DVCS ep Update

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ePIC Exclusive, Diffractive and Tagging WG meeting

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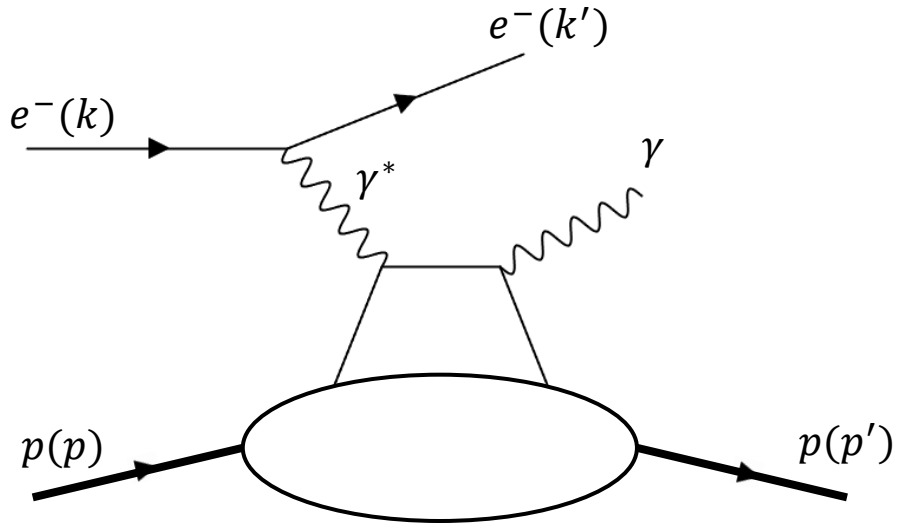
DVCS in ep collisions

- Looking at $e(k)p(p) \rightarrow e'(k')p'(p')\gamma$ process to probe Generalized Parton Distributions (GPDs).
- (Some) Important variables:
  - Photon 4-momentum transfer, $Q^2 = -q^2 = -(k - k')^2$
  - $t = (p' - p)^2$
  - Fractional parton momentum, x
  - Bjorken-x, $x_B = Q^2/2qp$



