# DVCS and $\pi^0$

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# Input parameters

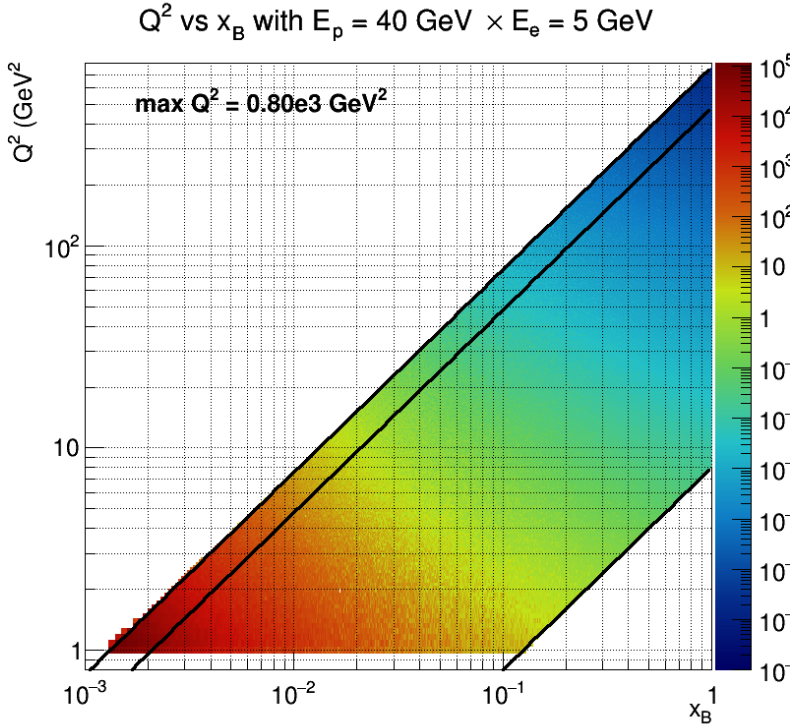
Scenarios 10 GeV $\times$ 100 GeV and 5 GeV $\times$ 40 GeV

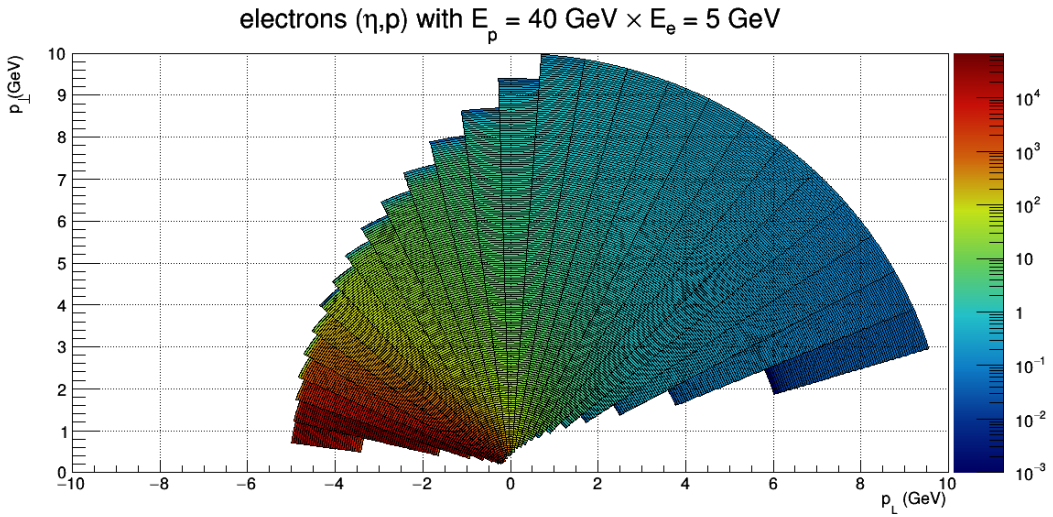
Input: Electron-Ion Collider Detector Requirements and R&D Handbook v1.1 Jan 10$^{th}$ 2019 available **here**

