DVCS ep update

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Early Science studies

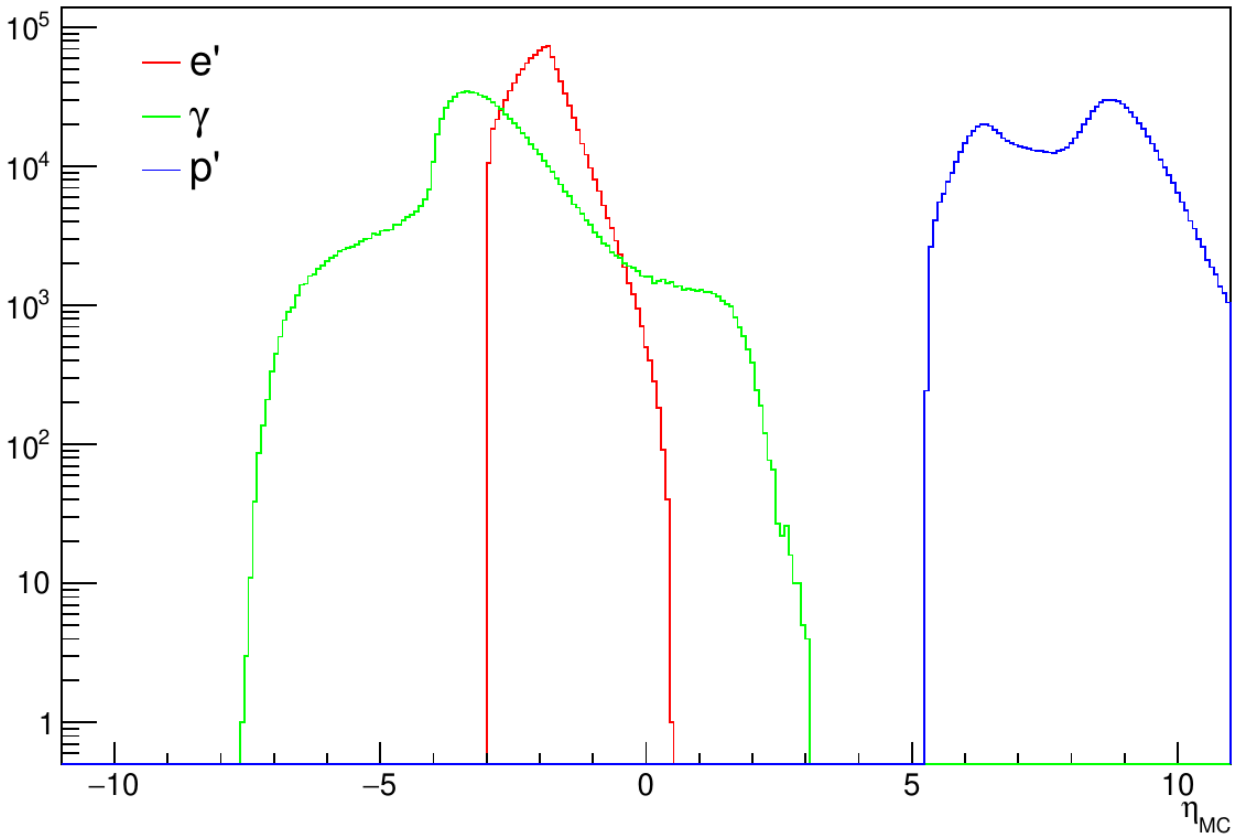
Many thanks to Alex for generating these!

DVCS early science

- 1M DVCS events, generated using the 10x130 energy setting.
  - Using EpIC v1.1.6
  - Full DVCS + Bethe-Heitler + interference
  - $\sigma_{int} = 2.144 \pm 0.001$ nb
  - Corresponds to $L_{int} \approx 0.5$ fb^{-1}

