



MarlinReco

A Marlin Based Reconstruction

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Outline

- Overview
- Reconstruction Processors
- Utilities
- Initial results
- Plans
- Where to get it

Overview

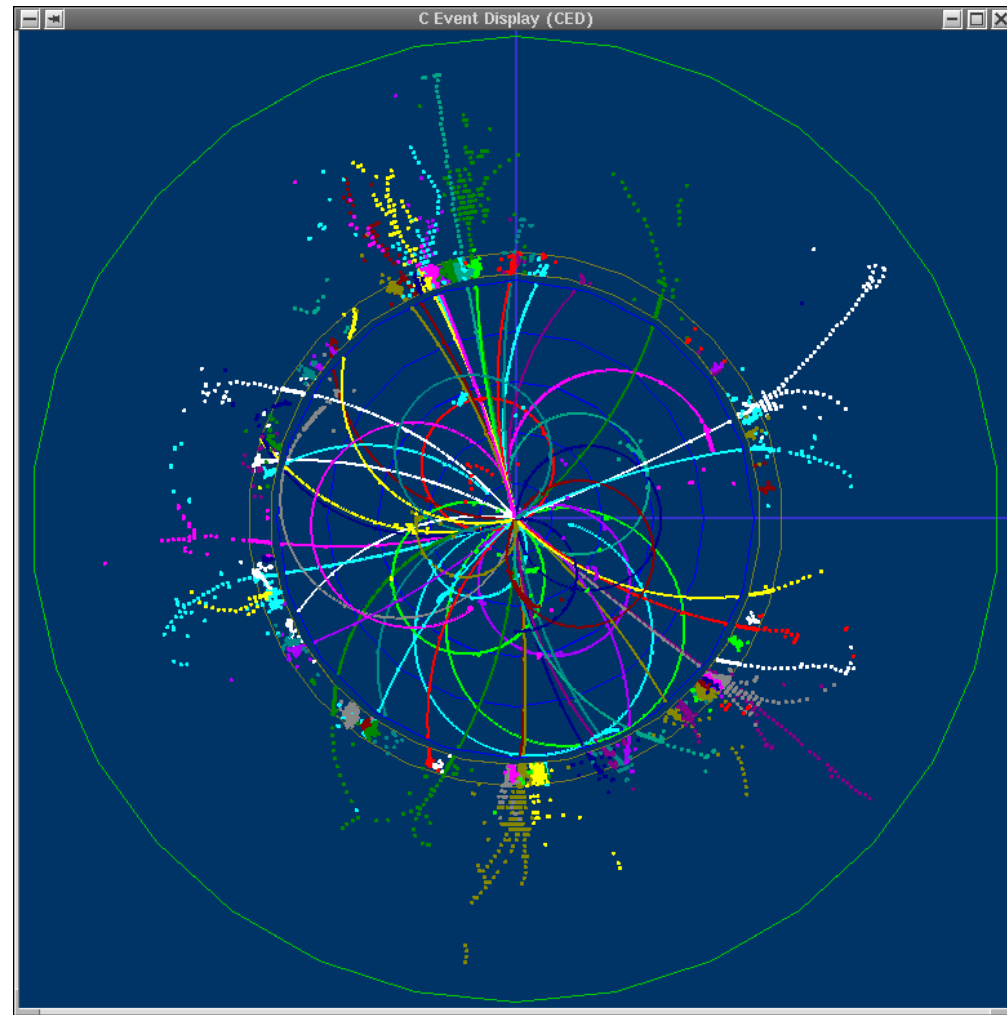
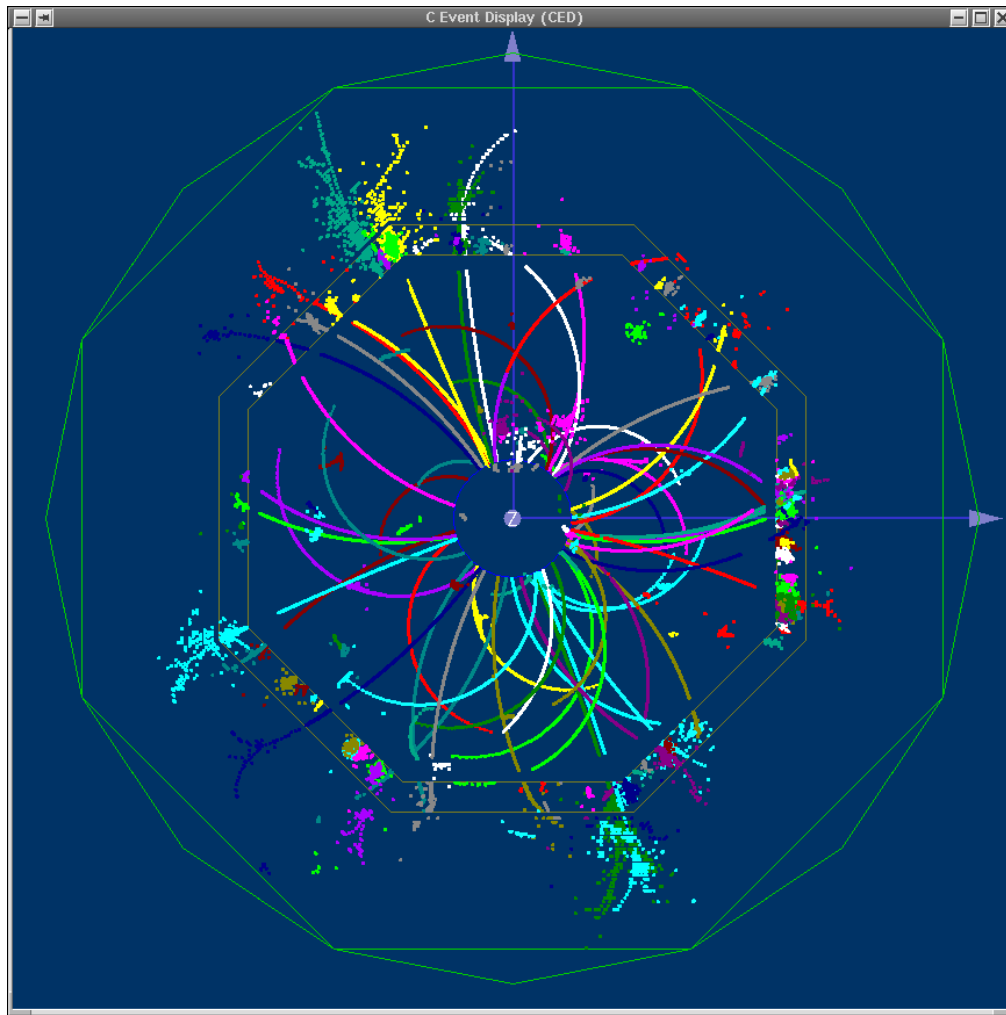
- MarlinReco is a suite of Marlin processors which aims to provide full reconstruction for detector concept studies
- Intended to take over from Brahms
- Uses LCIO as both transient and persistent data format
- Geometric input is implemented with GEAR and care has been taken to ensure algorithms are geometry independent – this allows MarlinReco to be applied to other Detector concepts

