

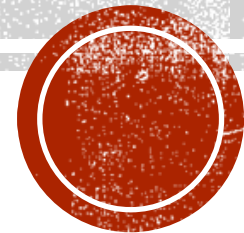
Particle production studies for pfRICH

Jan Vanek

BNL

pfRICH meeting

01/25/2023

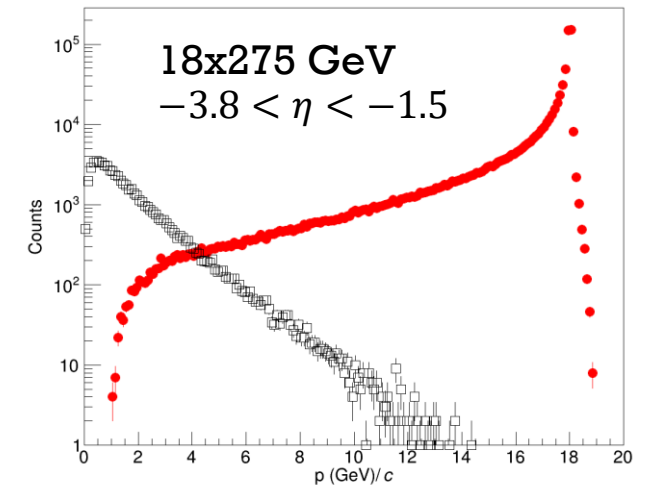
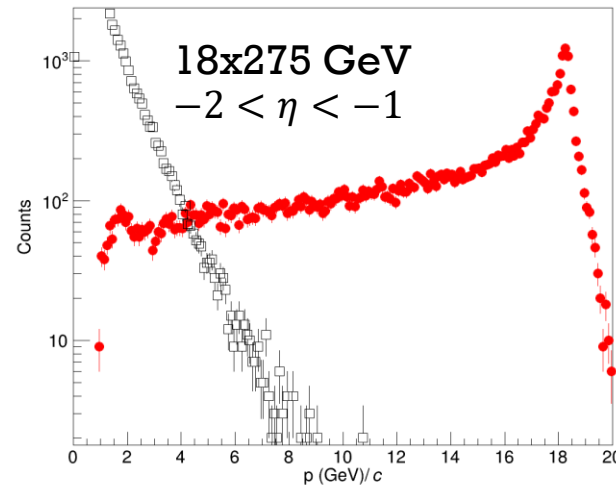
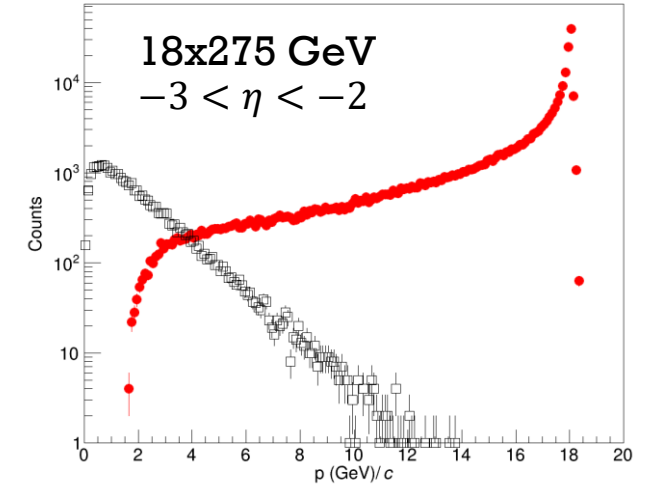
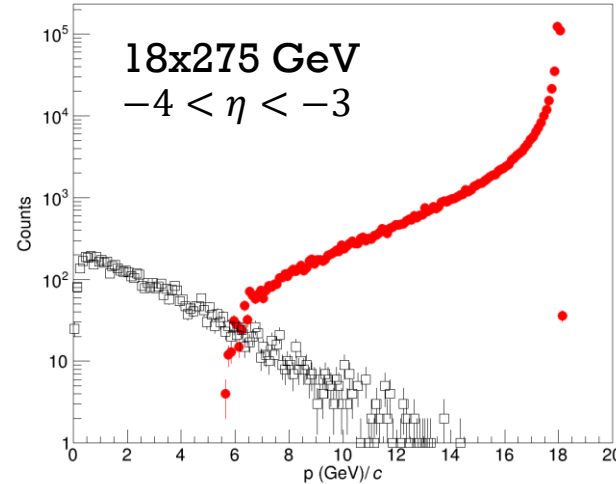


OVERVIEW

- Momentum distributions of scattered electrons and π^-
 - MC DIS ep collisions 10x100 and 18x275 GeV
 - Both MC level and RC level
 - Several η bins
 - $Q^2 > 1 \text{ GeV}^2/c^2, y < 0.95$
 - Same cuts as mentioned by inclusive group at collaboration meeting
 - Direct comparison of p spectra and π^-/e ratios

