

Current analyses in the ePIC Exclusive, Diffractive and Tagging Working Group

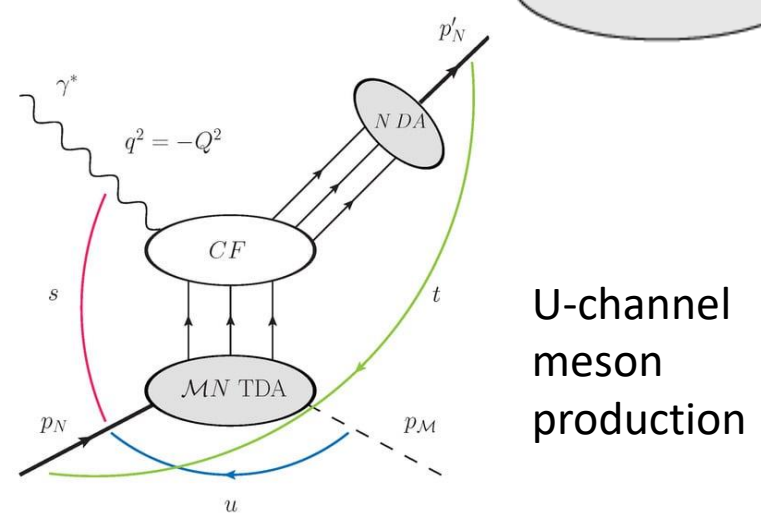
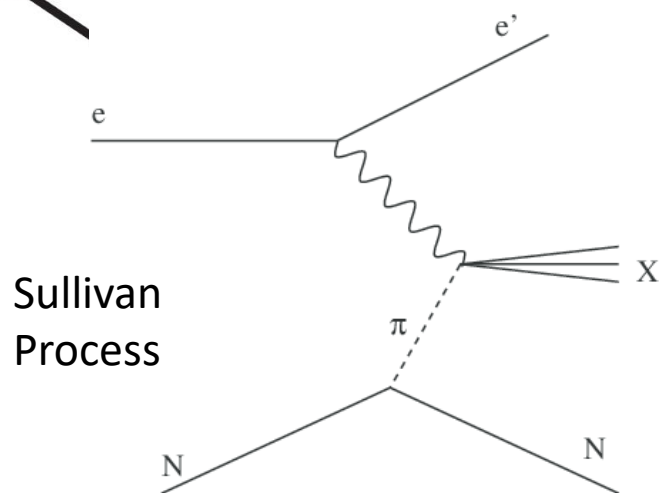
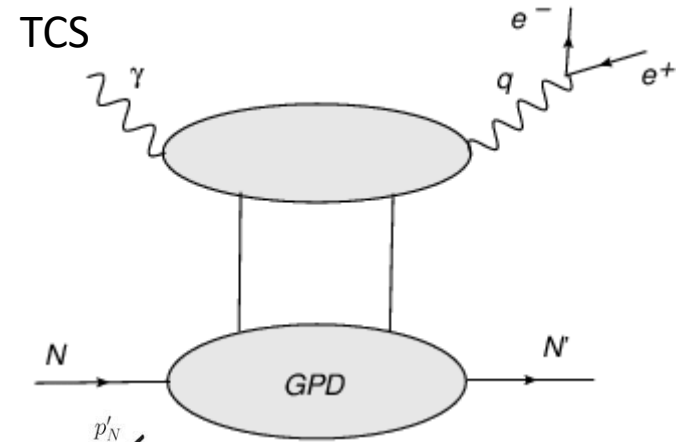
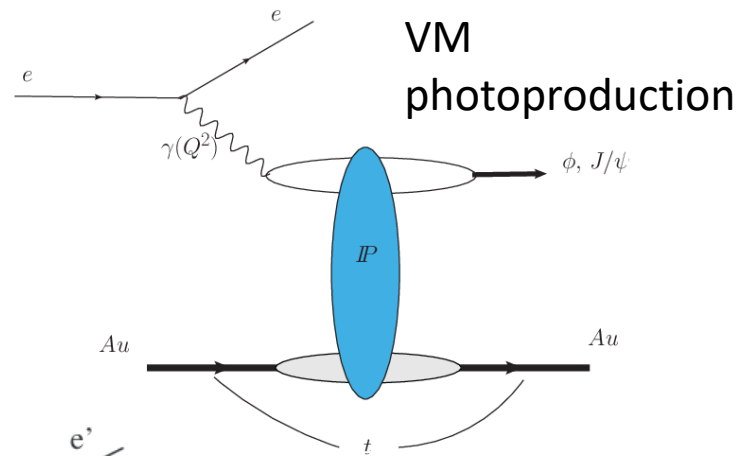
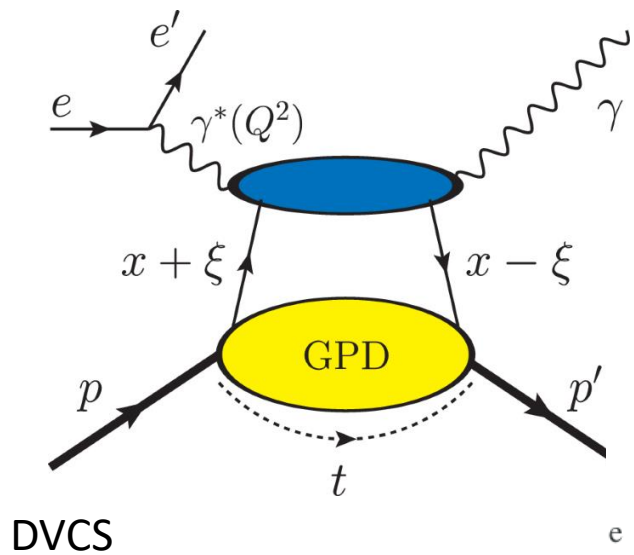
OLIVER JEVONS

