ECCE Diffractive and Tagging Group: Meson Form Factors Update

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ECCE Diffractive and Tagging
22/07/21

Outline

- Physics Recap
- Analysis Module Overview
- Interesting Plots
- Next Steps

Cover Image - Brookhaven National Lab, https://www.flickr.com/photos/brookhavenlab/

Physics Recap

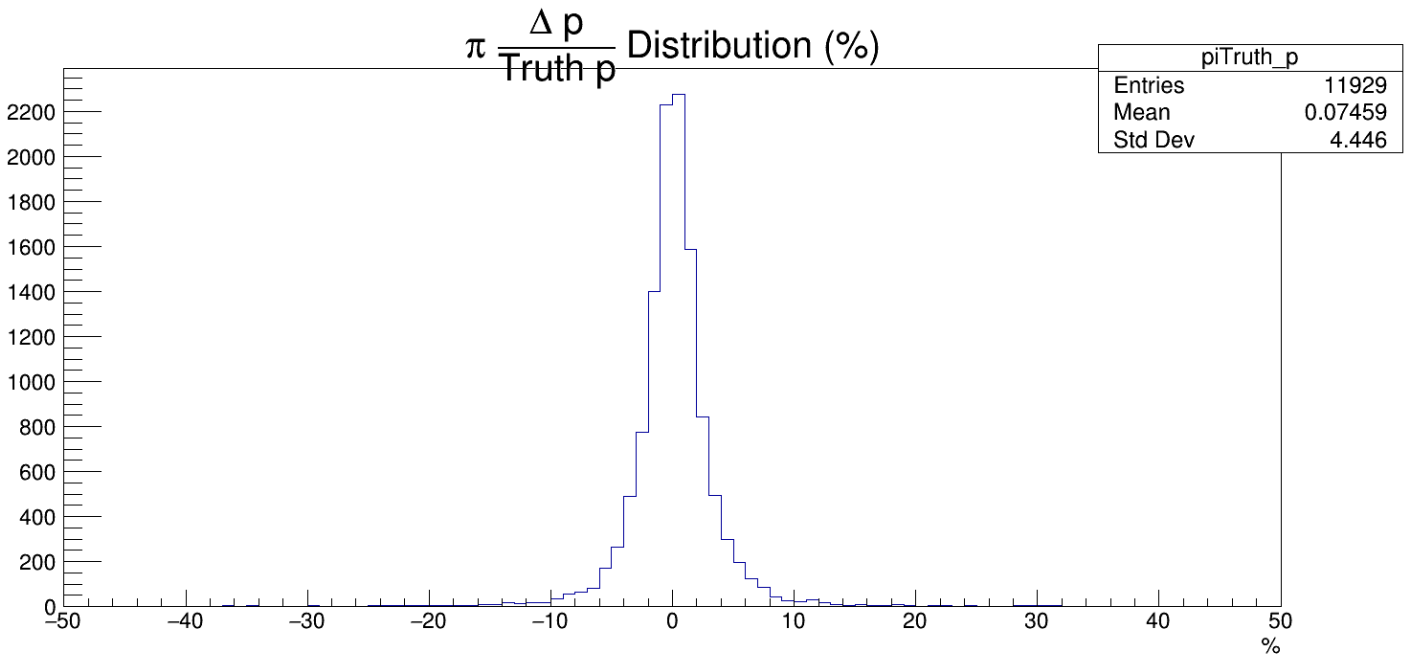
- Want to investigate feasibility of measuring F_π and F_K at the EIC to high Q^2
  - Describe the spatial distribution of partons within a hadron
  - Comparison of pion and kaon form factors of importance for understanding hadronic mass generation
- Access form factors at the EIC through **D**eep **E**xclusive **M**eson **P**roduction (**DEMP**) reactions
  - Need to cleanly isolate triple coincidences
  - For example, $p(e, e'\pi^+ n)$

Analysis Module Overview

- New analysis module to identify triple coincidences
  - Re-analyses the DST file
- Crudely (but effectively) selects triple coincidence events from the simulated file
- Process event loop checks in each event for
  - Two tracks, one -ve charged in the -z direction (e'), one +ve charged in the +z direction (π^+)
  - A hit in the ZDC with $>$ 40 GeV energy deposited
- For every event where conditions are met, calculate and plot some quantities
- Code available at - `https://github.com/sjdkay/ECCE_DEMP_Analysis`