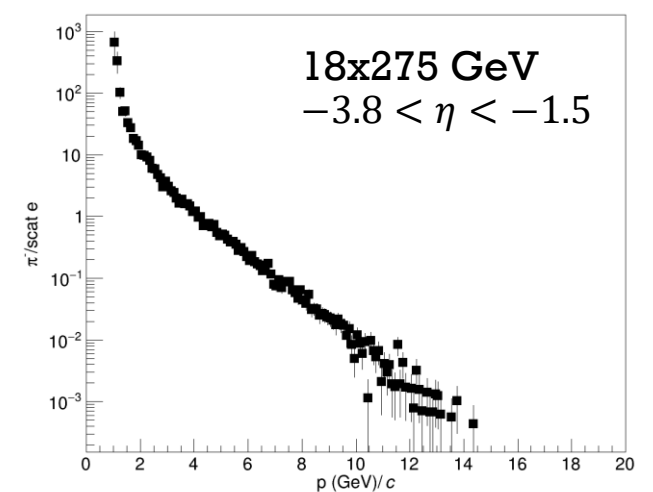
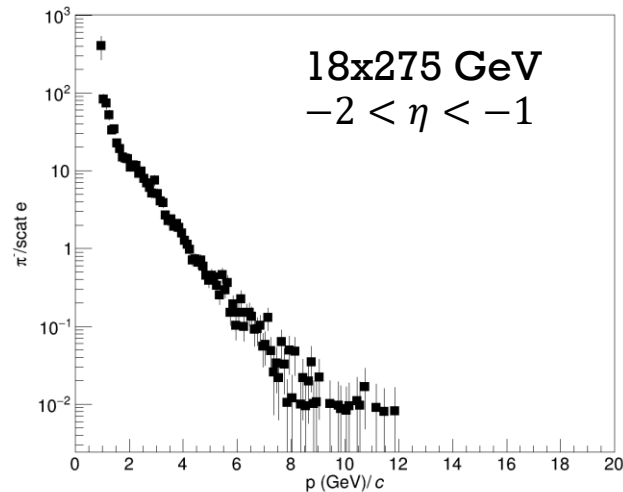
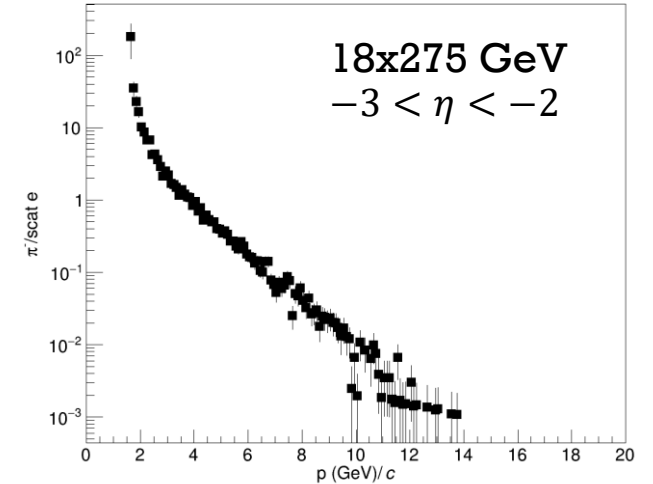
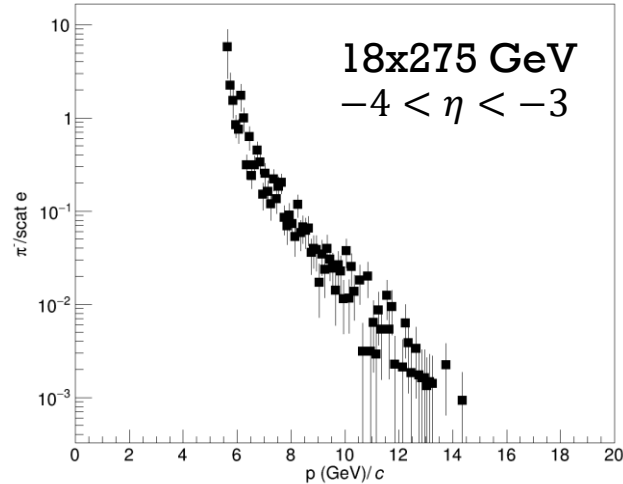
SCATTERED ELECTRON AND PION p SPECTRA

- Comparison of p distributions of MC scattered electrons and negative pions
 - Pure MC, without any pfRICH or eCAL selection
 - Bottom right figure for pfRICH η acceptance
- Scattered electron selection
 - $Q^2 > 1 \text{ GeV}^2/c^2, y < 0.95$



