

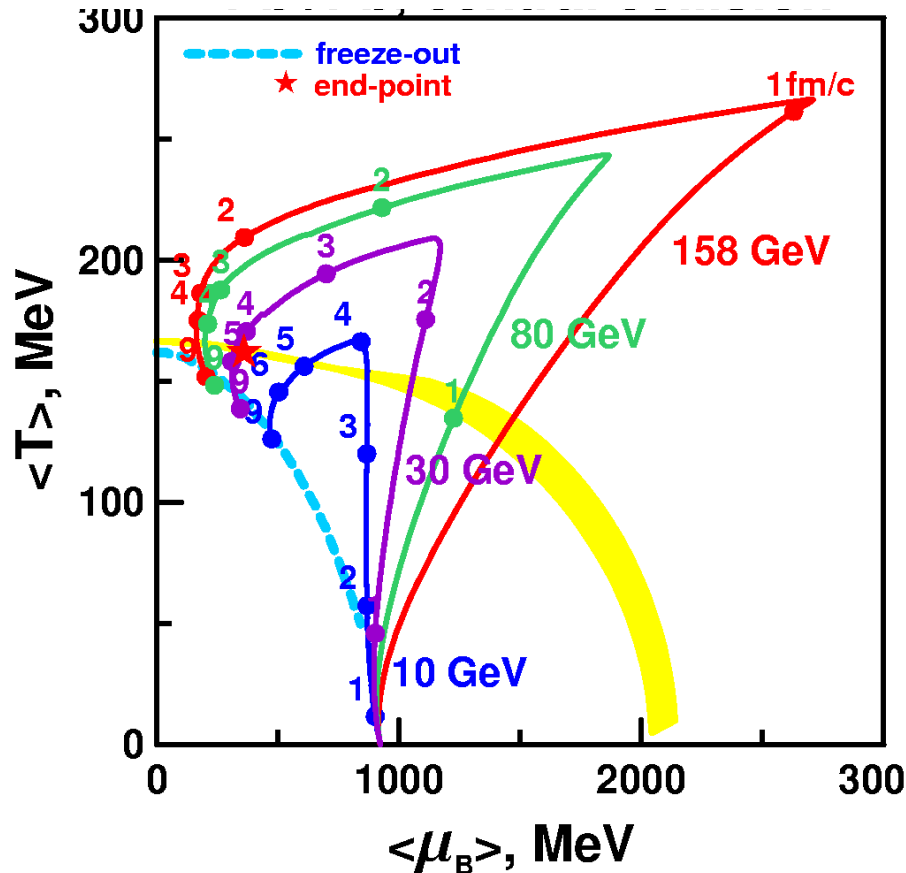


Hadron identification in MPD for study event-by-event fluctuations in heavy ion collisions at the NICA collider

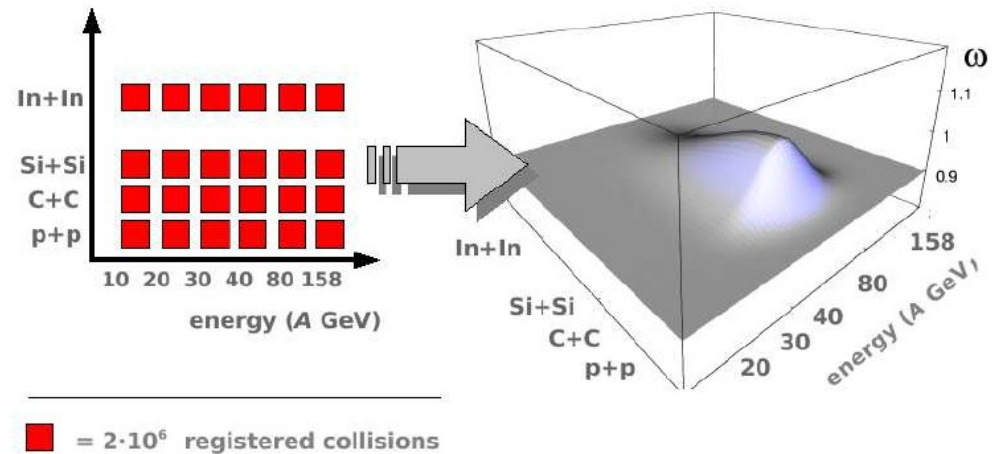
A. Mudrokh (VBLHEP)
on behalf of the MPD team

QCD phase diagram. Critical end point (CEP)

Trajectories calculated by a 3-fluid hydrodynamics model Toneev & Ivanov



If the trajectory is in the vicinity of the critical endpoint - abnormal fluctuations can be observed

