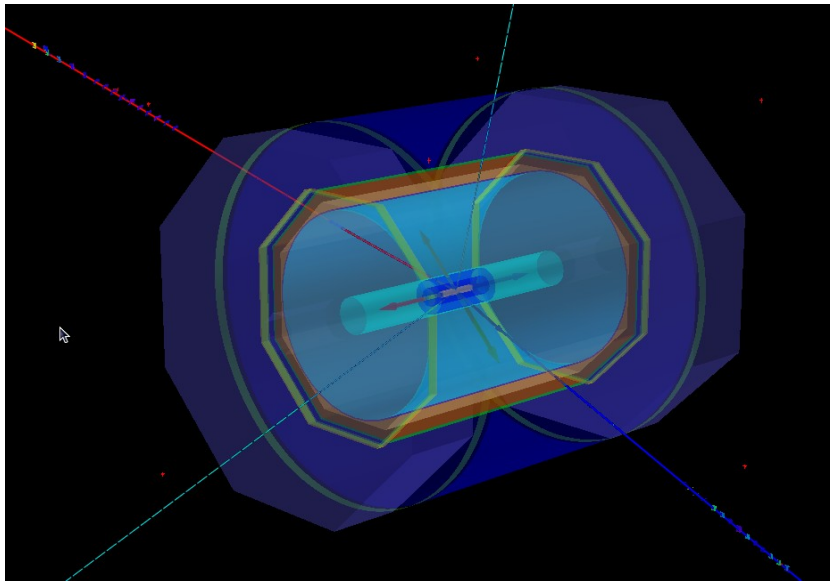
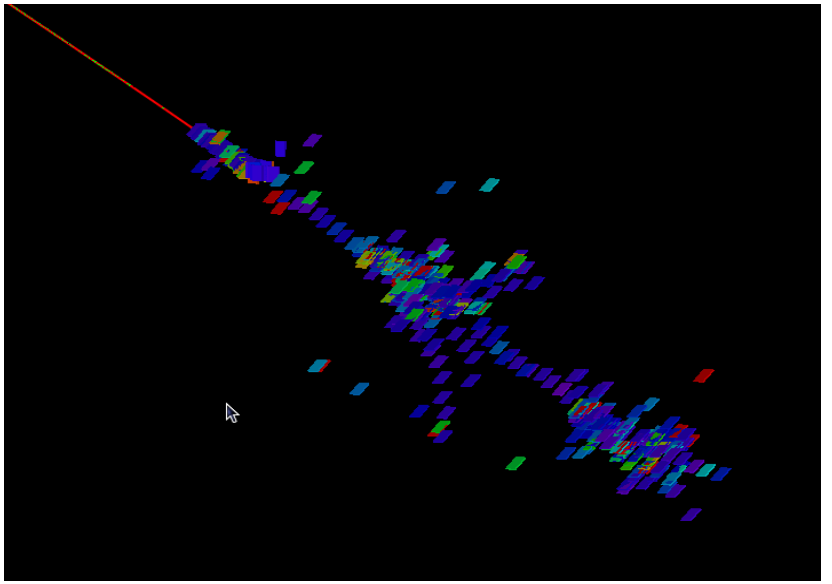
DRUID: Displaying Root module Used for ILD

Manqi Ruan

Introduction

- Motivation: to understand the ILC events & jet/shower details!