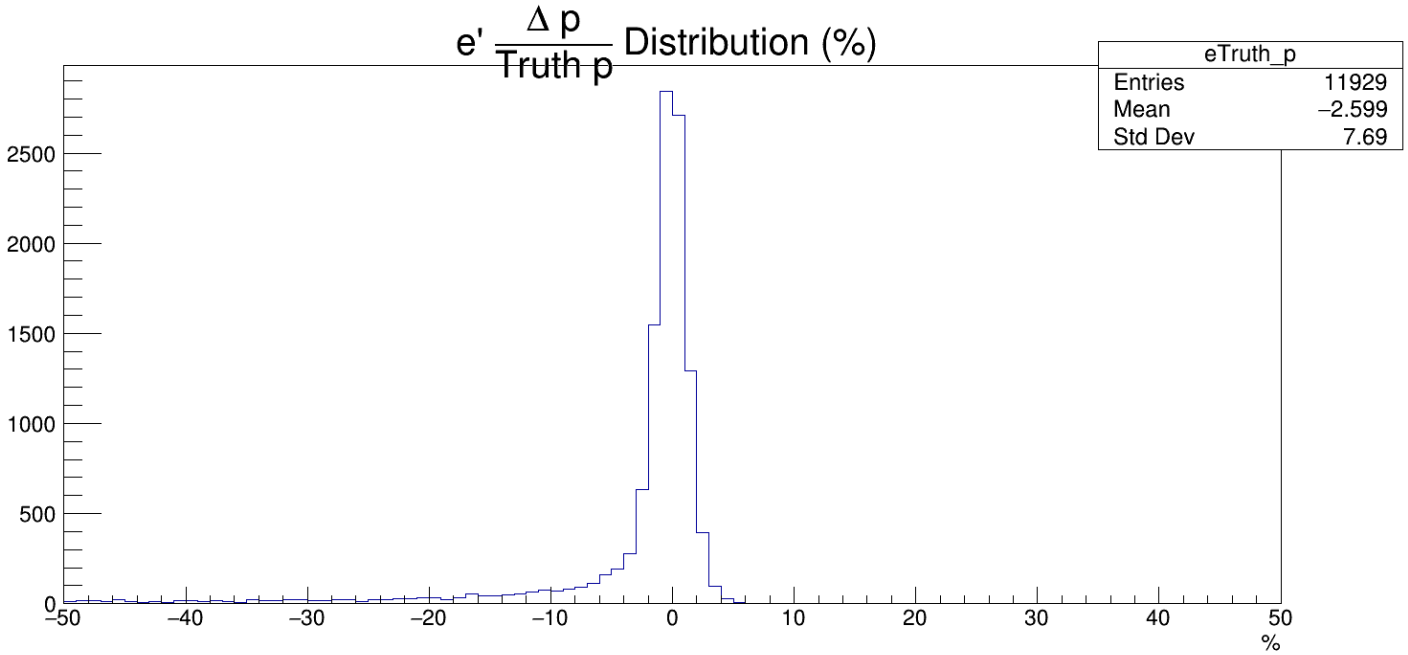
π^+Truth vs Track Comparison

- $\Delta p = \text{Measured} - \text{Truth}$
- Distribution is quite broad
- I assume the track info already includes some smearing