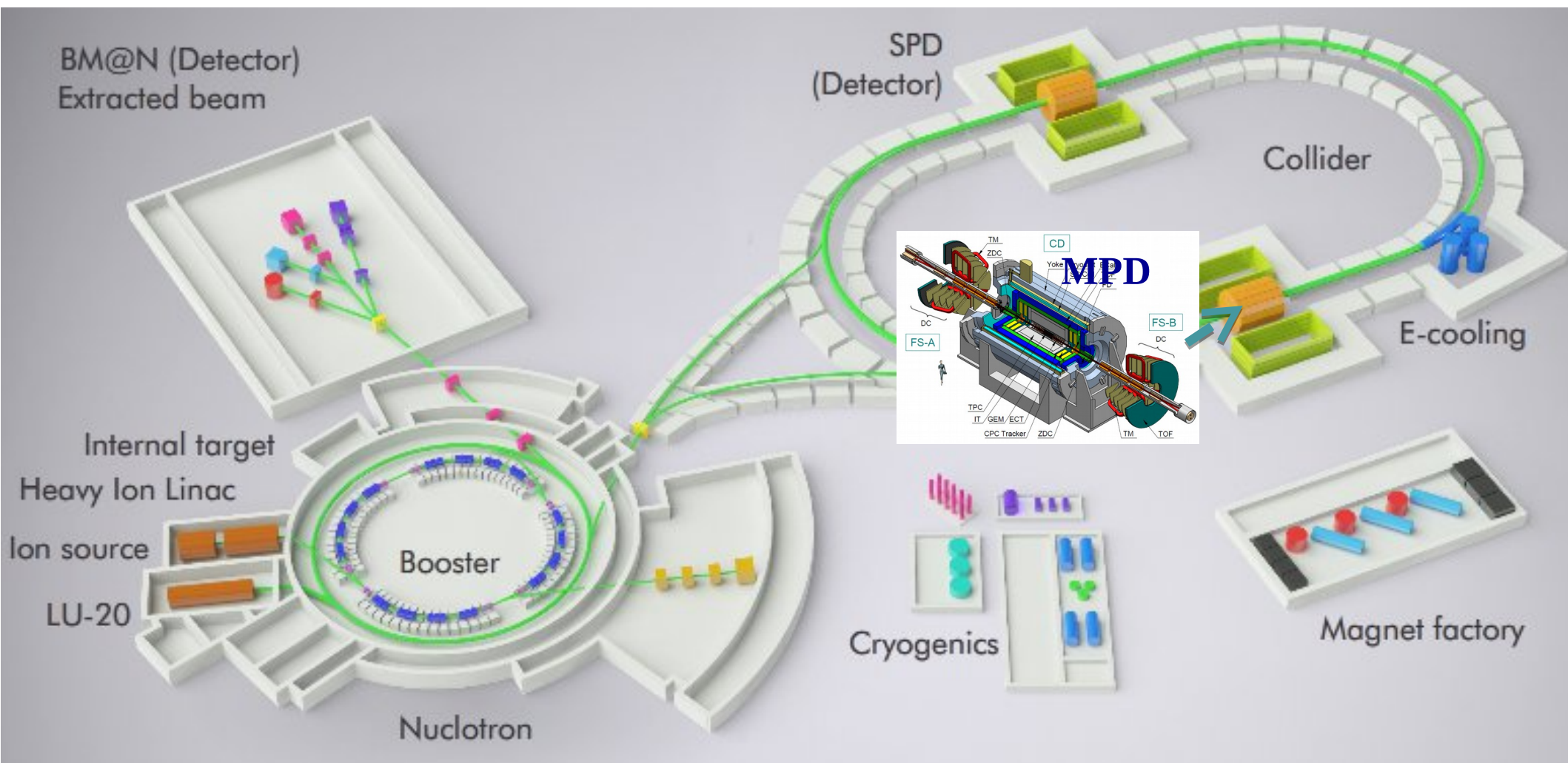


Observables - event-by-event fluctuations:

- multiplicity, charge number
- particle ratios
- mean p_T , azimuthal angle
- baryon number

