



Motivation

- The course allows to know a typical search for signals of new physics beyond the Standard Model of elementary particle with the ATLAS experiment at the CERN's Large Hadron Collider (LHC).
- The laboratory examples have provide a concrete example of the search for experimental data collected by the ATLAS experiment during the 2012 LHC run. In particular the techniques for the reduction and the estimation of the background.
- Data analysis in high energy physics has permitted corroborated the existence of Boson Higgs at experimental level.

The Large Hadron Collider (LHC)

The 27-kilometre LHC is the world's largest particle accelerator. It collides protons or lead ions at energies approaching the speed of light.



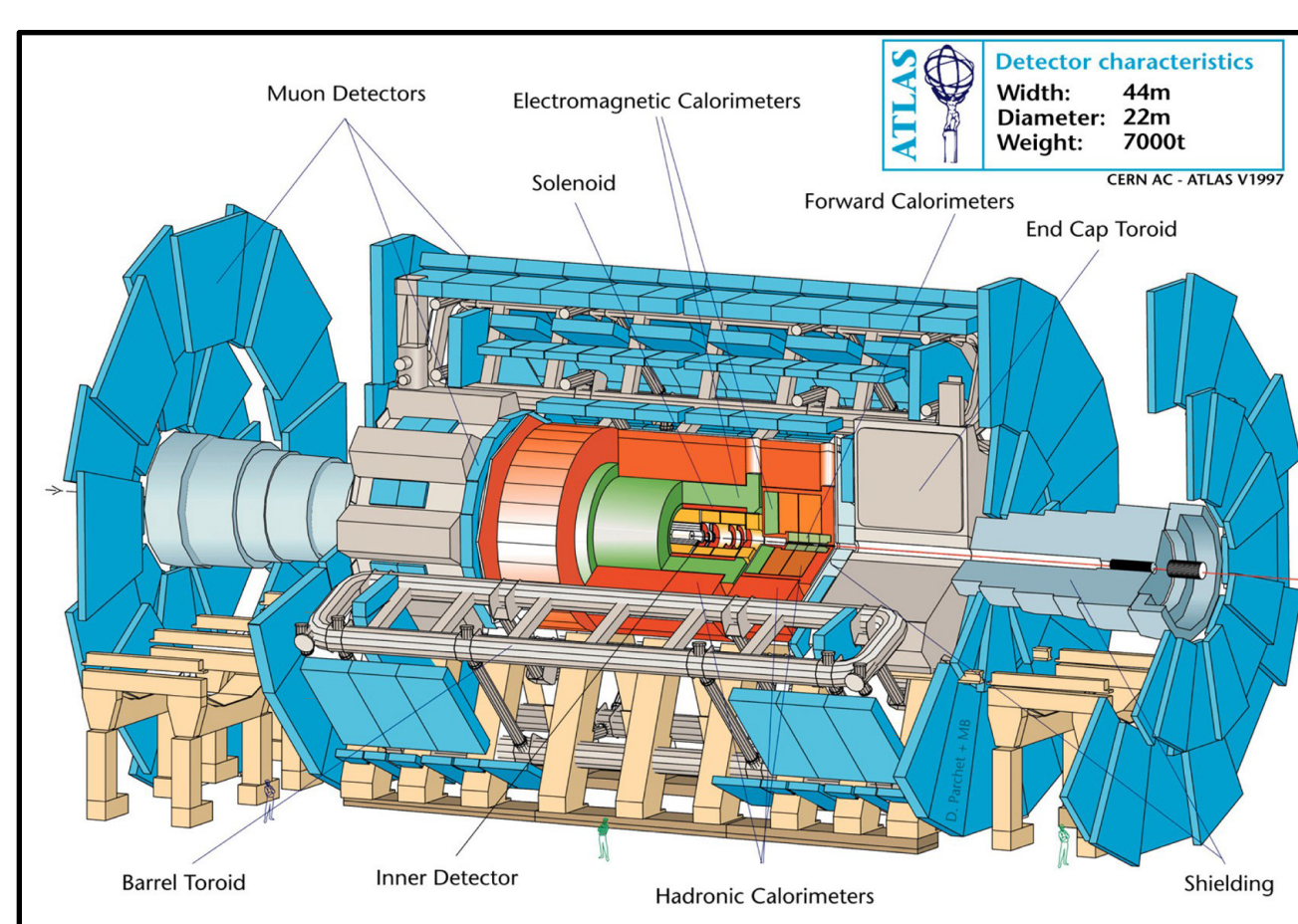
4 INTERSECTION POINTS

- ATLAS: A Toroidal LHC Apparatus
- CMS: Compact Muon Solenoid
- LHCb: B-physics
- ALICE: A Large Ion Collider (Pb-Pb)



