Particle production studies for pfRICH

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pfRICH meeting

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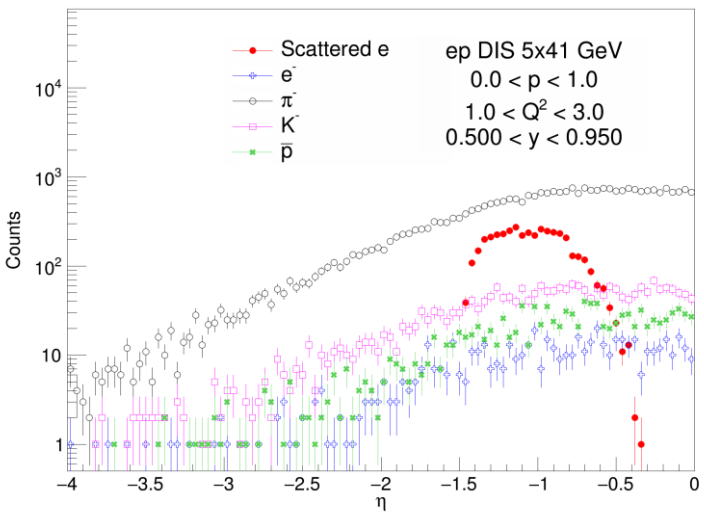
OVERVIEW

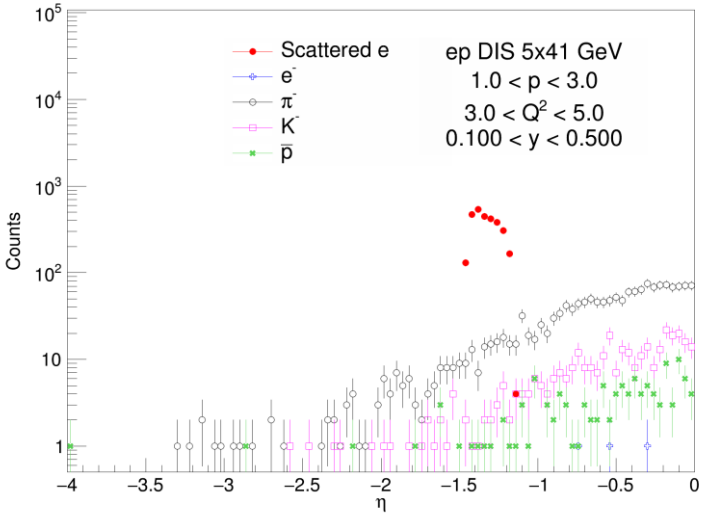
- Particle production in ep DIS as a function of η
  - Multiple p, Q^2 and y (inelasticity) bins
    - All particles have to pass p cut
  - Scattered electron, electrons, pions, kaons, and (anti-)protons
    - Main focus on particles with negative electric charge
  - MC DIS ep collisions at 5x41 GeV, 10x100 GeV, and 18x275 GeV

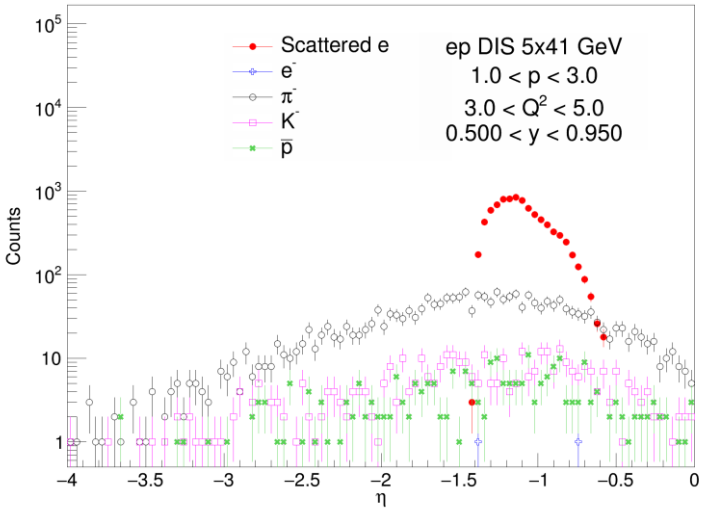
- Hadron suppression using eCAL and pfRICH

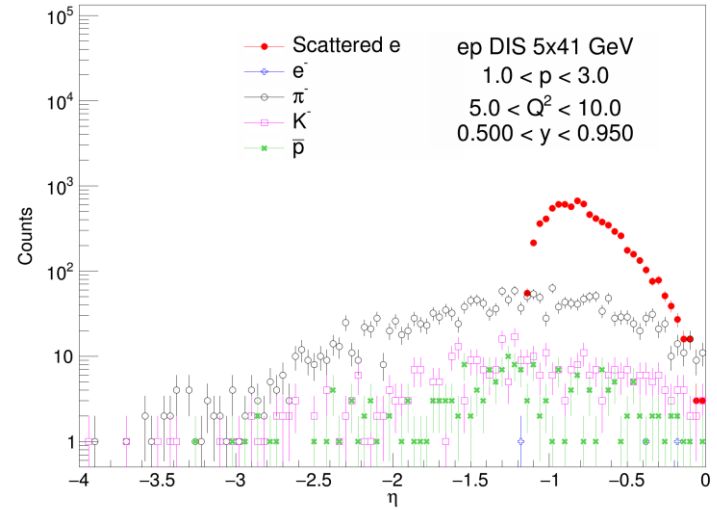
SCATTERED ELECTRON VS. NEGATIVE PARTICLES