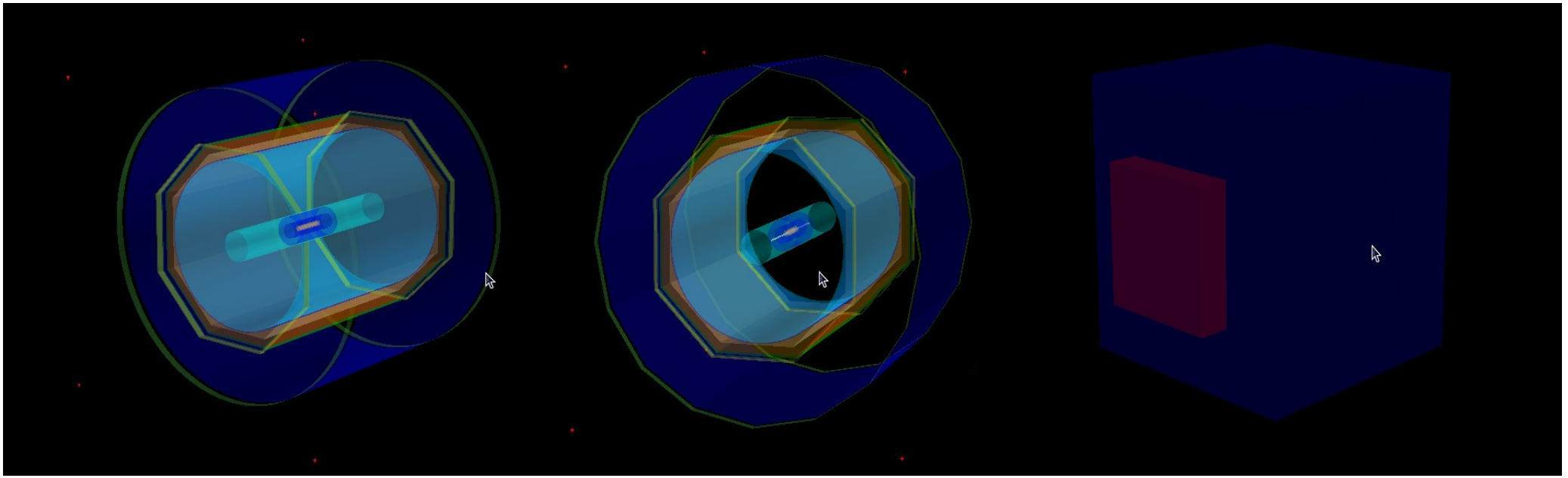


Left: μμνν event; Right: shower created by 100GeV Pion

- DRUID: a compilable, lightly weighted 3D event display package based on ROOT TEve class (src code ~ 200K)
  - Input: lcio file + gear geometry description file,
  - Work together with simulation (Mokka!)/reconstruction software!

Supported Geometries

- ILD with TESLA/a la Videau HCAL;
- CALICE test beam frame (parameters not tuned);

