DVCS ep Update

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ePIC Exclusive, Diffractive and Tagging WG meeting

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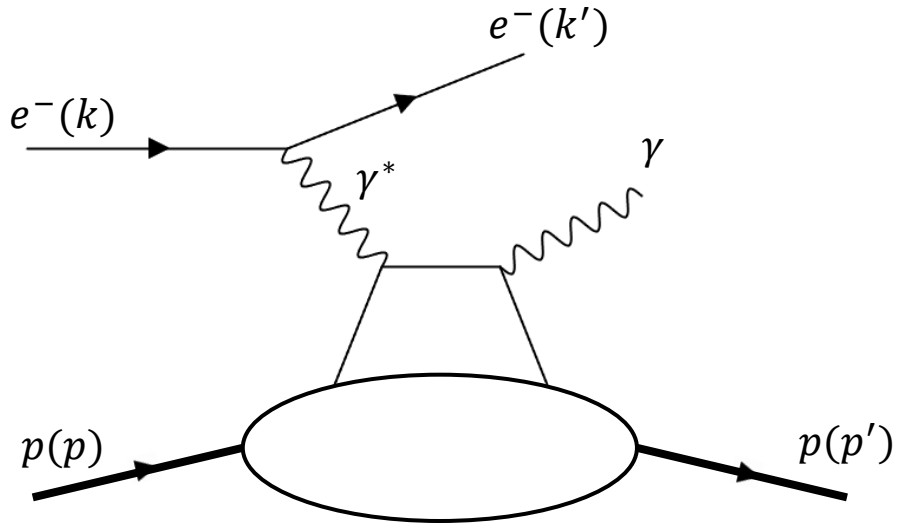
DVCS in ep collisions

- 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.