- MC DIS ep collisions at **5x41 GeV**
- Comparison of scattered electron and negative particles
- Potential use for pfRICH and eCAL for lower values of Q^2
  - Current simulation has $Q^2 > 1$ GeV^2
- Selection of a few figures from whole phase-space



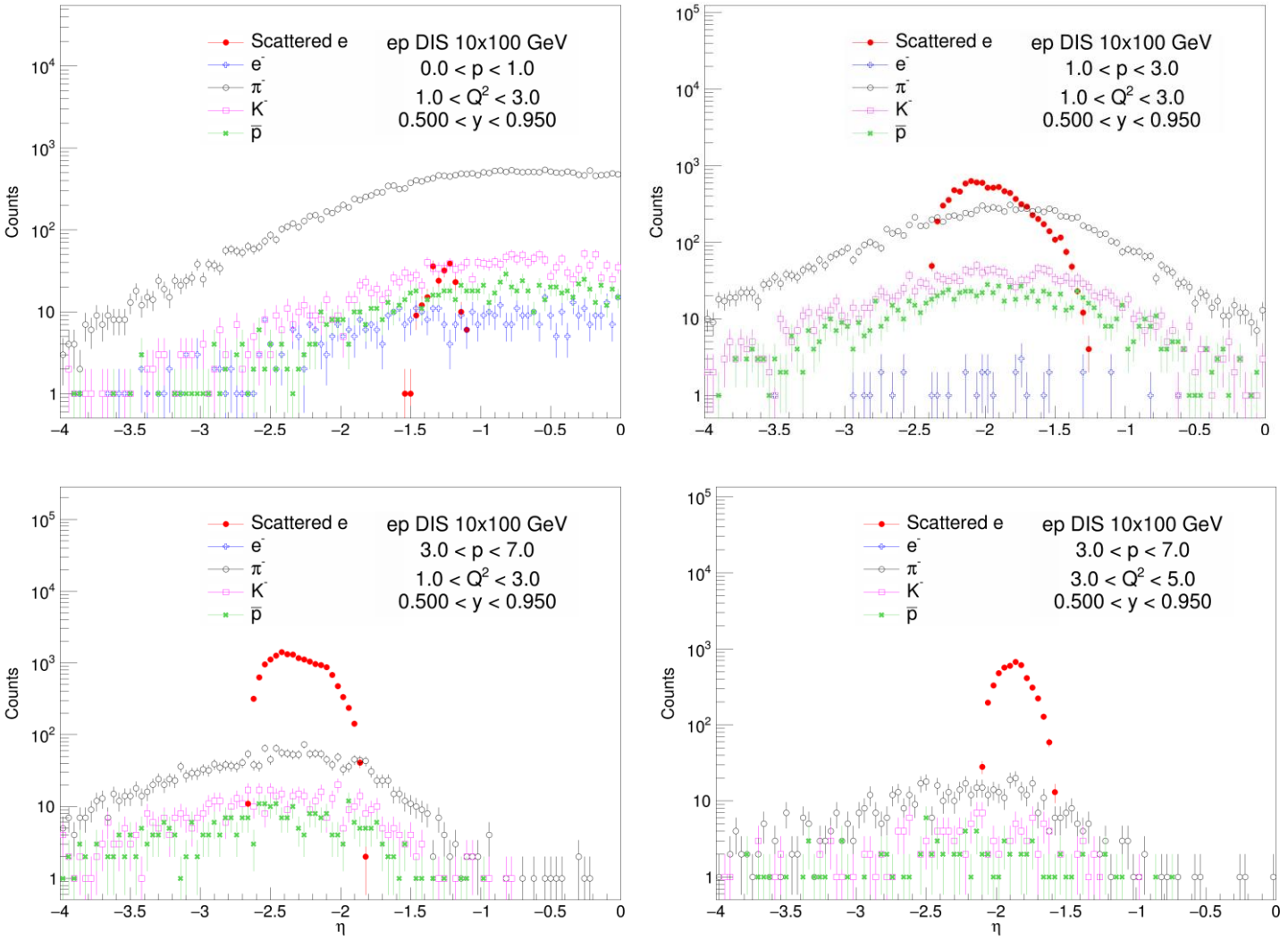






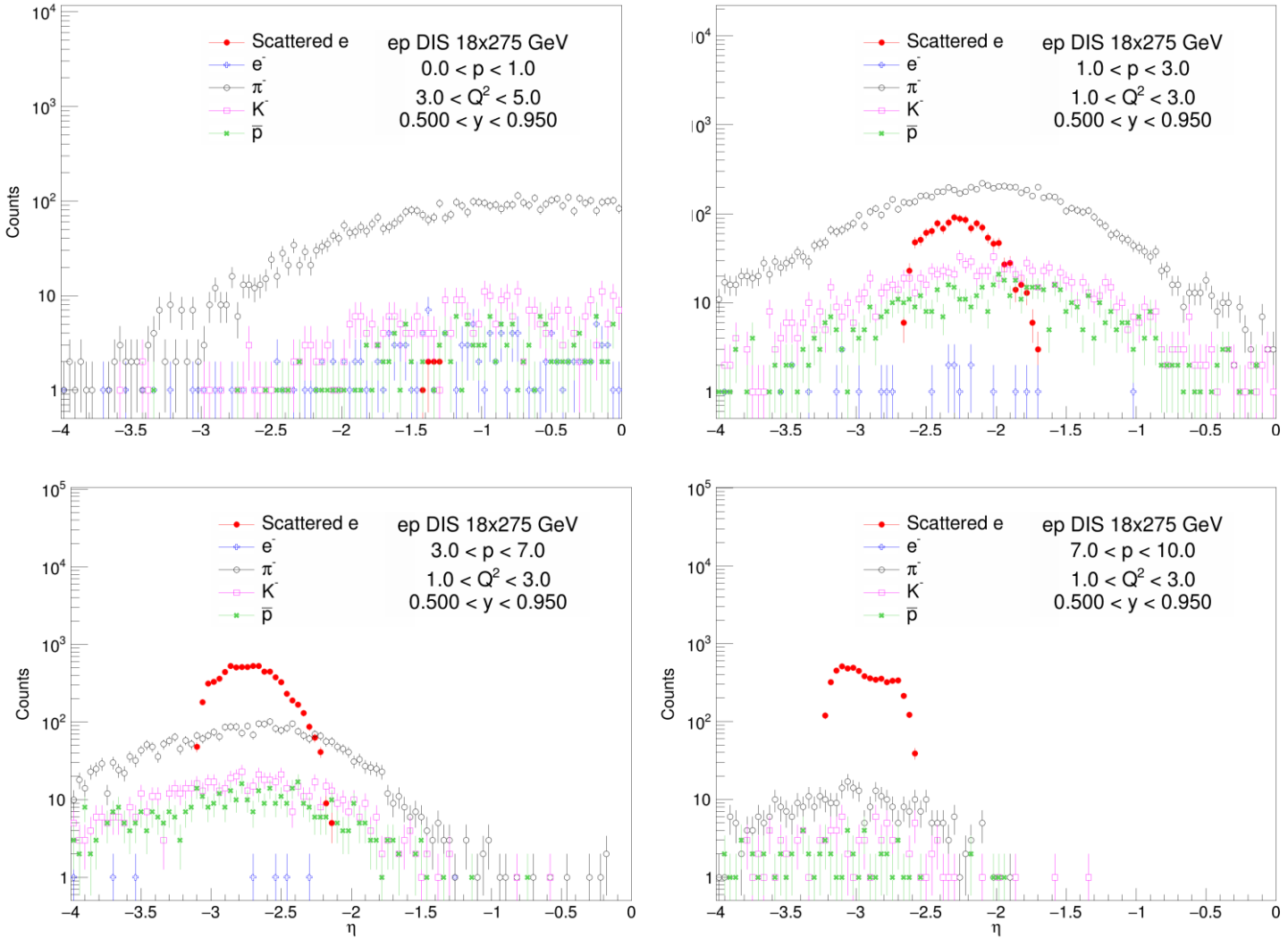
SCATTERED ELECTRON VS. NEGATIVE PARTICLES

- MC DIS ep collisions at **10x100 GeV**
- Comparison of scattered electron and negative particles
- Contamination problematic at low *p*
  - Pions dominant or comparable to scattered electron up to 3 GeV/*c*
  - Contamination by electrons, K and p at low *p*
- For low momenta need lower Q^2