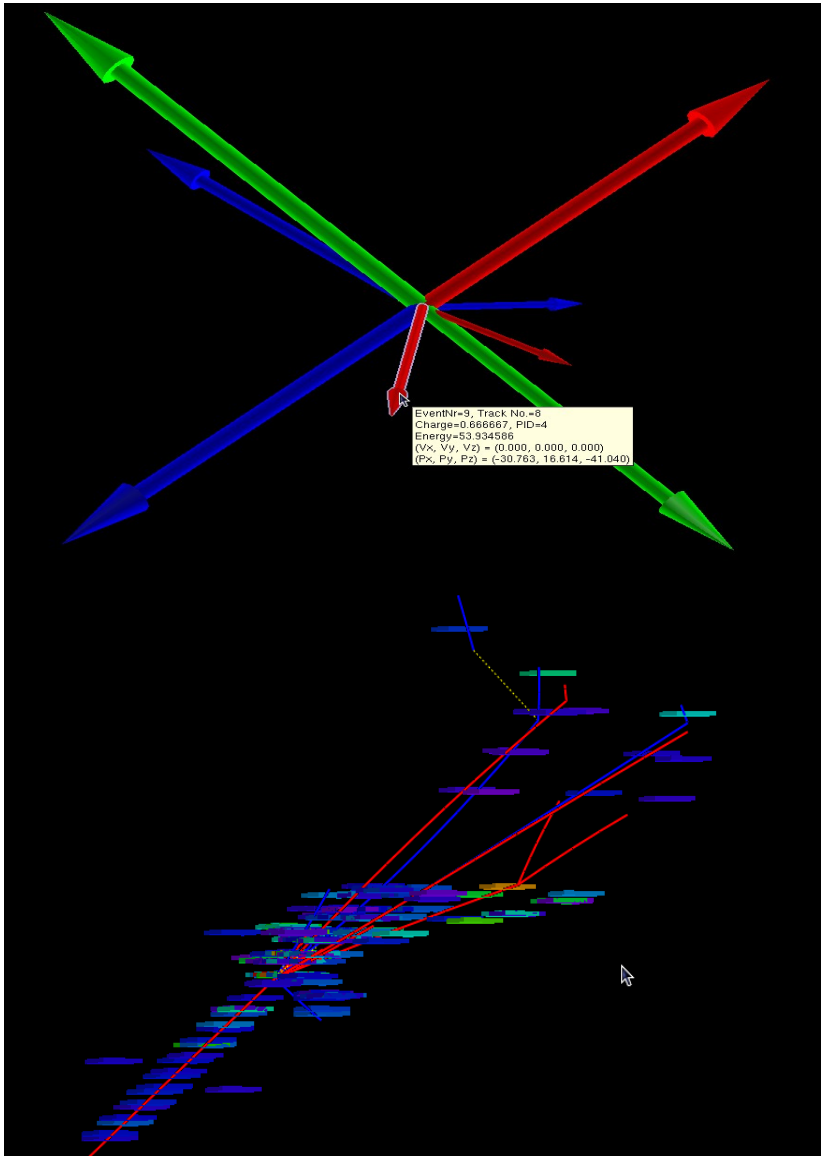


Left to Right: a la Videau, TESLA (DHCAL EndCap dismounted) & CALICE TB

- Mount and dismount sub detectors interactively in GUI;
- Tune parameters of detectors in input gear file;

