Charged particle track reconstruction with SπRIT Time Projection Chamber

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Overview

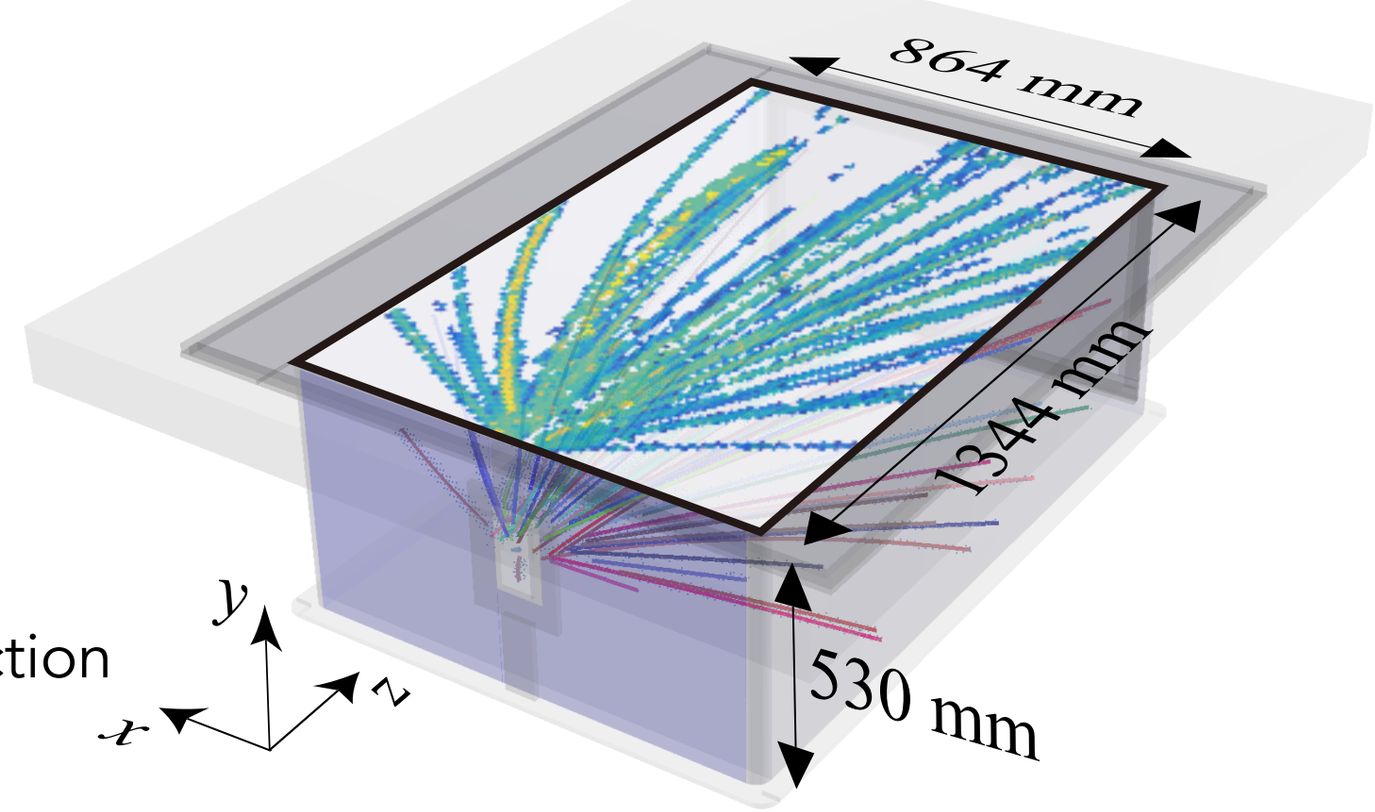
- SπRIT Time Projection Chamber: P10 gas, Pad plane containing 108×112 rectangular pads (8×12 mm).

- Collision systems of the expreriments: 132Sn + 124Sn, 124Sn + 112Sn, 108Sn + 124Sn, 108Sn + 112Sn (Beam Energy of 270 MeV/u). Magnetic field : 0.5 T.