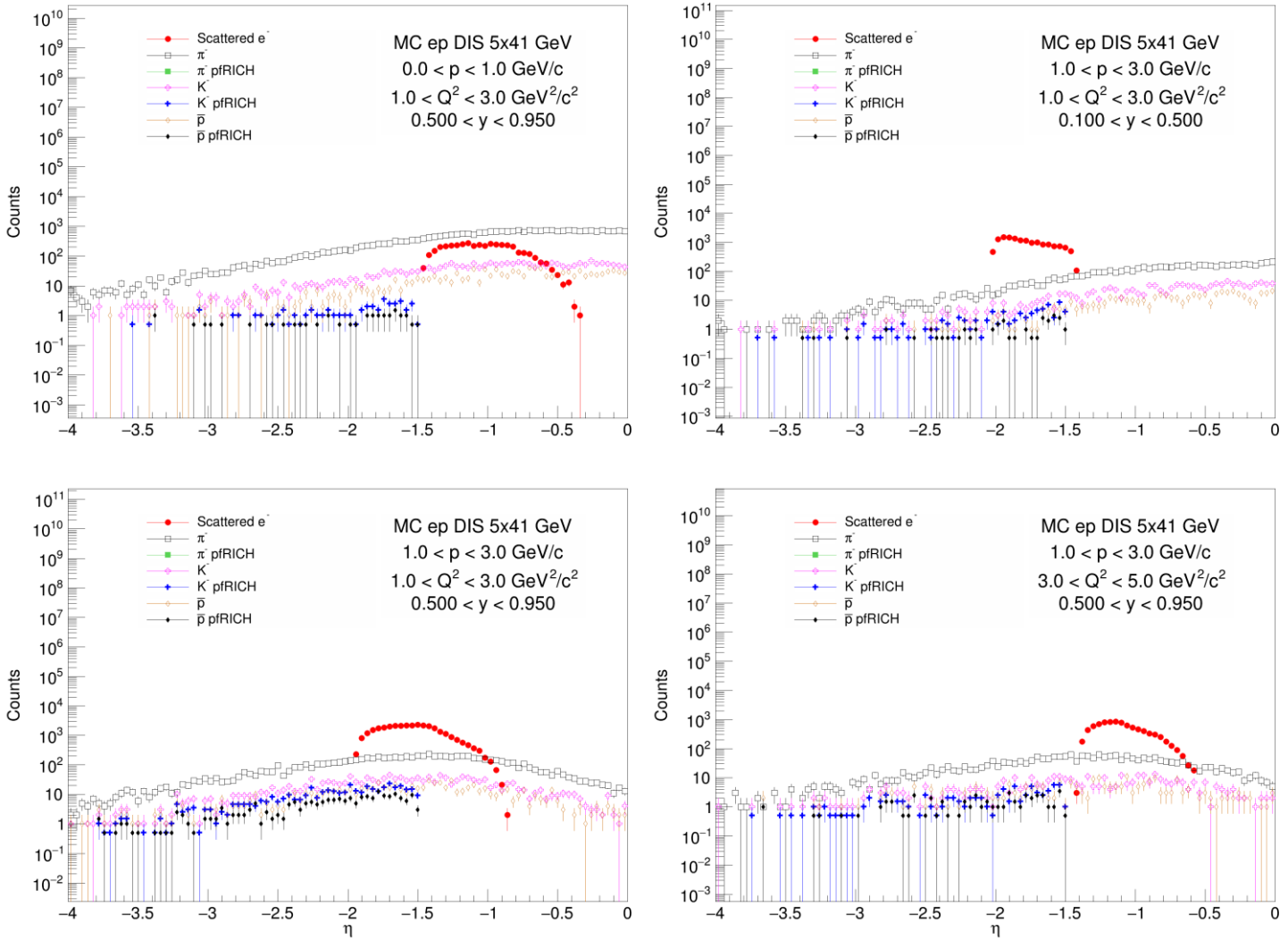
SCATTERED ELECTRON VS. NEGATIVE PARTICLES

- MC DIS ep collisions at **18x275 GeV**
- Comparison of scattered electron and negative particles
- Contamination problematic at low *p*
  - Pions dominant or comparable to scattered electron up to 3 GeV/*c*
  - Contamination by electrons, K and p at low *p*
- For low momenta need lower Q^2



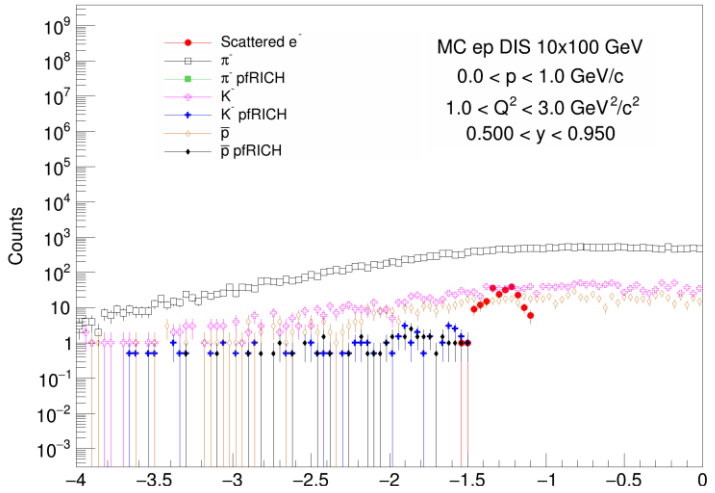
HADRON SUPPRESSION WITH pfRICH

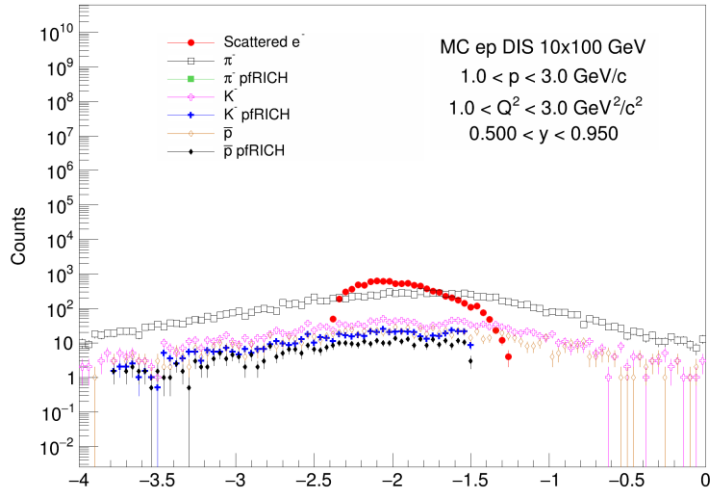
- MC DIS ep collisions at **5x41 GeV**
- pfRICH performance for π^-, K^-, and $\bar{p}$
- No pfRICH information observed for pions
  - Will investigate