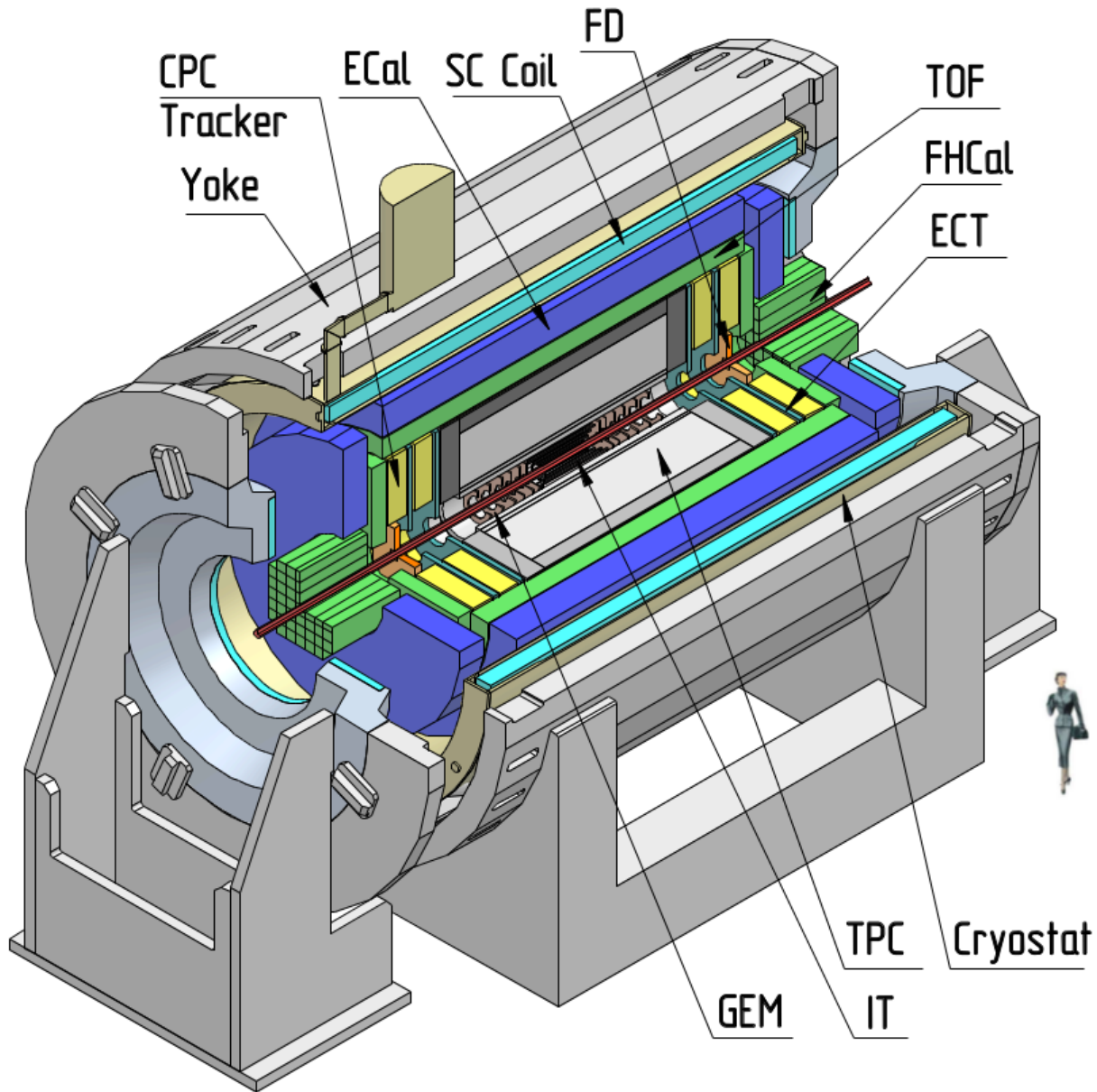
Experimental challenge: fluctuation signal may be suppressed due to final state interactions that washed out the signal. True CEP signal should show consistency in several observables!