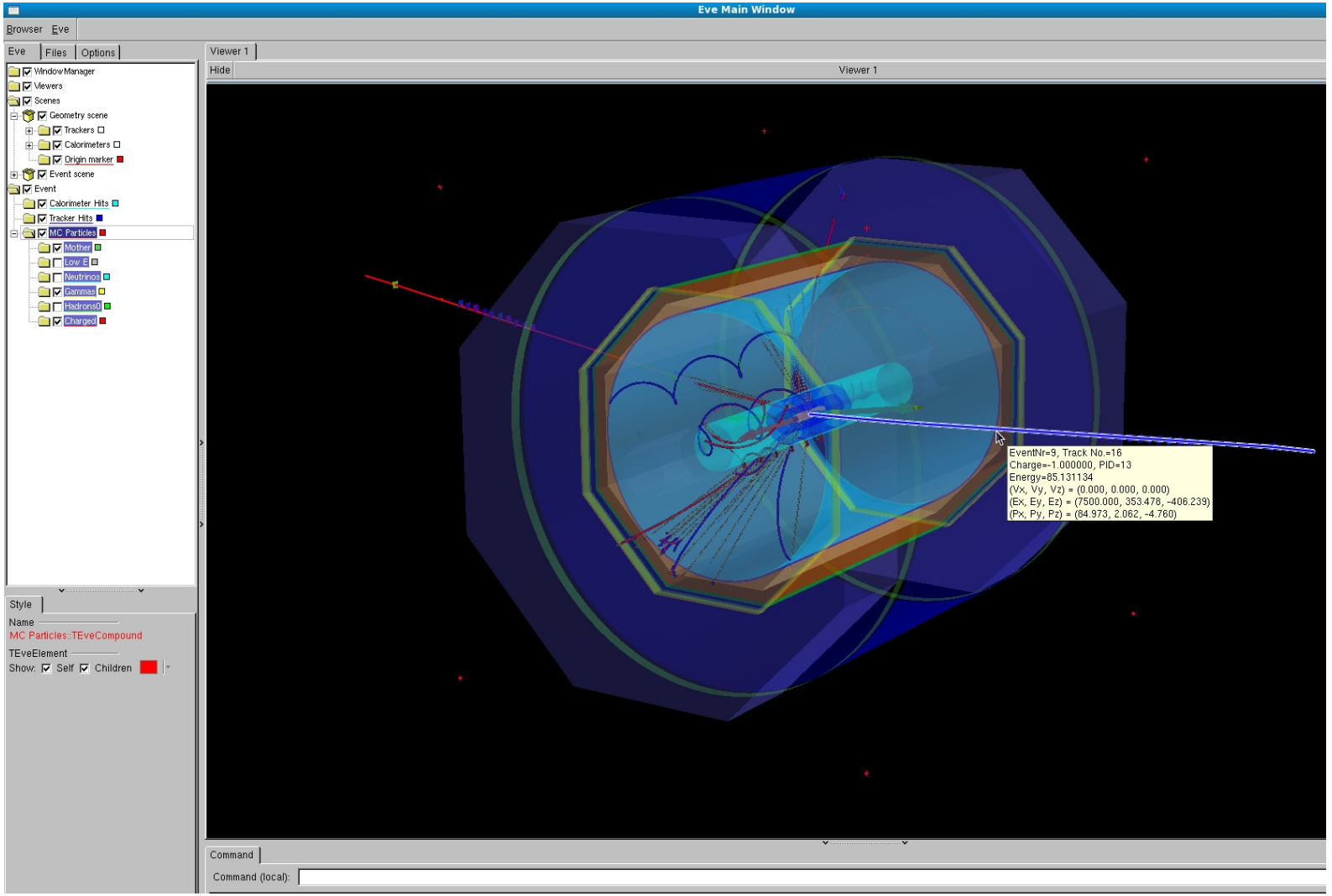
Displayed objects

- Detector Geometry;
- Detector hits:
  - Simulated/reconstructed hits for each sub-detector
- Event type:
  - Mother particle at the VTX
- Estimated Tracks:
  - From the MCParticle list (Generator/option dependent; contains particles generated in simulation, i.e, shower details)
  - Divided into different groups: charged, low energy, neutrinos ...

