π^0 reconstruction – update

Dorota Stefan, Robert Sulej
NCNR Warsaw

Introduction

Aim: reconstruction of π^0 topology:

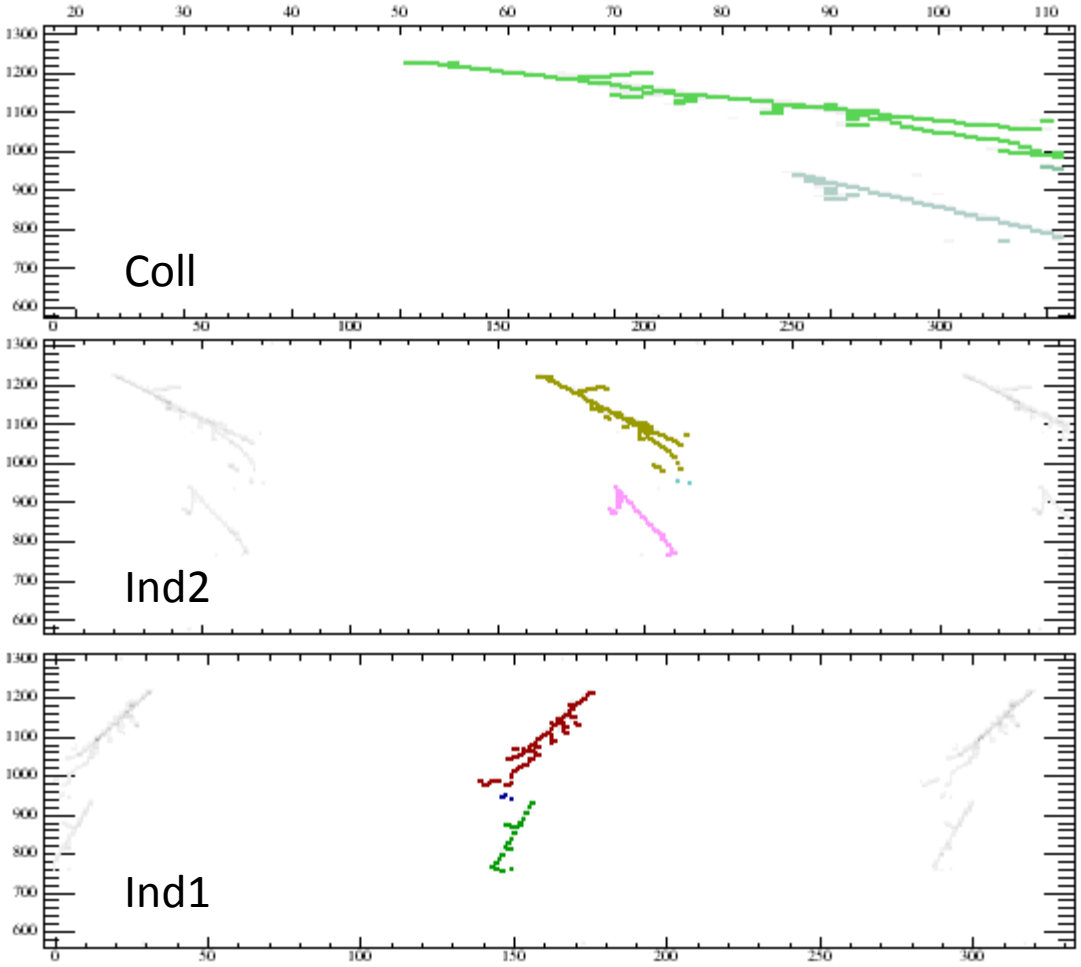
- identify 3D position of the π^0 decay vertex
- for reference: angle between two cascades

Data and algorithm

- π^0 generated at position (100, 20, 20) cm. Momentum: 0.7 GeV.
- Use 3 views, assumption: we can estimate charge from any view.
- Gauss hits → Cluster crawler → PMA tracks (to be used later for track subtraction, and also now for validation – see next points)