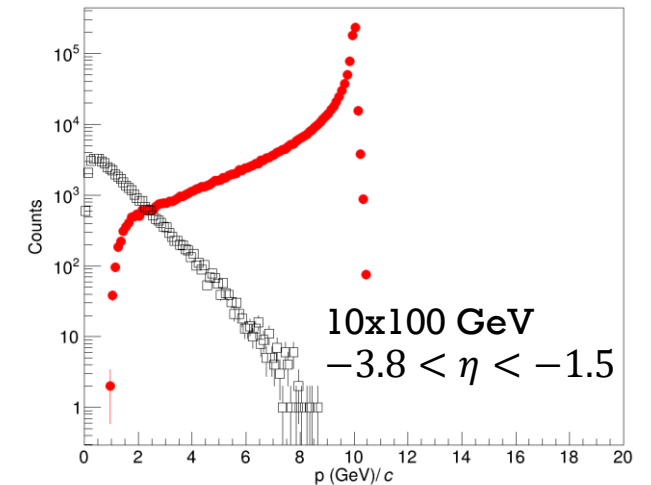
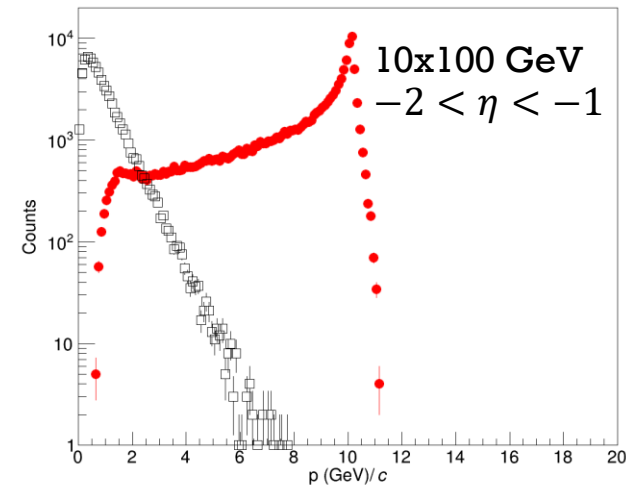
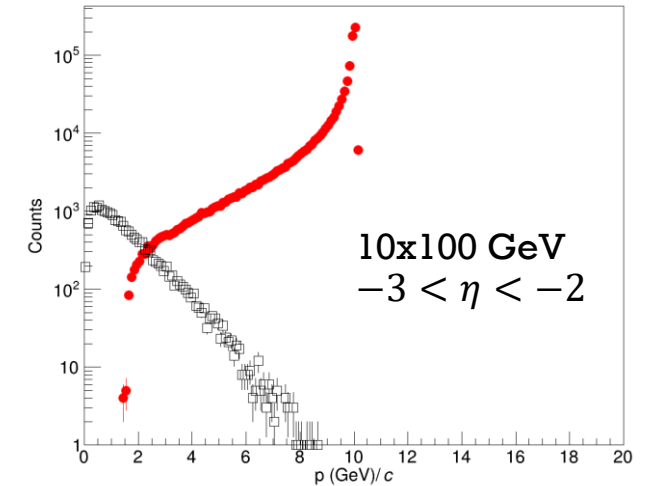
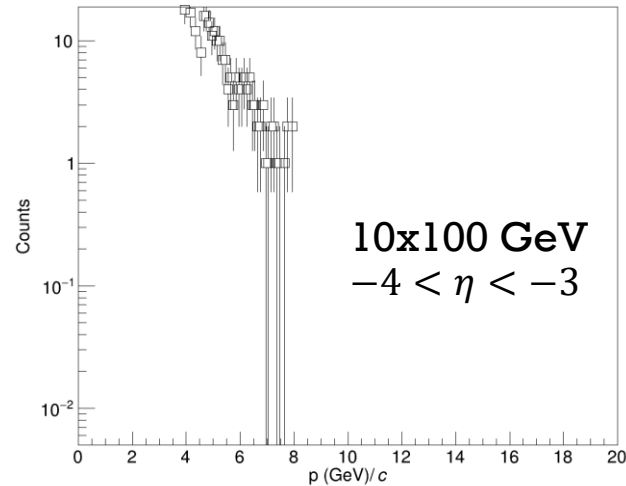
SCATTERED ELECTRON/PION RATIOS

- Scattered electron over pion ratio
 - Pure MC, without any pfRICH or eCAL selection
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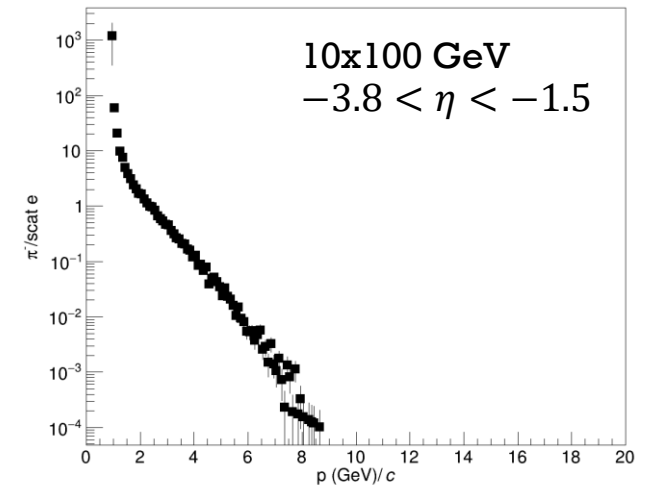
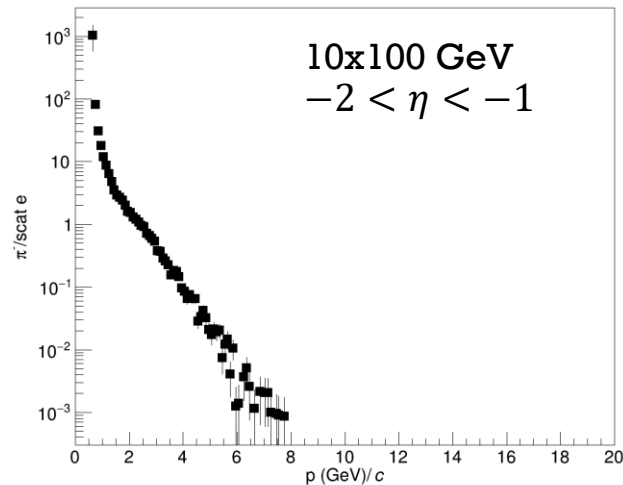
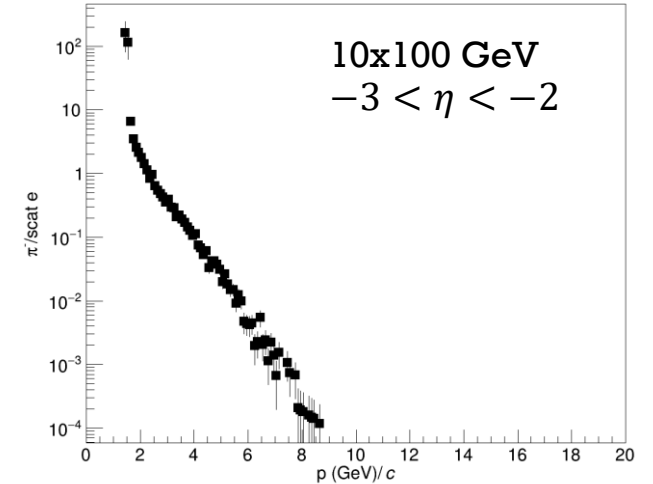
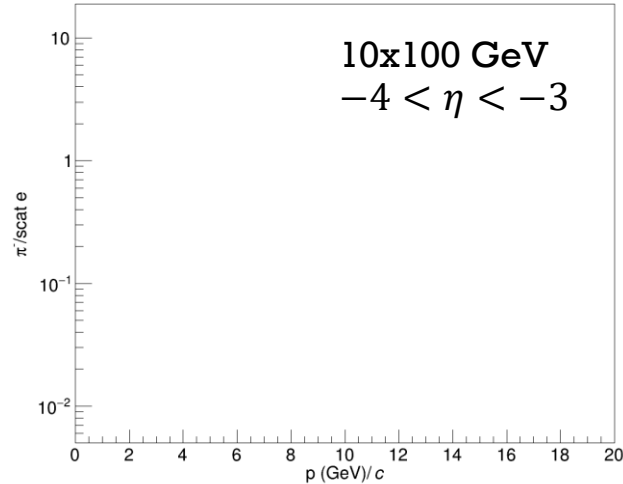
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- Need to check $-4 < \eta < -3$ bin