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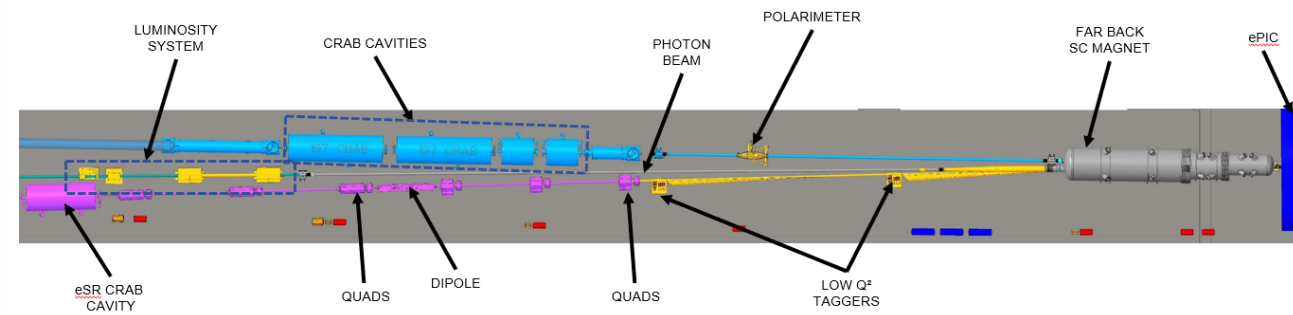