NICA collider

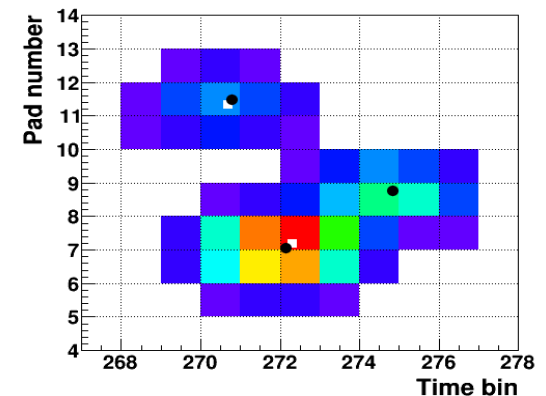
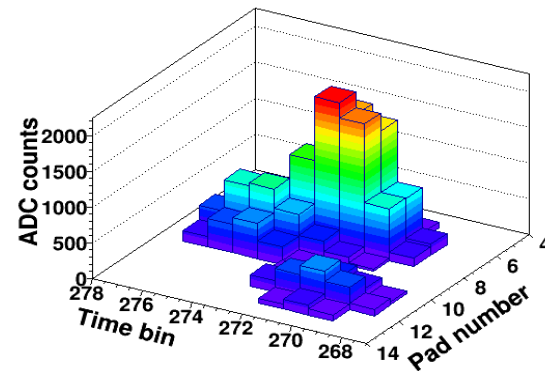
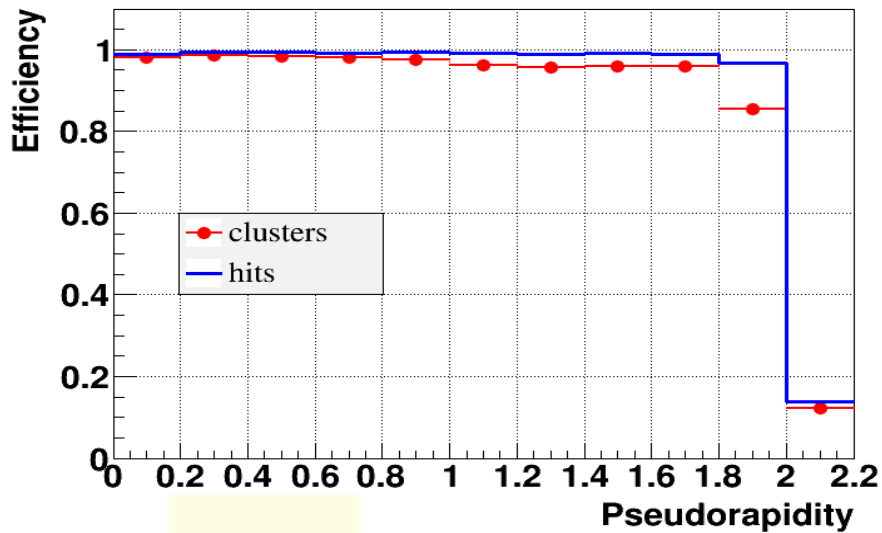
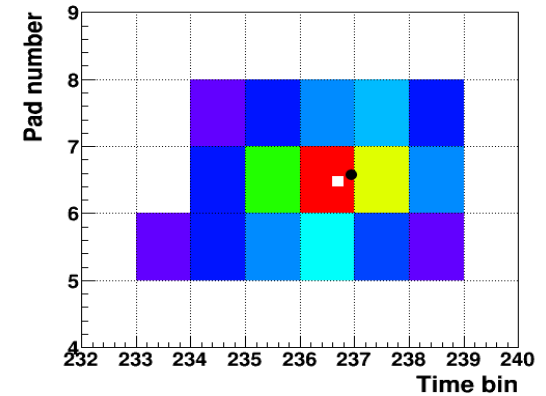
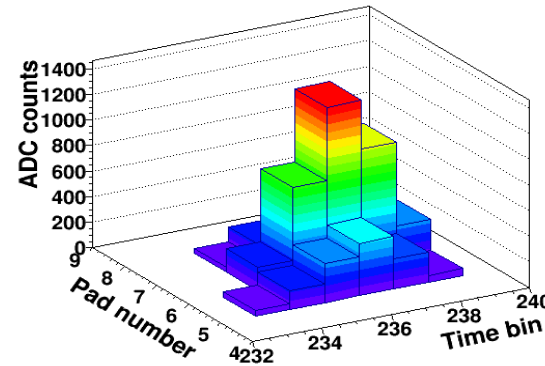
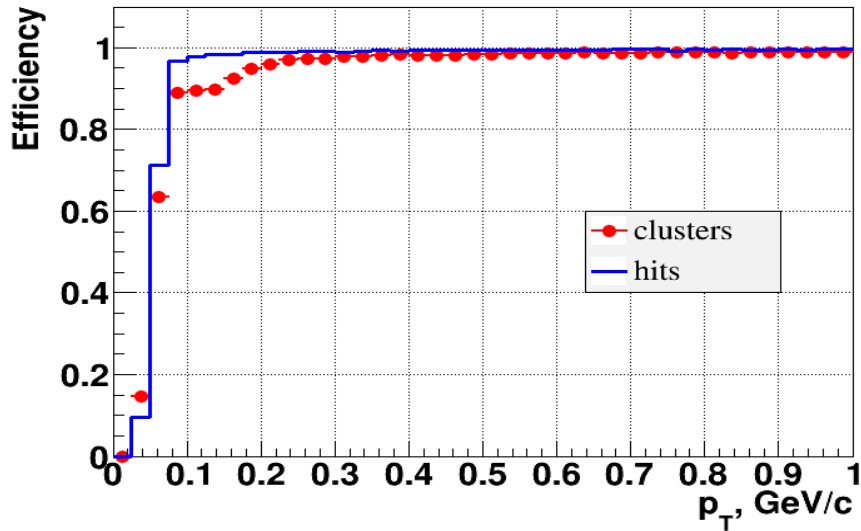
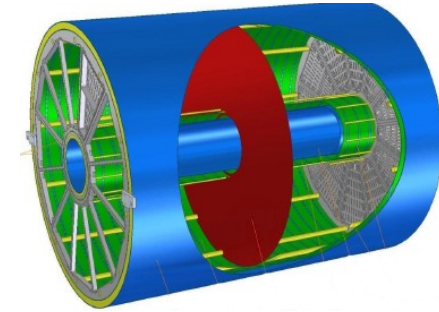