`http://eicug.org/web/sites/default/files/EIC_HANDBOOK_v1.1.pdf`

Not definitive on photon resolutions, in particular calorimeter granularity

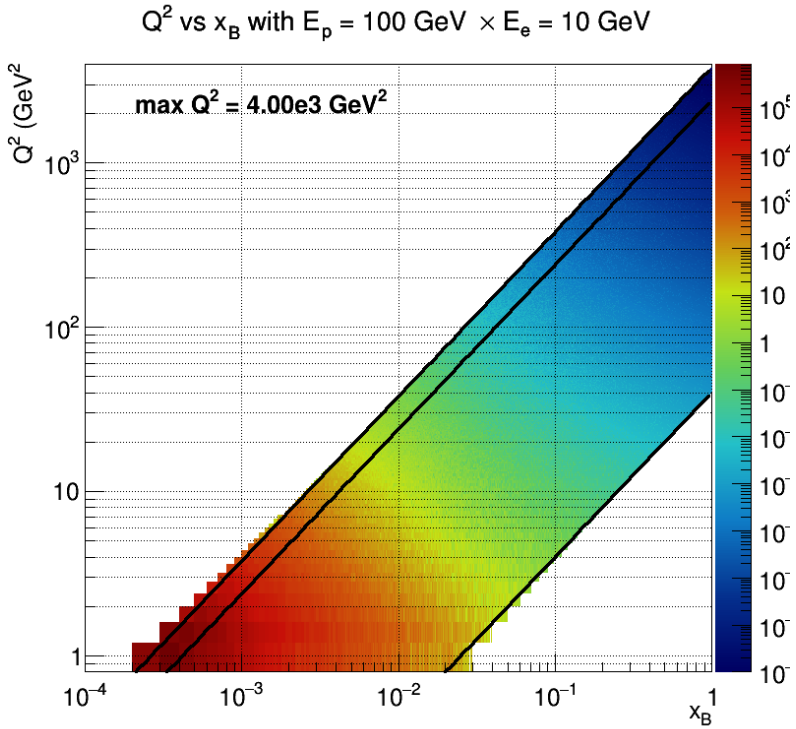
# Electron DIS kinematics scenario 1

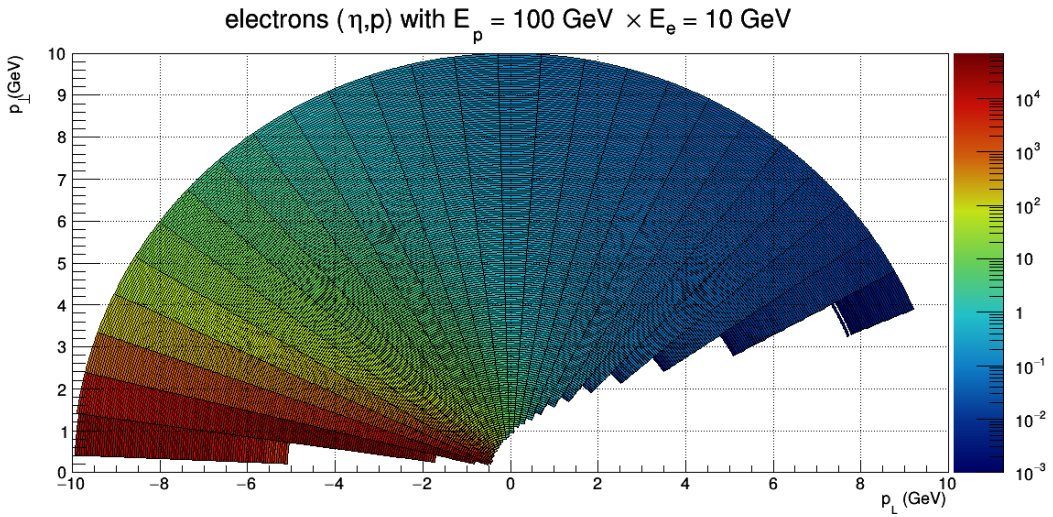