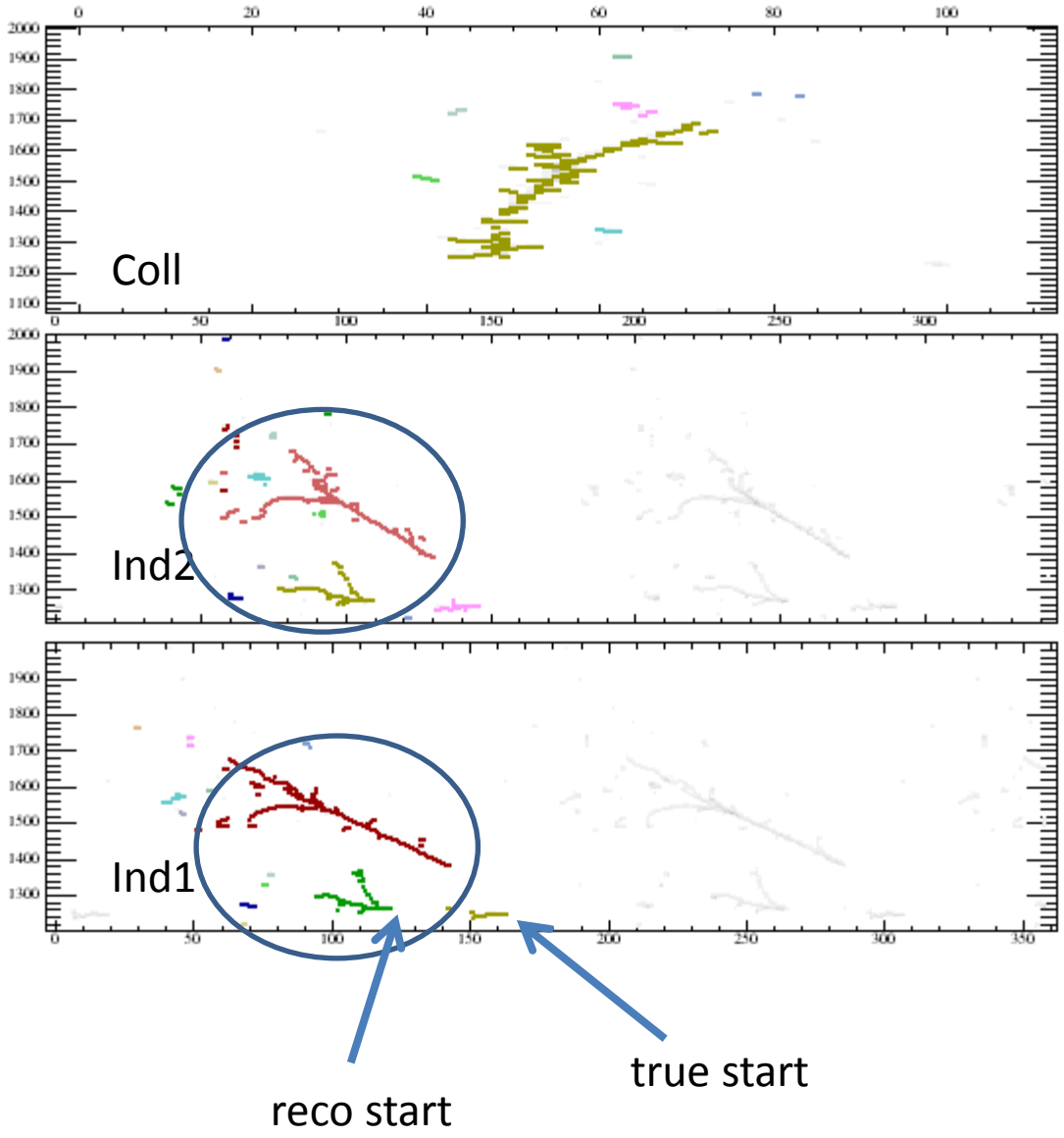
  → Blurred clustering.
- Search for 2D starting point and 2D initial part of cascades in each view independently (algorithm described before).
- Match showers from two views according to electron drift time of start point.
  - 3D segment to reconstruct initial part of cascade (using PMA)
  - verify segments to select best 2D view combination: close and parallel to a PMA track.
- 3D segment used to find: a) 3D start point; b) direction in order to find region of π^0 decay and estimate angle between photons.

Properly reconstructed event



- Example of blurred clustering: showers well seperated from each other, which (different colors).
- 3D starting points of cascades were also reconstructed properly here.