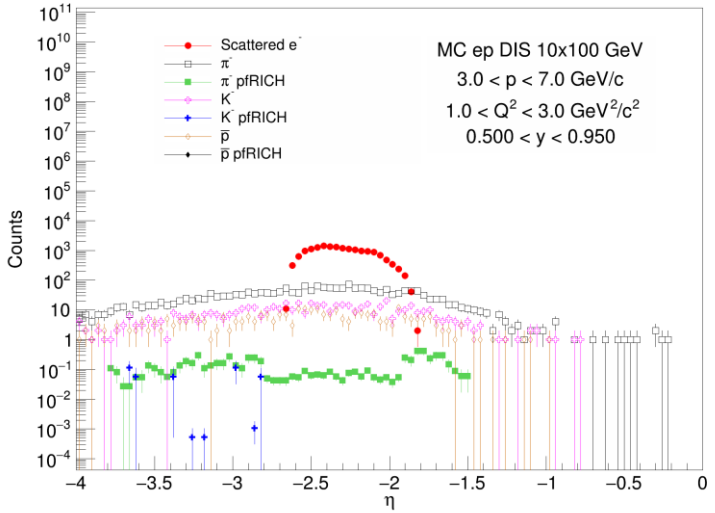


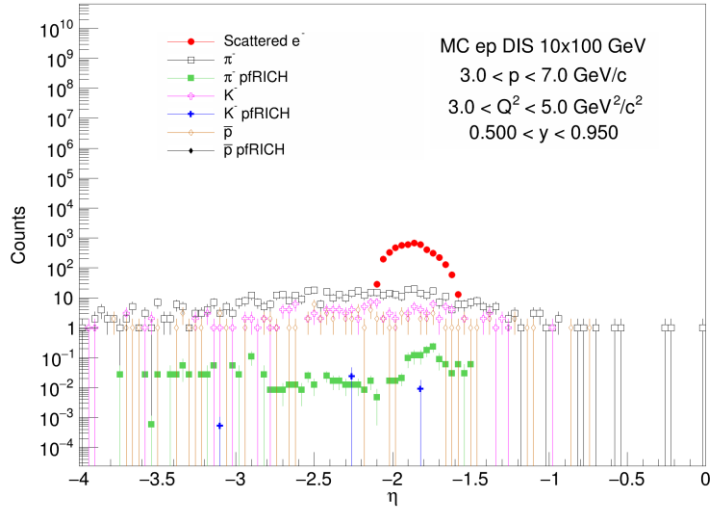
HADRON SUPPRESSION WITH pfRICH

- MC DIS ep collisions at **10x100 GeV**
- pfRICH performance for π^-, K^-, and $\bar{p}$
- Good pfRICH info for π^- at higher p
- Good pfRICH info for K^-, and $\bar{p}$ mainly at lower p