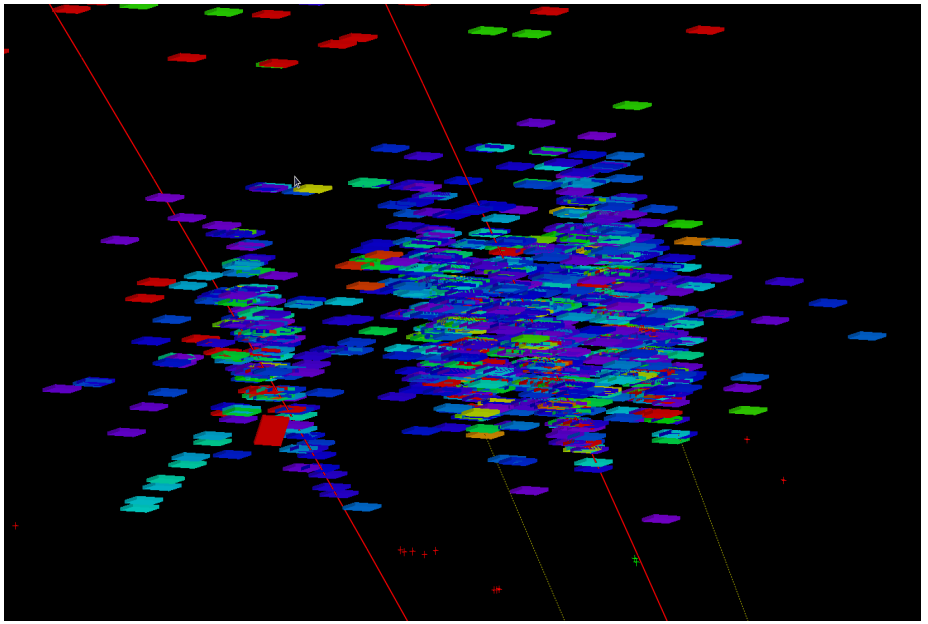


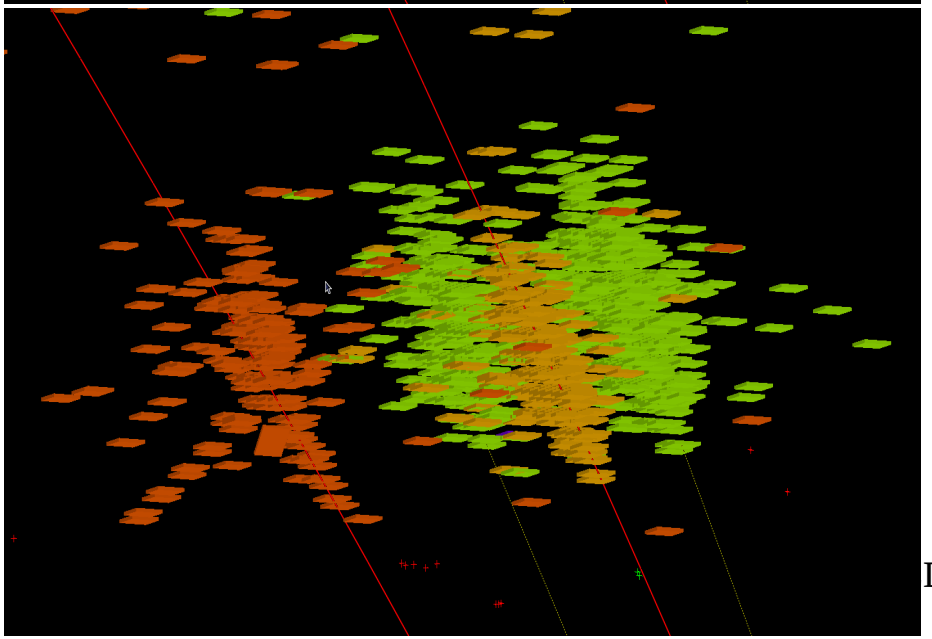
Displaying options

- General 3D options:
  - Zoom
  - Rotate
  - Projection
  - Tunable light source & background
- Individual objects:
  - Display/hidden
  - Pick up & read attached text information



Style: MC objects





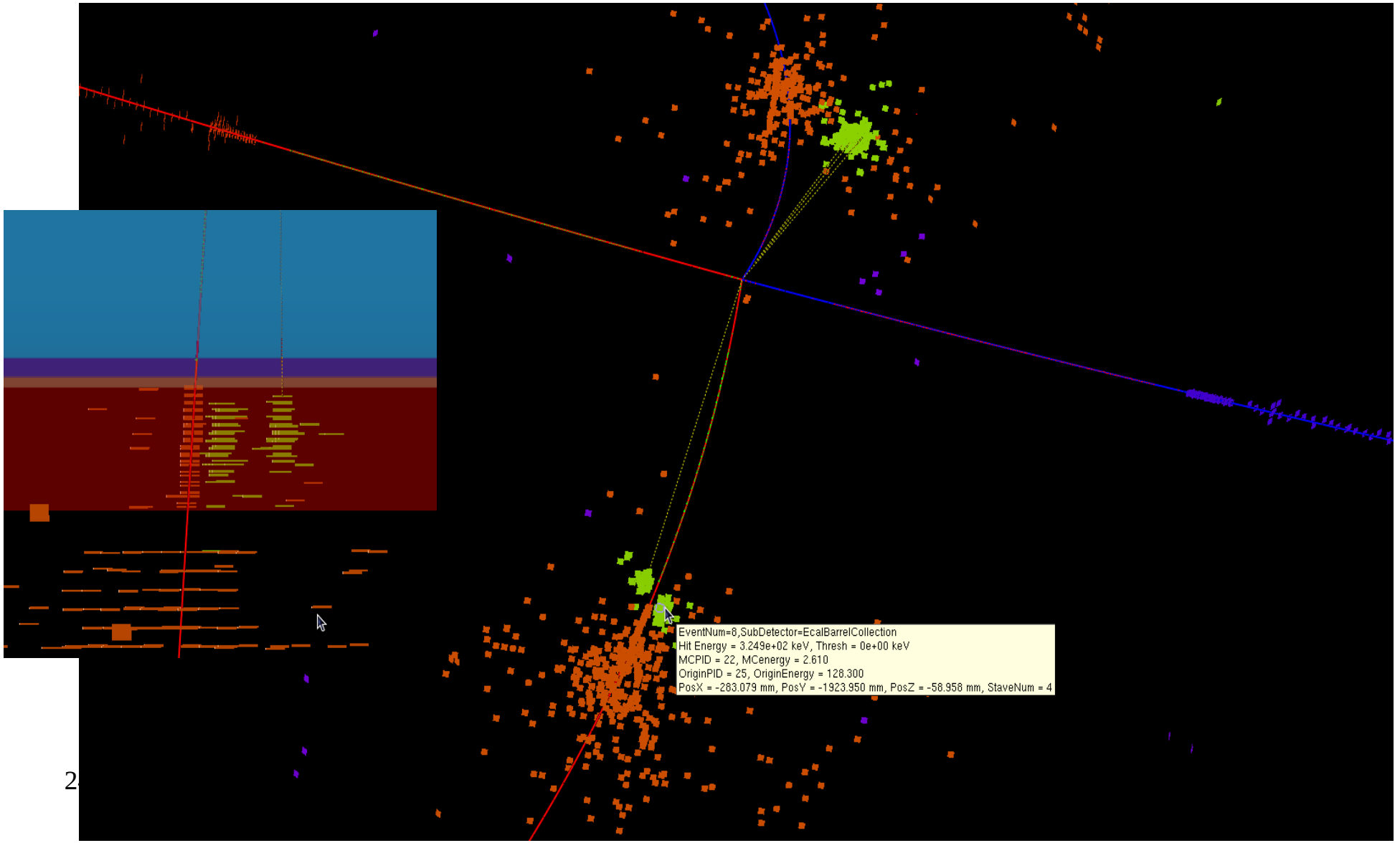
- Detector Hits Color:
  - Particle Index (*under development*)
  - Energy
    - True Energy deposition or dE/dx
    - Color (DHCAL) Hits with different Thresholds
  - PID
    - The particle passing through
    - The origin of the hit: PID of the mother (from VTX or from TPC)
    - Option to keep the Energy information: cell size