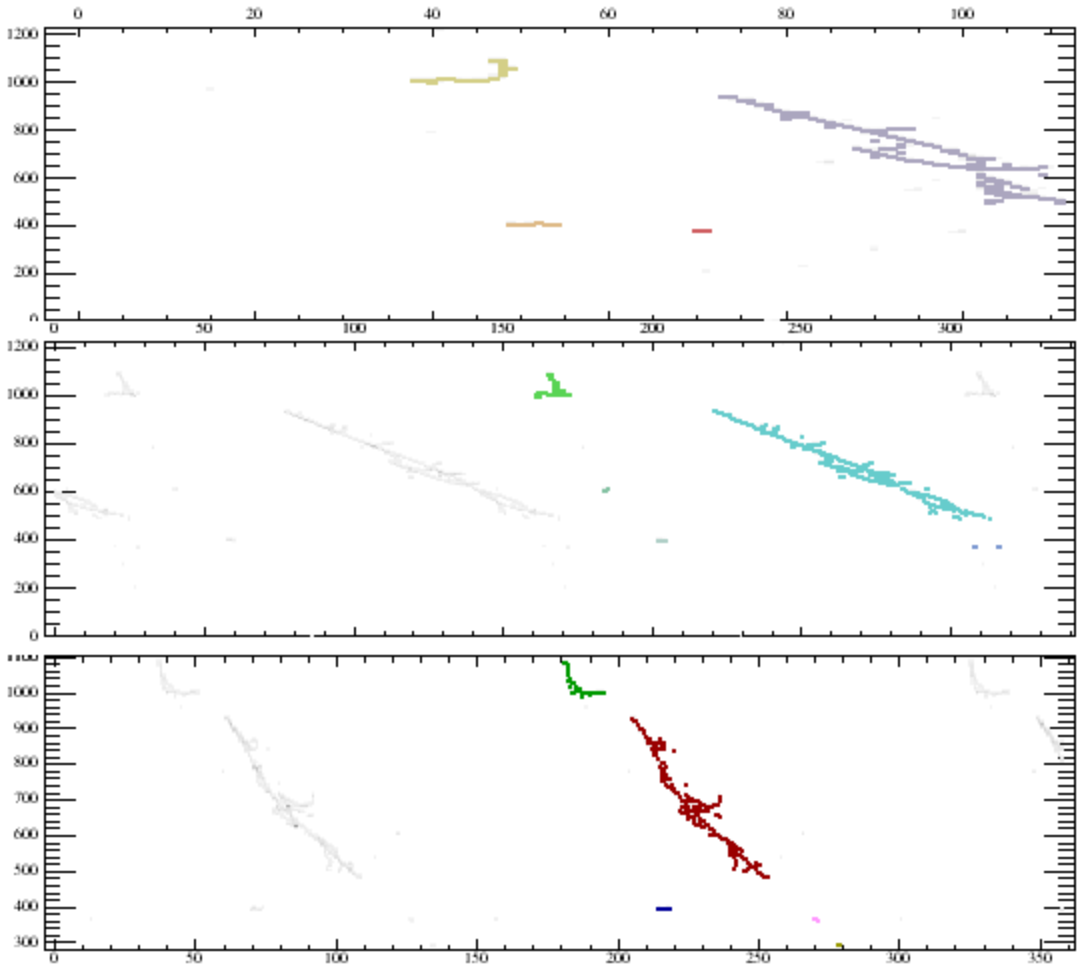
Not perfectly reconstructed event



- More than two clusters in one view – correct.
- To simplify presentation of results today:

  only events with exactly 2 reconstructed 3D starting points.
- In general: cascade can be fragmented, several clusters/starting points are found and should be 3D-clustered (and the true start selected).