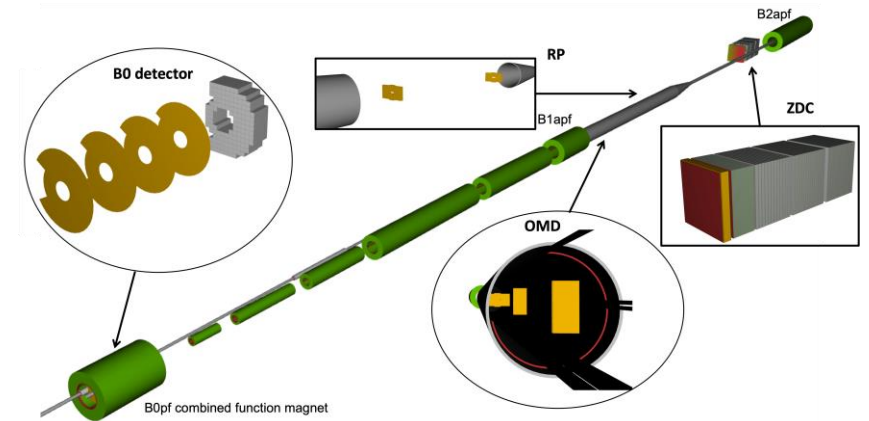
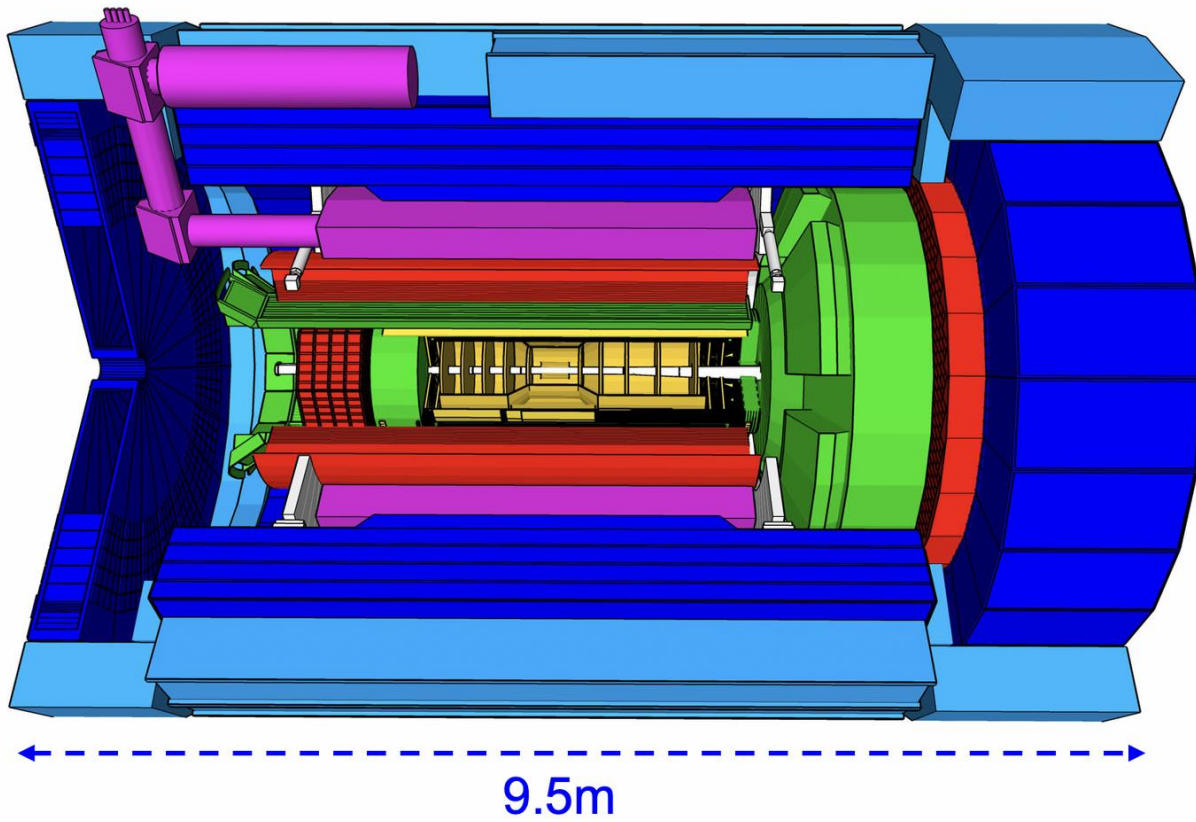
Exclusive physics at ePIC