High luminosity scenario
Focus on higher values of $x_B$

# Electron DIS kinematics scenario 2

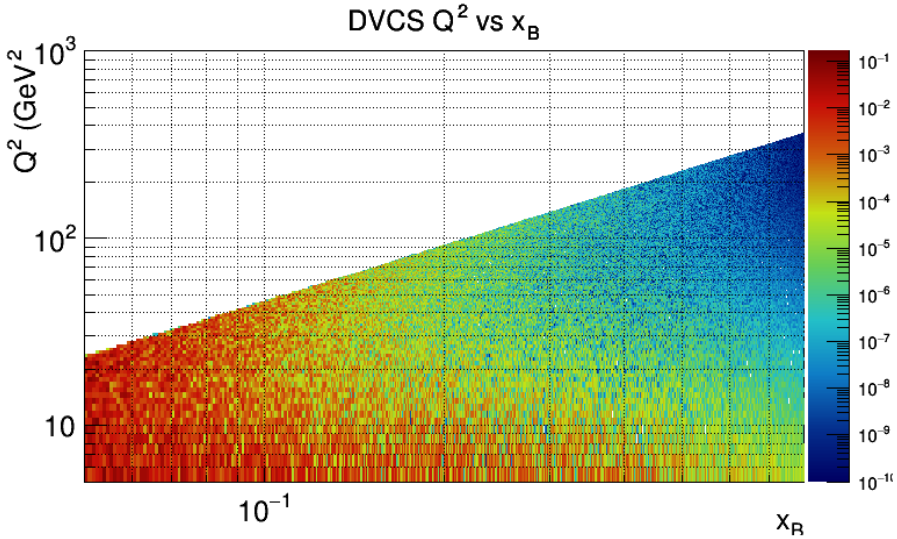


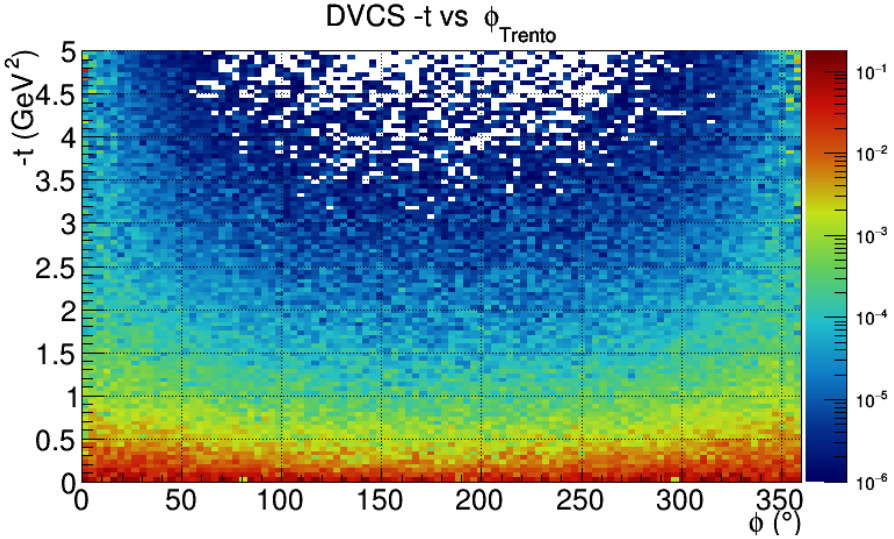




High energy scenario

Access to lowest $x_B$

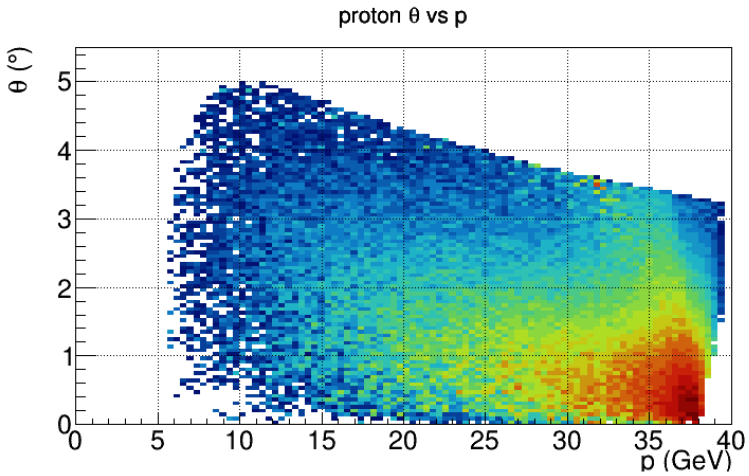