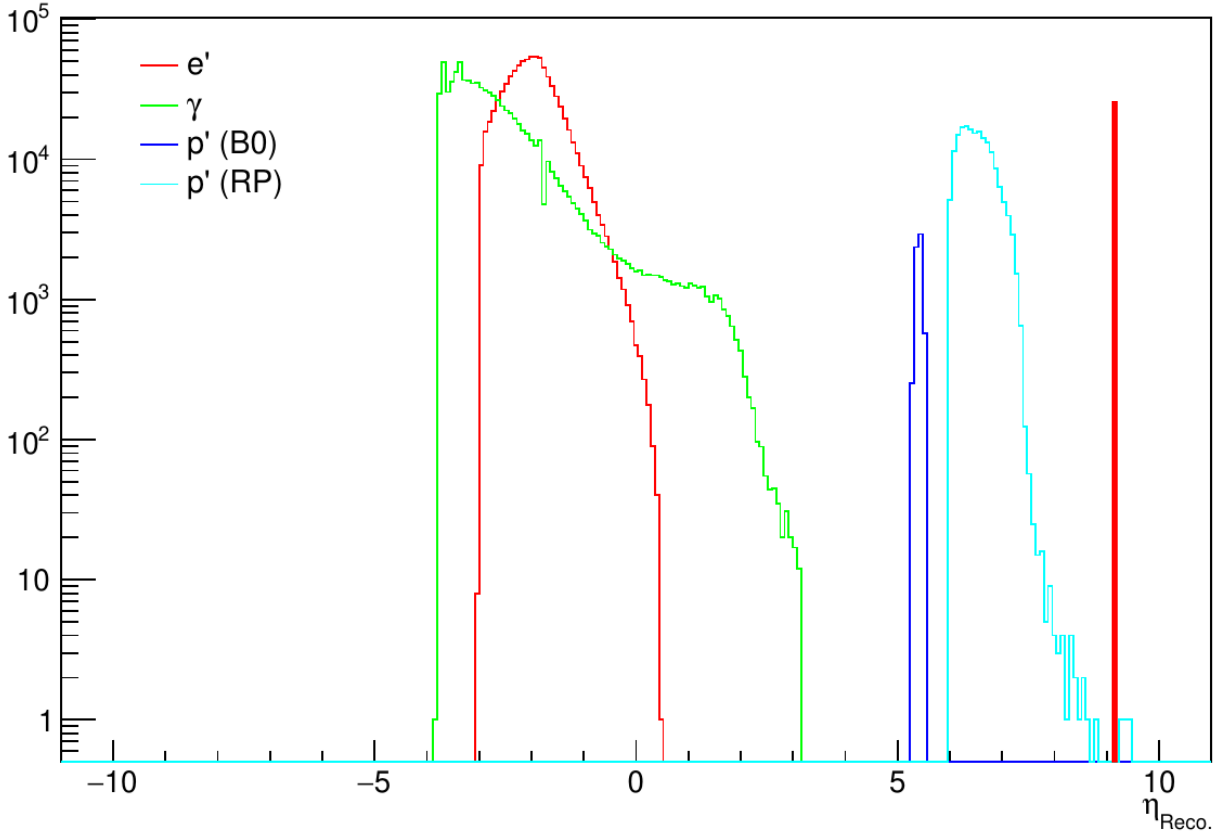
- Generator cuts
  - $10^{-5} < x_B < 0.7$
  - $0 < -t < 1.6$ GeV^2
  - $1 < Q^2 < 100$ GeV^2
  - $0.01 < y < 0.9$
  - $0.03 < \phi_h < (2\pi - 0.03)$ rad

Simulation campaign output



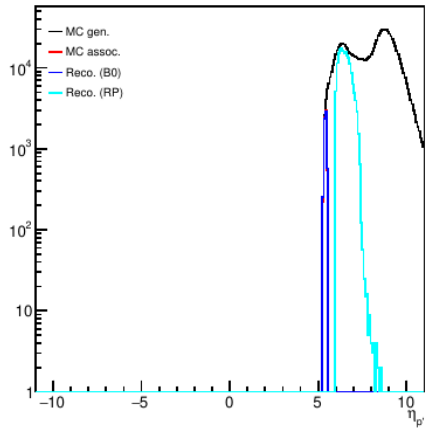
- MC η coverage.
- From discussion with Alex, the structures are partly to do with choice of processes (full DVCS+BH+int, rather than DVCS only).
- High-η proton peak from BH contribution, which then smears out the photon distribution.