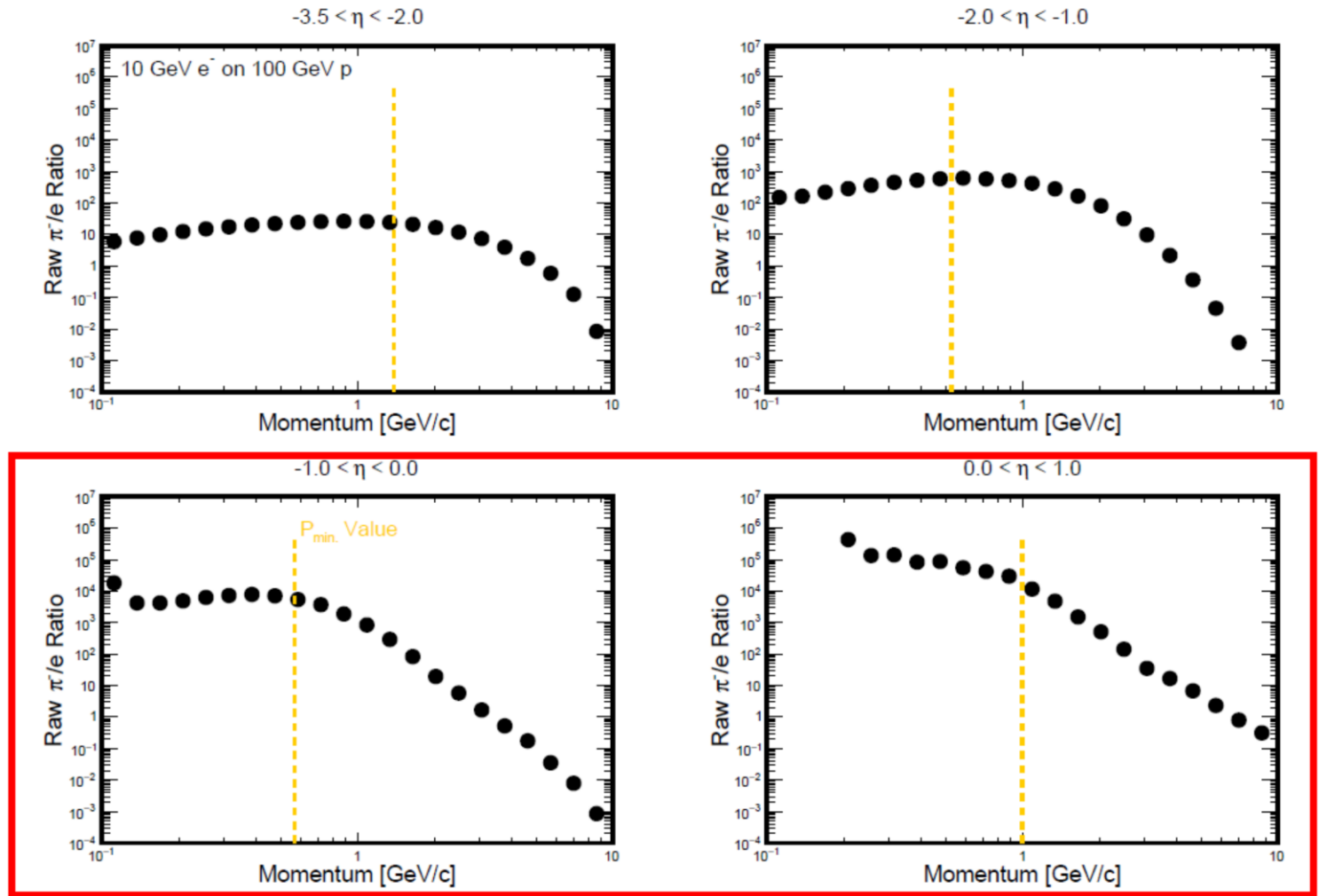
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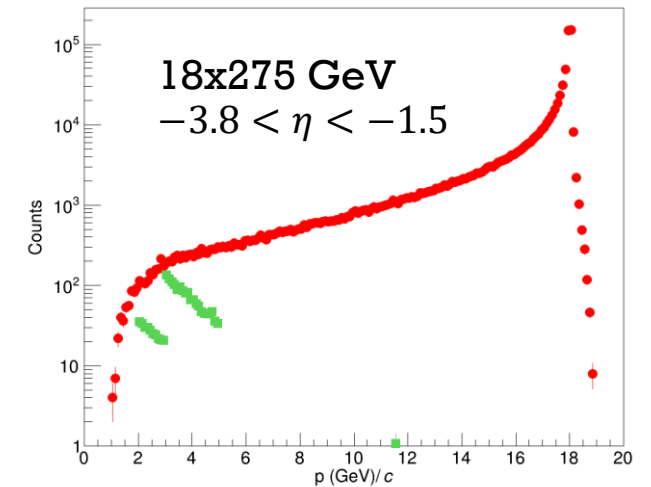
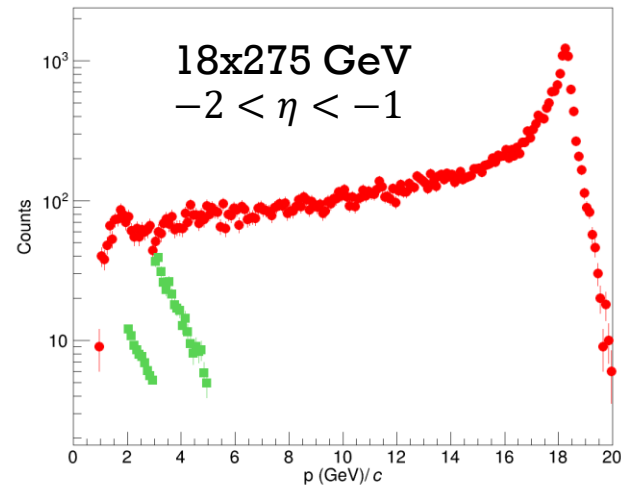
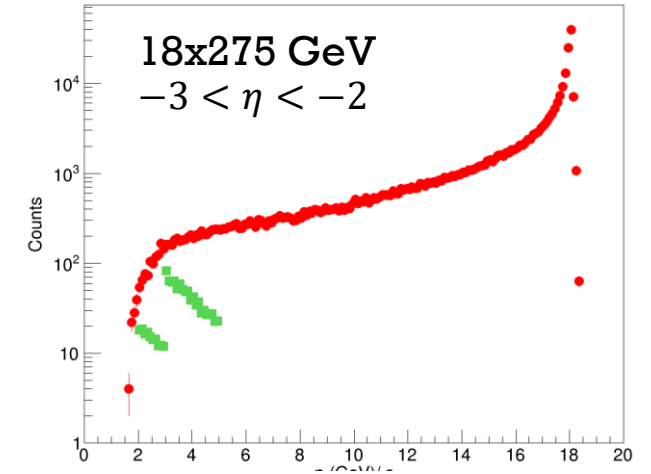
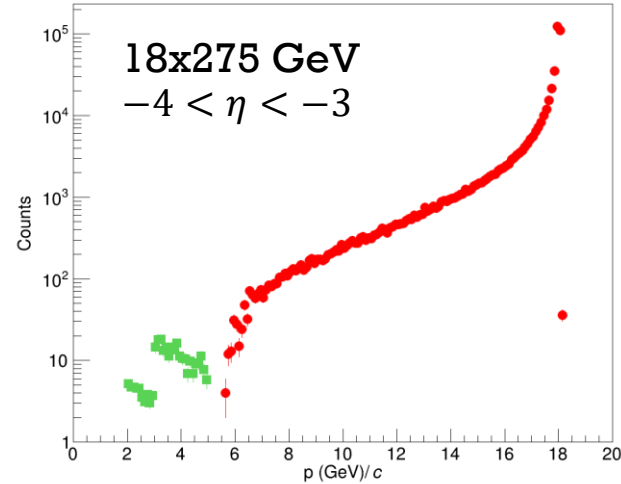
PION/SCATTERED ELECTRON RATIOS