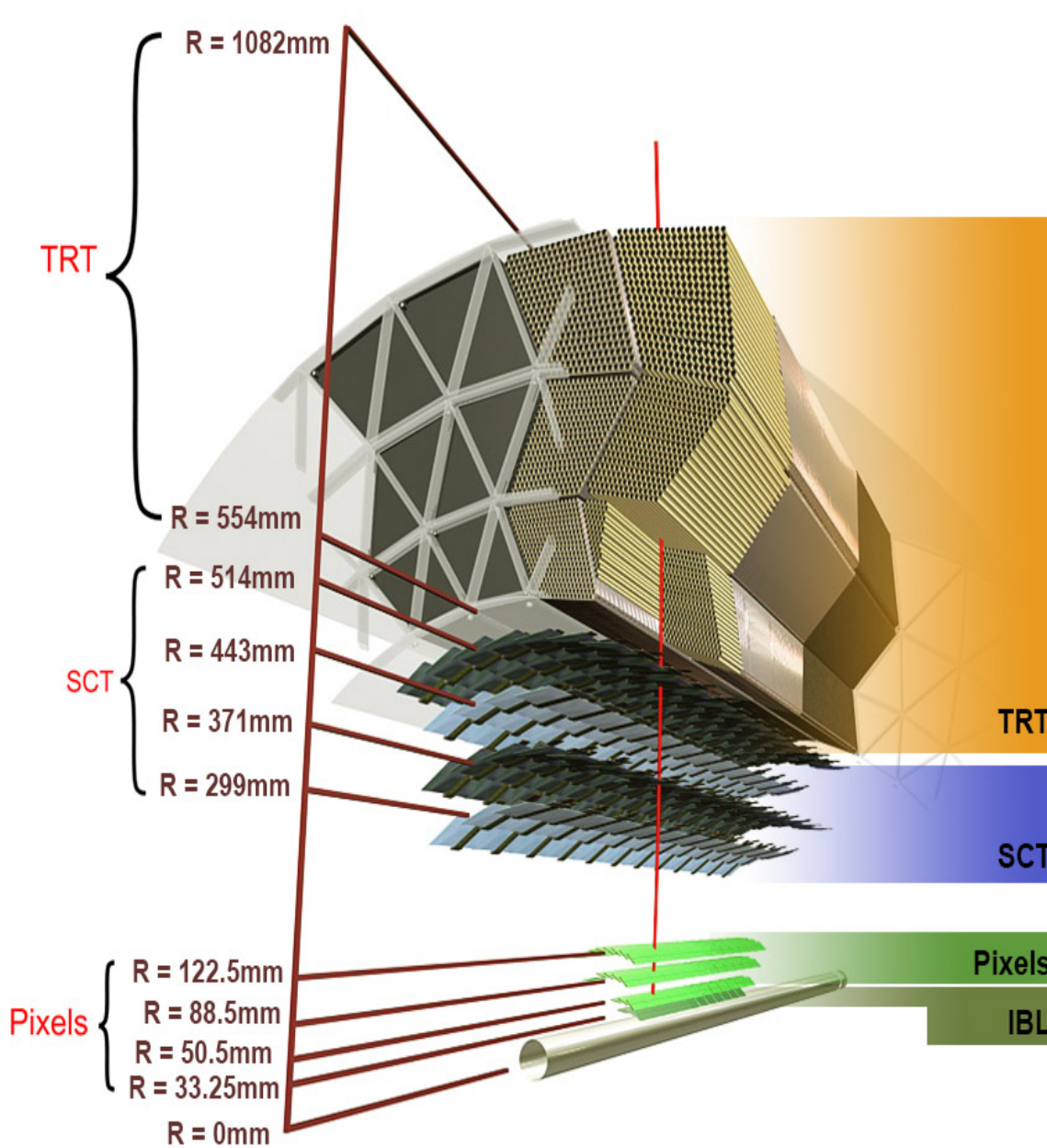