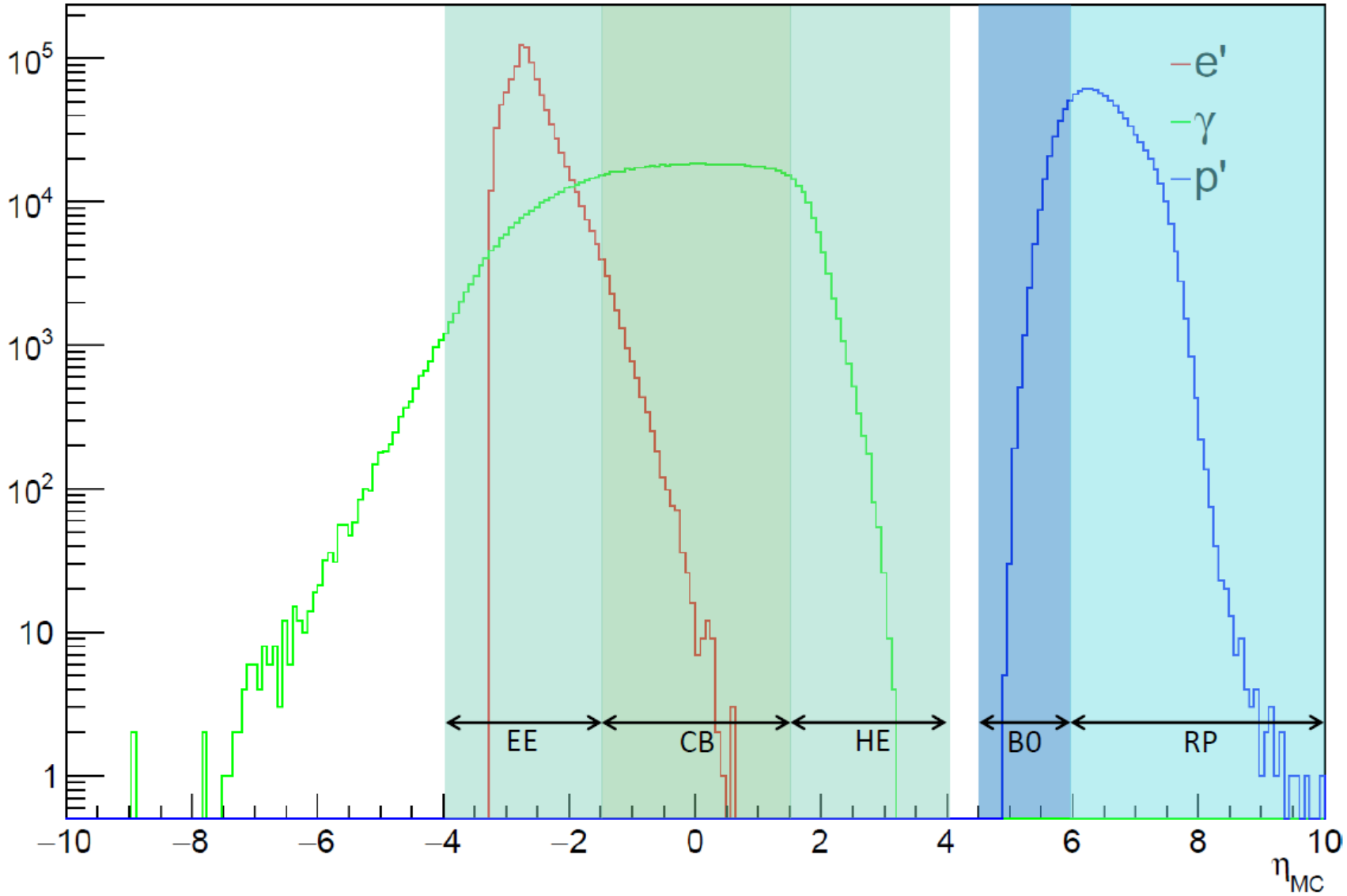
- Using EpIC generator files, passed through the ePIC detector geometry in monthly simulation campaigns.

Using DVCS to test ePIC

- DVCS is a good channel to test many of the ePIC subsystems.
- The scattered electron and photon are detected in the central barrel.
  - Can test PID and energy/momentum resolutions in the barrel and endcaps.
- Scattered proton gets picked up in the far forward region.
  - B0 for 5x41 and 10x100.
  - Roman Pots for 10x100 and 18x275.

- PID used:
  - Truth level PID for MC generated distribution
  - Simulated PID response for e', γ
  - Reconstructed charge and mass for p' (TRUE if $|m_X - 0.938| < 0.1$ GeV and charge = 1)

Generator coverage (old 10x100 campaign)



Cuts applied

- Cuts only applied if distribution cares about particles of interest (ie. no need to require full exclusivity for Q^2 distribution).
- Cuts used:

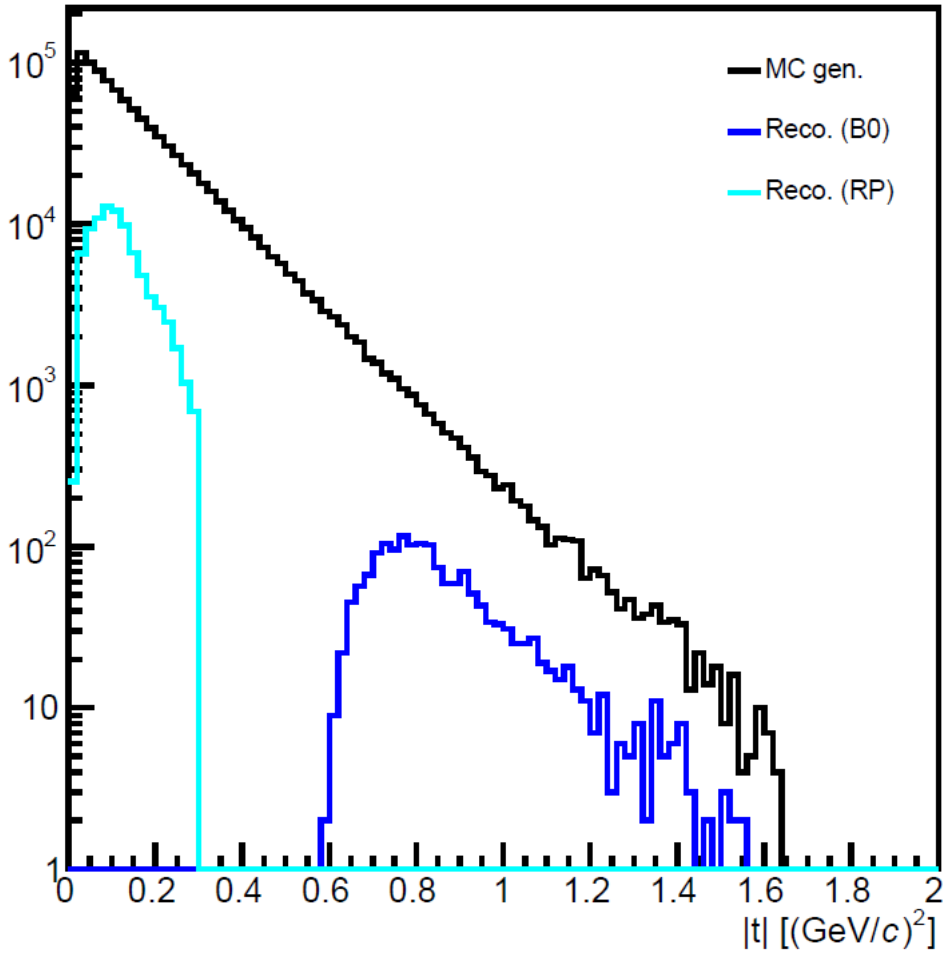
Single particle

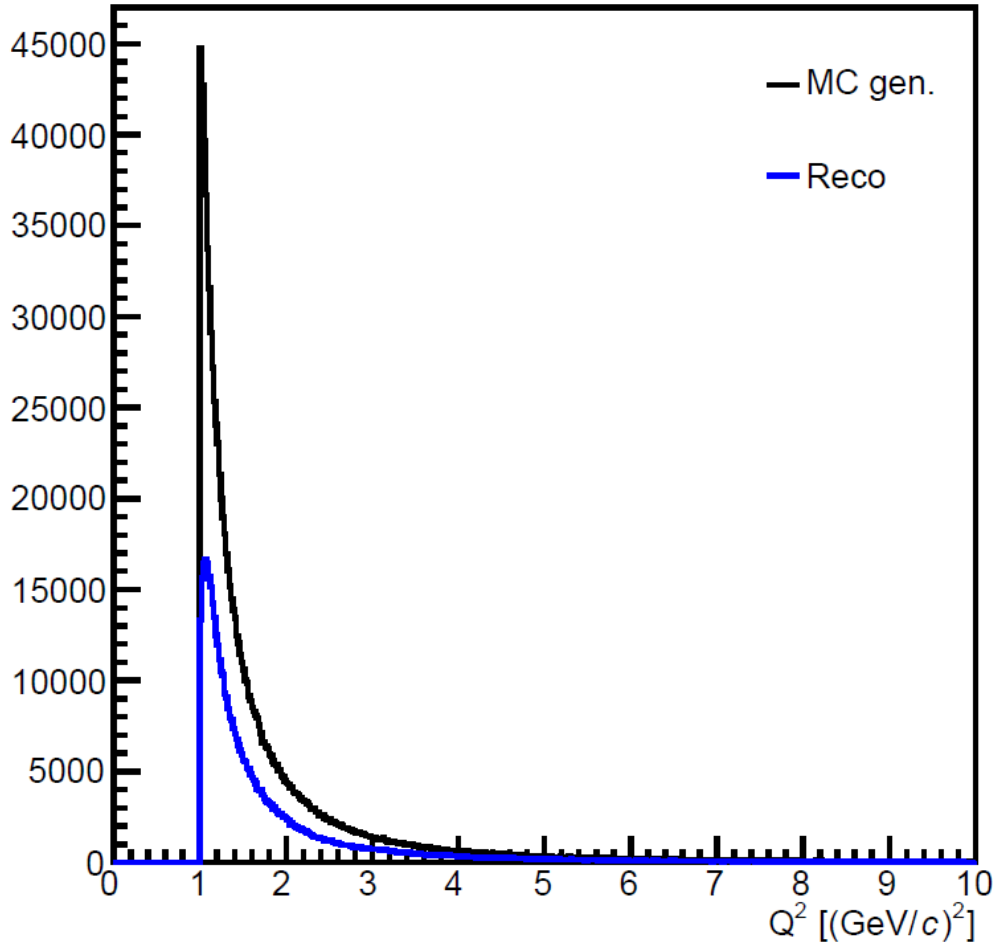
- Exactly 1 e’, p’, γ
- Momentum of e’, p’ no more than 10% above beam momentum
- Proton track angle cut: [5.5, 20]mrad for B0; [0, 5.5]mrad for Roman Pots