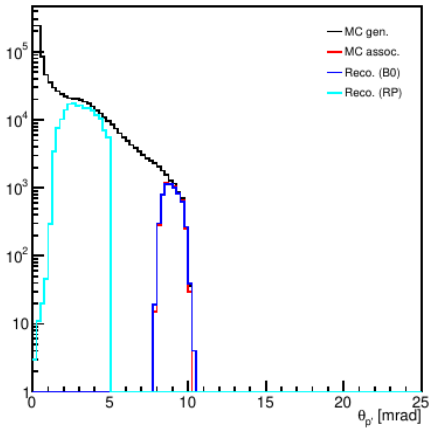
Simulation campaign output

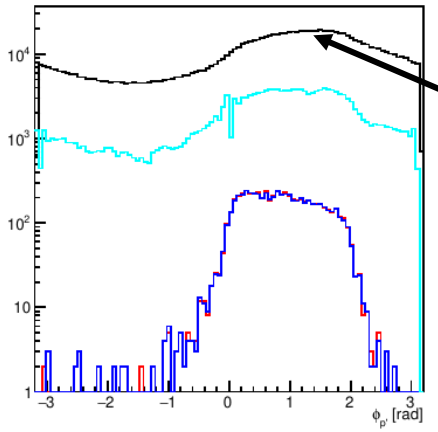


- Reconstructed η coverage.
- Peak of extra BH protons (red vertical) missed by RP but does smear into coverage at the inner RP chips.

Single particle kinematics – p’

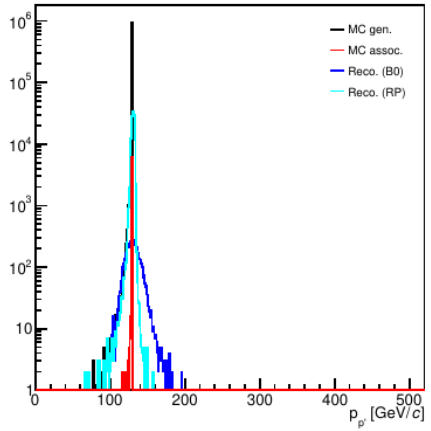


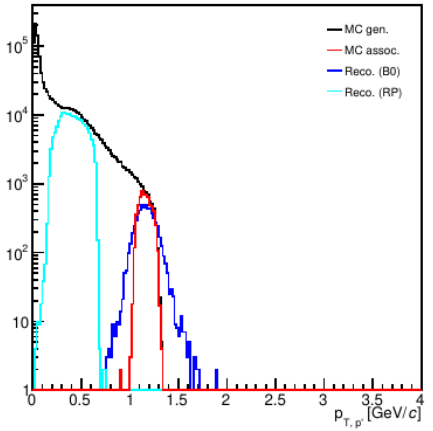


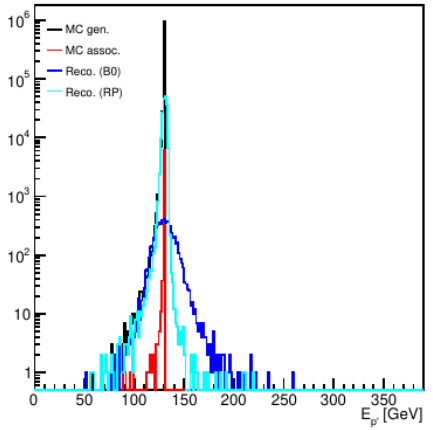


Phi distribution not flat?

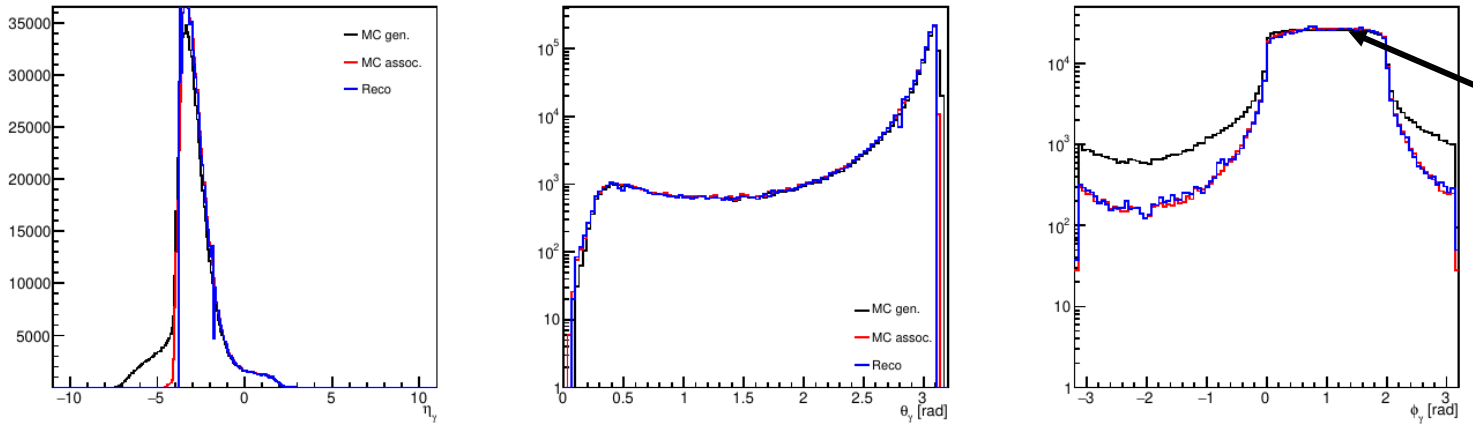
What is going on?