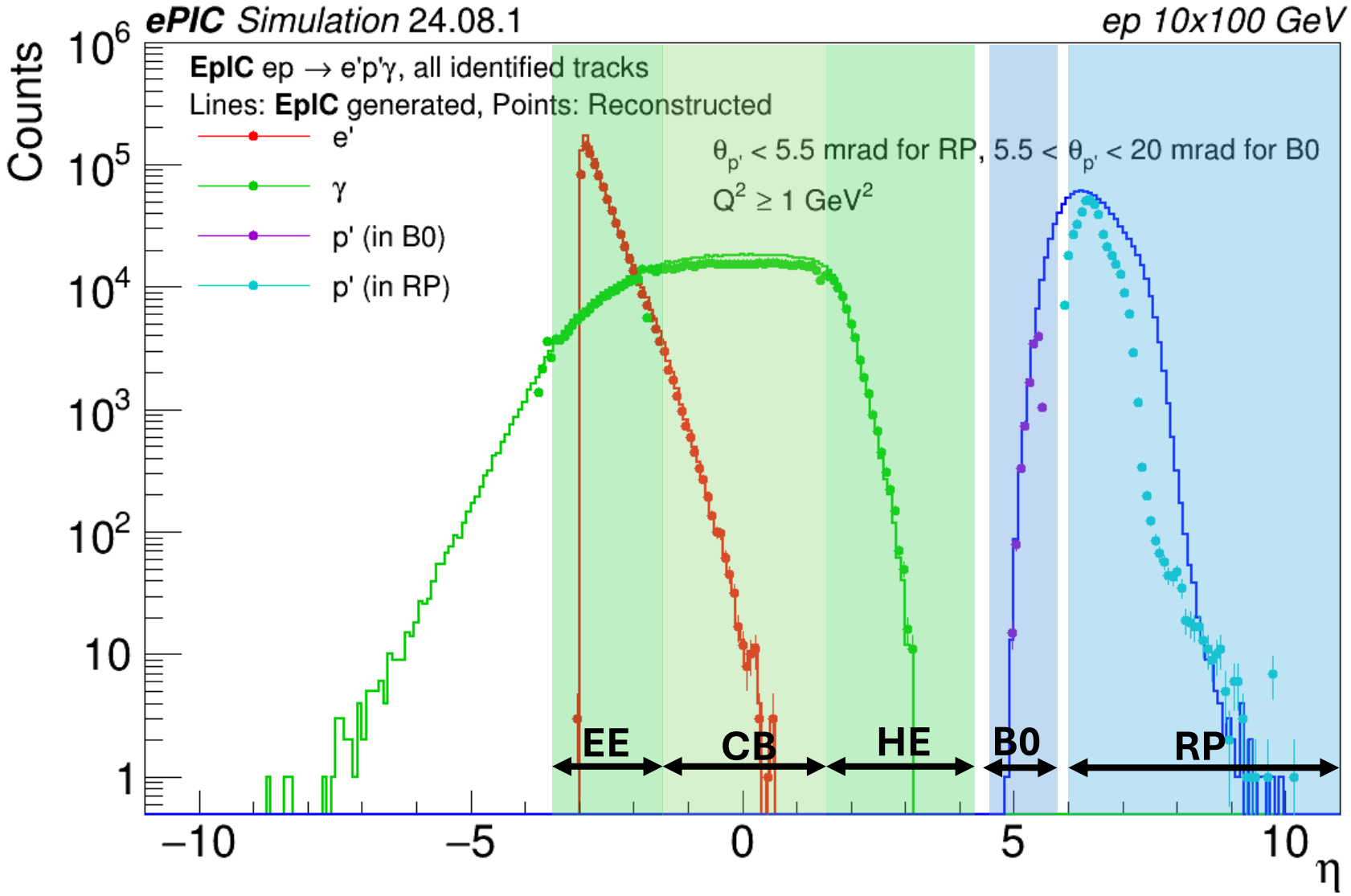
Using DVCS to test ePIC

- 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.

Changes since last update

- Changed default particle selection procedure.
  - Still have ePIC PID selection if desired, although this does not work for protons in the B0.
  - For protons, select on track charge and energy (80-120 GeV).
  - All RP tracks are assumed to be protons.
- *For now*, using charge of track to select e', p' (in B0), γ.
  - Proton: +1
  - Electron: -1
  - Photon: 0
- Move to using most recent DVCS campaign (24.08.1).
  - No DVCS yet run in 24.09.0.

Generator coverage (10x100, 24.08.1)



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:

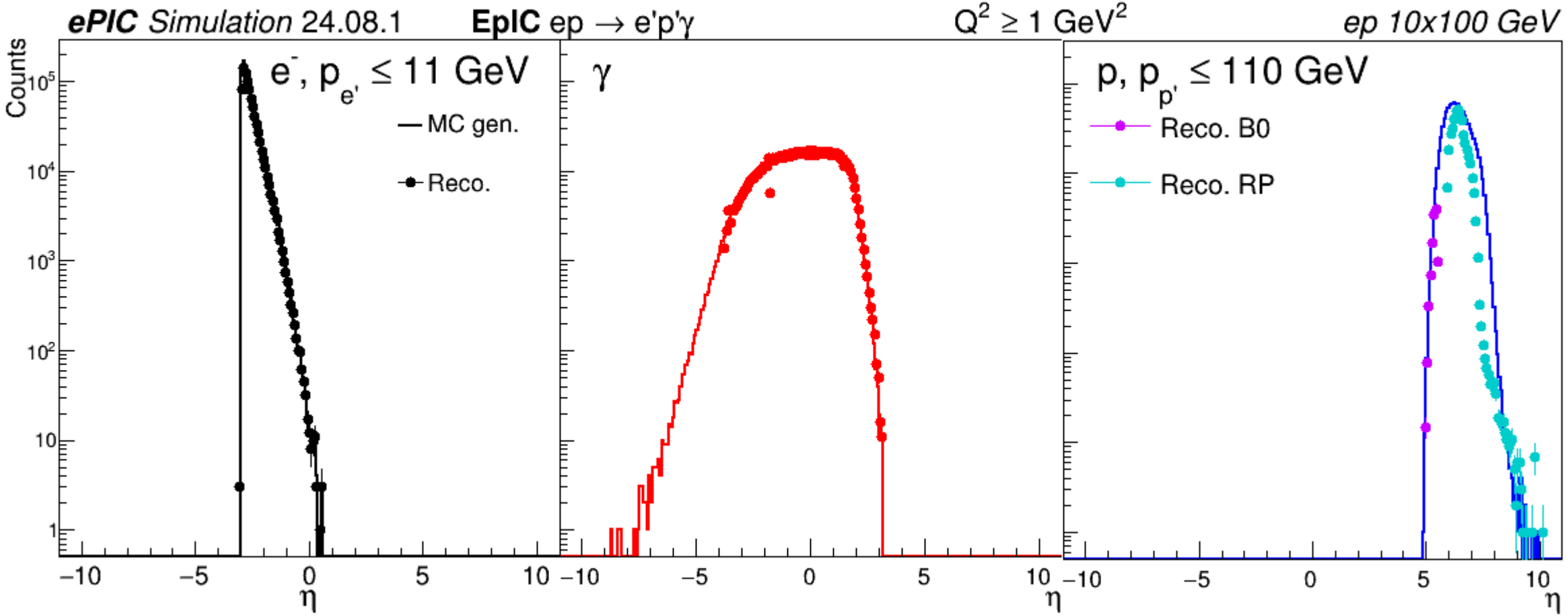
Single particle

- 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

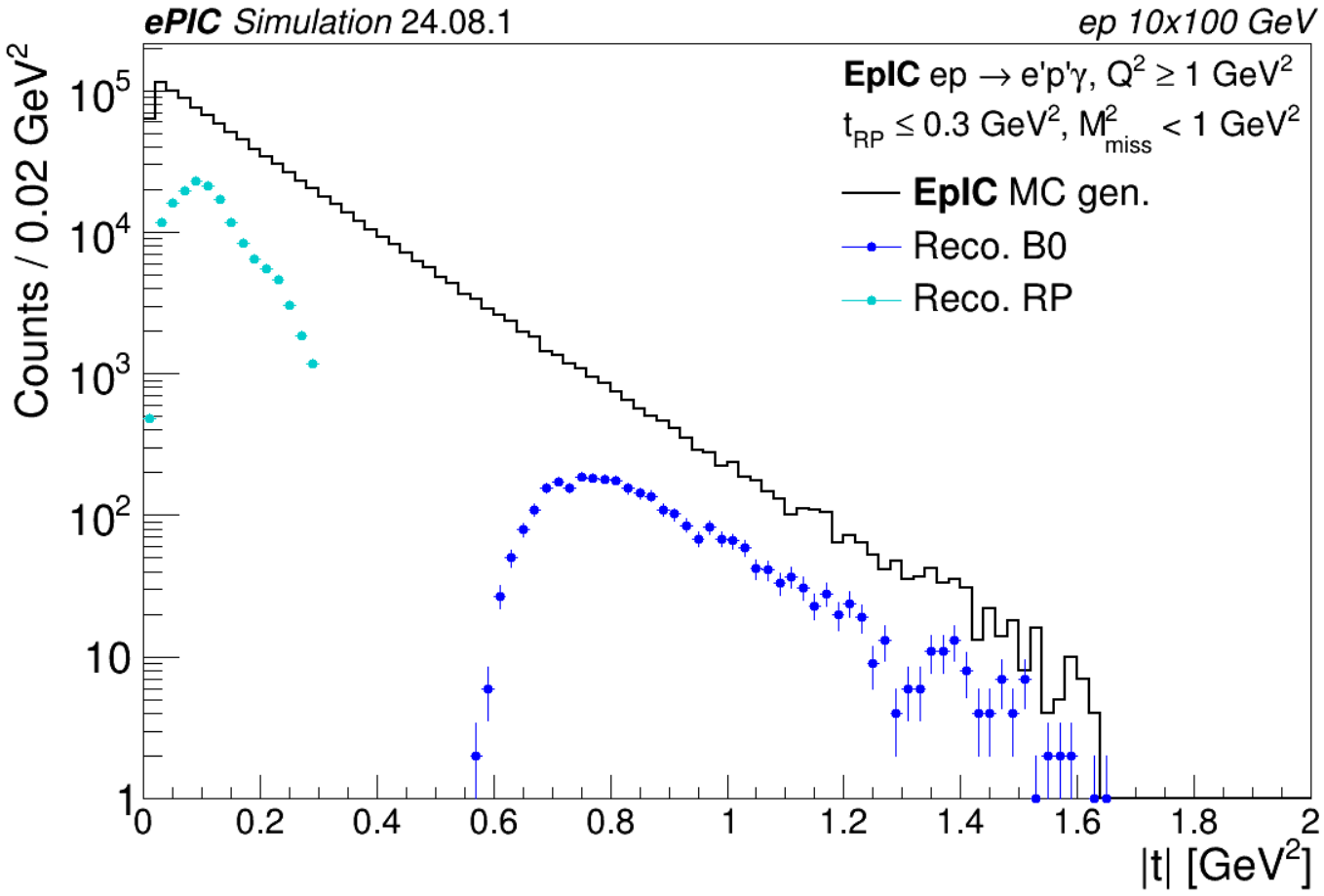
Event

- $Q^2 \geq 1$ 