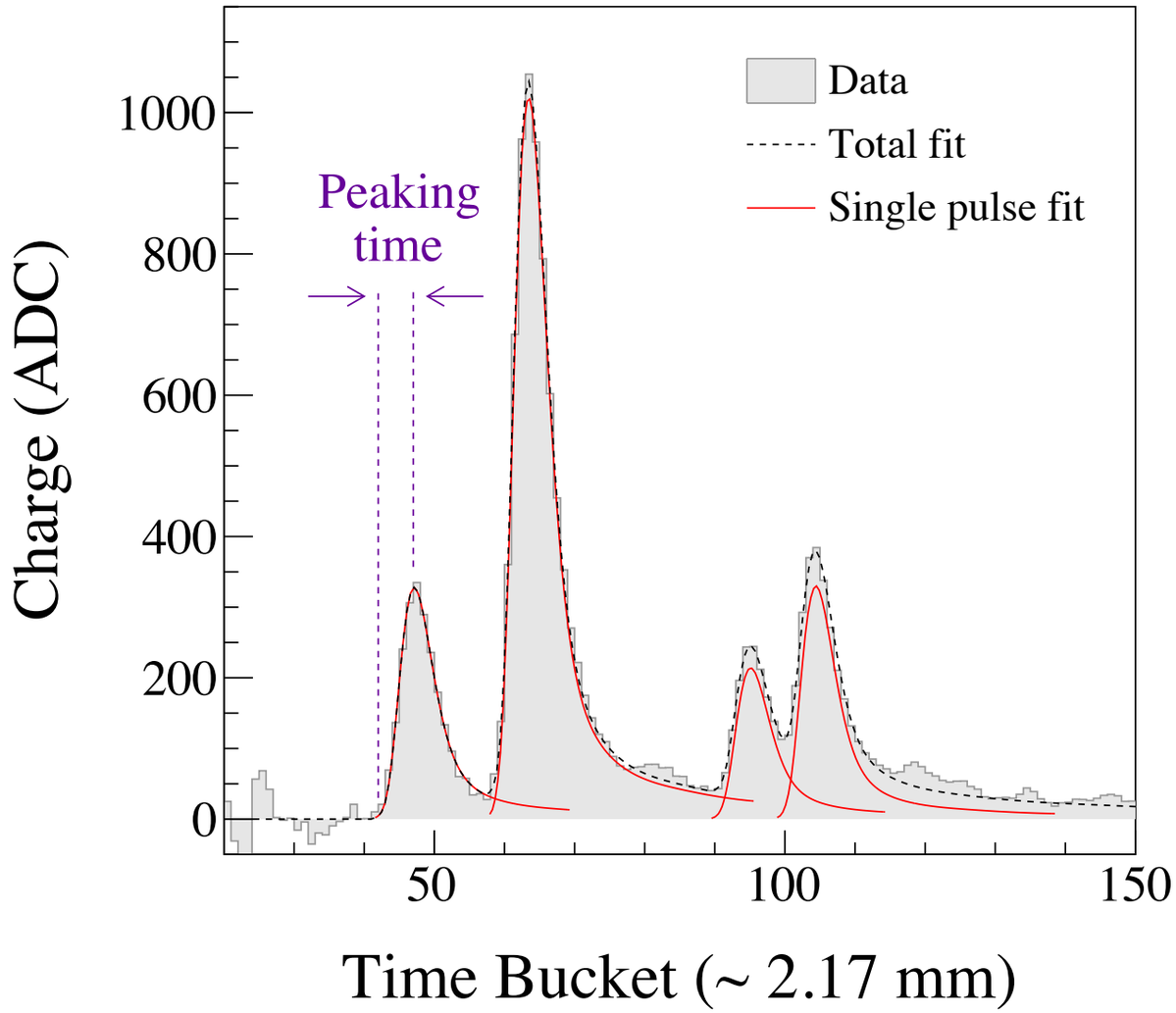
- **SpiRITROOT**

  Event reconstruction

  - Pulse analysis
  - Track finding
  - Hit-cluster finding
  - Track and vertex reconstruction
  - Particle identification