- Processes covered involve:
 - Exclusive – all final state particles detected and identified.
 - Diffractive – very small scattering angles of particles in the beam (< 20 mrad for ePIC).
- Useful for the study of all parts of the ePIC detector:
 - Far forward – detection of scattered beam hadrons.
 - Barrel endcaps – PID and momentum/energy measurements of boosted decay products (hadron side), detection of scattered electron for high- Q^2 events (electron side).
 - Central barrel – highest Q^2 scattered electron reconstruction, photon detection.
 - Far backward – use of tagger for lowest Q^2 events.

Typical processes

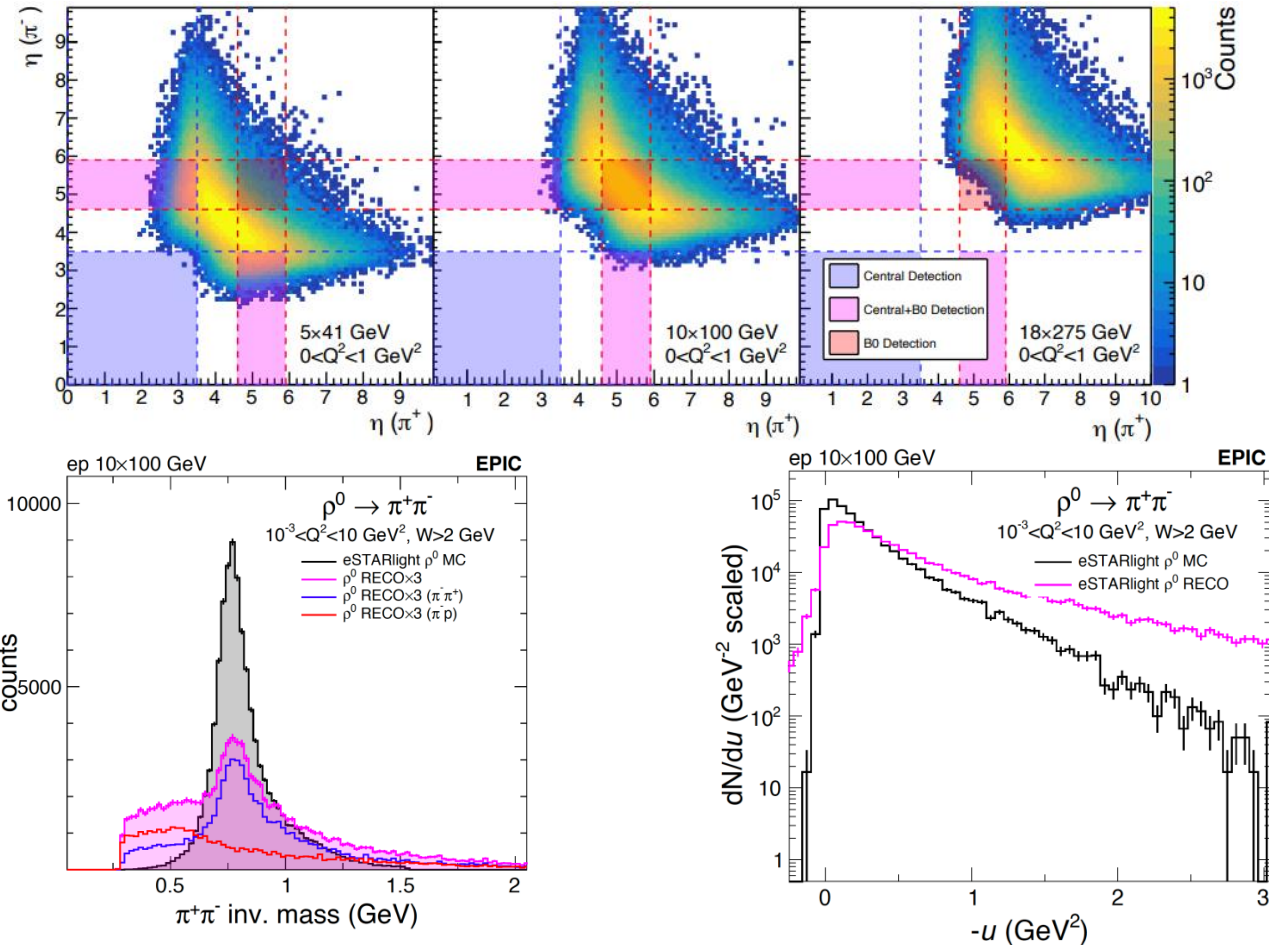


The ePIC detector



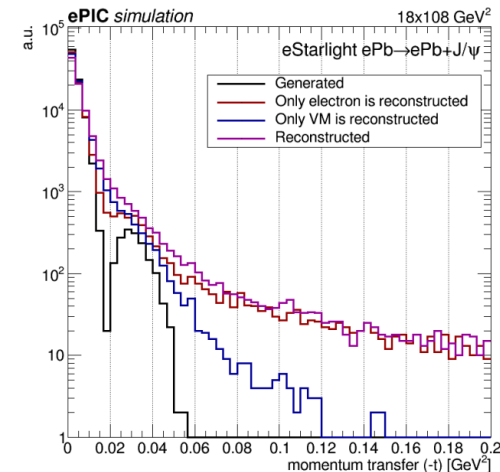
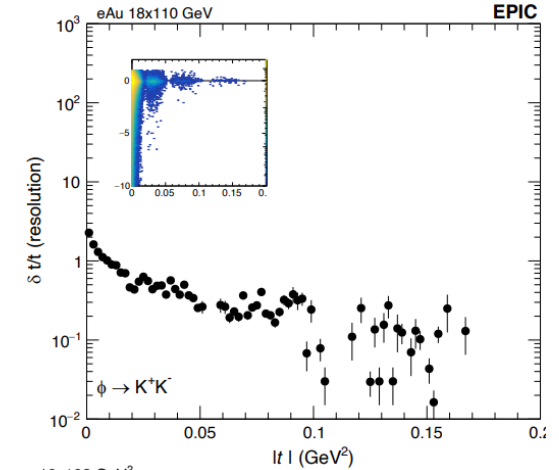
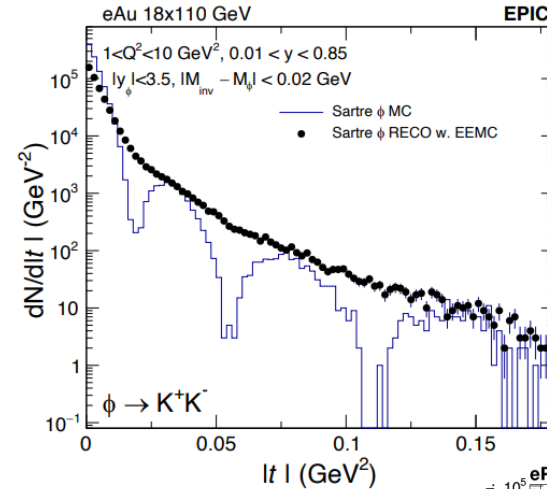
Current analyses: Backward meson production

- Looking at production of single vector mesons in ep collisions (e.g. $ep \rightarrow e' \rho$)
- Provides test of the capabilities of most of the ePIC detector.
 - Backward endcap for scattered electron.
 - Barrel and forward endcap for detection of ρ decay products.
 - B0 for detection of scattered proton.
- Currently adding in benchmark plots to be run automatically with simulation campaigns.



