = 2 , bin(t) = 3



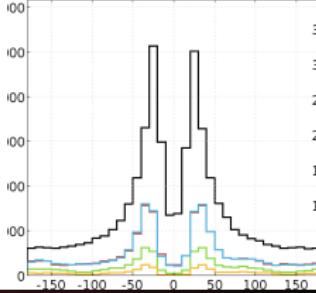
GEN bin(xB,Q2) = 5 , bin(t) = 3



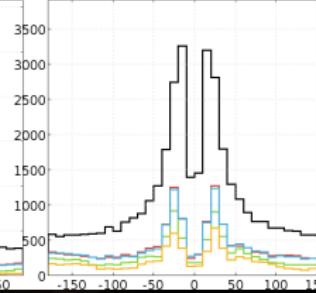
GEN bin(xB,Q2) = 8 , bin(t) = 3



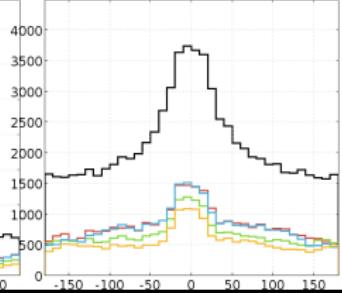
GEN bin(xB,Q2) = 1 , bin(t) = 3

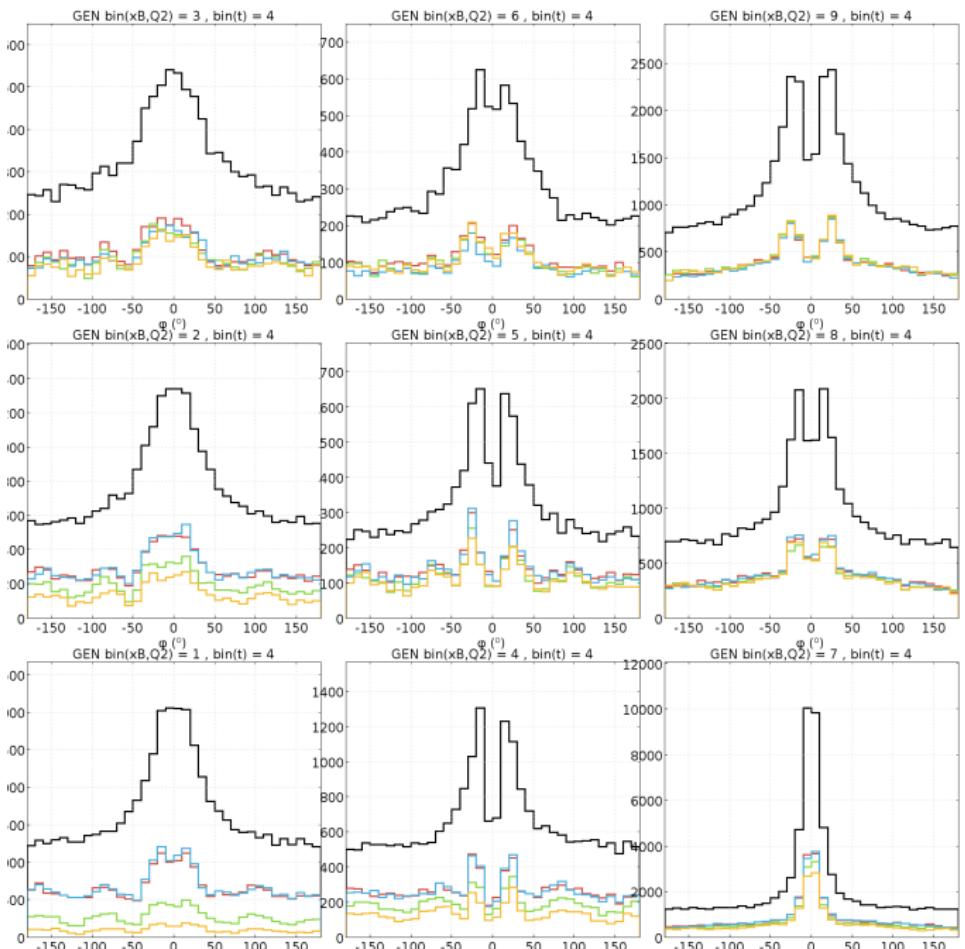


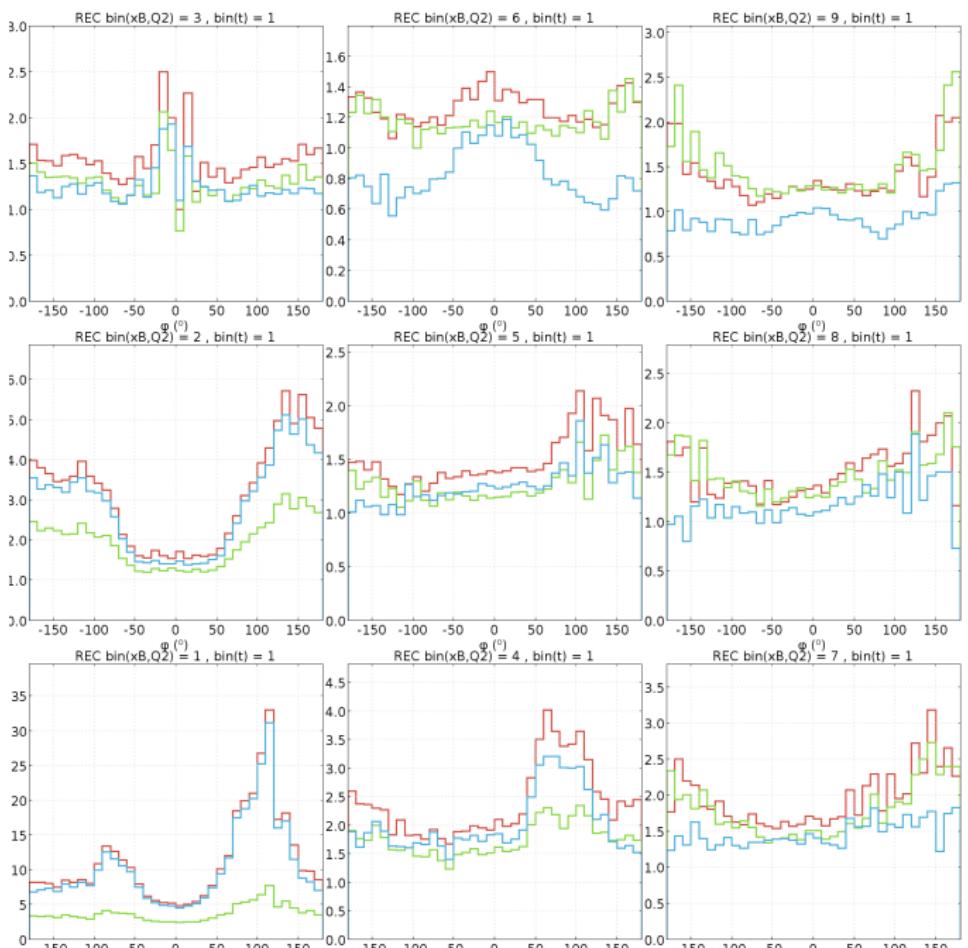
GEN bin(xB,Q2) = 4 , bin(t) = 3