Beam atomic mass range: 1 – 197
Centre-of-mass energy range: 4 – 11 GeV

MPD detector

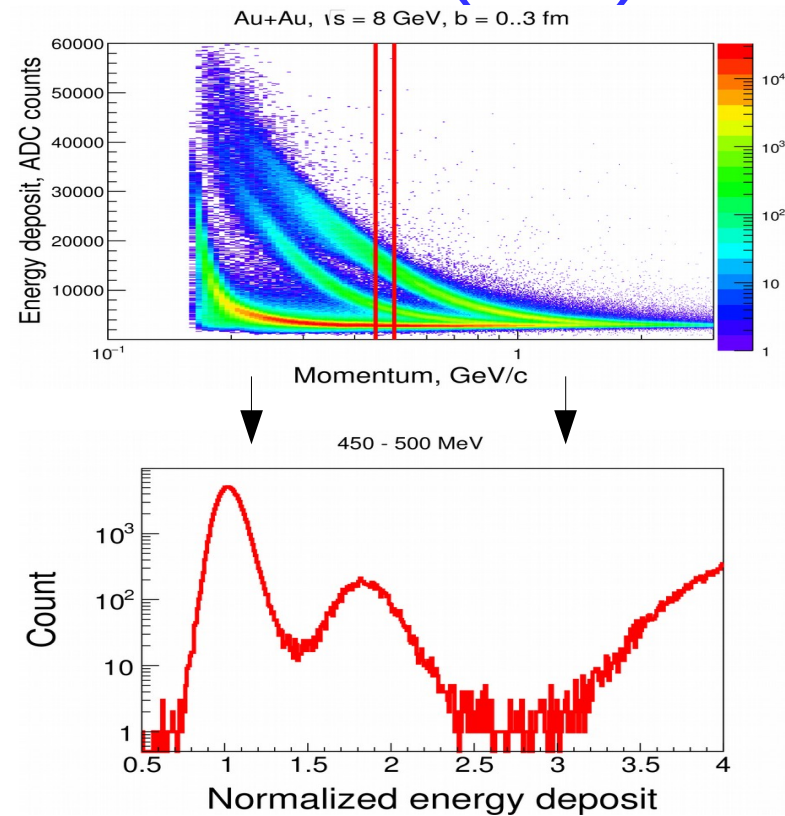
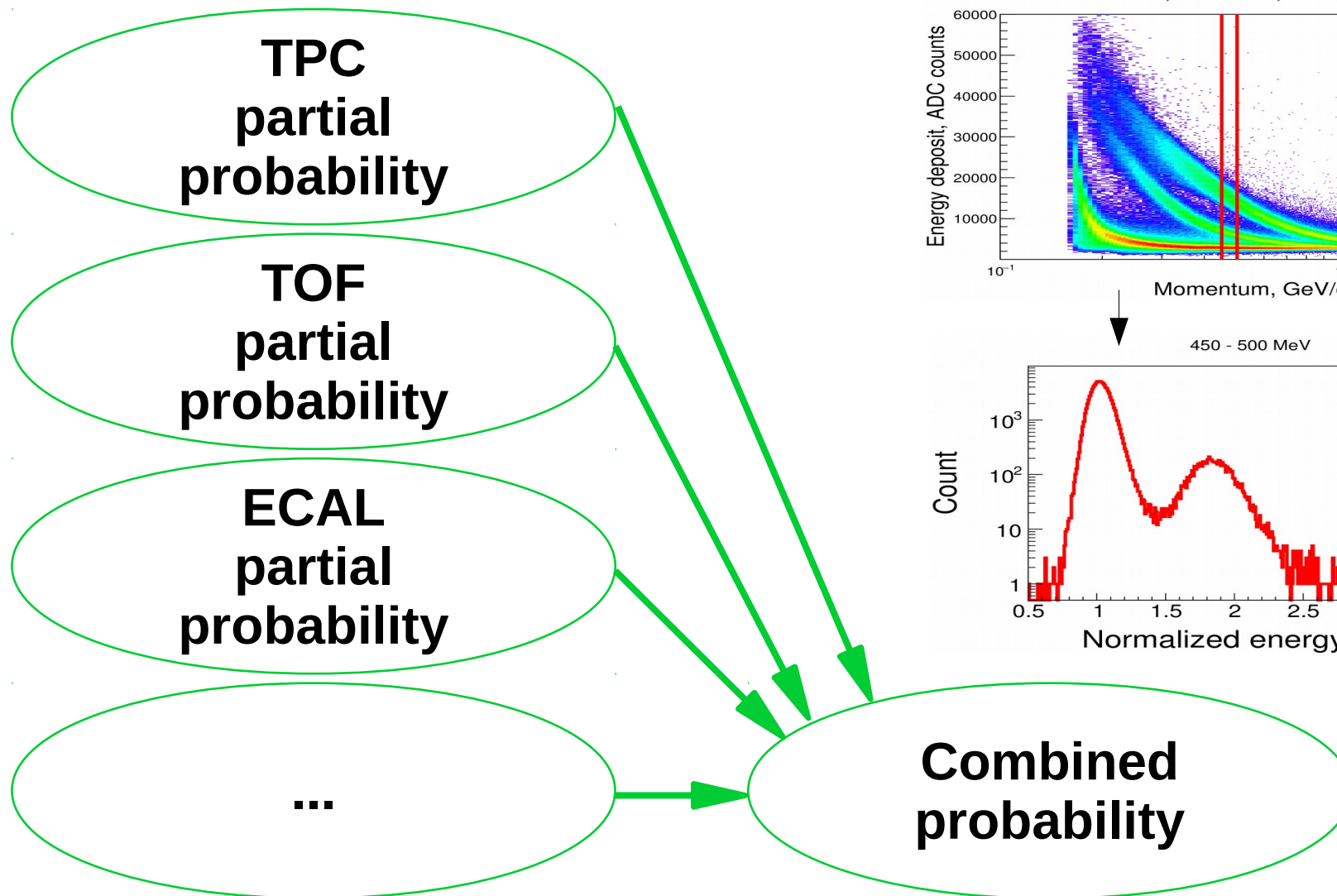