- Reference plots from inclusive group shown during collaboration meeting
 - Different simulation with different Q^2 and y coverage
 - Yellow lines correspond to scattered electron with $Q^2 > 1 \text{ GeV}^2/c^2, y < 0.95$



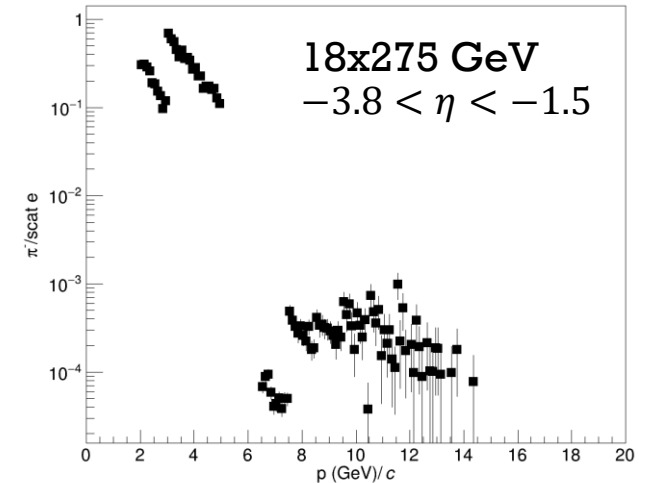
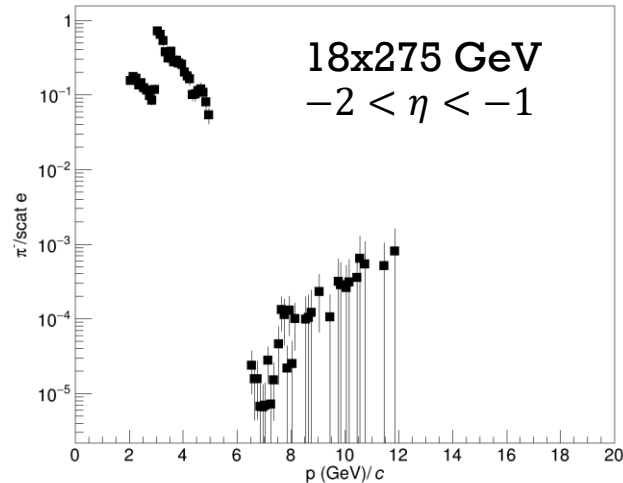
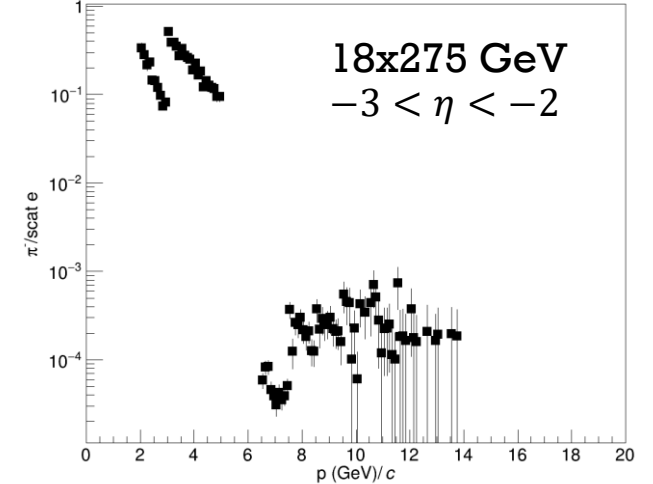
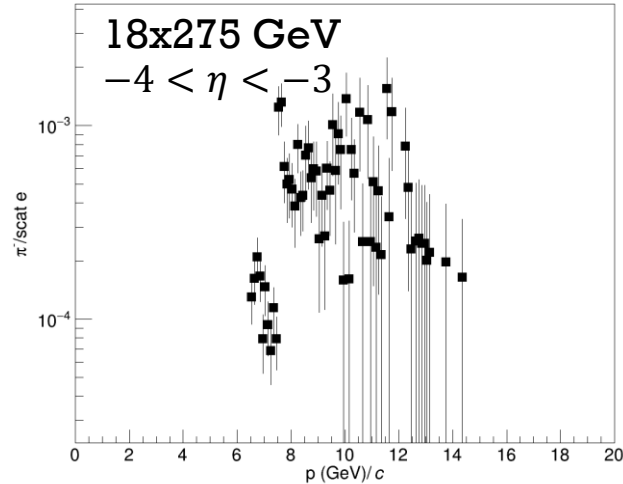
SCATTERED ELECTRON AND PION p SPECTRA