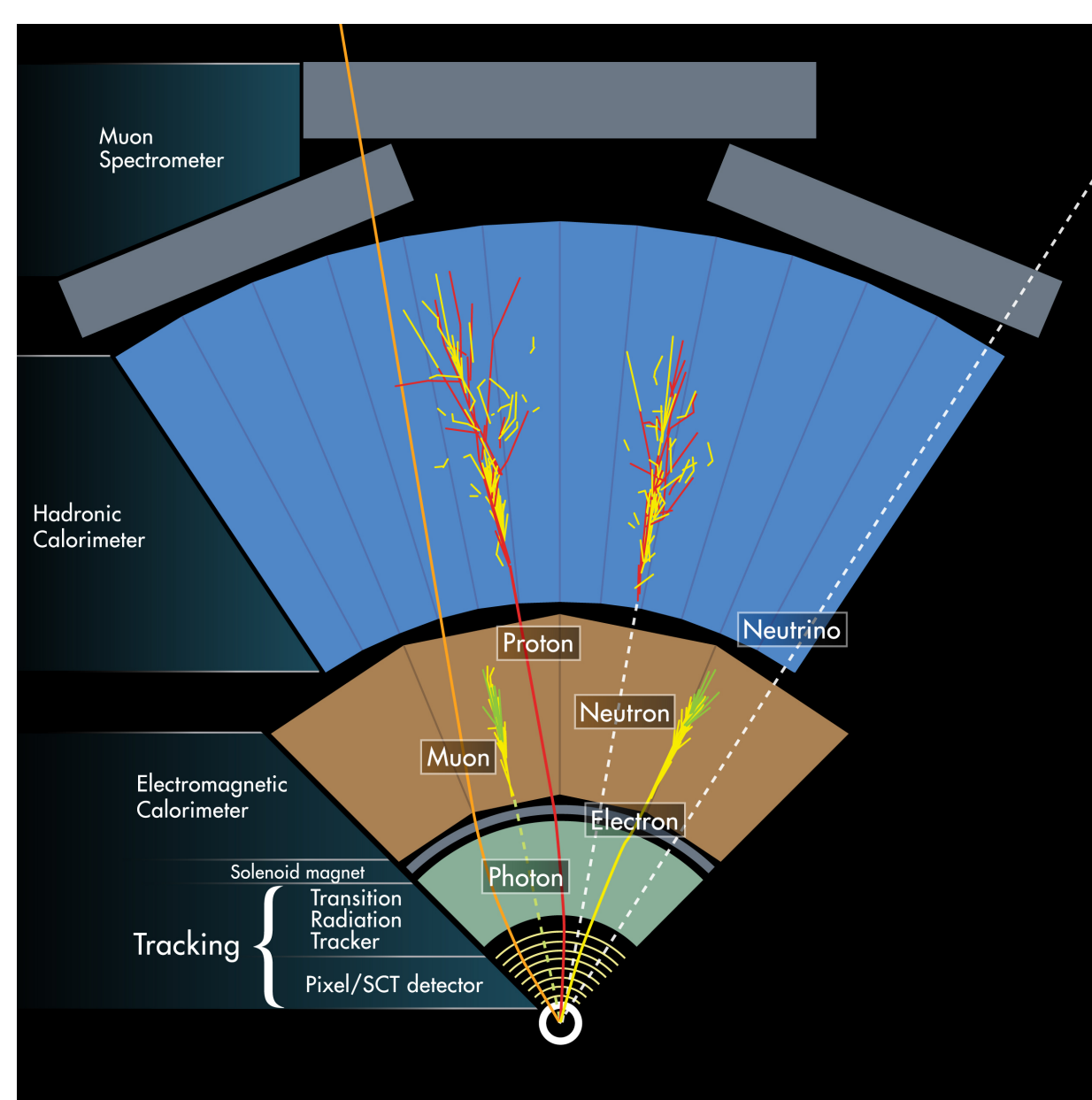
ATLAS Experiment