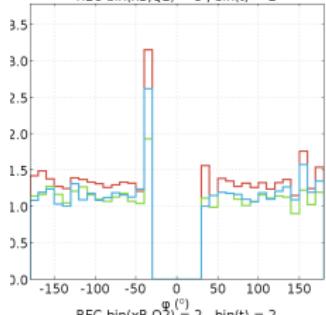
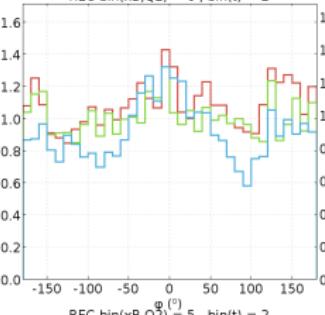
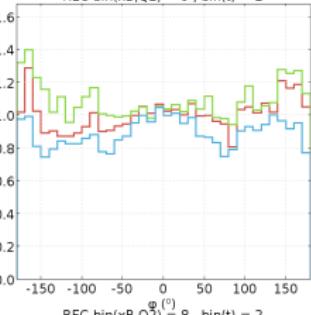
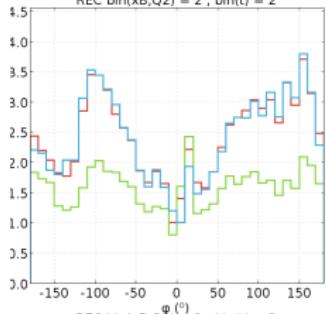
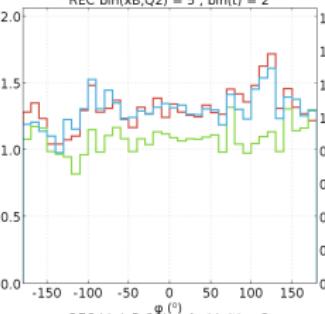
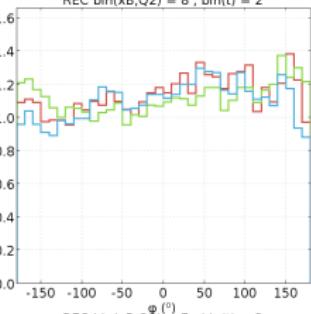
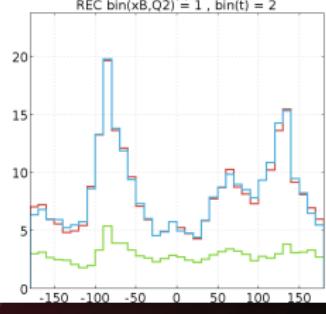
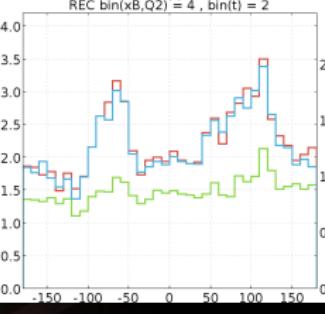
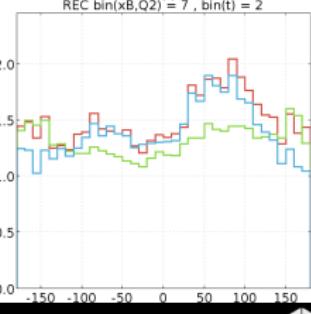


