CyberPFA object reconstruction

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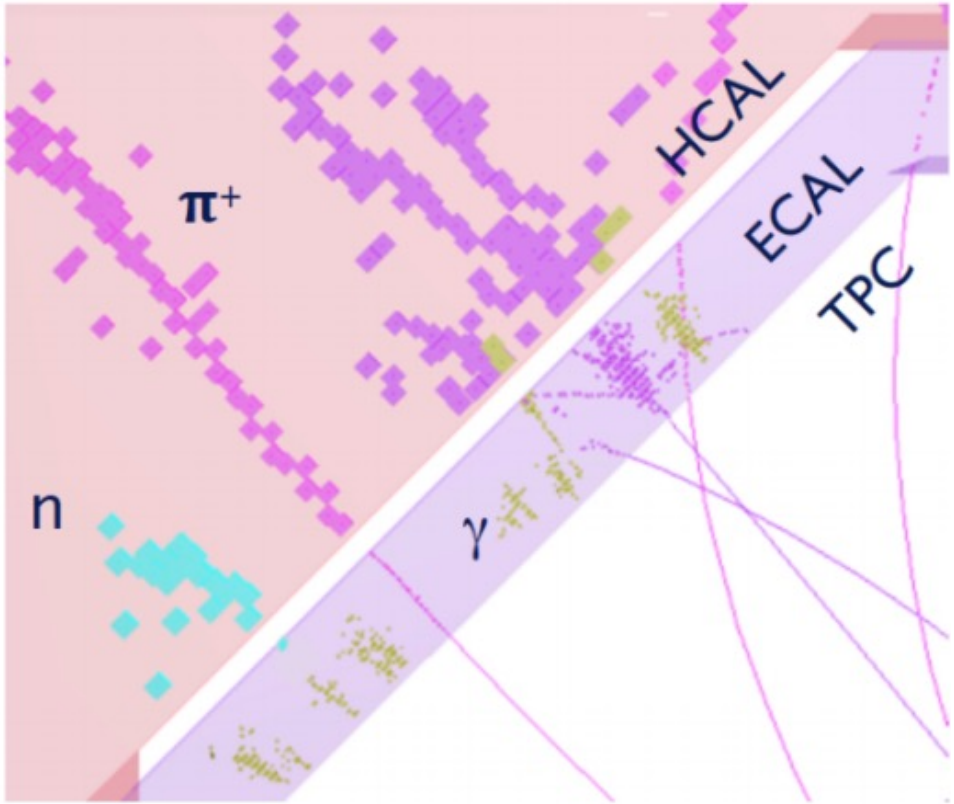
PFA reconstruction

- **Particle flow approach: measure objects with most proper sub-detector.**
  - Tracker (charged particles) + ECAL (photons) + HCAL (neutral hadrons)
  - High granularity calorimeter + pattern recognition algorithms (PandoraPFA, ArborPFA).