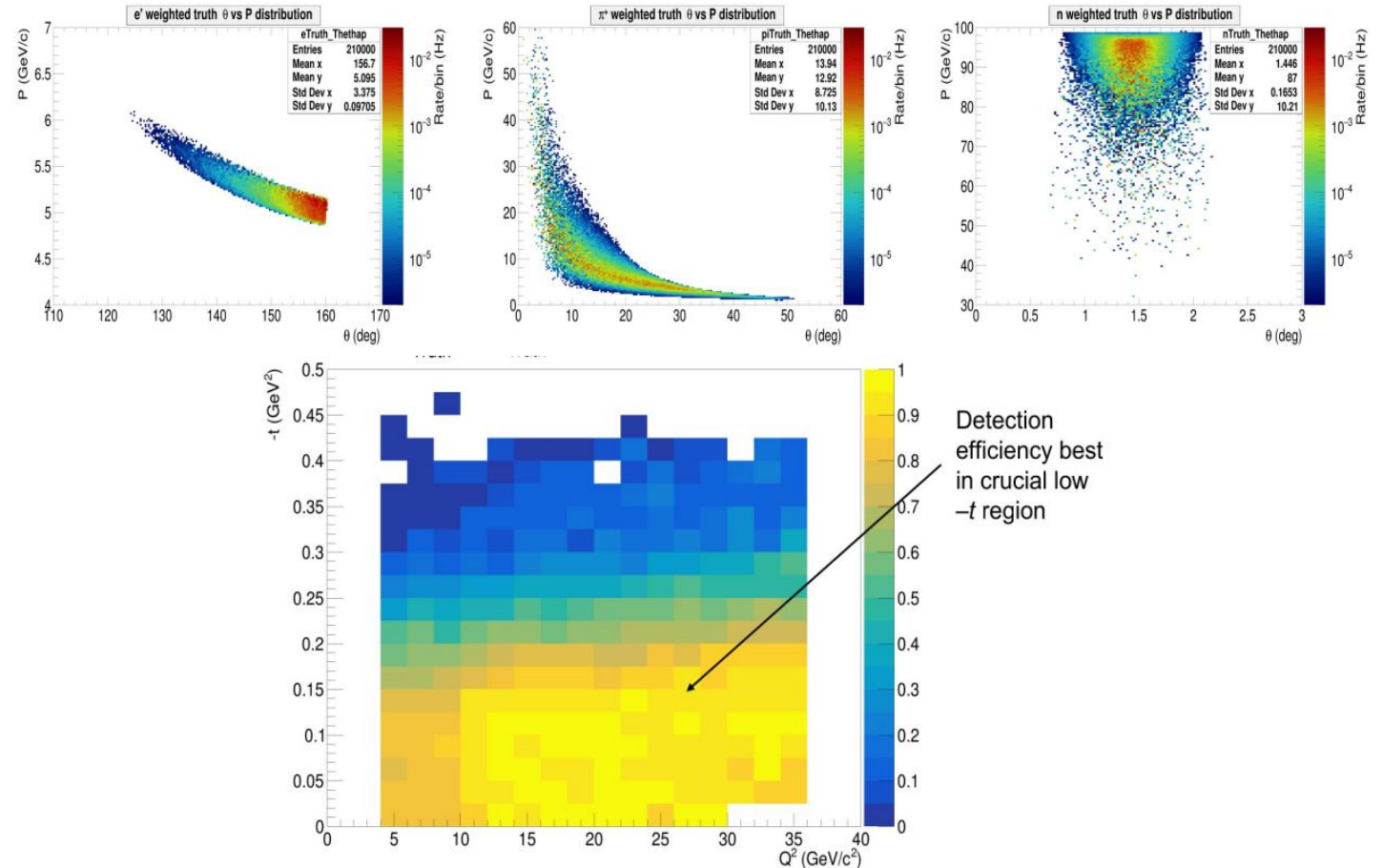
Current analyses: VM photoproduction

- Useful study of internal structure of nuclei.
 - ep: low-x structure of the proton.
 - eA: spatial distributions of gluons within nuclei.
- Current focus is on ϕ and J/ψ production.
- Uses far forward detectors to provide vetoes for incoherent production (with nuclear breakup).