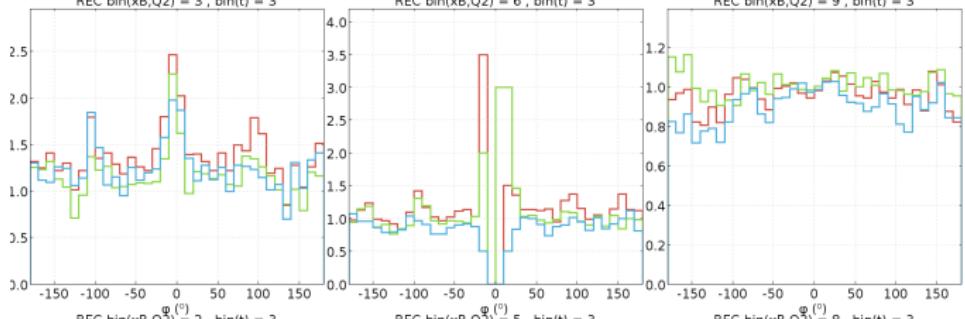
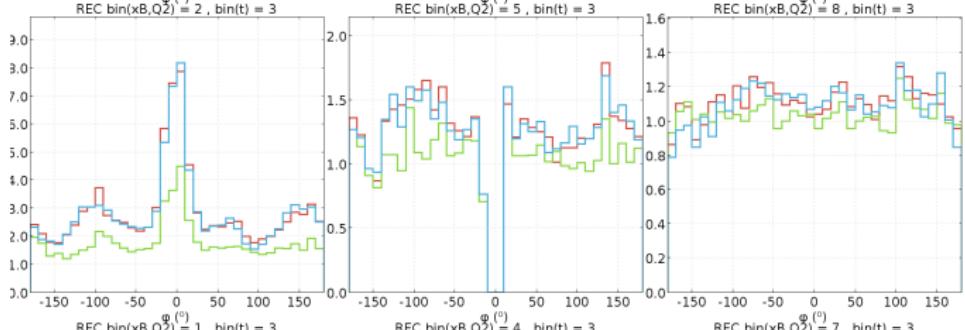
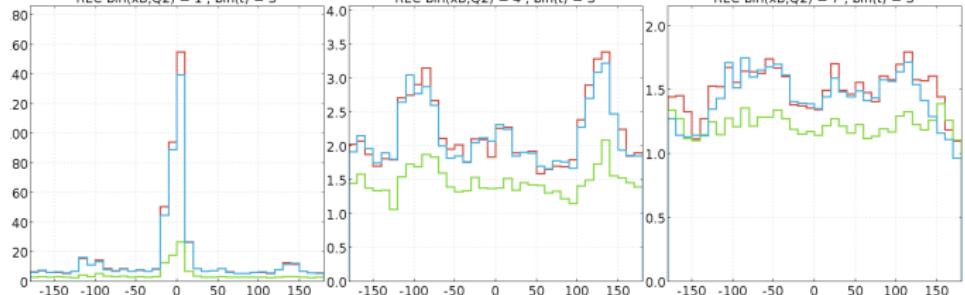
GEN bin(xB,Q2) = 7 , bin(t) = 3