Event

- $Q^2 \geq 1$ GeV^2
- $t \leq 0.3$ GeV^2 for protons in the RP
- Full final state $MM^2 \leq 1$ GeV^2
- Cut on tail of reconstructed x_B distribution based on tail of MC generated distribution

Event distributions (24.07.0, 10x100)





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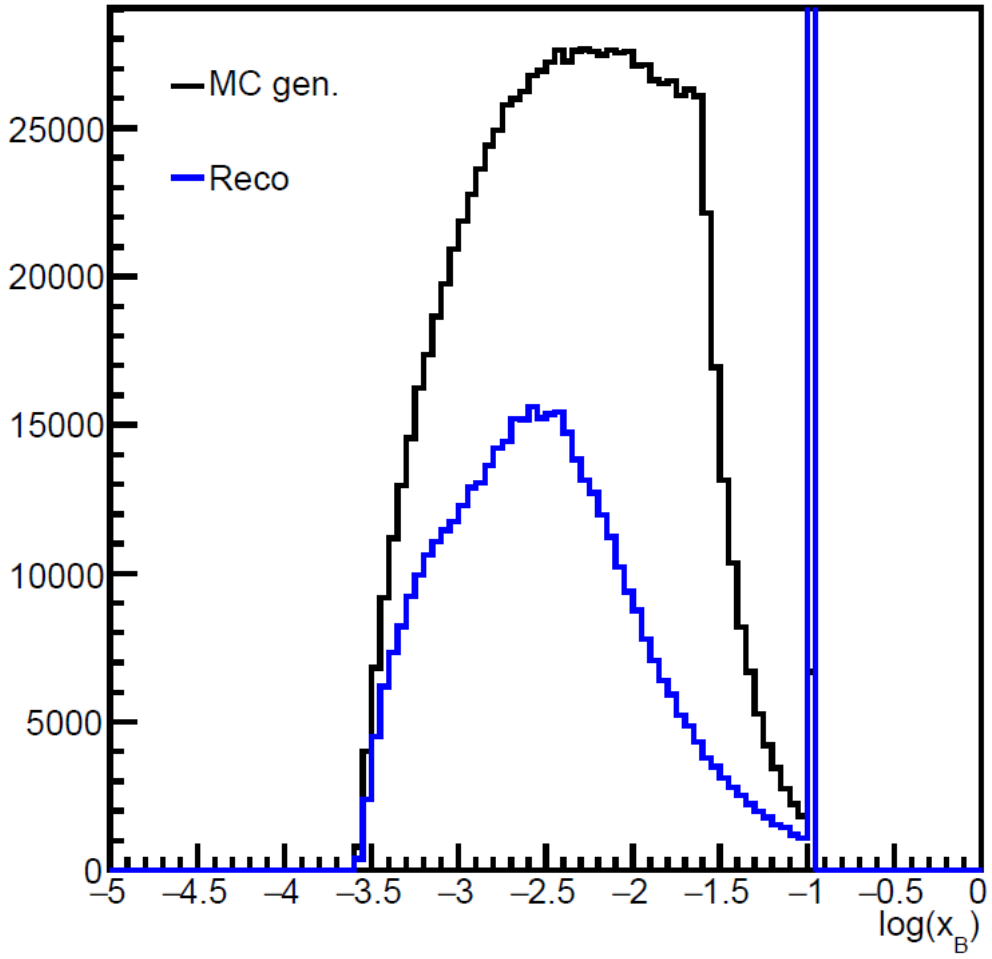