Style: Reco objects

- Reconstruction Software Dependent;
- Standard: PFO
  - Reconstructed Particle :: PandoraPFO, displayed as Tracks;
  - PFO associated Hits (*under development*):
    - PFO -> Clusters & Tracks -> Detector Hits: color with PID/energy information of corresponding PFO;
    - Color with Hit energy/Index;
    - Special color for Hits dropped in clustering, tracking & PFO reconstruction
- Idea: display reconstructed & MC objects simultaneously, to analysis reconstruction software performance
  - MCTrack/MCHits + PFOs (done!)
  - MCHits/MCParticle + PFOs/PFO associated Hits
  - ...

Example: PFO + MCHits

- One prong decay of τ from Z(μμ)H(ττ) event: failed to reconstruct the second gamma decay from pi0

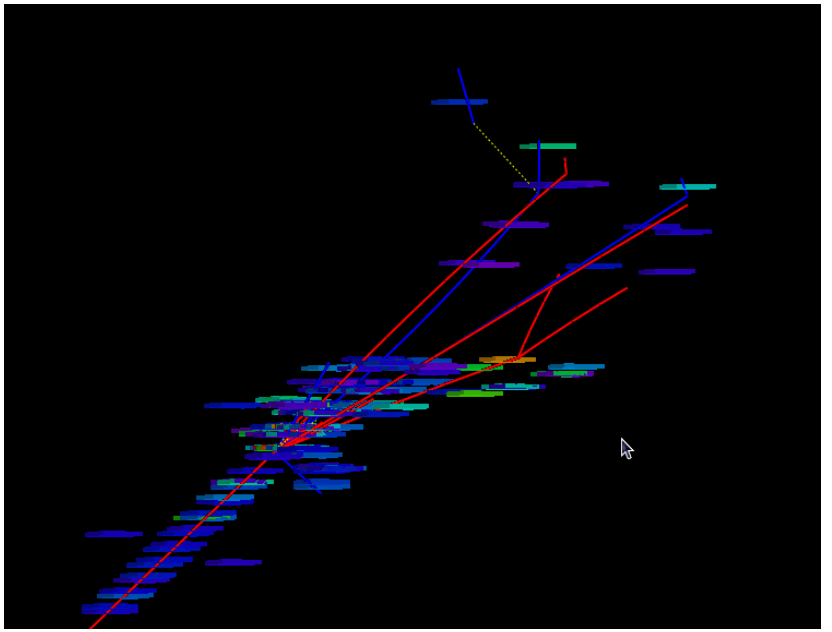


Mokka options

- Plugin to keep tracks generated inside calorimeter region: allows to study shower detail (*highly increase the size of MCParticle collection: need to be splitted to accelerate the display*)

- Plugin to suspends tracks that enter Dhcal: allows comparison of different options on Hcal

- Local copy, not yet committed to repository



To do & Summary

- To do:
  - Style optimization & GUI development
  - Detector geometry extension
  - Supporting module: Marlin module to optimize the collection in slcio file for DURID input

- Summary:
  - DRUID is now available to display the ILD events, preliminary version available at LLRForge (same as Mokka!) https://llrforge.in2p3.fr/svn/Druid or http://polywww.in2p3.fr/~ruan/ILDDisplay/Druid_0.0.tar.gz
  - New versions will be released with Mokka to include new geometries
  - To improve: waiting for your comments & suggestions!