Single particle kinematics – γ



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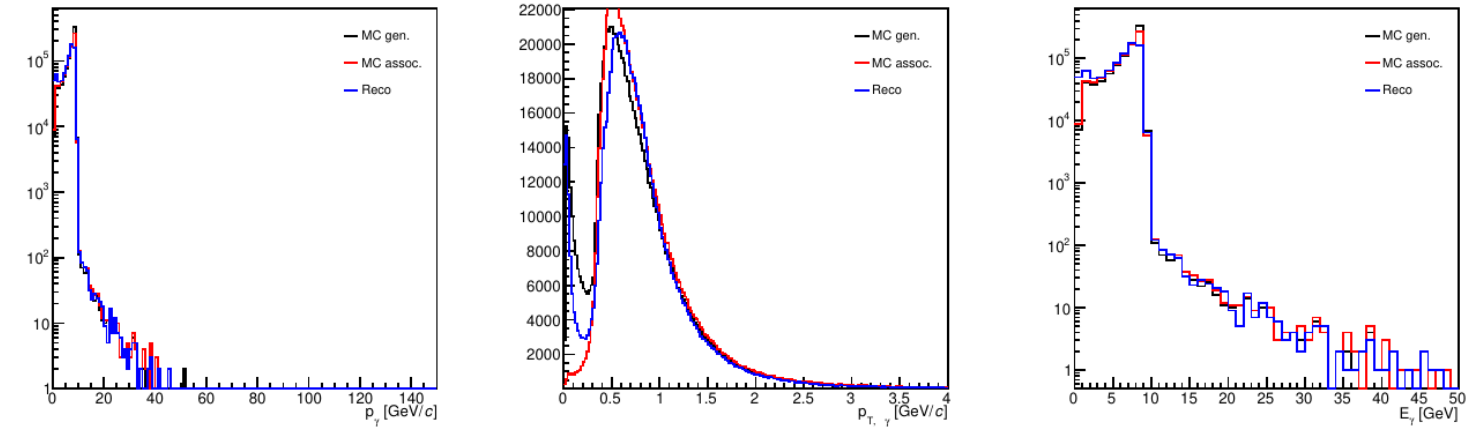
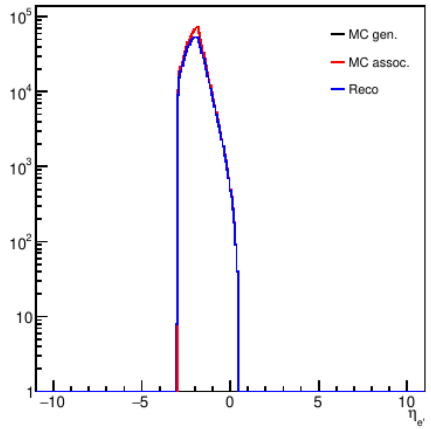
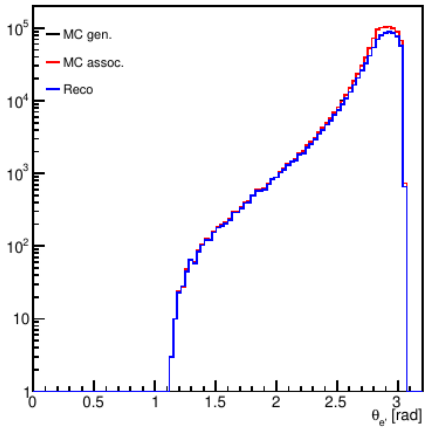
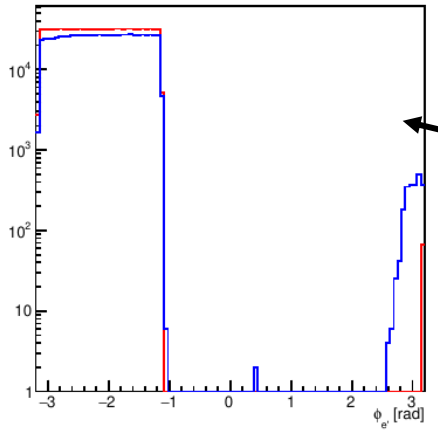