# DVCS 5 GeV $\times$ 40 GeV

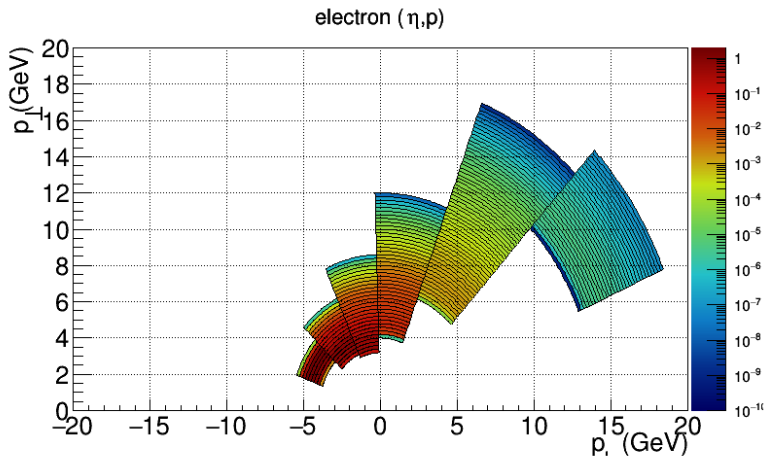


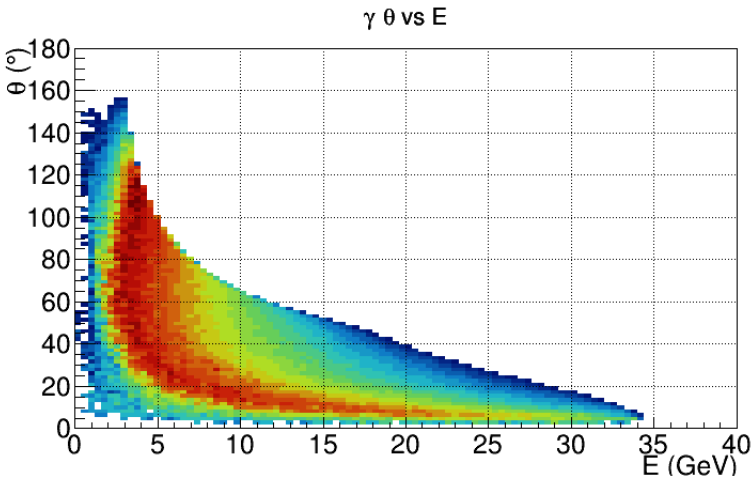



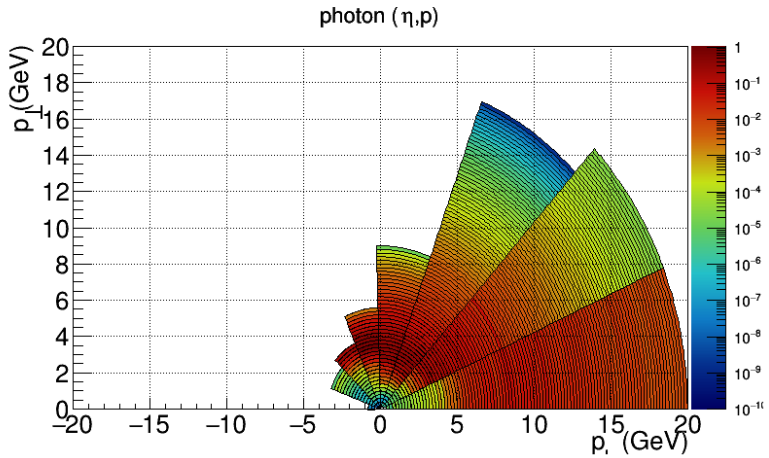

Coverage focused on high $x_B$ and high $Q^2$
(mostly to save time now)
$-t$ extends to high values but dominated by low range