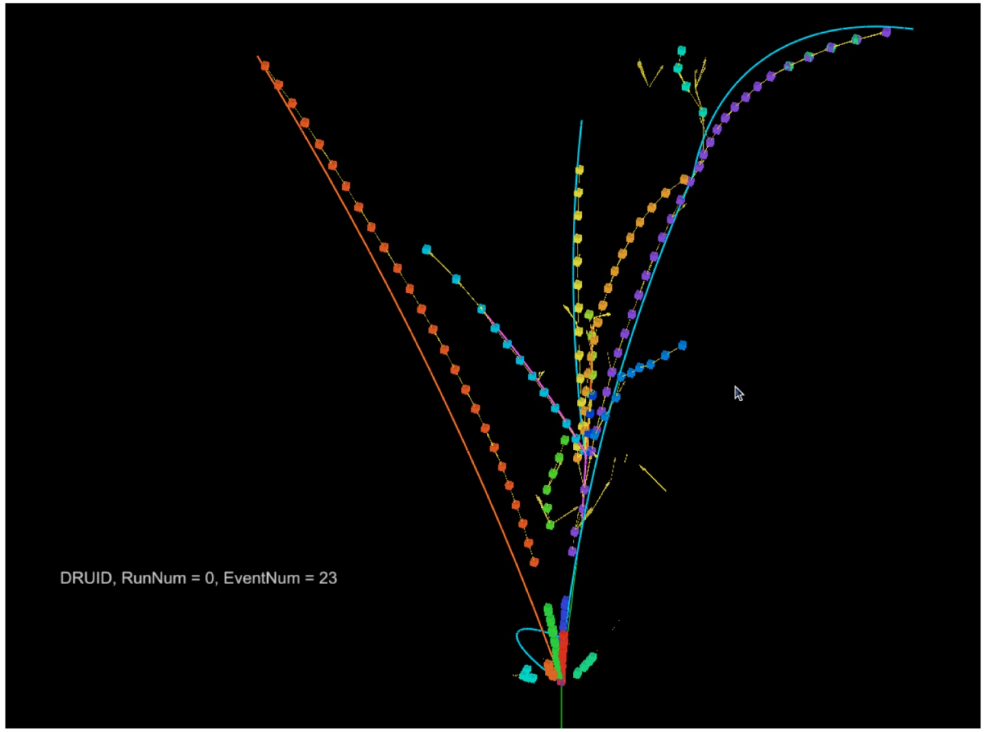
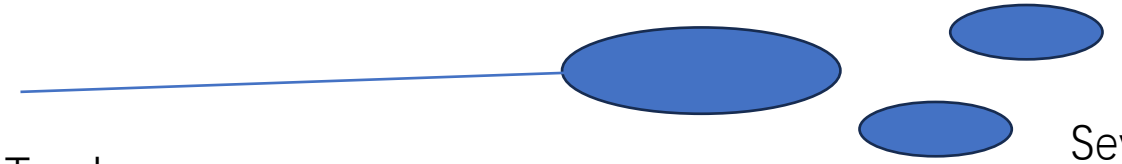


Figure 3: A 20 GeV K_L^0 shower reconstructed by Arbor Algorithm

PFA reconstruction

- **Particle Flow Object (edm4hep::ReconstructedParticle)**
  - PFO output in CyberPFA: RecPFACyber/src/Tools/OutputCreator.cpp



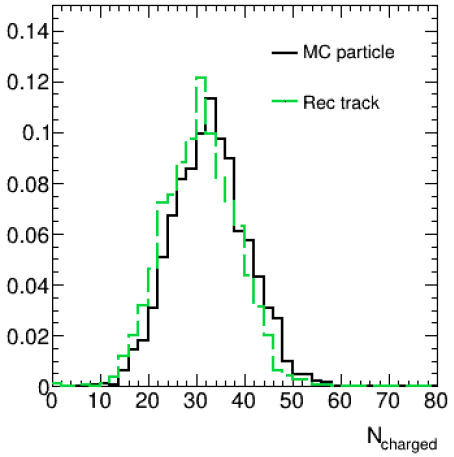
1 Track
edm4hep::ReconstructedParticle::getTracks(std::size_t)

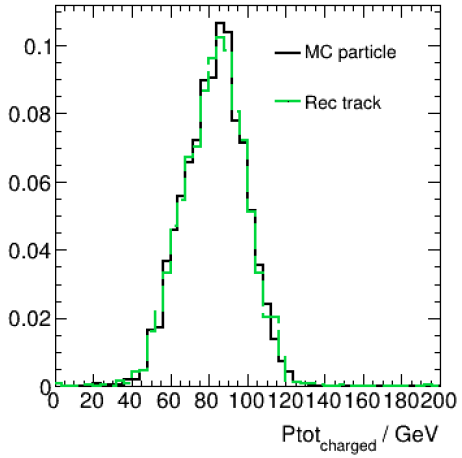
Several clusters.
Ncluster: edm4hep::ReconstructedParticle::clusters_size()
Cluster[i]: edm4hep::ReconstructedParticle::getTracks(std::size_t)
Distinguish ECAL and HCAL cluster:
- Now only from cluster position (ECAL: R<2130, HCAL: R>2130)
- Will add a tag in cluster.