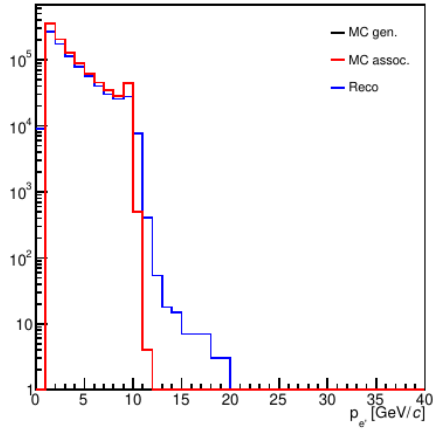
Single particle kinematics – e’

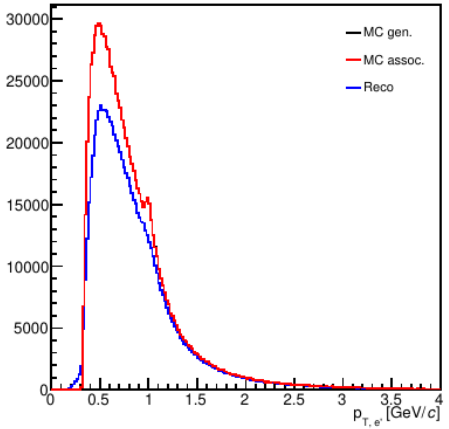


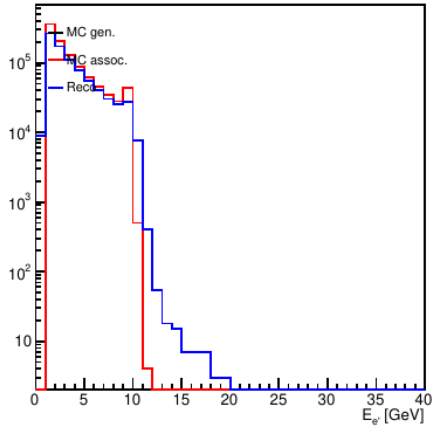




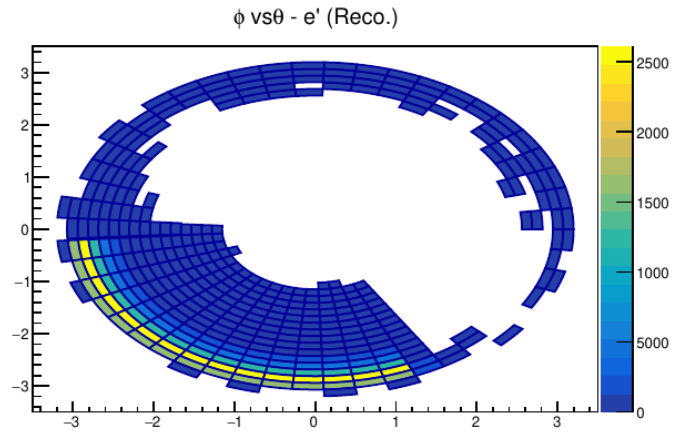
Missing phi coverage?