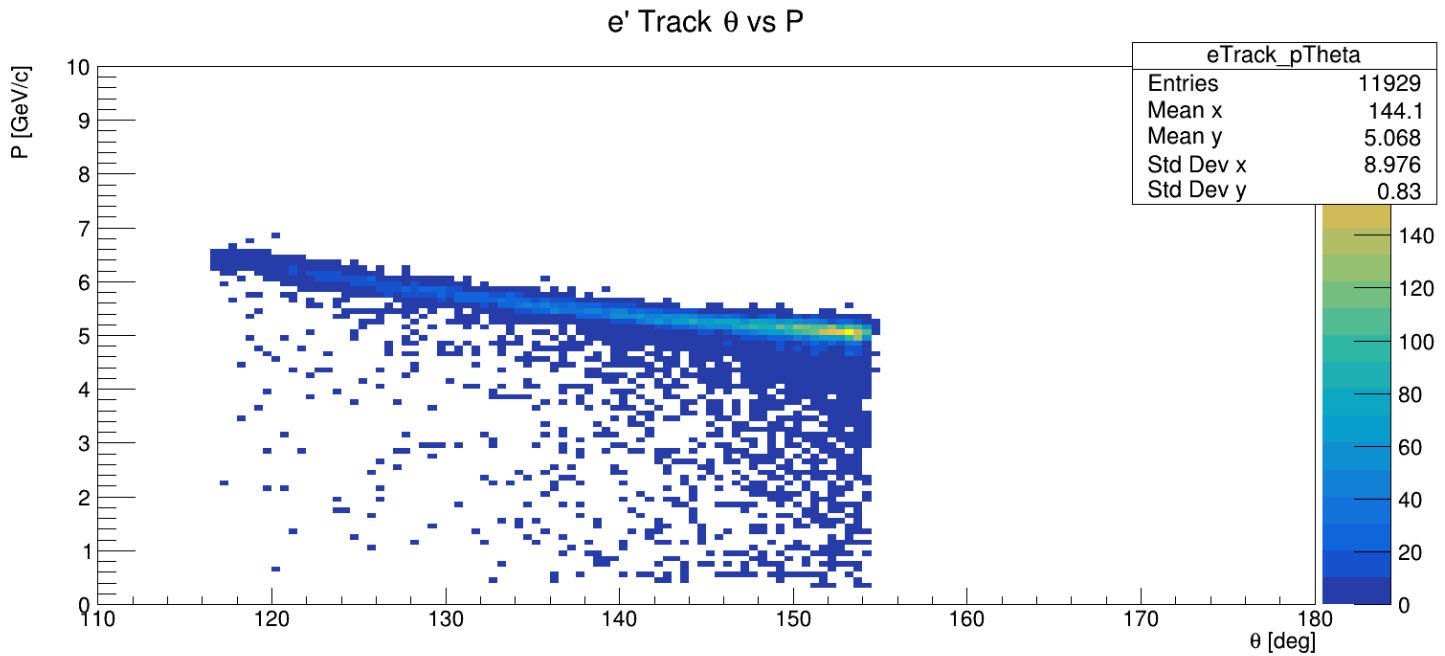
e'Truth vs Track Comparison

- Distribution is asymmetrical
- Radiative tail
- Again, relatively broad



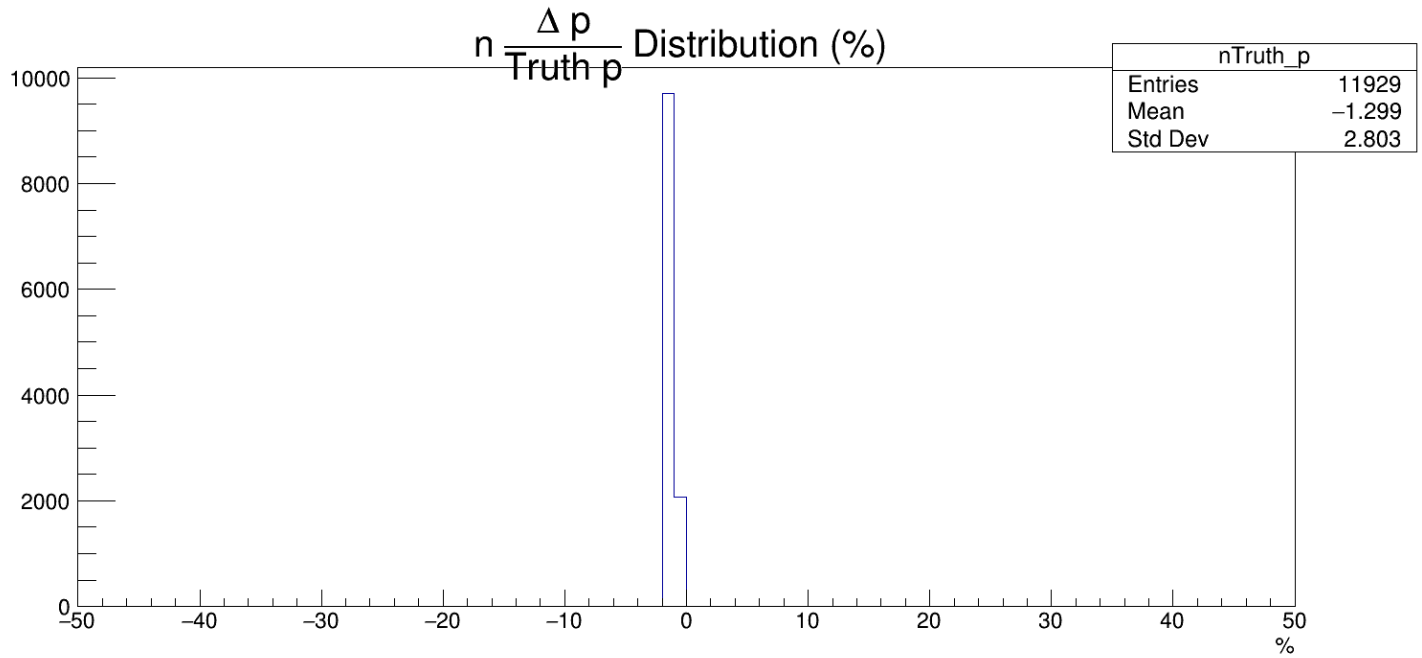
e' θ vs P Distribution