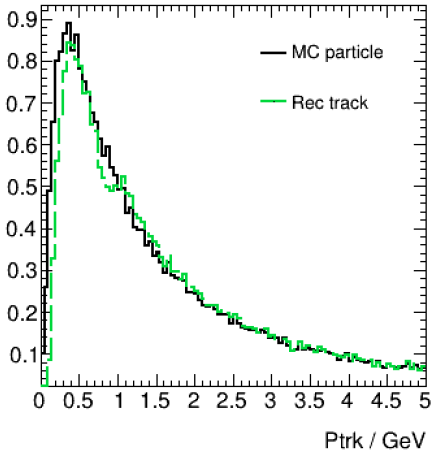
  - Other properties:
    - PID: still work in progress.
      - PID info from inner tracker (dN/dx, TOF) is going to be applied in PFA.
      - PID info from muon chamber: a truth-based tagger in track. Need to be implemented in PFA.
      - PID info from calorimeter need to be developed.
    - Truth link: need good definition to combine track truth link and calorimeter truth link.
    - Others?

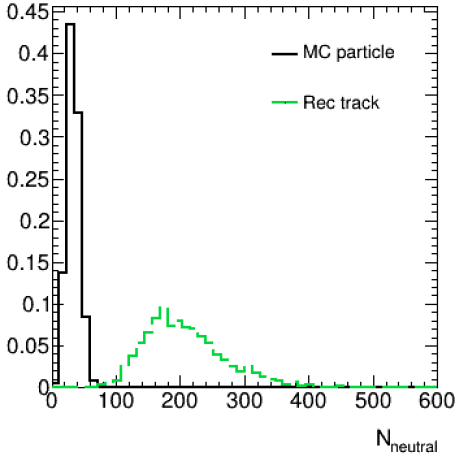
PFA reconstruction

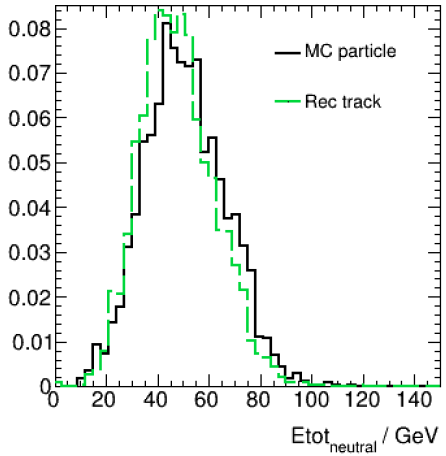
- **Performance in cluster and track level:**

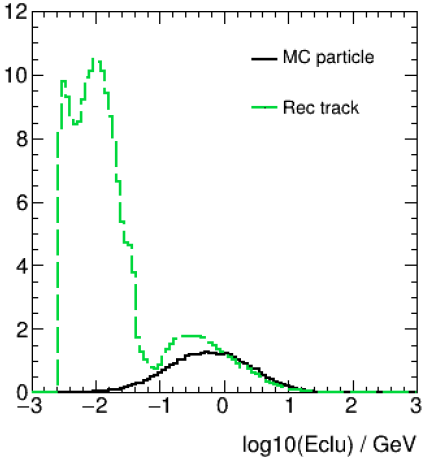












PFO info to be checked:

- Neutral/charged PFO number (2 plots)
- Neutral/charged PFO energy and total energy (4 plots)

Sub-PFO info to be checked:

- Track/ECAL cluster/HCAL cluster number in one PFO (3 plots)
- Track P, cluster E in event (1+4 plots)
- Other useful properties, e.g. E/P.