Overview

- Implemented as a package under Marlin v.9.1
 - This means it is possible to use it together with other Marlin processors. i.e. MAGIC
- It contains both full TPC Tracking and Clustering algorithms, as well as PFlow algorithms and other Event Property processors
- Cheaters are implemented to enable “Perfect PFlow” studies and to cover area of reconstruction not yet implemented e.g. forward tracking
- MarlinReco is able to run under both Linux and Windows

ttbar events for LDC and SID

No cheaters, only full reconstruction



Digitisation

- TPC – simple Gaussian smearing approach with a parameterised z dependence of the r - ϕ point resolution
- Calorimeter – Calibration coefficients are used though no smearing is yet implemented, possibility to perform digitisation using user defined thresholds
 - Ganging is provided to investigate different granularity
- Silicon Detectors – No digitisation currently implemented

Tracking

- Full TPC track finding and fitting algorithms taken from ALEPH and DELPHI
- Track finding is based on out – in search, using Circle Fit to build reference tracks
- These are then passed to a Kalman Filter in order to take scattering within the material into account for the final fit
- Provides LCIO tracks with full covariance matrix
- Track Cheater
 - Uses MC to generate road along which hits are taken, these are then fitted with a helix hypothesis

Clustering

- Trackwise calorimeter clustering exploiting the imaging capabilities of highly granular calorimeters
- Algorithm focuses on spatial information (no amplitude information is used at the stage of clustering), applicable to both digital and analogue calorimeters
- Minimal dependence on detector geometry, can be used for detector optimization studies
- Output : LCIO collection of Clusters. Each cluster is attributed with the following characteristics : center-of-gravity (as position estimate), vector of the main principle axis of inertia tensor (as direction estimate), total energy

PFlow

- PFA is implemented as a dedicated processor
- Track-cluster matching
- Estimation of four-momenta of PF objects
 - charged objects (clusters with associated tracks) : 4-momentum is evaluated based on tracking information
 - neutral particles (calorimeter clusters with no associated tracks) : 4-momentum is evaluated using calorimeter information
- Particle ID based on calorimeter cluster shape analysis (fraction of energy in ECAL, longitudinal profile, transverse profile) and amplitude analysis (test of MIP hypothesis)