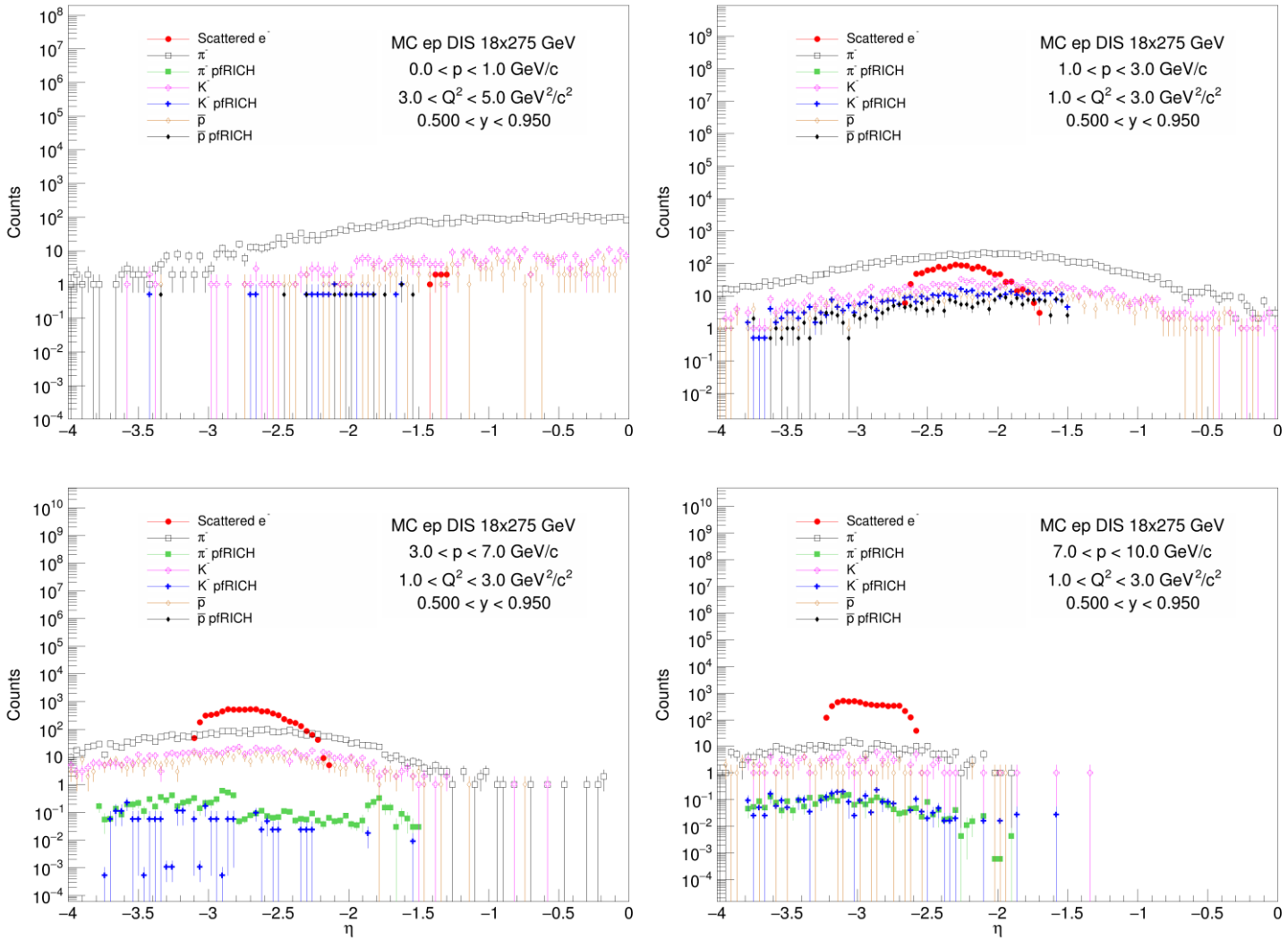






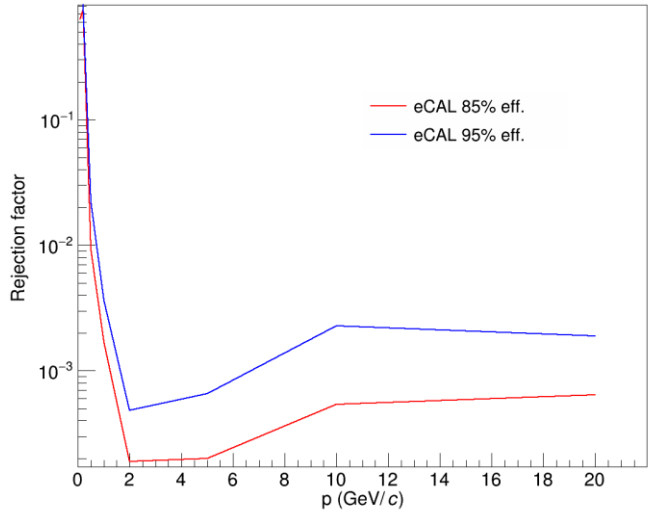
HADRON SUPPRESSION WITH pfRICH

- MC DIS ep collisions at **18x275 GeV**
- pfRICH performance for π^-, K^-, and $\bar{p}$
- Good pfRICH info for π^- at higher p
- Good pfRICH info for K^-, and $\bar{p}$ mainly at lower p