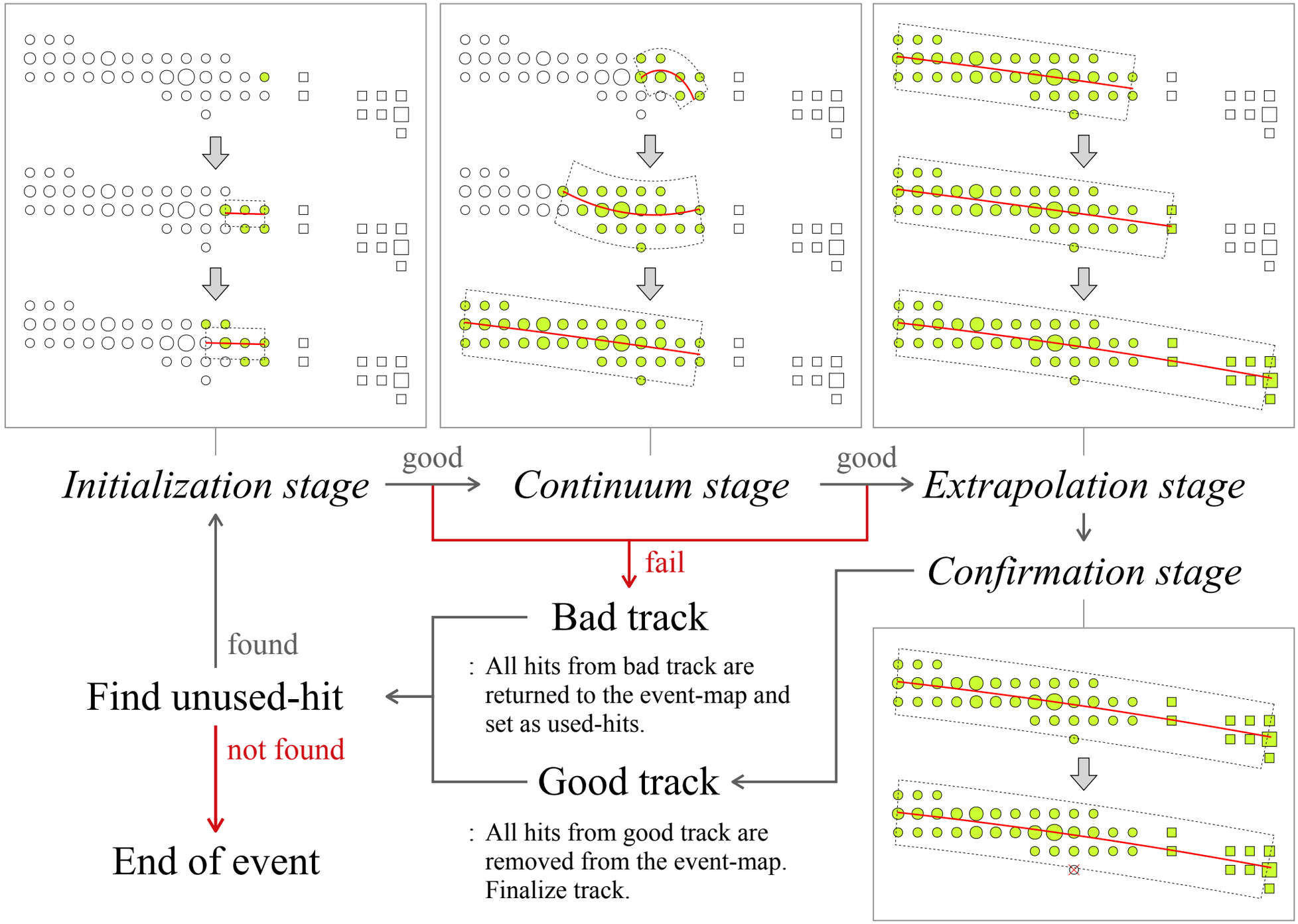


Pulse Analysis

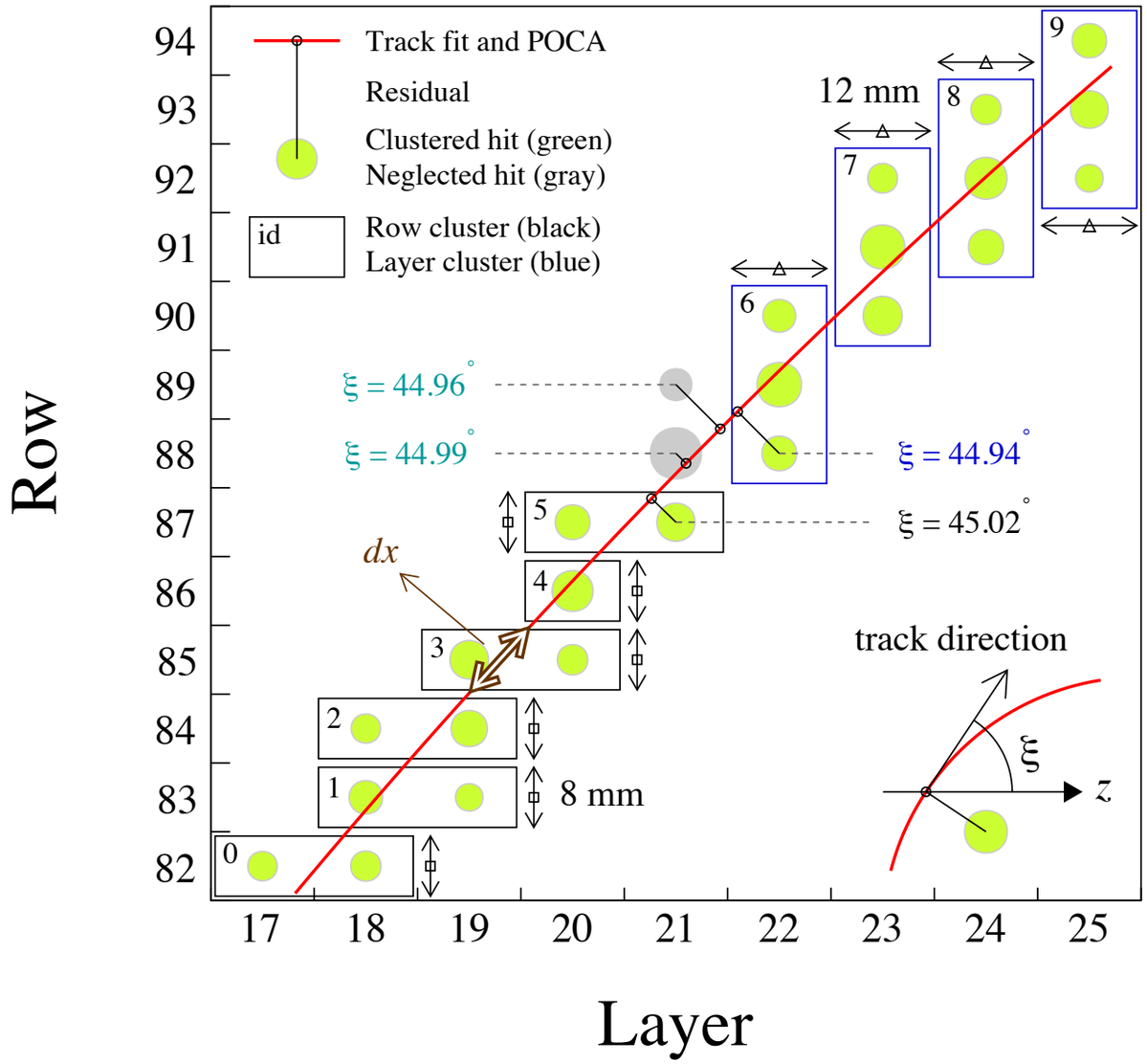


- Pulse Analysis was performed finding overlapping pulses in TPC pads.
- The method use the multi-pulse fitting using reference extracted from the pulse data.
- One hit finding efficiency = 95 ± 1 %