- Again, can see the radiative tail effect clearly



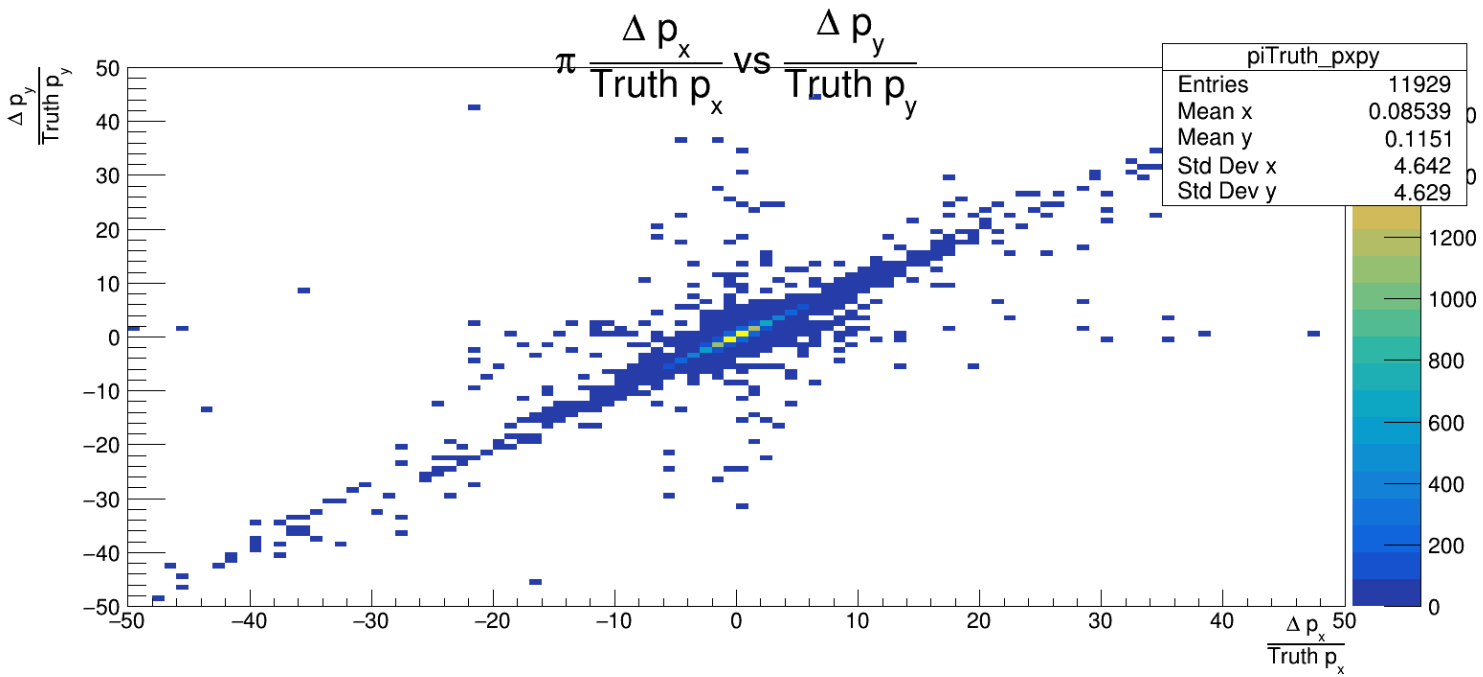
n Truth vs Track Comparison

- Sharp peak, need smearing in position and energy for the neutron?