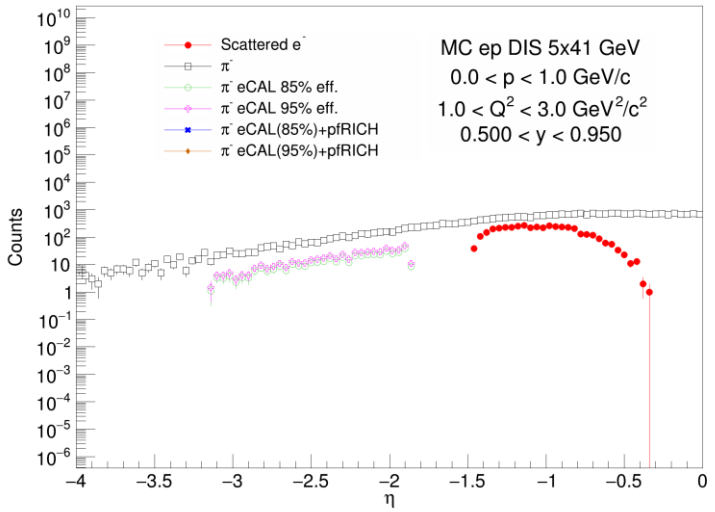


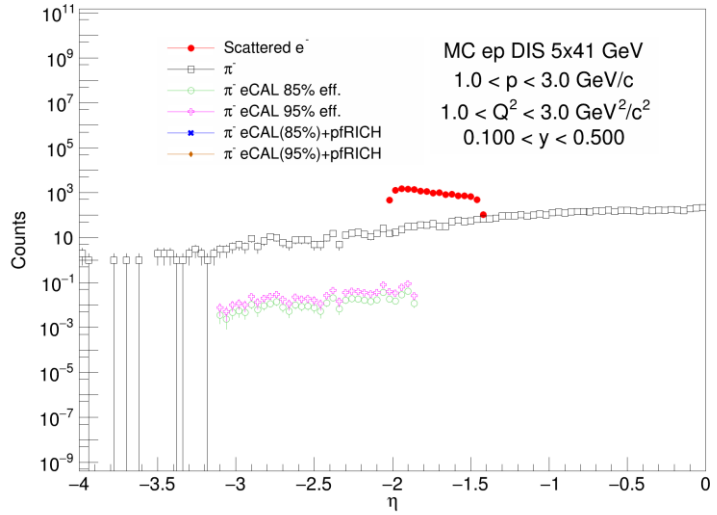
PION SUPPRESSION WITH eCAL+pfRICH

- Information from eCAL based on curves by Dimitry Kalinkin



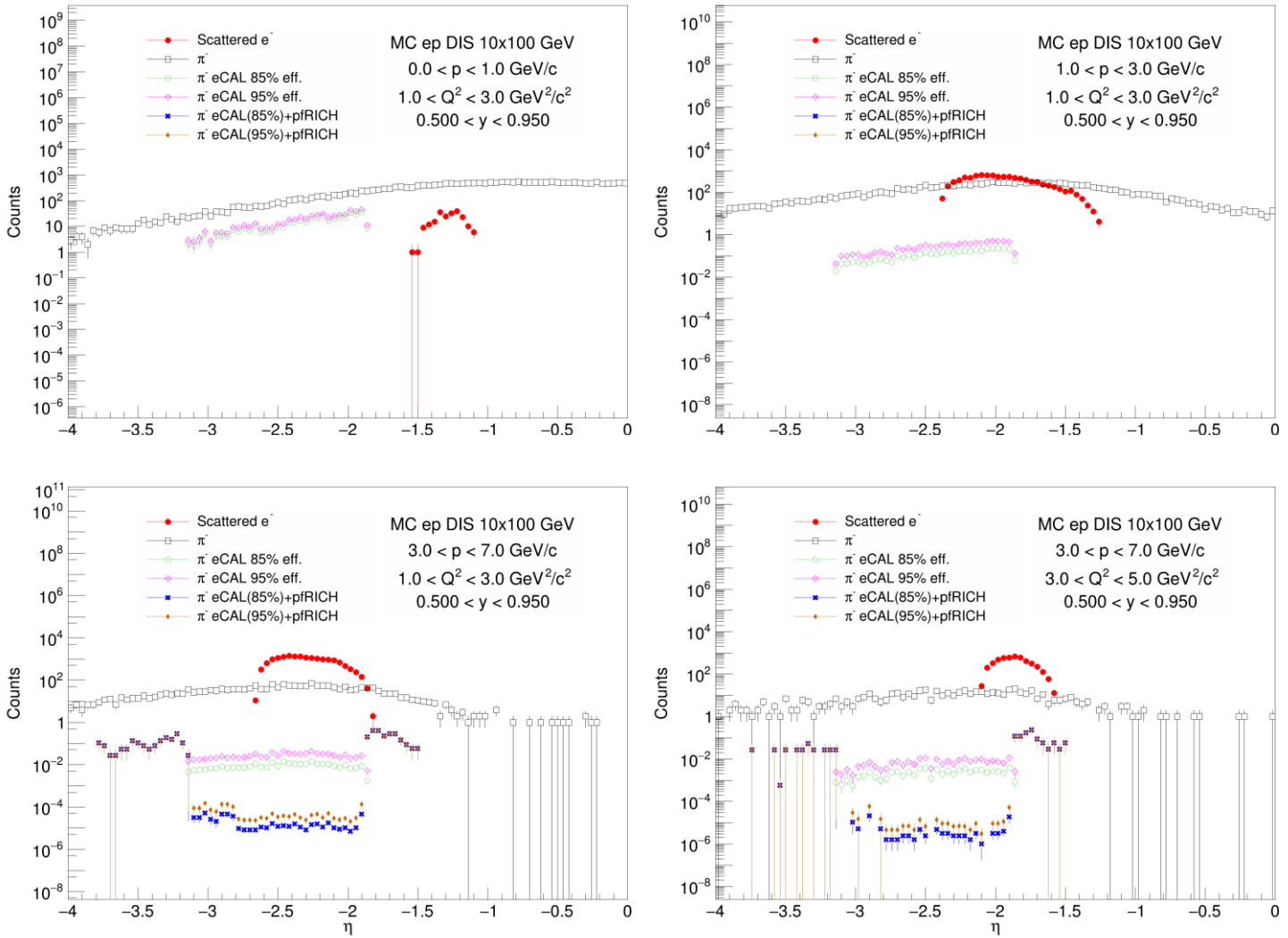
- MC DIS ep collisions at **5x41 GeV**
- eCAL+pfRICH performance for π^-
  - Too low momenta to use RICH
    - Can use timing information from pfRICH
    - Need lower Q^2 to access region where scattered electron and π^- overlap