Track Finding

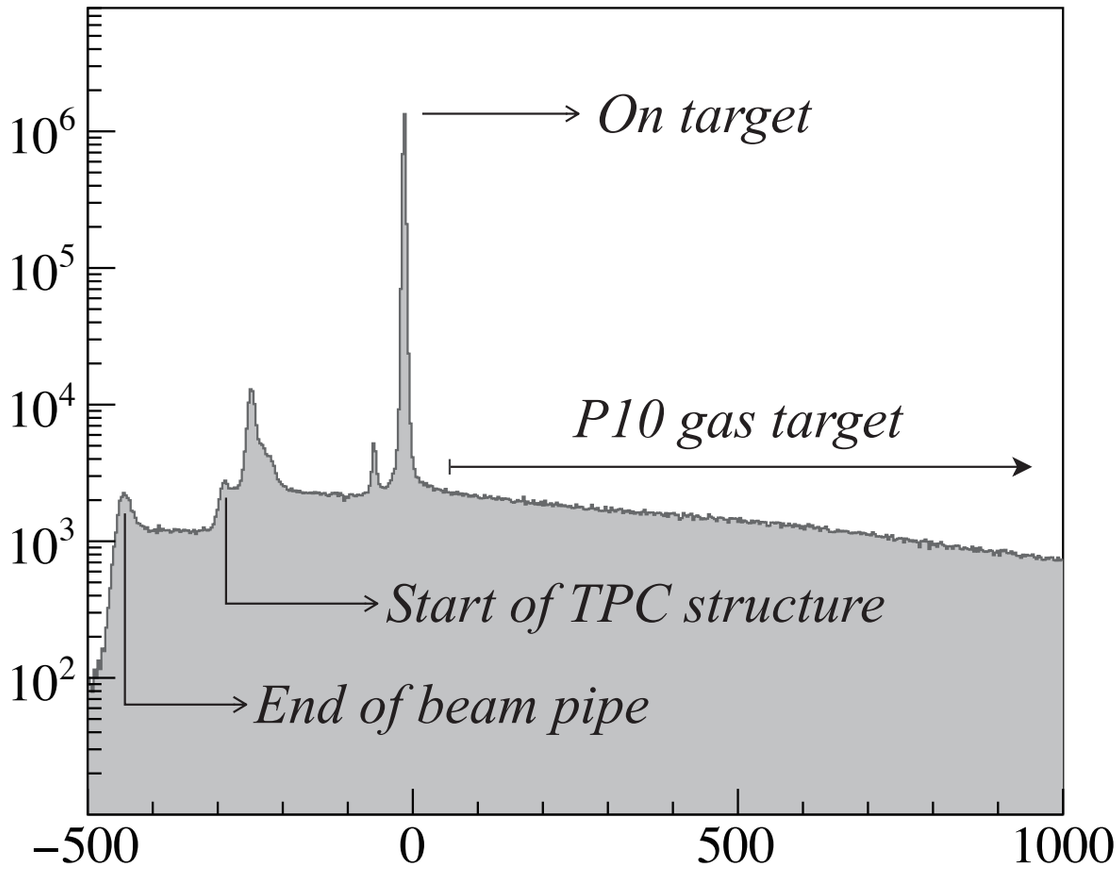


Hit Clustering



- Hit-Clusters are created by adding hits of same layer (or same row) depending on the track angle.
- Track direction and hit residual angle decides the type of cluster.
- Hit-clusters are points used for measurement points in track reconstruction and points for <dE/dx>.