Typical shell detector

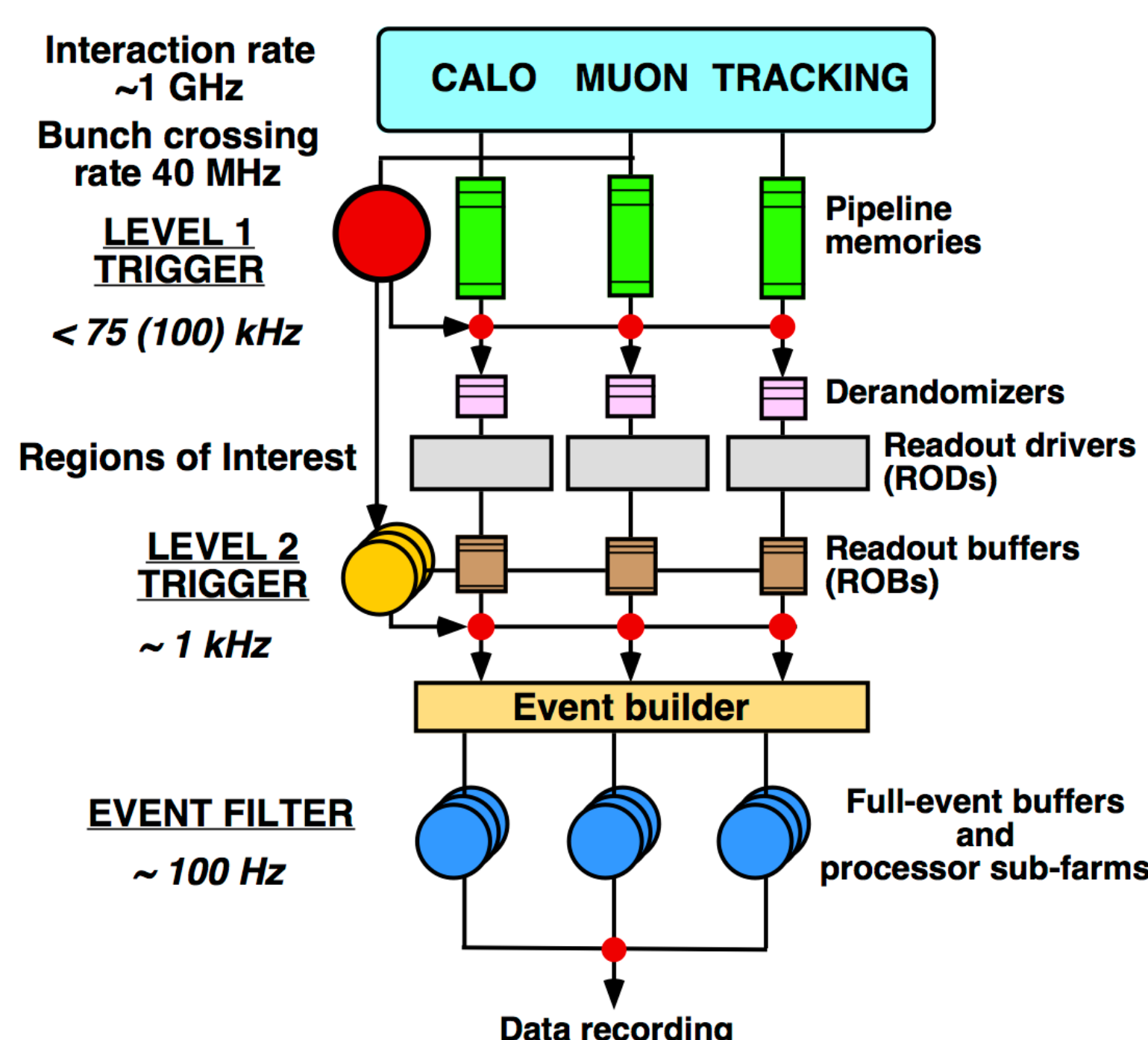


Sub-Detectors

- Magnet system (A Toroidal LHC Apparatus)
- Inner Detector
- Calorimeters
- Muon Spectrometer