π^+ Truth vs Track, P_x vs P_y Comparison

- Quick check to see if one component is "bad"
- Seem strongly correlated



e' Truth vs Track, P_x vs P_y Comparison

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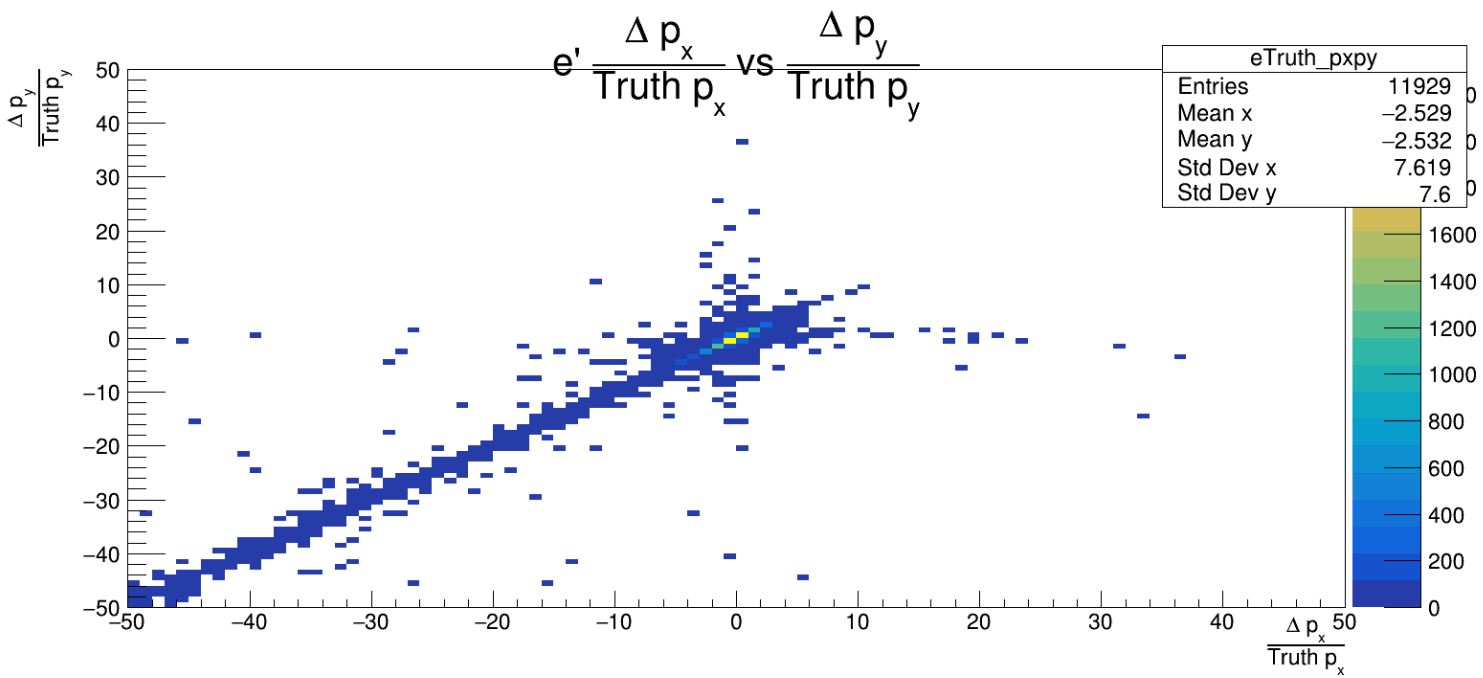
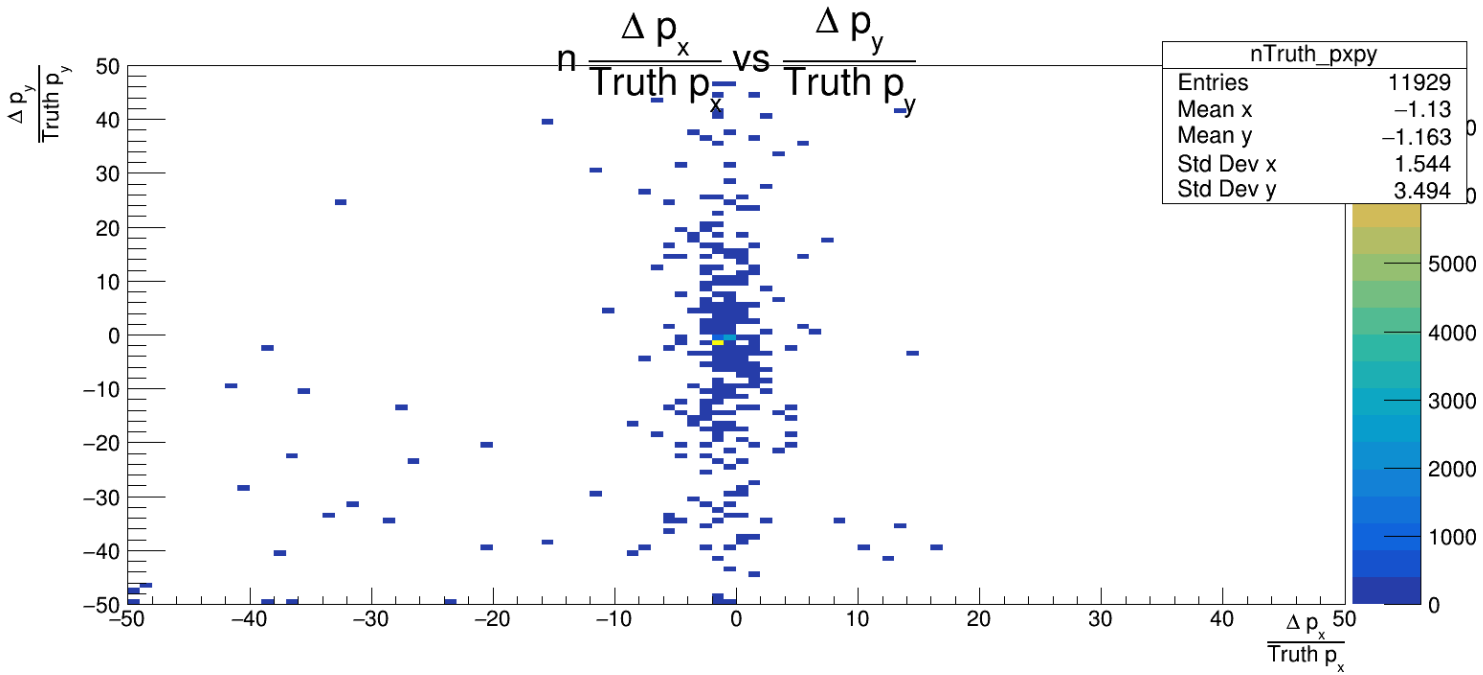


π^+ Truth vs Track, P_x vs P_y Comparison

- Very odd distribution
  - x resolution looks good but y resolution looks terrible?
  - Again, probably need smearing applied here



Summary and Next Steps

- Kinematic quantity calculations now included
  - Need beam information!
  - Current calculation uses a temporary pair of beam 4-vectors
- Need to confirm track quantities are already smeared
- Need to apply realistic smearing for ZDC quantities
- Need weights incorporated eventually
- Need more events (and different settings!) to process
- Also need to look at kaons
  - Will need a slightly more complex module
- Summer student Maggie Kerr (Mount Allison U) has taken a further look at the truth info for our events
  - See supplemental pdf on the meetings page for more

Thanks for listening, any questions?

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This research was supported by the Natural Sciences and Engineering Research Council of Canada (NSERC), FRN: SAPIN-2021-00026