- Comparison of p distributions of MC scattered electrons and negative pions
 - Pions suppressed using pFRICH
 - Relevant p range up to 5 GeV/c
 - Range of e/π PID table
 - Bottom right figure for pFRICH η acceptance
- Scattered electron selection
 - $Q^2 > 1 \text{ GeV}^2/c^2, y < 0.95$



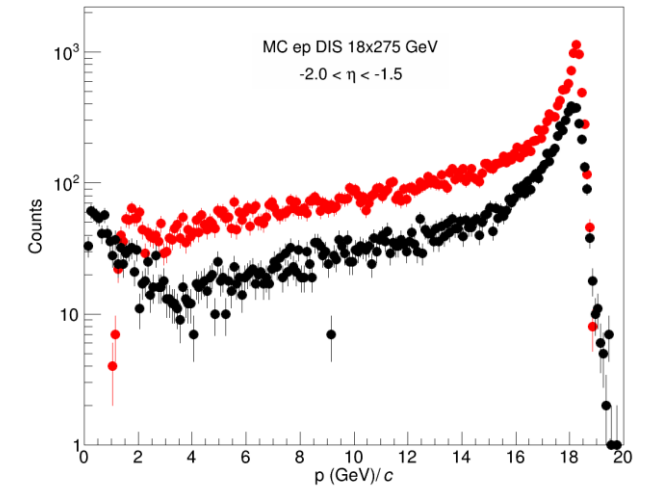
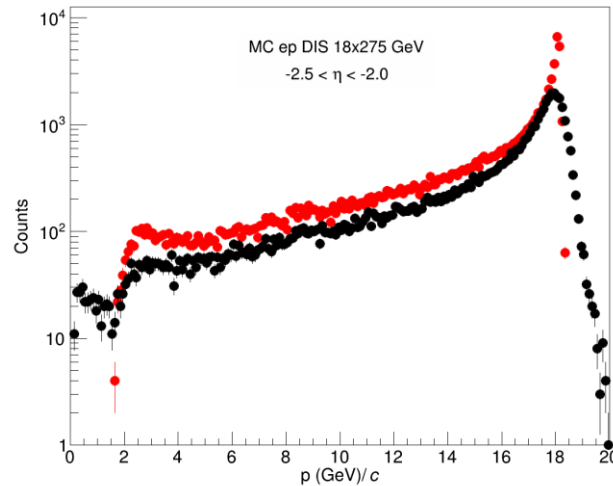
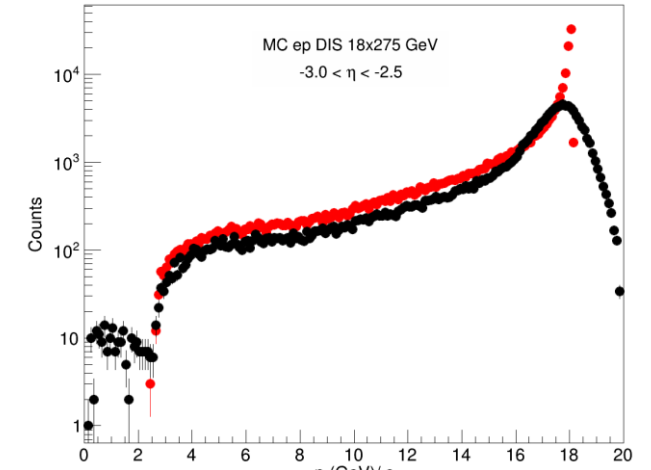
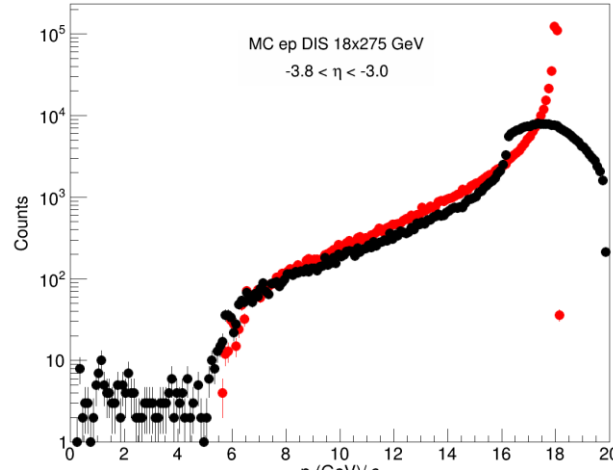
PION/SCATTERED ELECTRON RATIOS