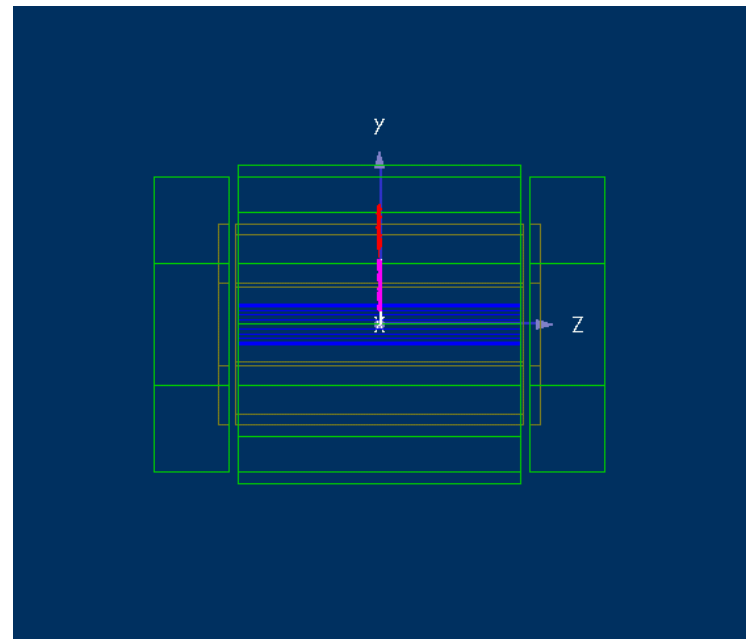
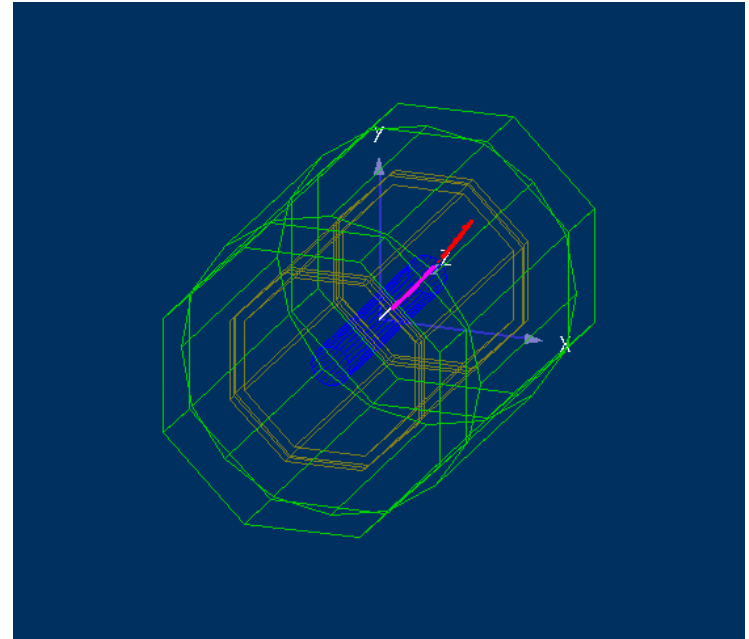
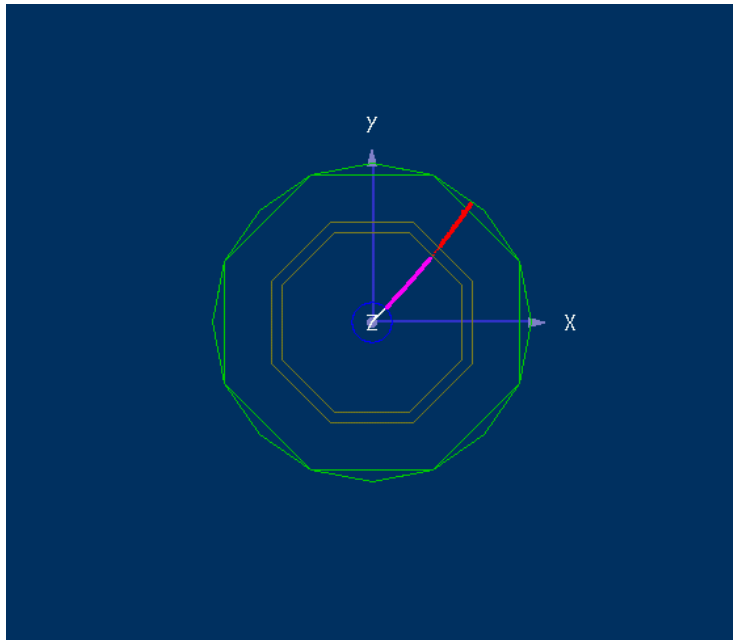
Event Properties