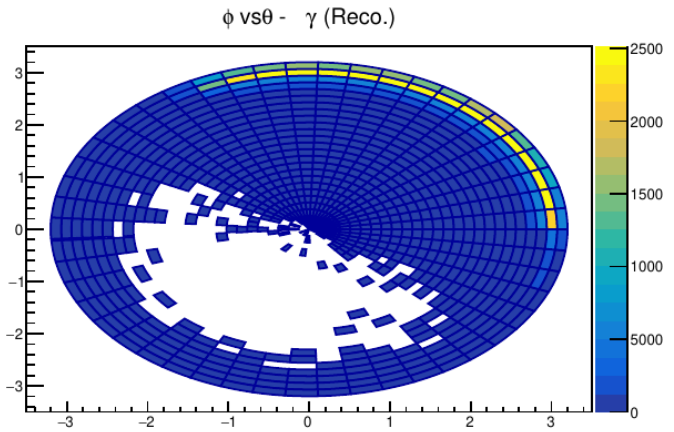


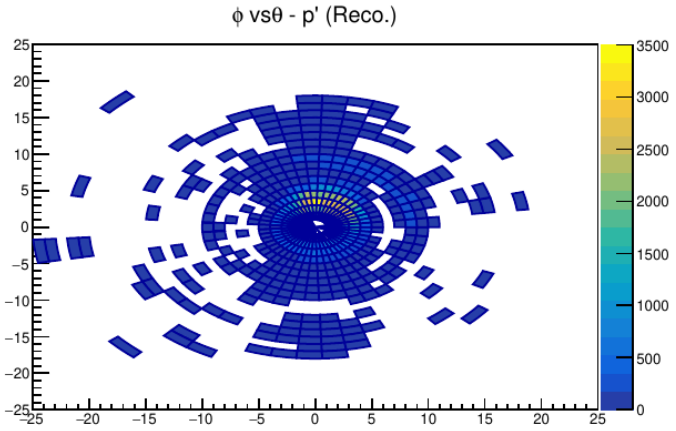




2D ϕ vs θ (reconstructed)







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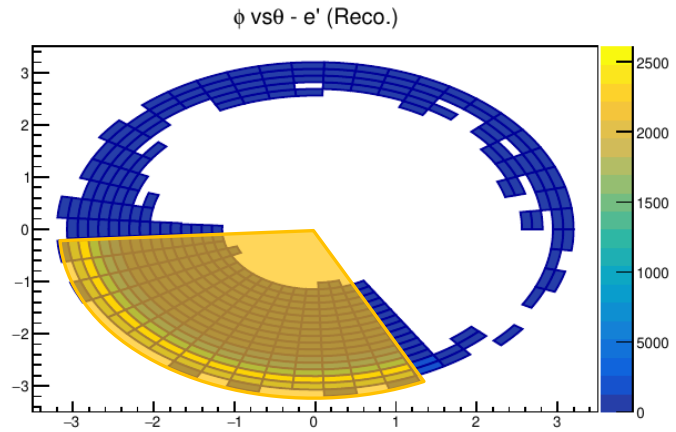
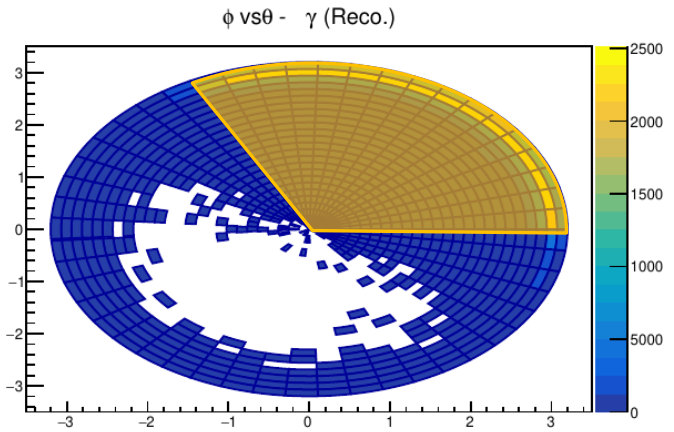
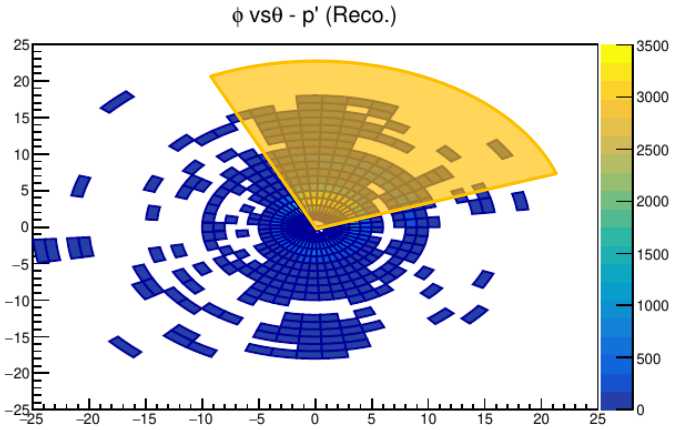
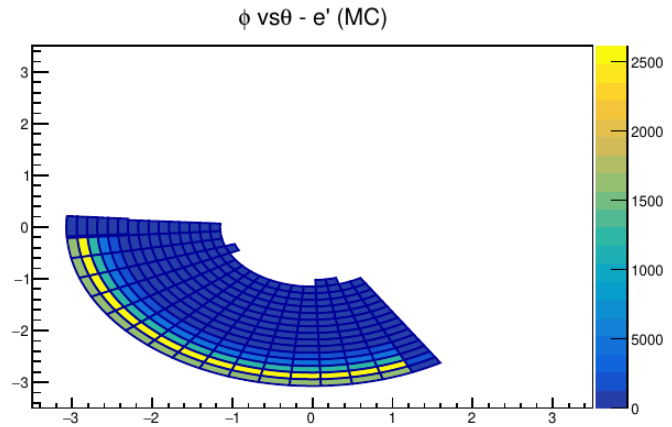
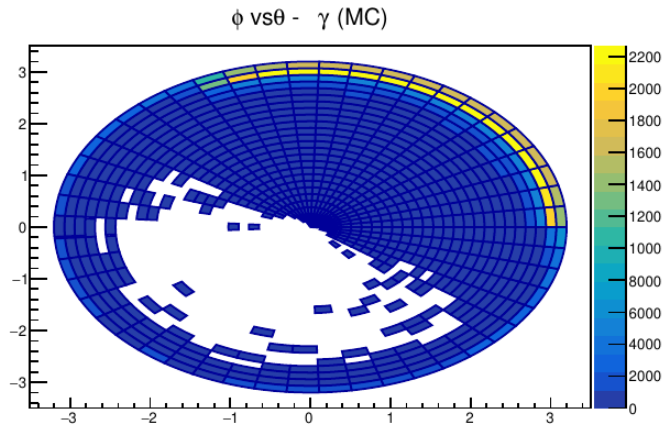