- Scattered electron over pion ratio
 - Pions suppressed using pFRICH
 - Relevant p range is $p < 5 \text{ GeV}/c$**
 - Range of e/π PID table
 - Values for $p > 5 \text{ GeV}/c$ from pi PID probability from pi/K/p table
 - Bottom right figure for pFRICH η acceptance
- Scattered electron selection
 - $Q^2 > 1 \text{ GeV}^2/c^2, y < 0.95$



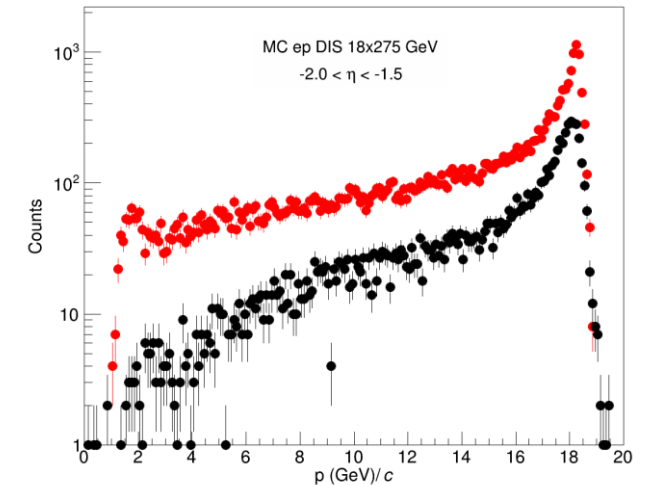
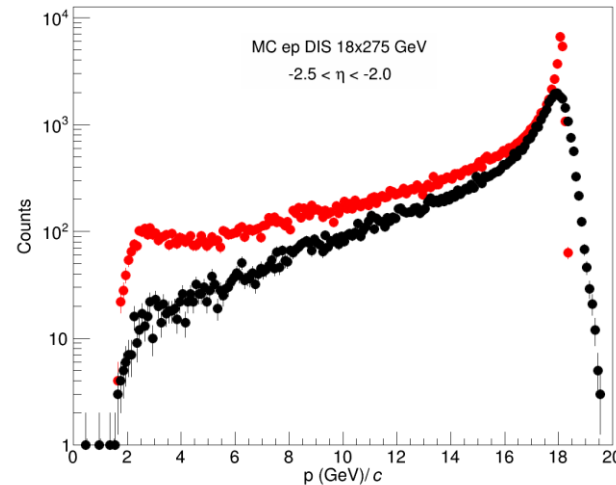
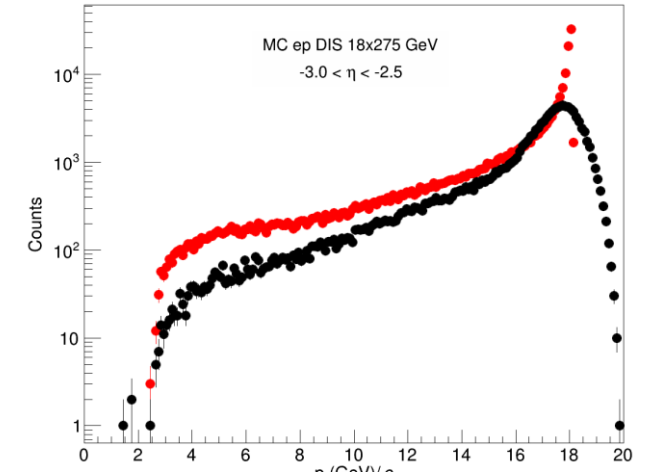
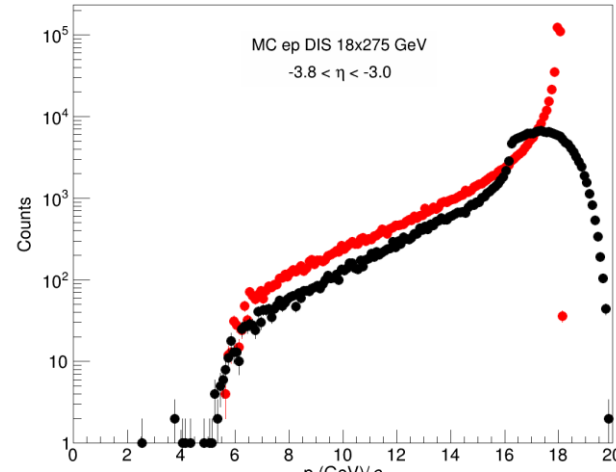
RECONSTRUCTED SCATTERED ELECTRON p SPECTRA