# Electrons and photons 5 GeV $\times$ 40 GeV



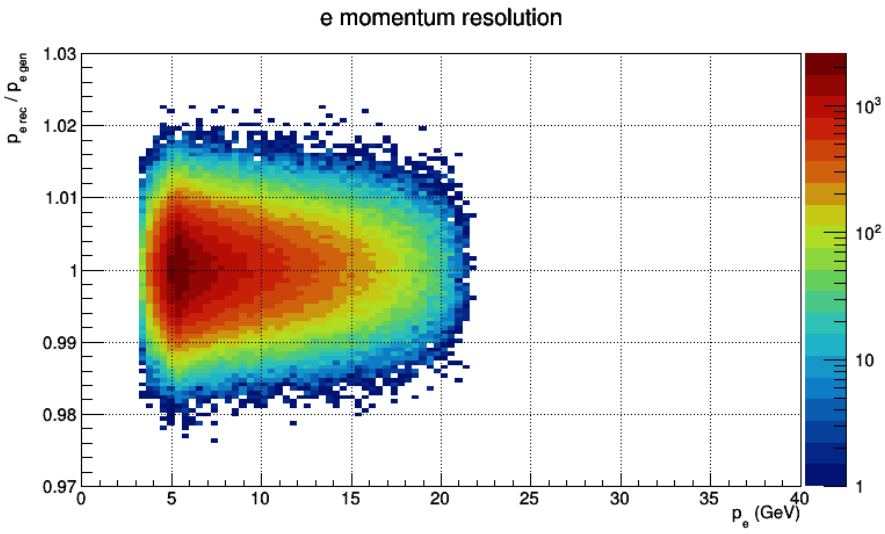



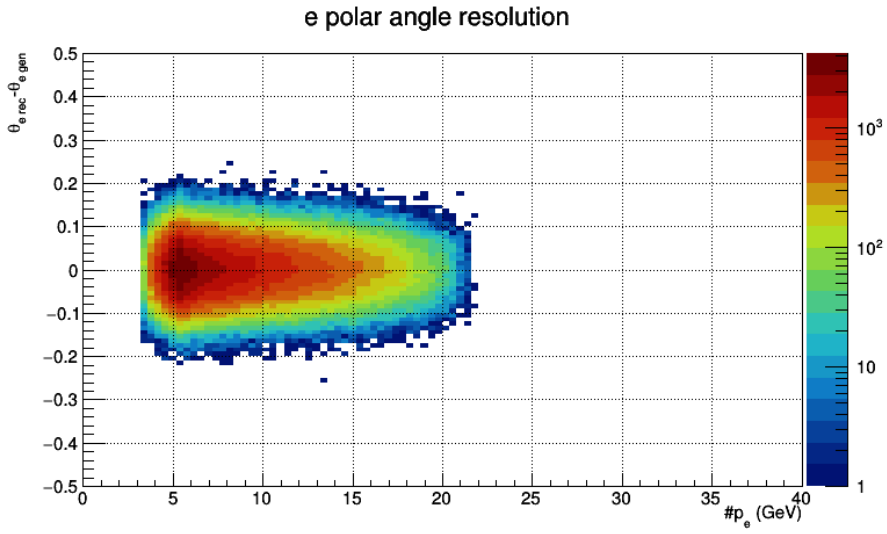



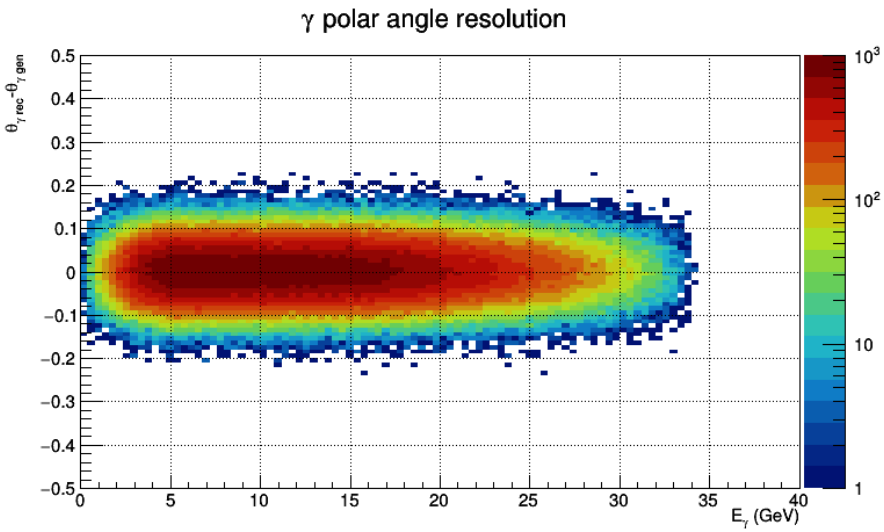



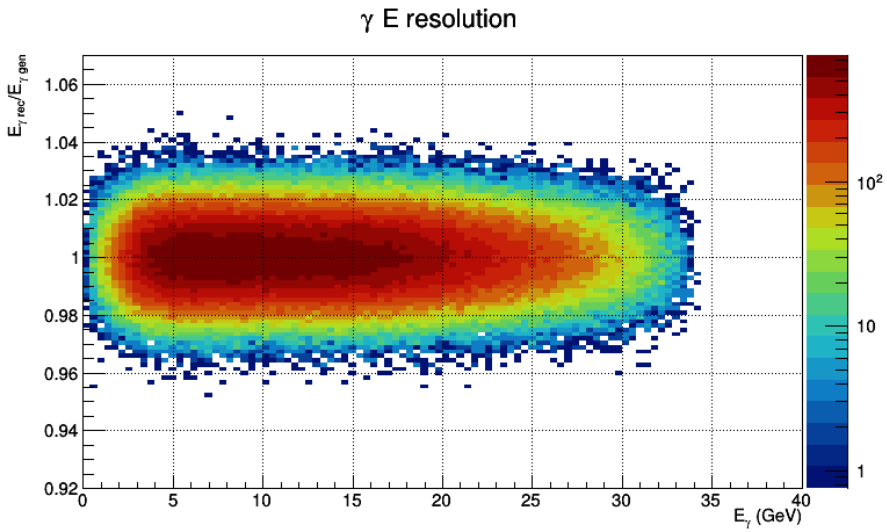

Questions on ROOT polar plots here (?)