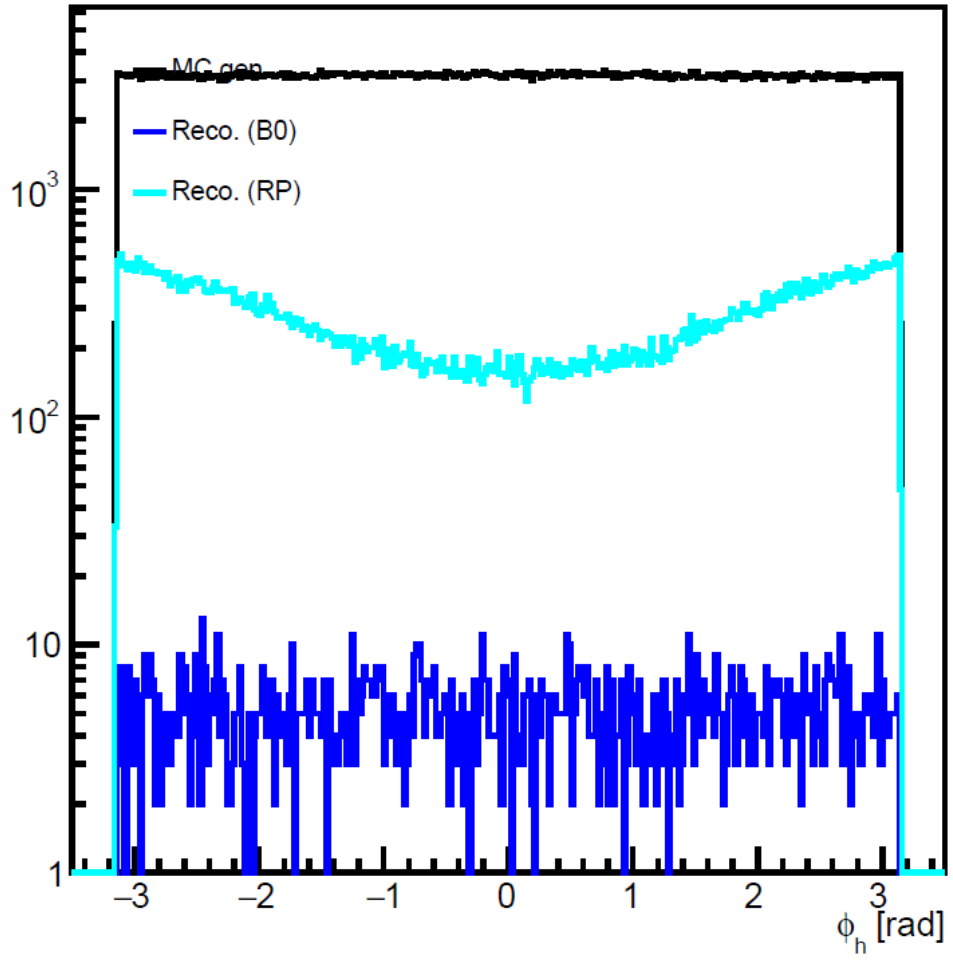

Issues/Next steps

- Not yet had the chance to run the 24.08.1 campaign.
- Major issues with RP reconstruction in 24.07.0 18x275 run (might be fixed in 24.08.1 – only the chance to run it will tell).
- Need to convert analysis code to using RDataFrames (currently based on TTreeReader).

- Where from here?
- What plots need to be added to the (pre-)TDR/physics paper?