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

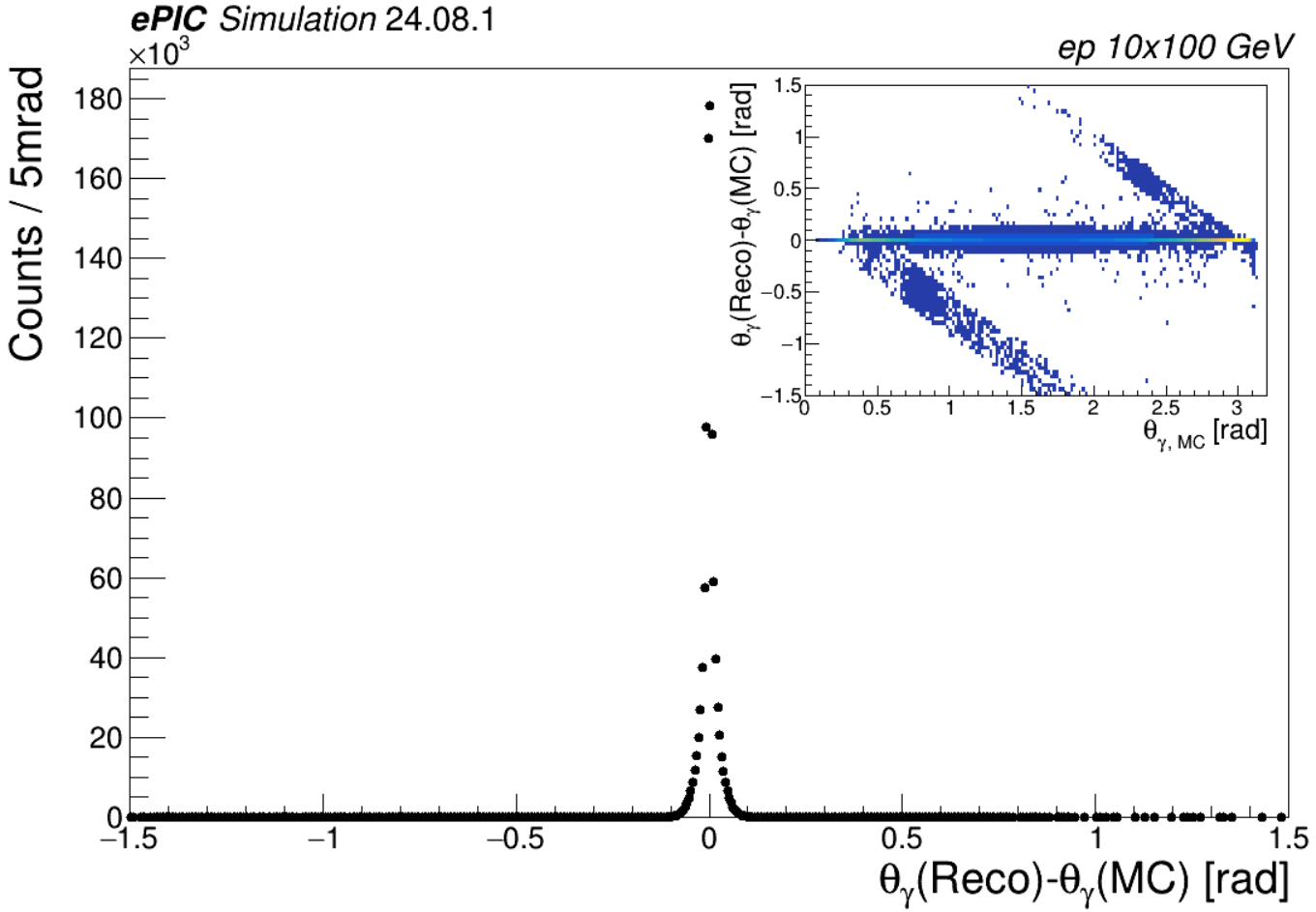
TDR plots: η distribution



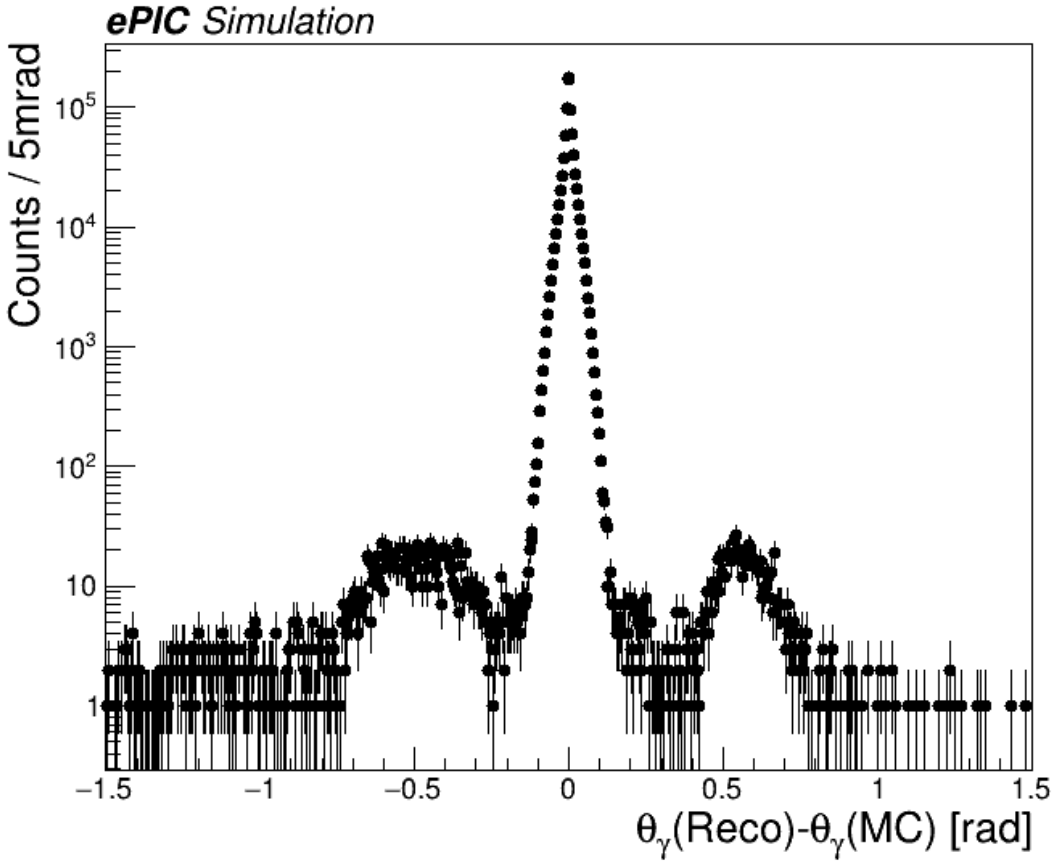
TDR plots: t distribution

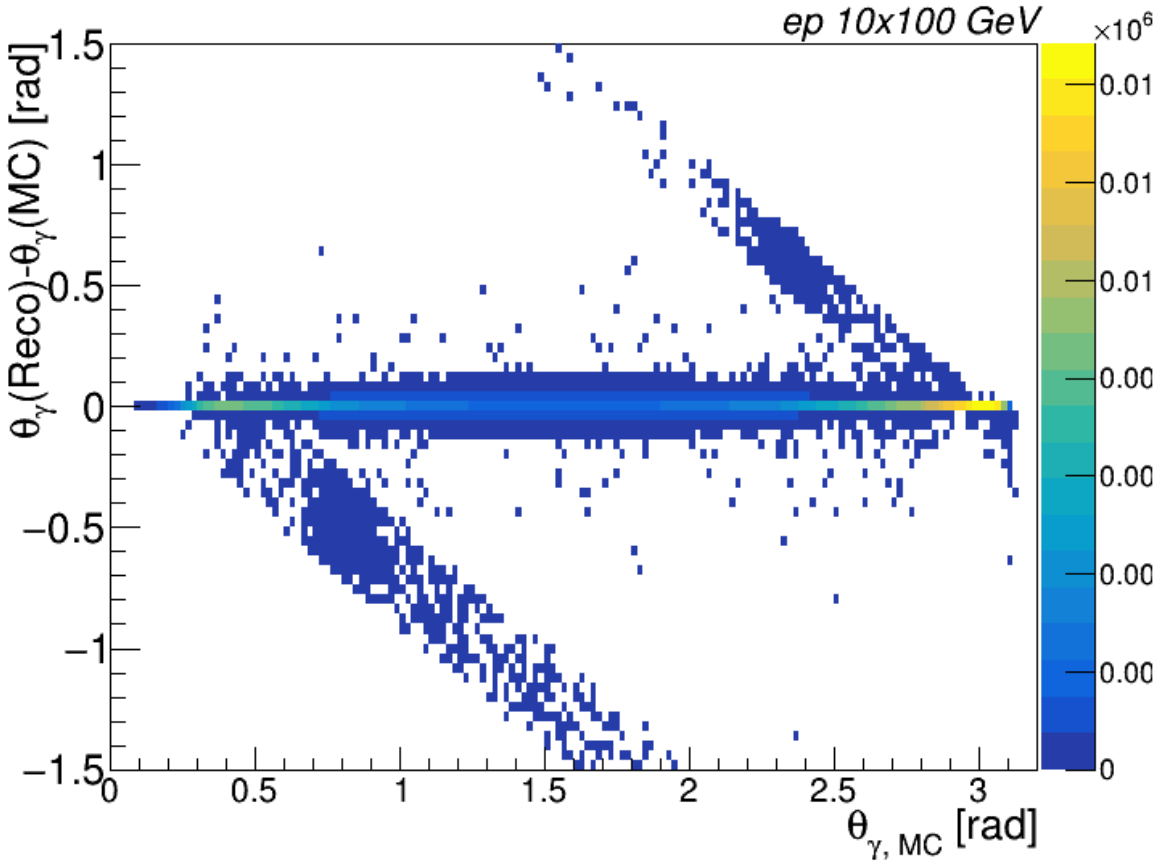