# Single particle resolutiosns



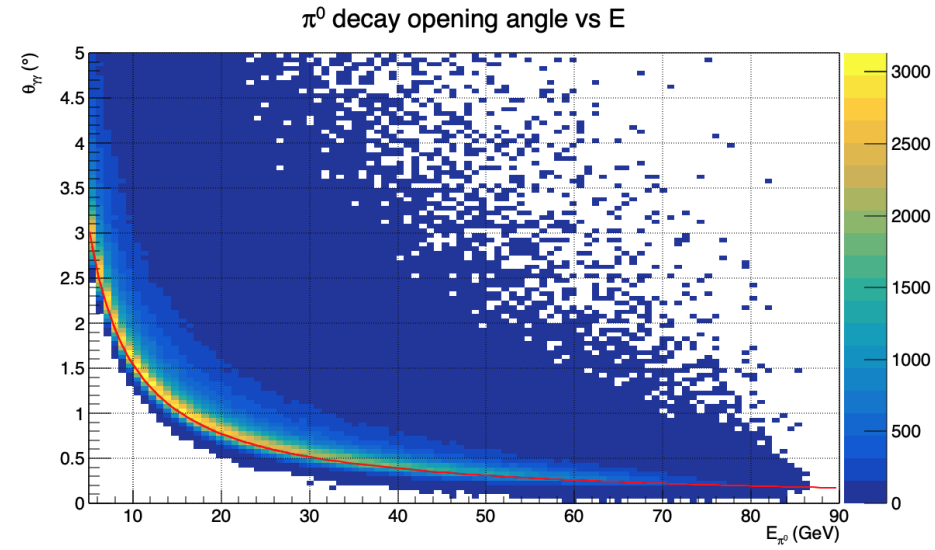



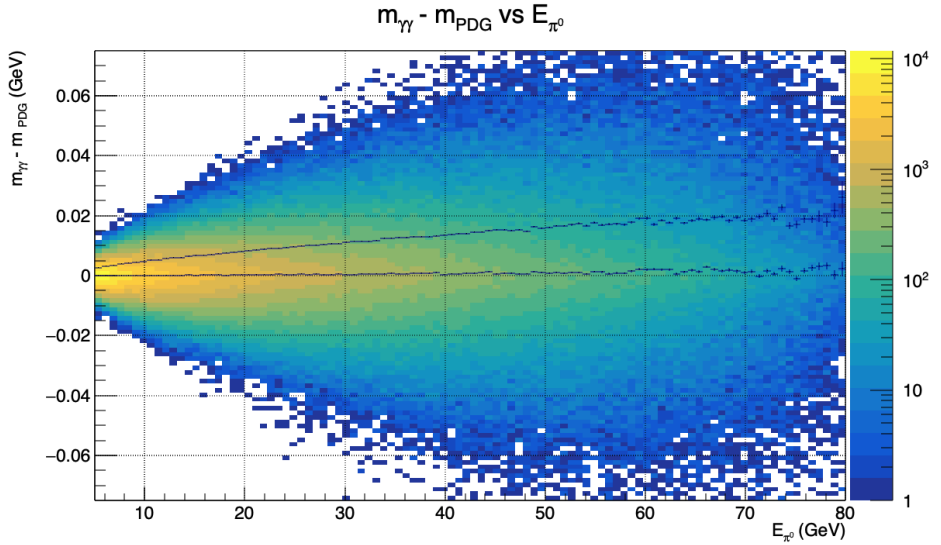



# $\pi^0$ decay at 10 GeV $\times$ 100 GeV

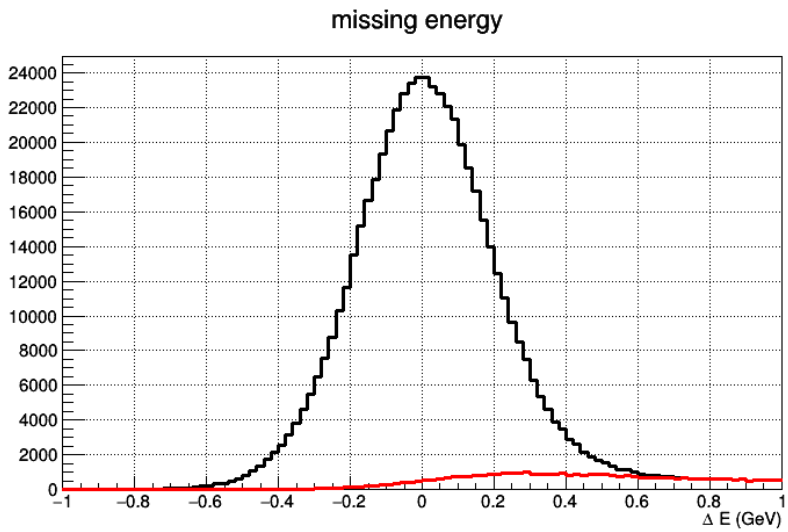
Photon angular resolution is essential to discrimate clusters at high energies
Both $\theta$ and $\phi$ have $\sigma \sim 0.05^\circ < 1$ mrad