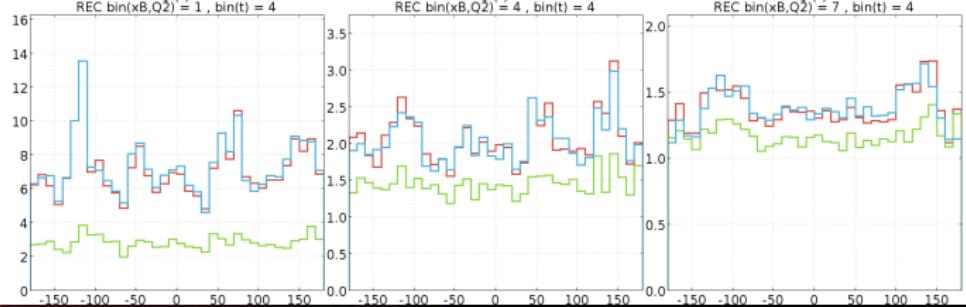
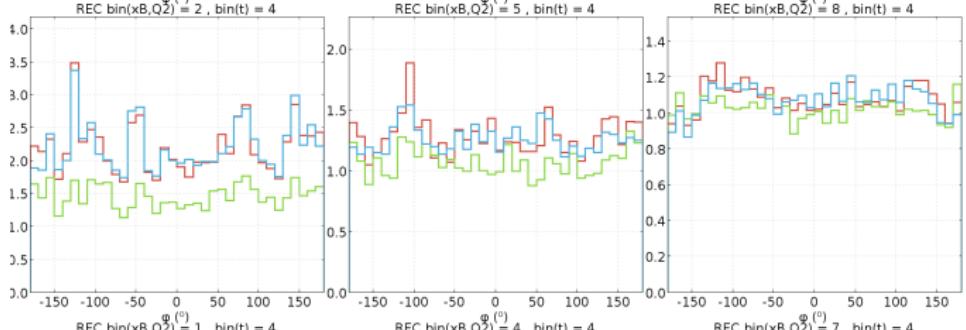
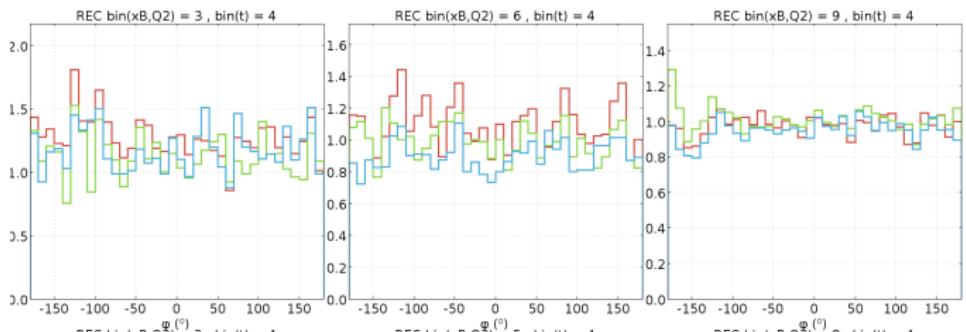




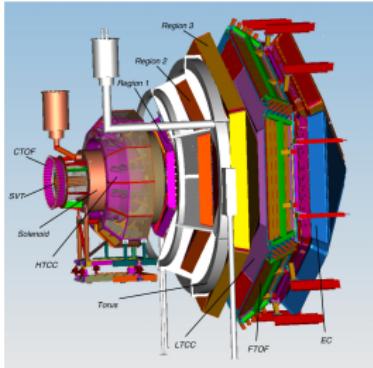


REC bin(x_B, Q^2) = 3 , bin(t) = 2REC bin(x_B, Q^2) = 6 , bin(t) = 2REC bin(x_B, Q^2) = 9 , bin(t) = 2REC bin(x_B, Q^2) = 2 , bin(t) = 2REC bin(x_B, Q^2) = 5 , bin(t) = 2REC bin(x_B, Q^2) = 8 , bin(t) = 2REC bin(x_B, Q^2) = 1 , bin(t) = 2REC bin(x_B, Q^2) = 4 , bin(t) = 2REC bin(x_B, Q^2) = 7 , bin(t) = 2

REC bin(x_B, Q_2) = 3 , bin(t) = 3REC bin(x_B, Q_2) = 6 , bin(t) = 3REC bin(x_B, Q_2) = 9 , bin(t) = 3



Summary and Outlook



- CLAS12 Full Chain Simulations **works**
- You should **use** it and **check** it
- Baseline Specifications are **met or exceeded**
- Particles Identification, Event Builder
- The PAC approved proposals were obtained with questionable acceptances and resolutions
- Document your study on **optimization** for your proposal
- Basis for final discussion on the run plan and configuration