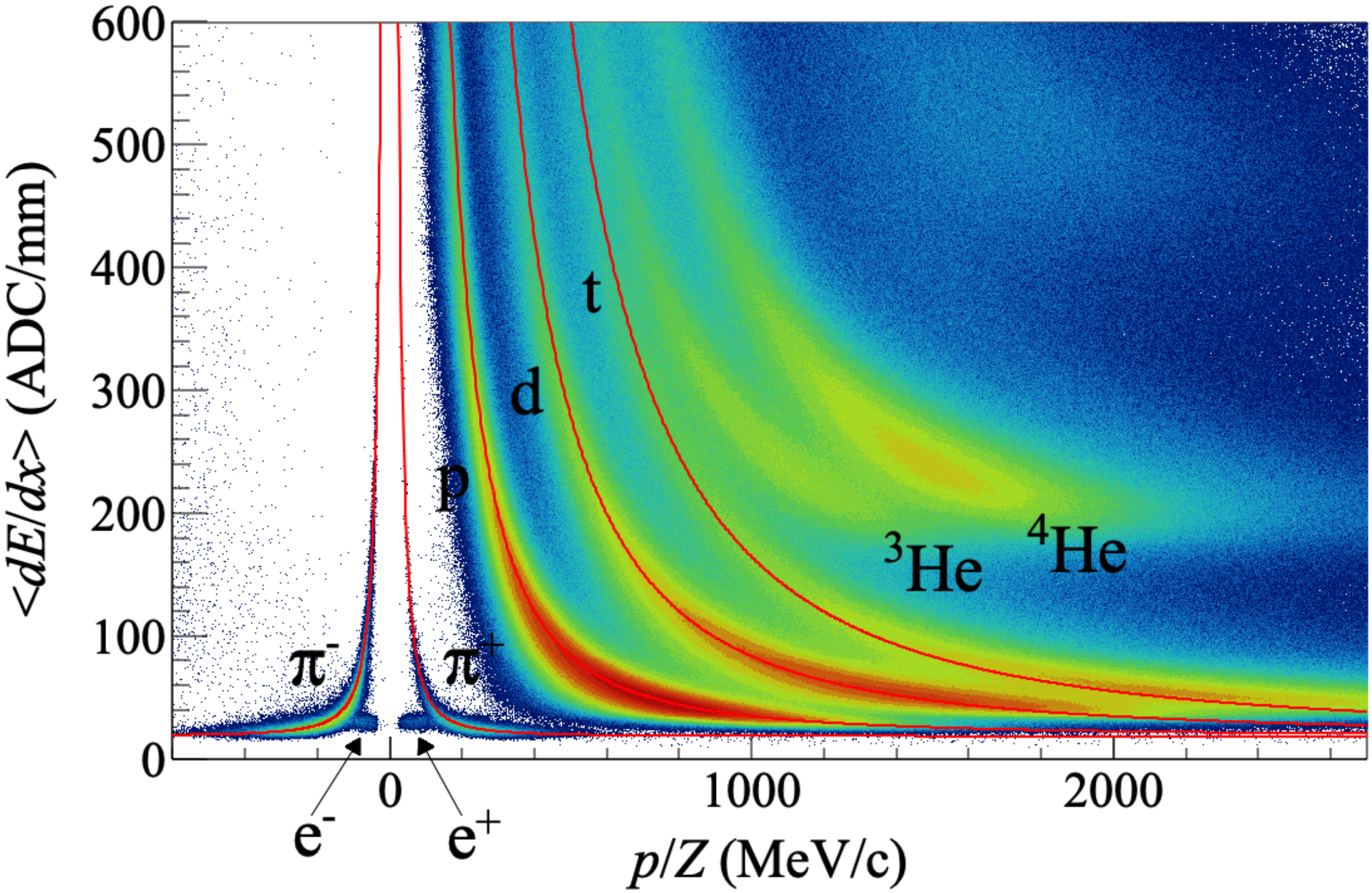
Vetex & Momentum Reconstruction



- Track reconstruction: GENFIT considering field map, measurement error and material effect.

- Vertex reconstuction: RAVE, Adaptive Vertex Fitter (AVF) an iterative weighted Kalman filter finding one vertex.

Particle Identification



Summary

- SπRIT-TPC experiment was performed with heavy-ion collision with neutron rich/poor systems.

- The software framework SπRITROOT capable of simulation reconstruction and analysis.

- In reconstruction, pulse analysis, track finding, hit-cluster finding, momentum and vertex reconstruction, particle identification tasks were developed

- Physics observables for nuclear symmetry energy are being studied.