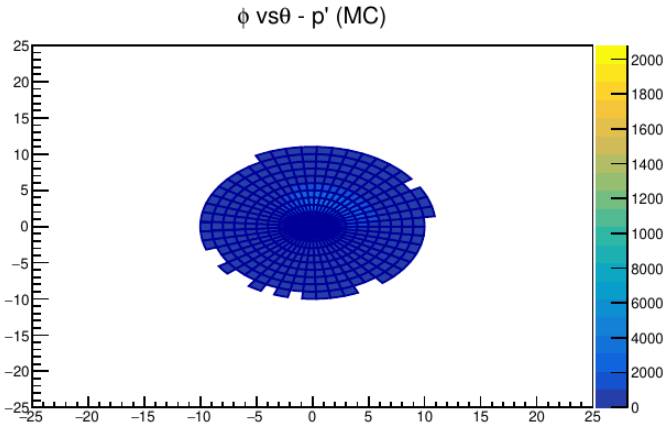




2D ϕ vs θ (MC)







Partial detector coverage is present at MCParticles level.

Is this at the raw generator level, or from the afterburner?

Conclusions and next steps

- Significant differences seen in the 10x130 plots when compared to 10x100.
  - Smearing/peaking in eta distributions; spike at low-t; shape of y-distribution; extremely low full event acceptance with B0 protons.

- How much this is due to chosen channels, and how much is a generator problem needs to be checked.
  - Need to look at distributions (not yet had time to do this).
  - Would also like to look at 10x100 DVCS+BH+int. events.

- Now have raw EpIC files (pre- and post-afterburner) from Alex.
  - Will look at these in the coming days.

Standard energy settings

25.04.1 → 25.05.0

- Roman Pots events missing from 25.04.1 plots.
- Raised this with Alex.
  - Pair of issues compounding on top of each other.
  - 1) RP hits being duplicated unknowingly.
  - 2) Issue when submitting campaign jobs too close to each other (due to date/time formatting of job files).
    - This issue likely to blame for the multiple previous instances of empty RP tracks in simulation campaigns.
- These have now been addressed, and plots look good.

Other steps

- Need to convert plots into physics deliverables.

- For this, need generator cuts for 5x41, 10x100 and 18x275 files.
  - Have asked Sal for these but had no response yet.