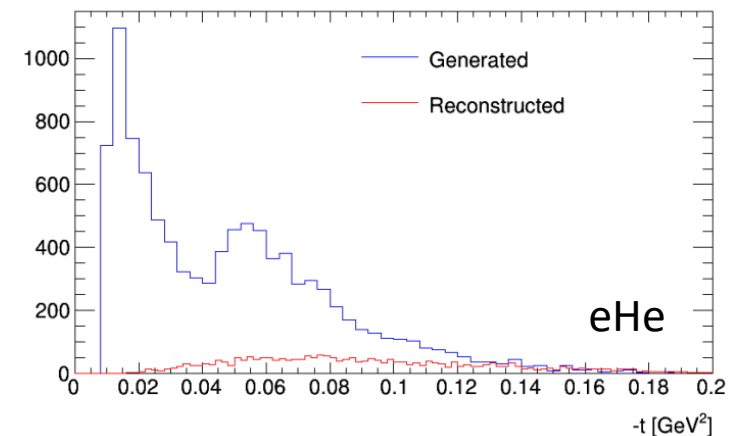
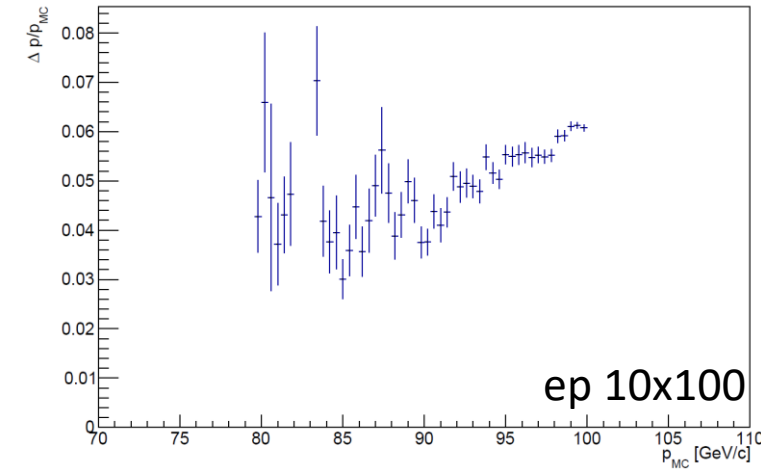
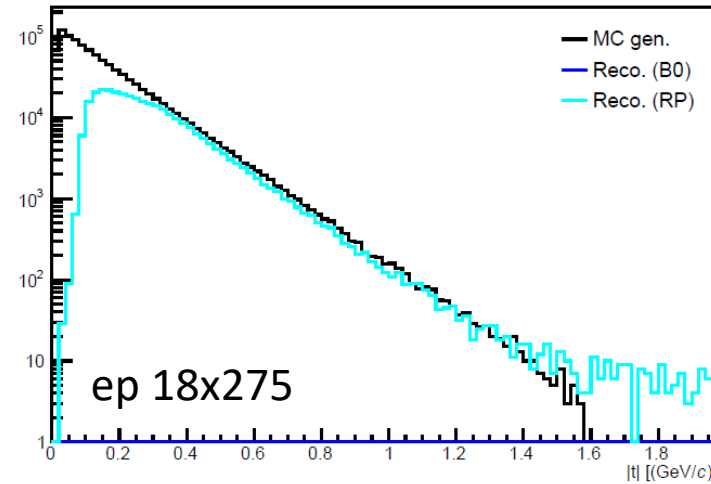
Current analyses: Meson form factors

- Studying pion and kaon electroproduction.
- Looking at reactions which convert the beam proton into a neutron (e.g. $ep \rightarrow en\pi^-$).
 - Electron involved scatters off “meson cloud” surrounding the initial hadron.
- More on this from Stephen Kay later.



Current analyses: DVCS

- Simplest inelastic channel available to EIC: $eh \rightarrow eh\gamma$.
- Allows for the study of Generalized Parton Distributions within the initial hadron.
 - Method of imaging the internal structure of protons and neutrons.
- Also good as a test of the resolution of far forward detectors.
- More on DVCS in eHe events from Gary Penman later.



Summary

- Many analyses ongoing, with a few at the stage of running CI benchmarks.
- More analyses are in progress, but have not been recently presented:
 - Deeply Virtual Meson Production – talk from Stuart Fegan later.
 - Timelike Compton Scattering.
 - Exclusive production of $\Upsilon(1S, 2S, 3S)$ states.
- Meetings every other Monday at 5pm GMT. All are welcome to attend!
 - Conveners: Rachel Montgomery (Glasgow), Raphaël Dupré (IJCLab, Orsay)
 - Mailing list, Mattermost channel and details on our regular meetings are on the ePIC Wiki page (<https://wiki.bnl.gov/EPIC/index.php?title=ExclusiveDiffractionTagging>)