- Reconstructed momentum distributions of scattered electron candidates in 18x275 GeV
 - Compared to MC
 - **Leading cluster in eCAL**
 - Pseudorapidity bins within pFRICH acceptance
- Scattered electron selection
 - $Q^2 > 1 \text{ GeV}^2/c^2, y < 0.95$



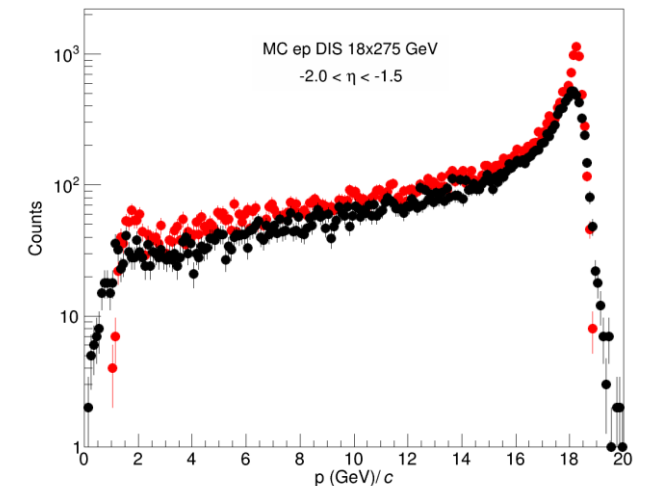
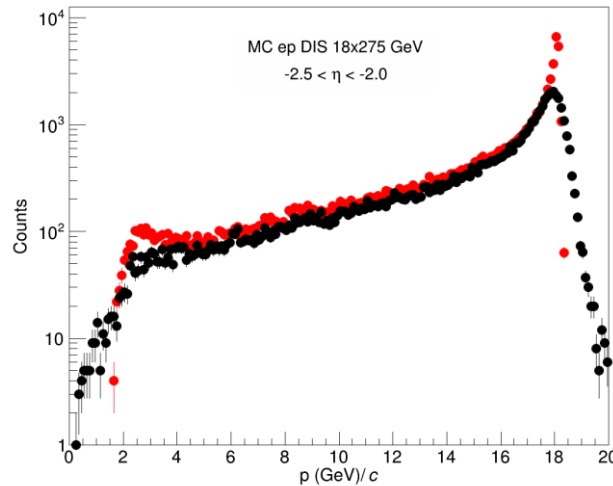
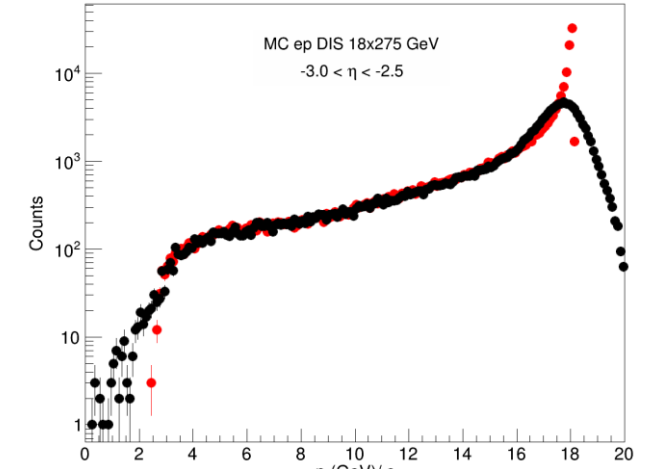
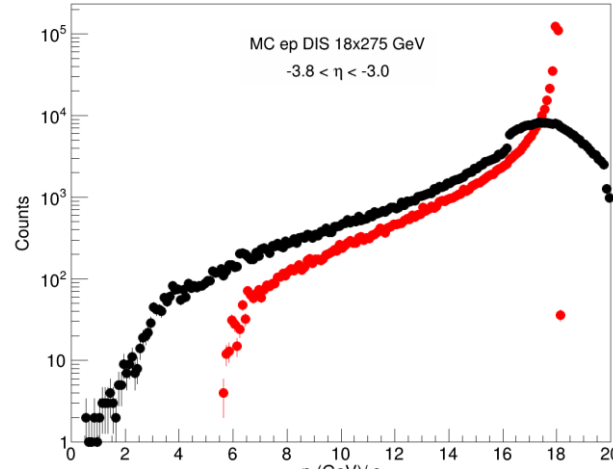
RECONSTRUCTED SCATTERED ELECTRON p SPECTRA

- Reconstructed momentum distributions of scattered electron candidates in 18x275 GeV
 - Compared to MC
 - Leading cluster in eCAL + E/p**
 - $0.9 < E/p < 1.1$
 - Pseudorapidity bins within pFRICH acceptance
- Scattered electron selection
 - $Q^2 > 1 \text{ GeV}^2/c^2, y < 0.95$



RECONSTRUCTED SCATTERED ELECTRON p SPECTRA

- Reconstructed momentum distributions of scattered electron candidates in 18x275 GeV
 - Compared to MC
 - **Leading momentum**
 - Pseudorapidity bins within pFRICH acceptance
- Scattered electron selection
 - $Q^2 > 1 \text{ GeV}^2/c^2, y < 0.95$



SUMMARY

- Added comparison of scattered electrons and pions as a function of momentum
 - MC level
- Compared MC scattered electrons and RC scattered electron candidates
 - Leading cluster in eCAL
 - Leading cluster in eCAL + E/p cut
 - Leading momentum track
- Will evaluate electron purities for momentum distributions in η bins
- Possibly need to cross-check low momentum scattered electron selection in MC
 - MC does not have information which electron is the scattered one
 - Now using leading momentum in MC

THANK YOU FOR ATTENTION