Data Acquisition



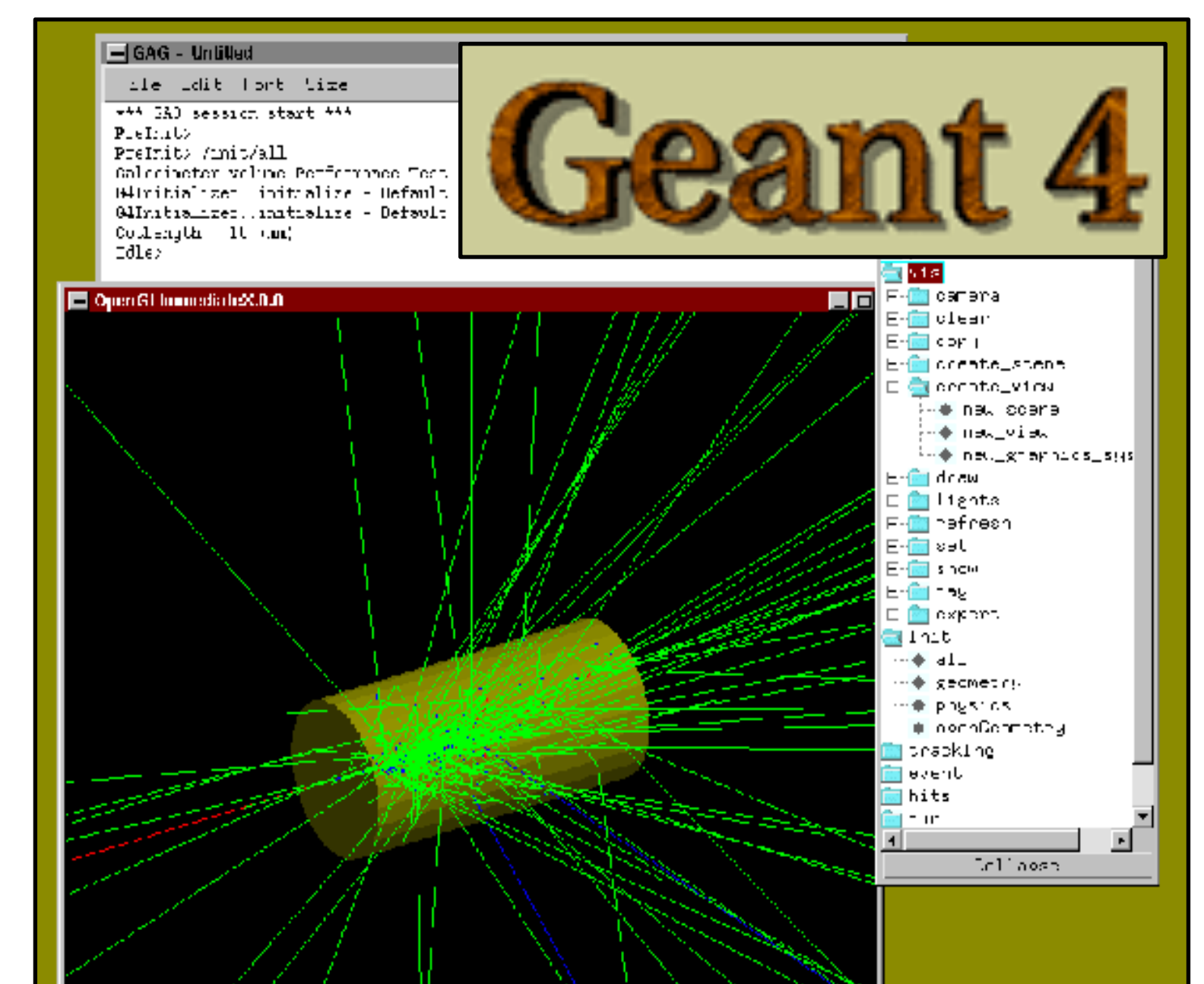
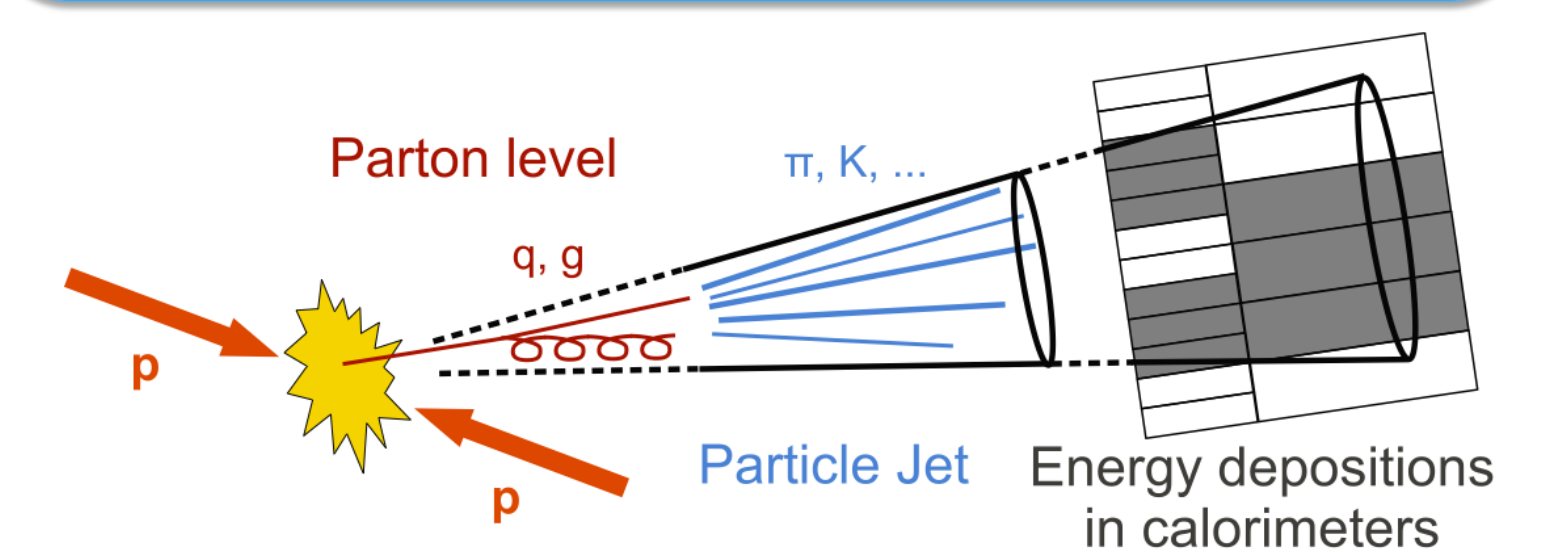
Level 1: custom-made electronics signatures from high- p_T muons, electron/photons, jets, taus into hadrons