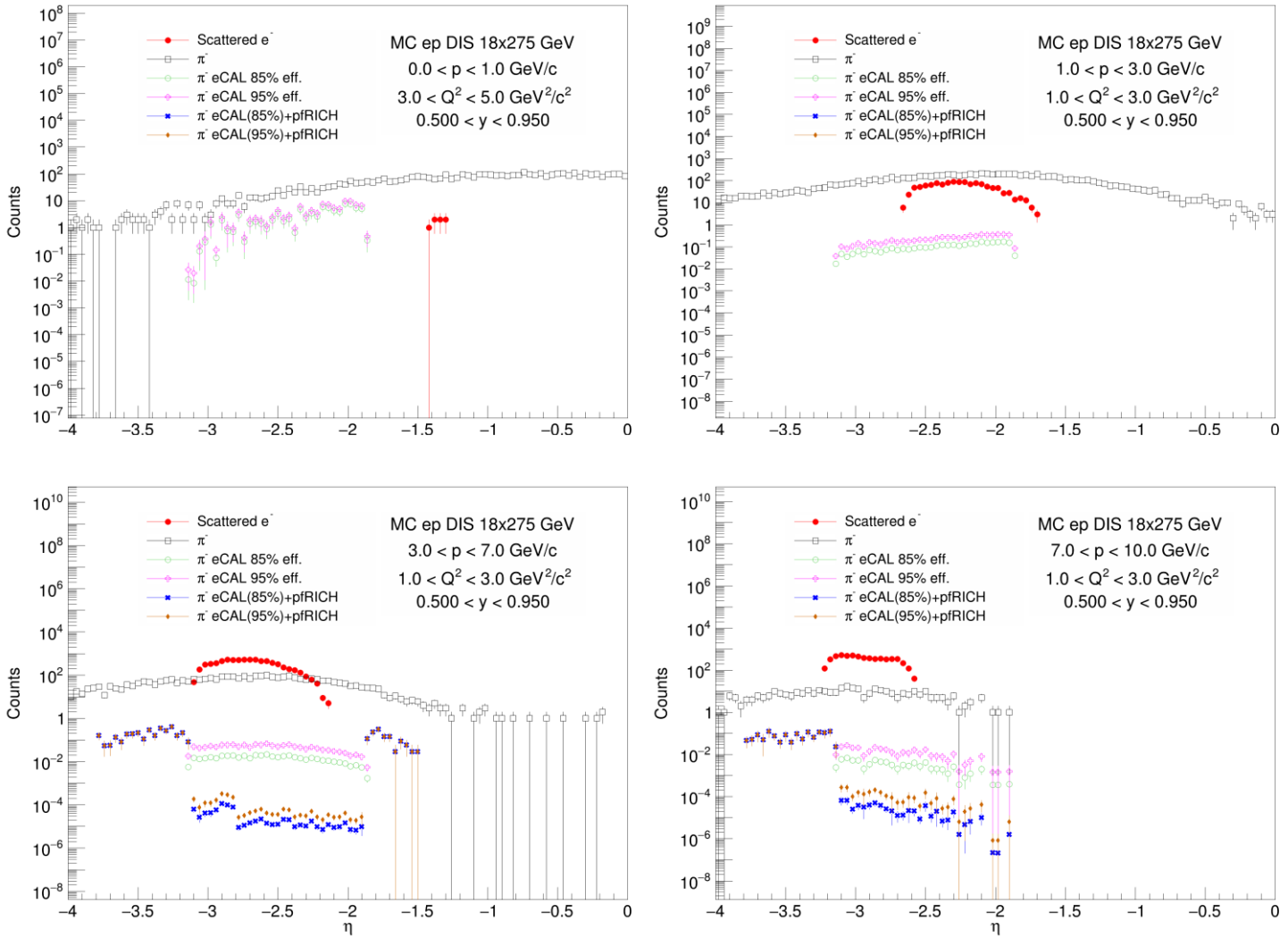
PION SUPPRESSION WITH eCAL+pfRICH

- MC DIS ep collisions at **10x100 GeV**
- eCAL+pfRICH performance for π^-
- No pfRICH PID for low p
  - Cannot use RICH, but can use timing information
- Very good performance of pfRICH for higher momenta
  - Excellent performance in combination with eCAL



PION SUPPRESSION WITH eCAL+pfRICH

- MC DIS ep collisions at **18x275 GeV**
- eCAL+pfRICH performance for π^-
- No pfRICH PID for low p
  - Cannot use RICH, but can use timing information
- Very good performance of pfRICH for higher momenta
  - Excellent performance in combination with eCAL



SUMMARY

- Examined performance of pfRICH and eCAL PID in three MC samples
  - 5x41 GeV, 10x100 GeV, and 18x275 GeV
- Both pfRICH and eCAL can individually suppress hadronic background
- Combined pfRICH+eCAL should provide very good π^- suppression
- To-do:
  - Cross-check PID in pfRICH
  - Usage of eCAL for kaons and (anti-)protons?
  - Add reconstructed level

THANK YOU FOR ATTENTION

BACKUP

SCATTERED ELECTRON DISTRIBUTIONS