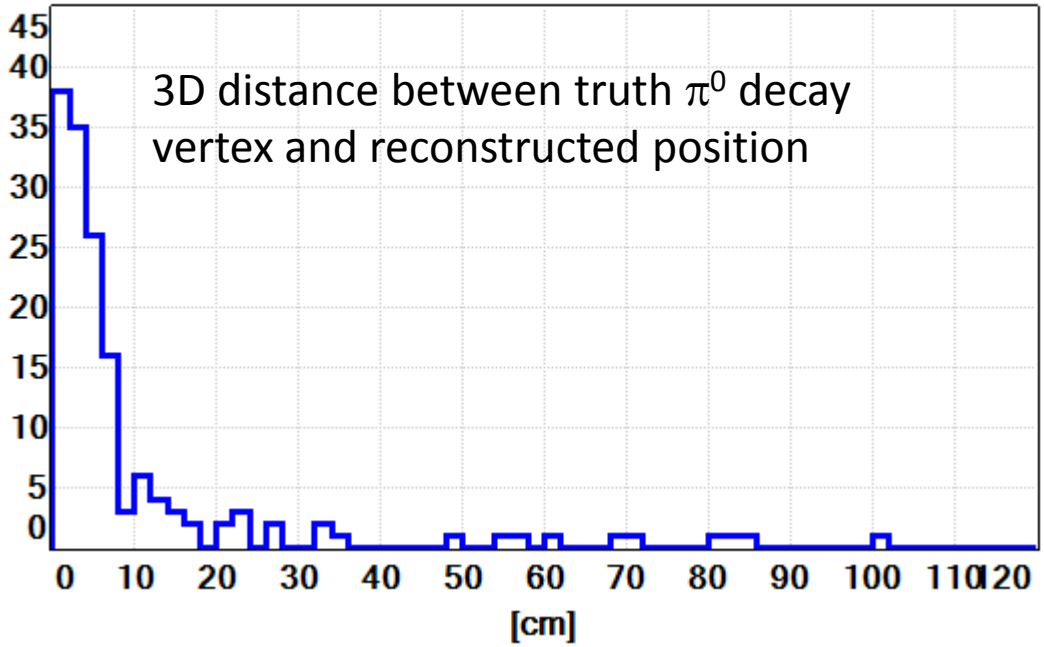
One of difficult events

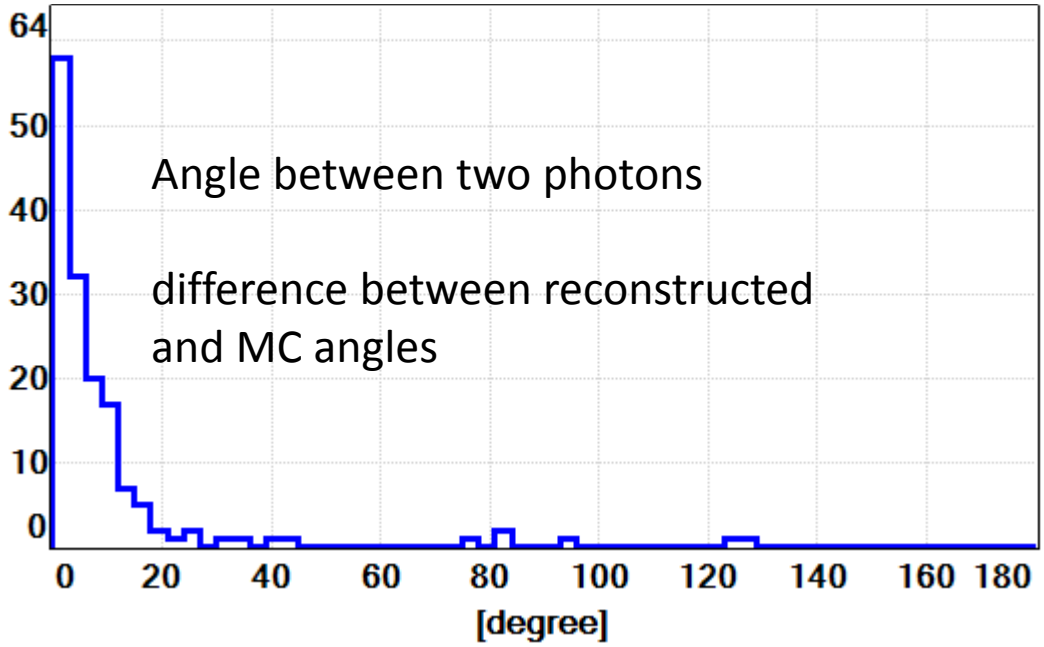


Low energy photon:

Difficult to find starting point of the cascade without full context of the event.

π^0 topology reconstruction





Tails – cases in which position was reconstructed from secondary cascade conversion points.

To be done:

- Aglomerate 3D parts of showers in one cluster to find the first point of photon conversion.
- Generate π^0 associated with hadronic interactions.