Level 2: uses Region-Of-Interest

High Level Trigger: algorithms use full granularity and precision of ID, CALs and MS

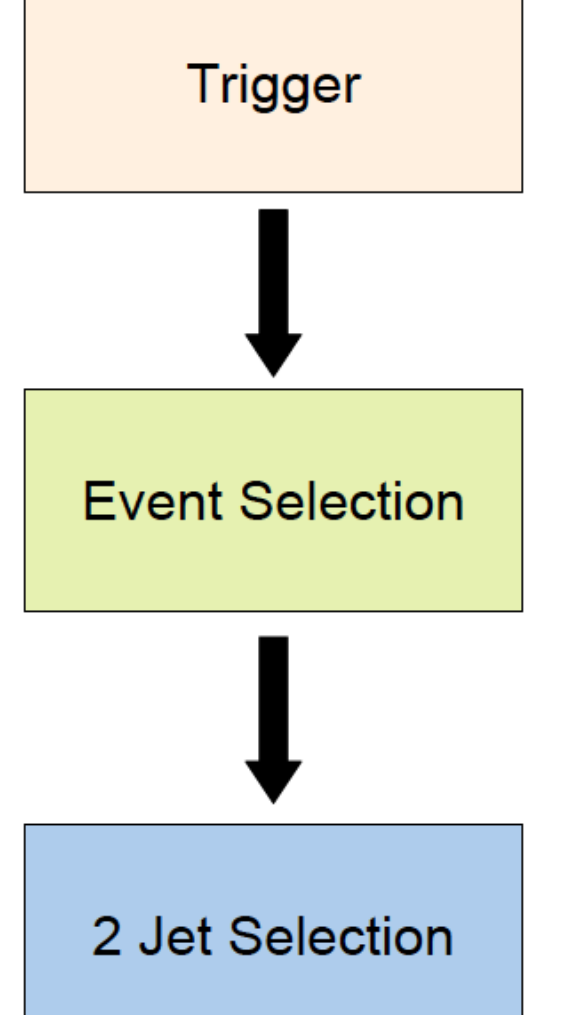
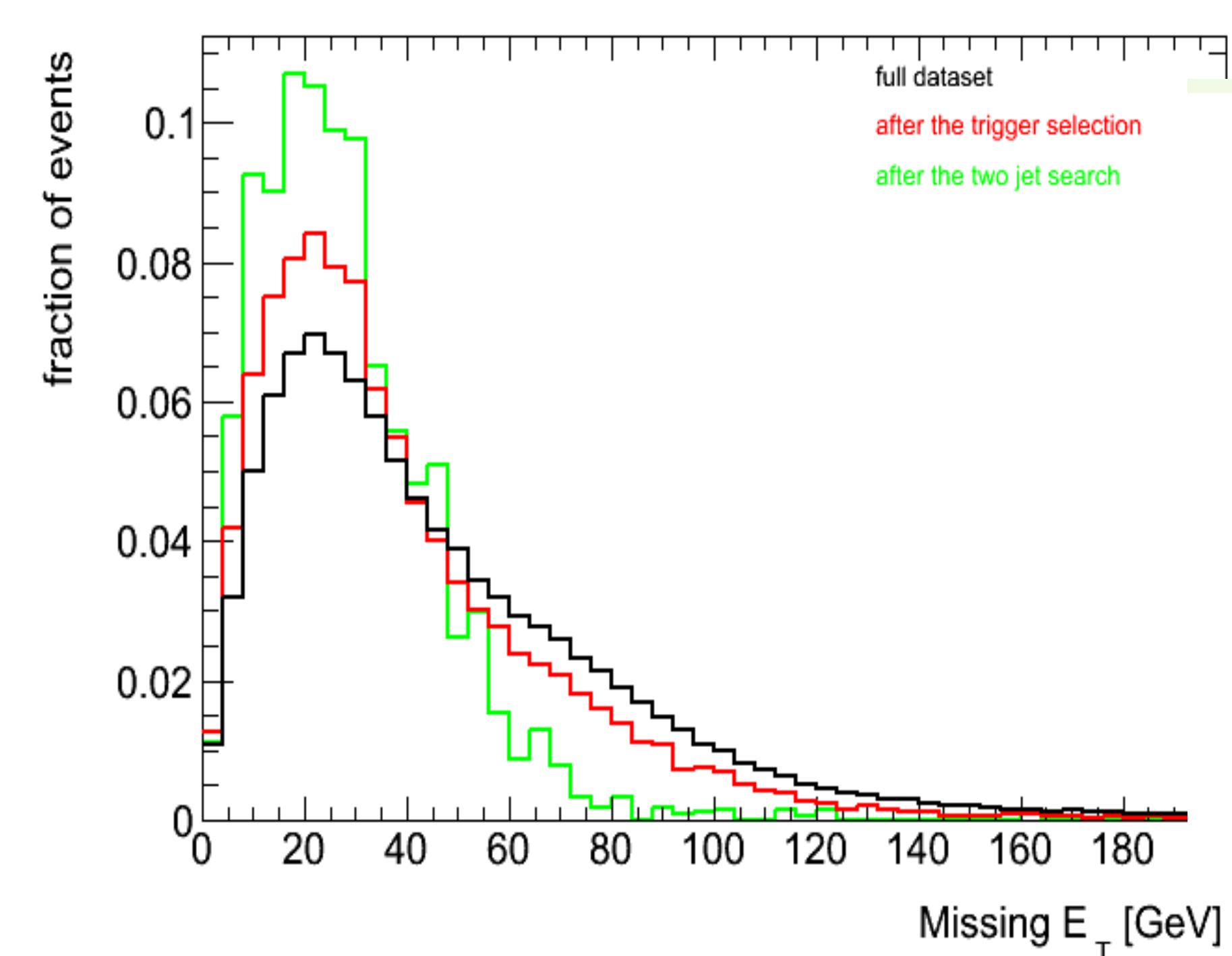
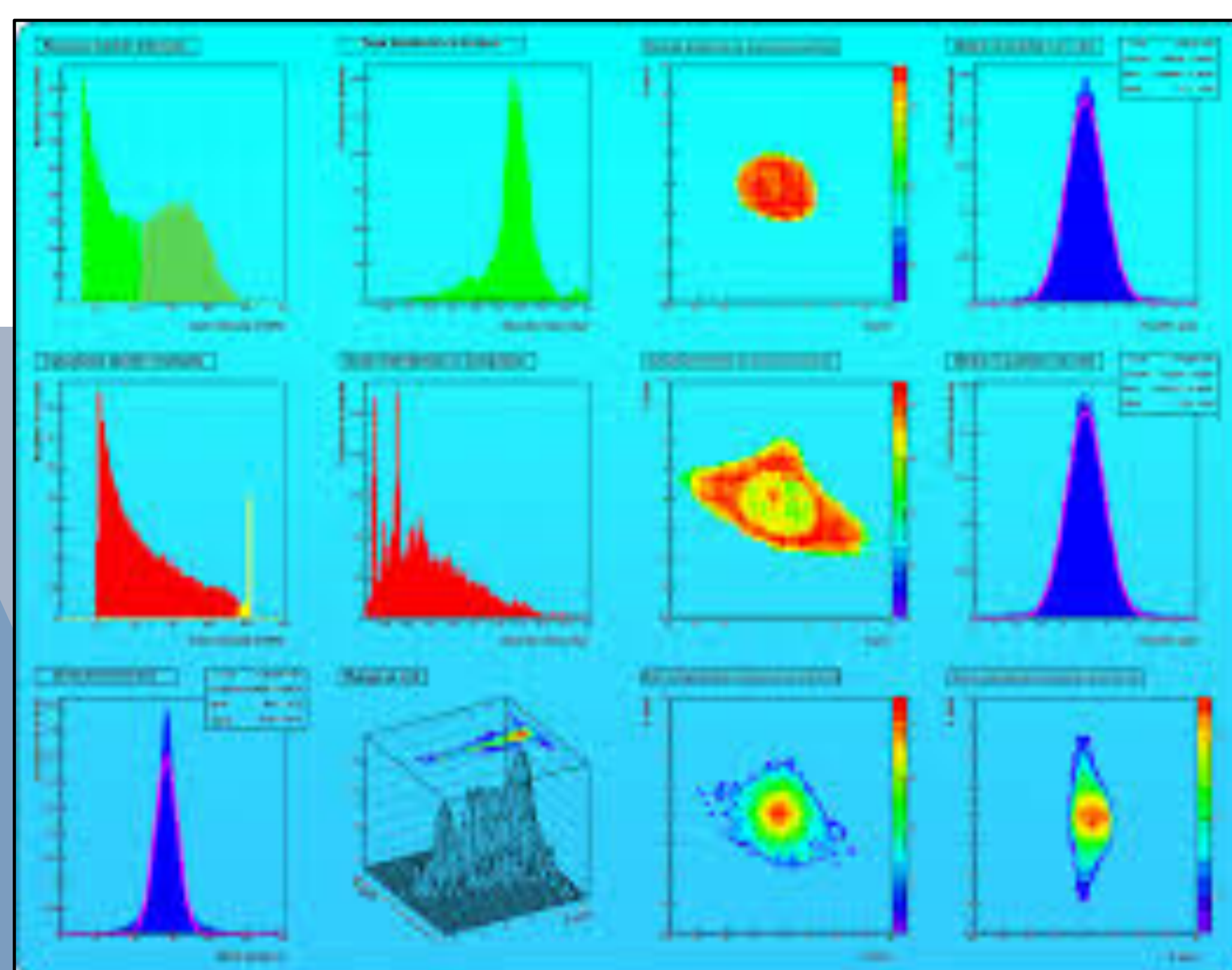
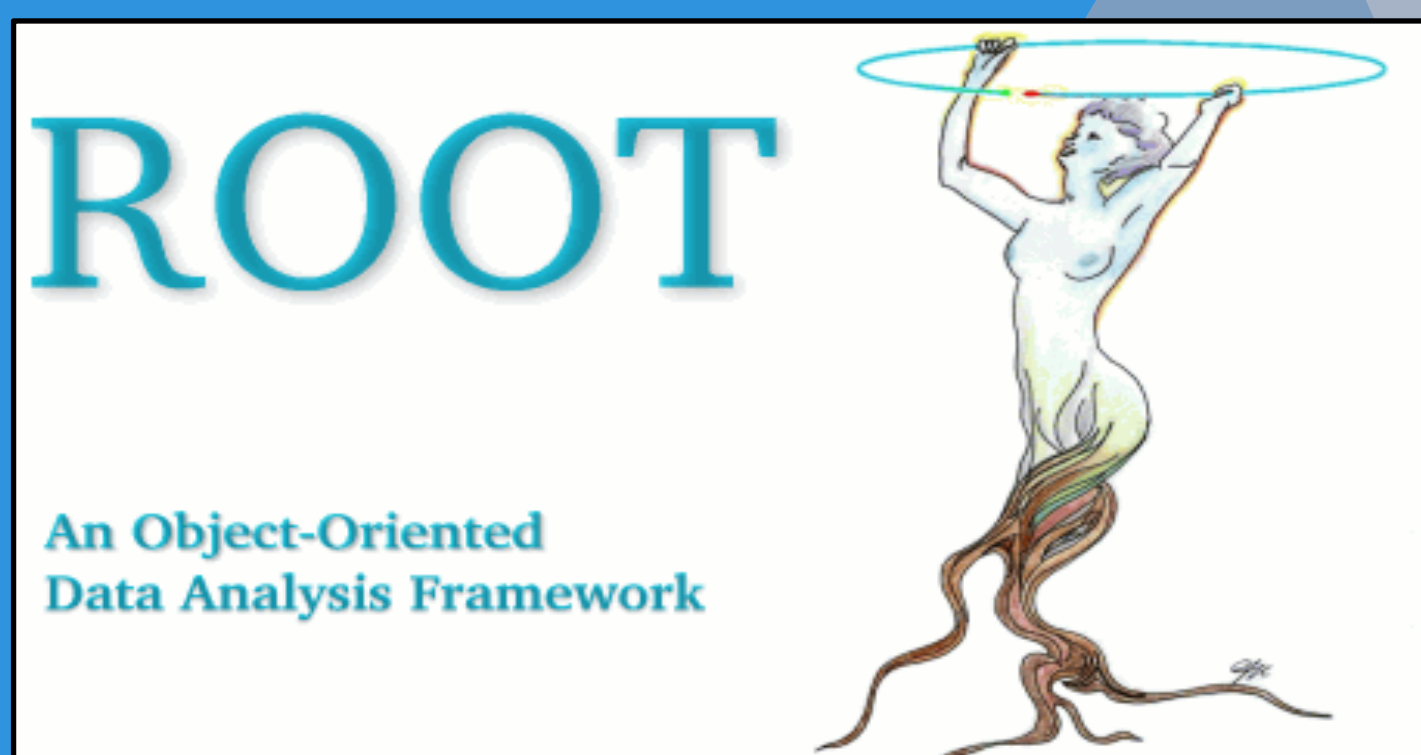
Object Reconstruction

- Charged particles (Inner Detector)
- Electron and photons
- Jet particles
- Muons (ID and MS)



Data Analysis

The ROOT system provides a set of frameworks with all the functionality needed to handle and analyze large amounts of data in a very efficient way.



ROOT could gradually be extended in many directions to become the cornerstone of most HEP software systems today, covering many areas of HEP computing, like analysis, simulation, reconstruction, event display and DAQ.

Besides in High Energy Physics ROOT is also widely used in many other scientific fields, like astronomy and biology but also in finance and medicine.

Congratulations to both
Atlas and CMS Collaborations
and to the builders of the LHC
on a magnificent achievement!

Peter Higgs

30 August 2012