TDR plots: γ angular performance

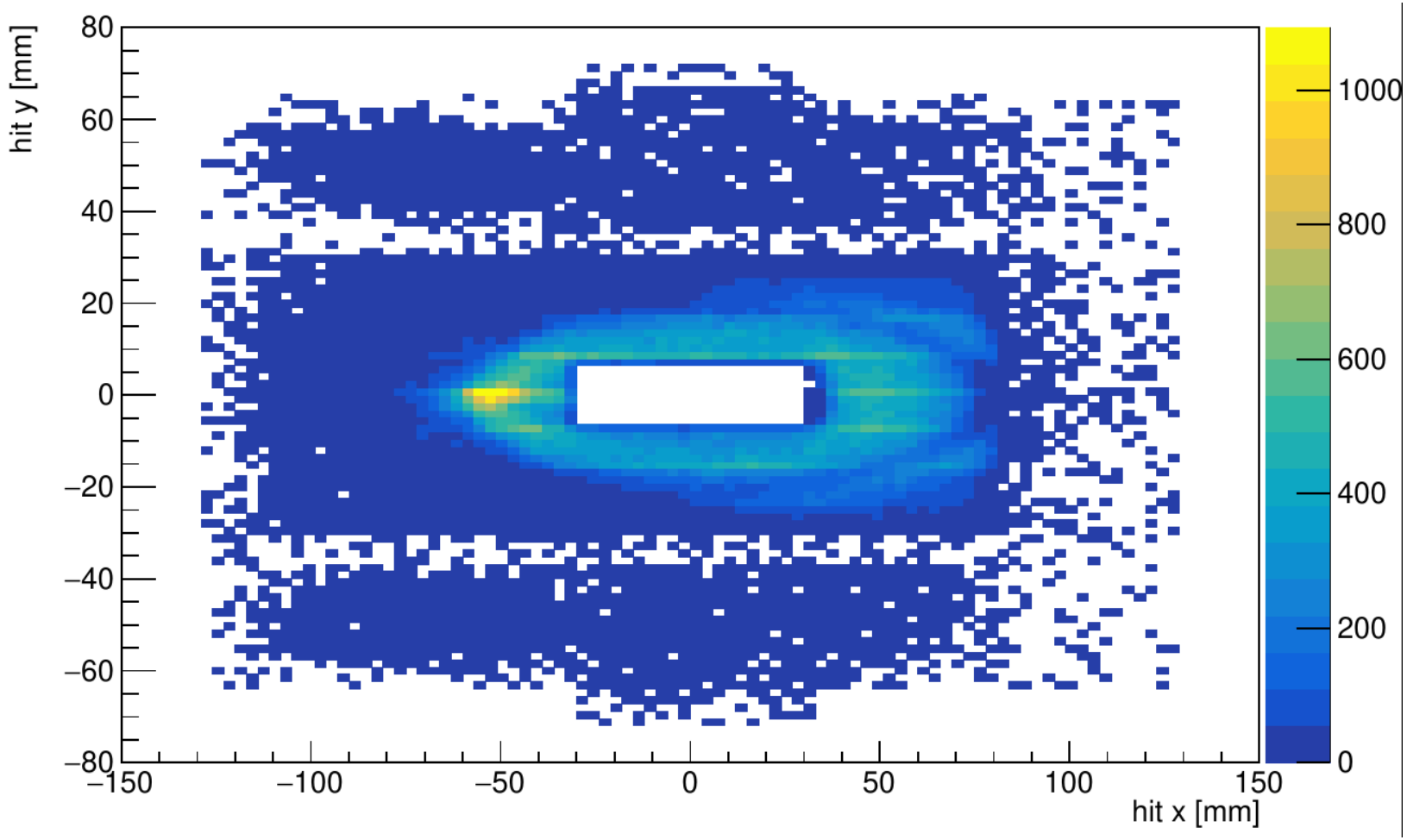


TDR plots: $\Delta\theta_\gamma$ (zoom in)





Other things: 24.08.1, 5x41 GeV



- Roman Pot occupancy for 5x41 beam energy.
- Perhaps wrong magnet settings used?

Issues/Next steps

- Think that 24.08.1 5x41 run using wrong magnet settings.
- (Long-term) Need to convert analysis code to using RDataFrames (currently based on TTreeReader).

- Any more requests for TDR/physics plots?
- (Especially looking forwards to early physics workshop) Need to turn current analysis into projections of final observables.