TPC simulation: cluster finding



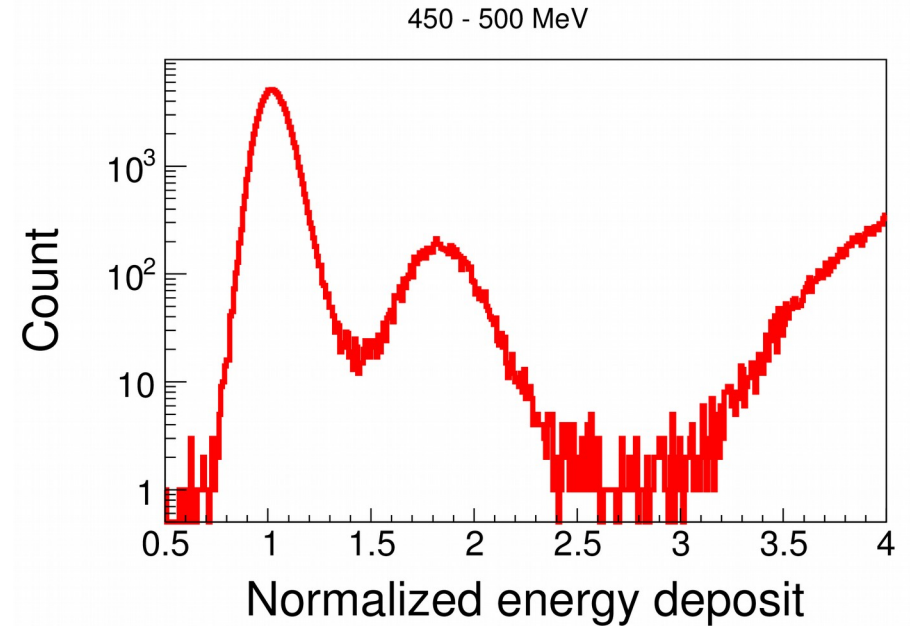
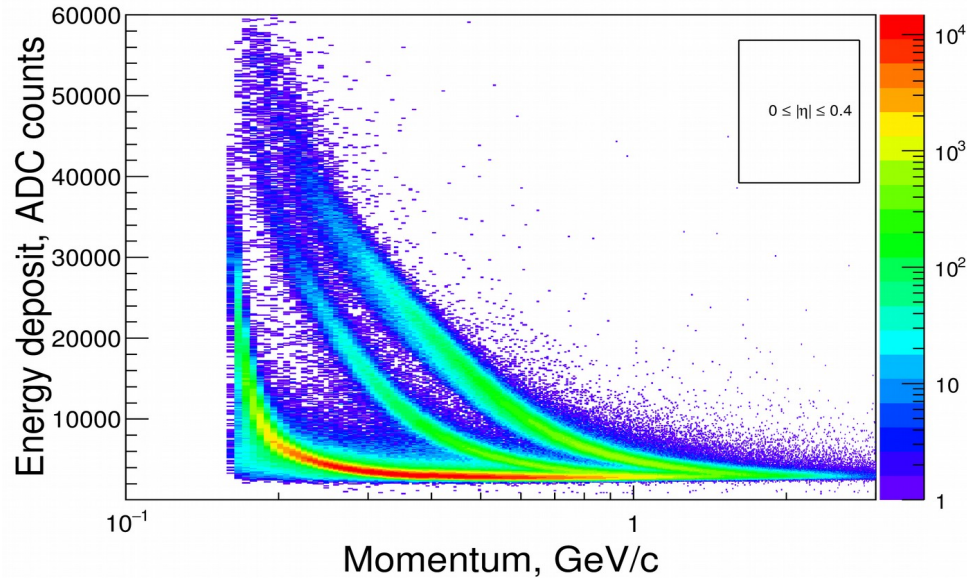
Top – 3D and 2D views of a single track cluster, Bottom – 3D and 2D views of a 3-track cluster.

General idea of Particle Identification (PID)



Parameterizations:
 dE/dx (mean, sigma and amplitude vs momentum)
 m^2 (mean, sigma and amplitude vs momentum)

dE/dx parameterization



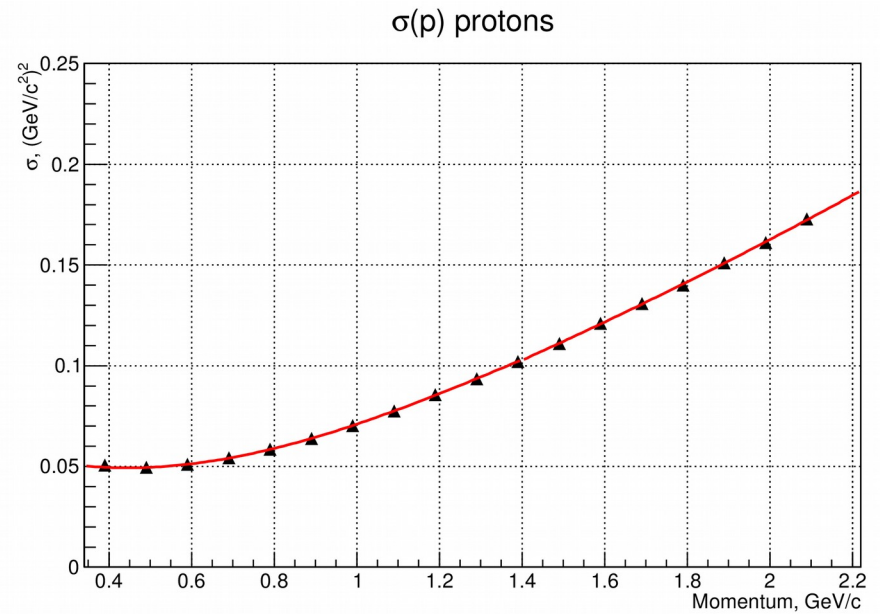
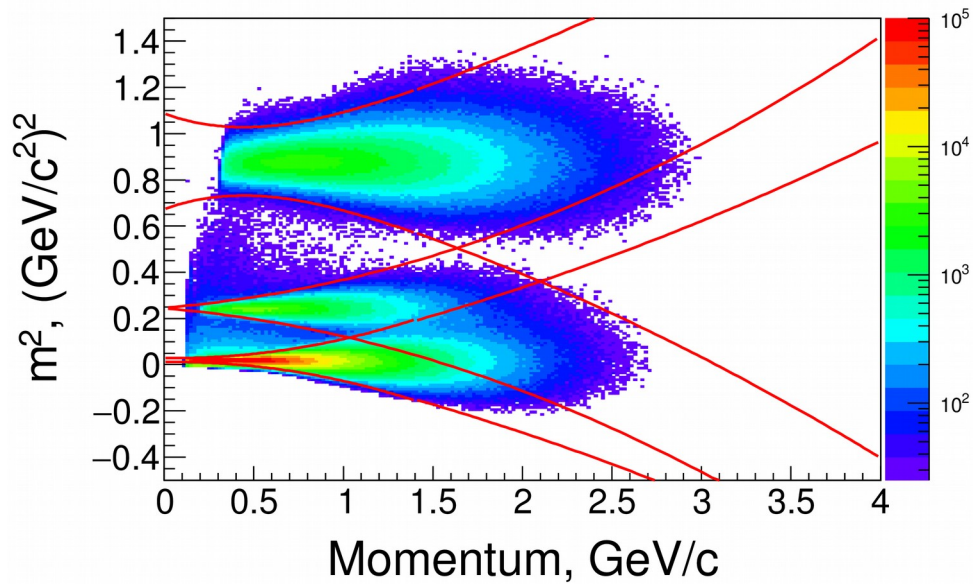
Normalized energy deposit:

$$\frac{\text{Track}[dE/dx]}{\text{pion's } dE/dx \text{ parameterization}}$$

Cuts:

- 1) $0 < |\eta| < 1.4$
- 2) Primary particles
- 3) $n\text{Hits} \geq 10$
- 4) TPC edge cut

m^2 parameterization

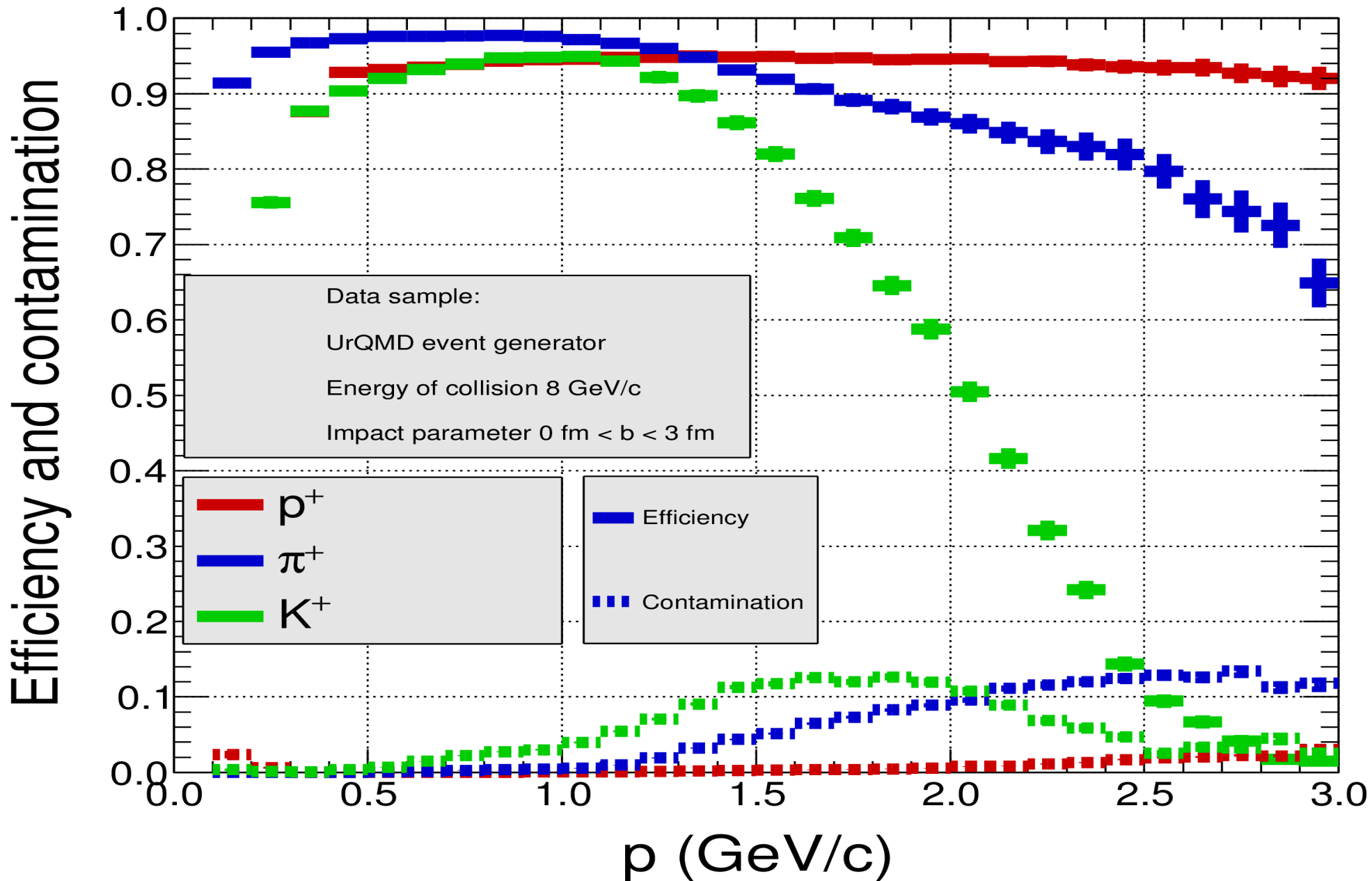


Cuts:

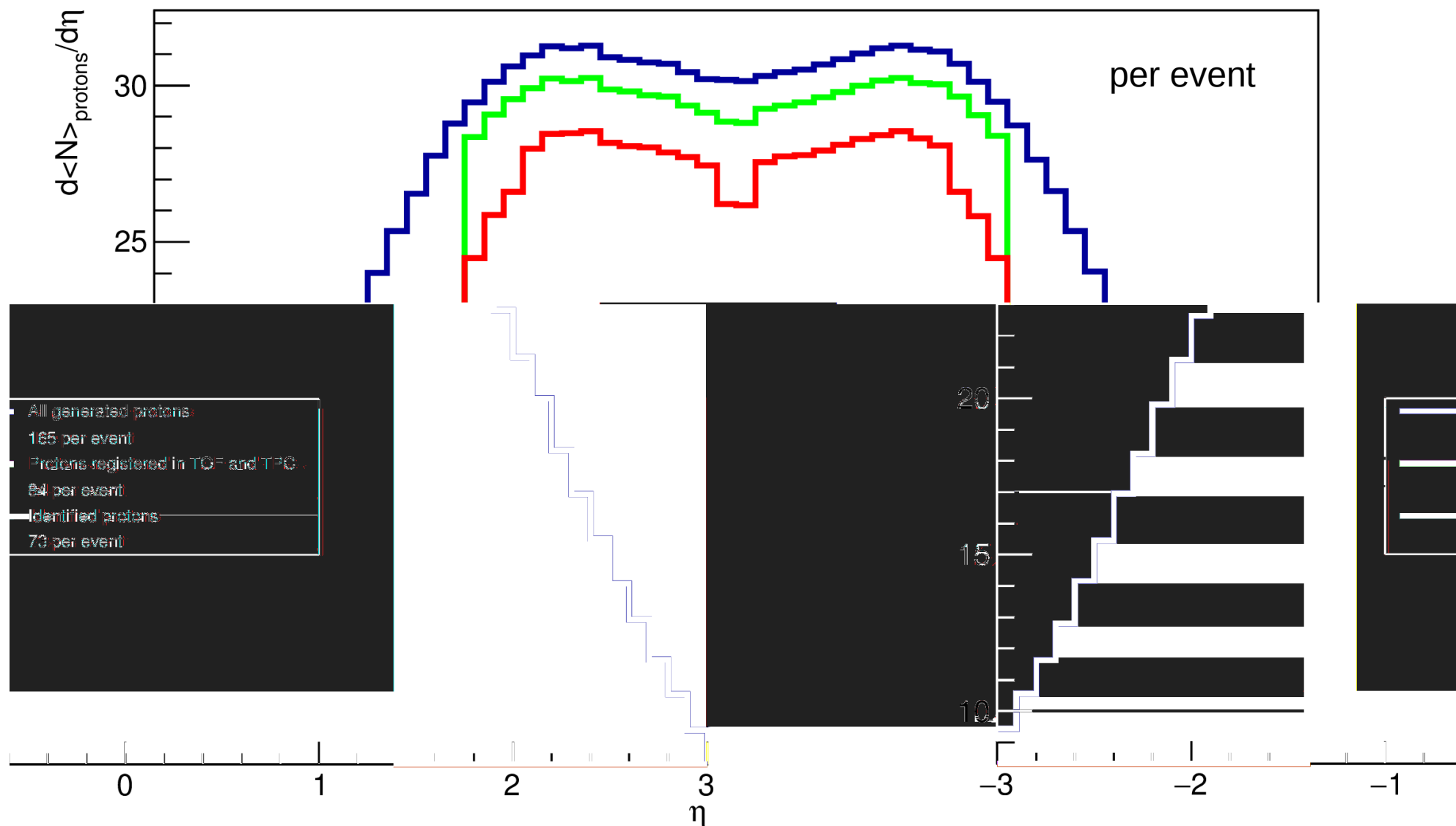
- 1) $|\eta| < 1.4$
- 2) Primary particles
- 3) $n\text{Hits} \geq 10$
- 4) TPC edge cut
- 5) TOF matching exists

Combined efficiency and contamination of PID

$0 < |\eta| < 1.4$



MPD barrel acceptance for protons



Summary

Particle identification (PID) based on Cluster Finder tracking has been developed and implemented within the MpdRoot software package. Effective π/K separation is working up to 1.5 GeV, π/p separation is working up to 3 GeV.

PID can identify 73 protons per event in barrel part. Adding endcaps allow to increase the number of identified protons by 67% - to 122 protons per event.