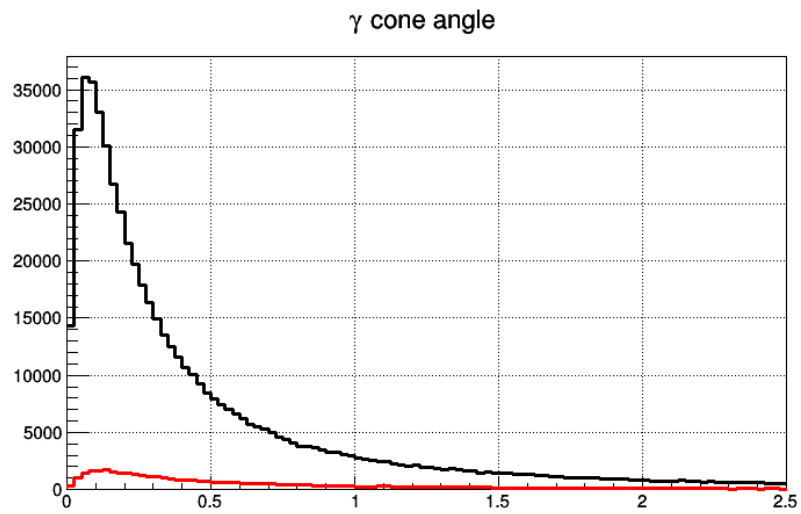


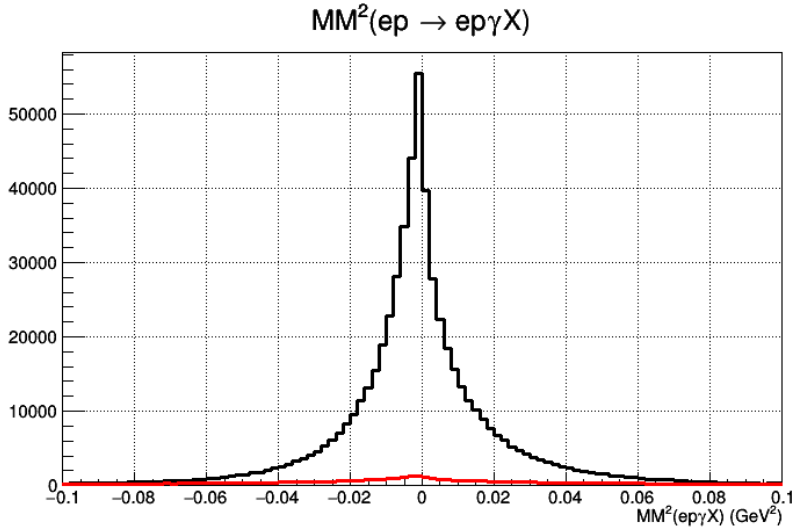

Corresponding invariant mass resolution $\sim$ 5 to 20 MeV

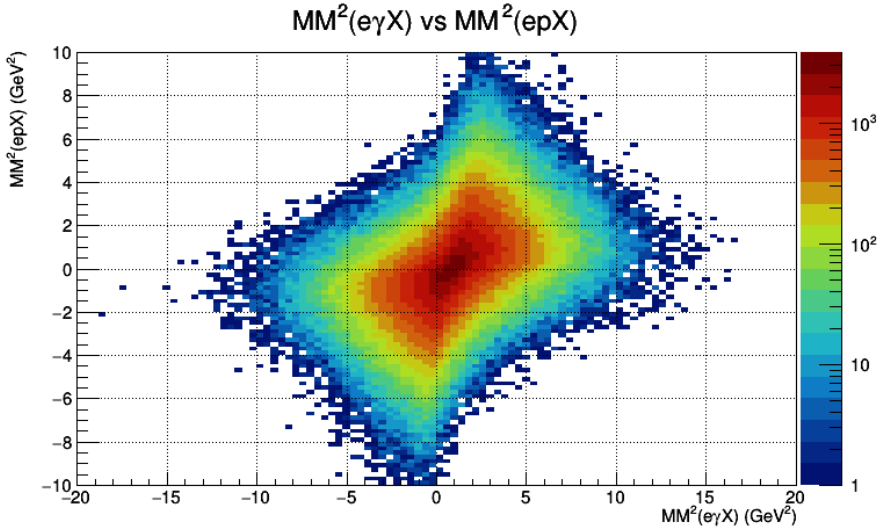


# DVCS $\pi^0$ separation 5 GeV $\times$ 40 GeV



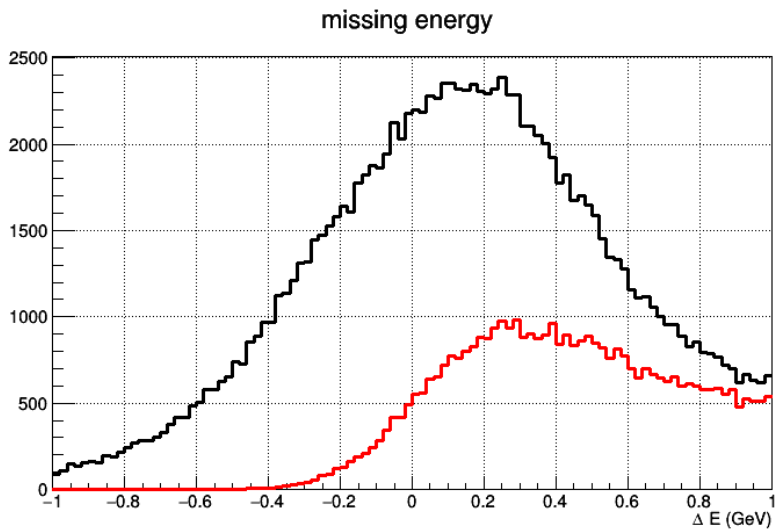



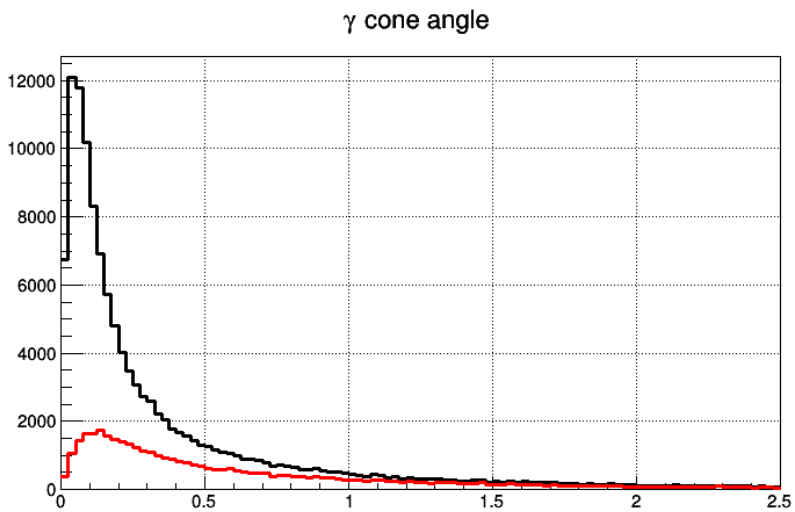



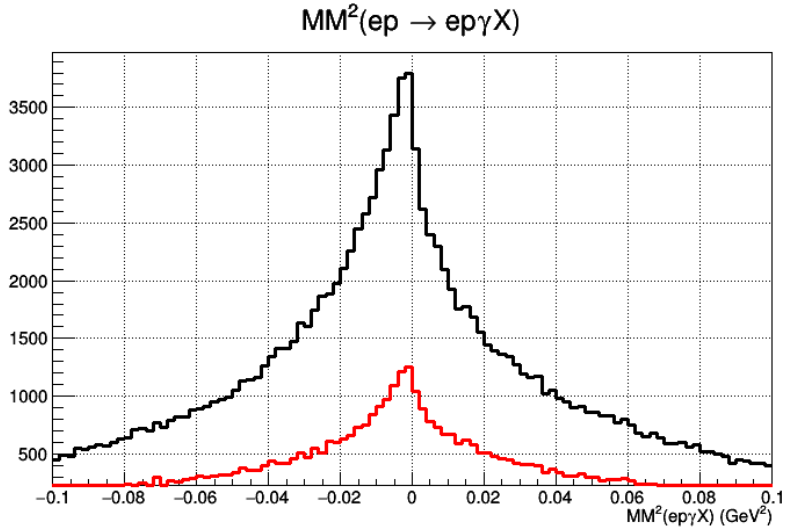



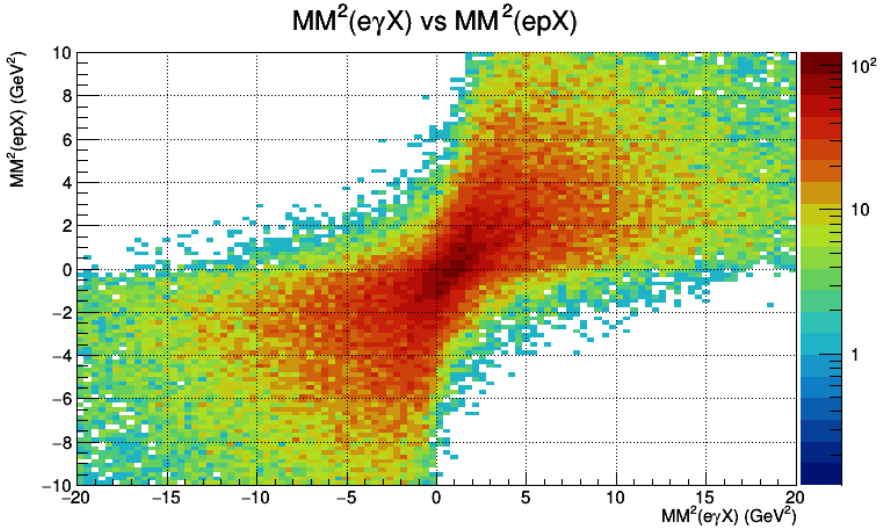

Excellent separation at low energy

# DVCS $\pi^0$ separation 10 GeV $\times$ 100 GeV




Challenging background at high energy

# Summary

- Scenarios 10 GeV $\times$ 100 GeV and 5 GeV $\times$ 40 GeV
- First look at DVCS $\pi^0$ separation
- Absolute normalization of $\pi^0$ to DVCS:
  fair uncertainties / arbitrariness

- **Photon angular resolution** is crucial
- First results only, lots of possible improvements
- Other backgrounds also (?)