- ThrustReconstruction (T. Kraemer)
 - Tasso algorithm - calculates the principle thrust value and axis
 - Jetnet algorithm - calculates the principle thrust value and axis as well as the major and minor thrust values and axis
- Sphere (P. Krstonic)
 - calculates the sphericity, aplanarity, C and D event parameters
- SatoruJetFinder (J. Samson)
 - A universal jetfinder module developed by Satoru Yamashita for OPAL

CEDViewer

- CED developed by Alexi Zhelezov
- Based on GLUT – OpenGL
- Two Marlin Processors available
 - CEDViewer
 - GenericViewer
- Displays MC objects; simulated and reconstructed hits; reconstructed track and clusters
- Very useful in the early stages of algorithm development

CEDViewer

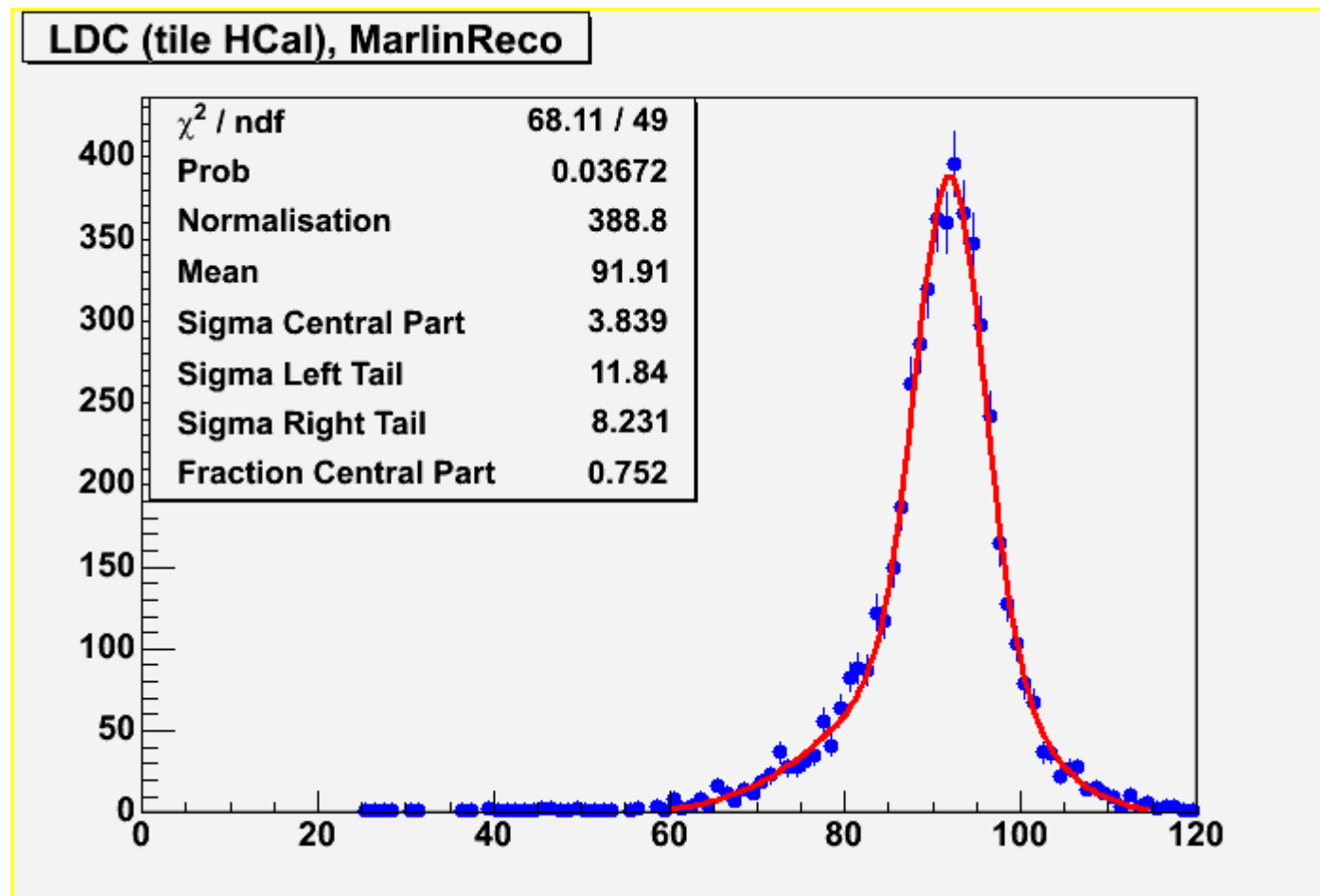


MarlinUtil

- Utility and Helper classes reside parallel to MarlinReco currently implemented as a separate Marlin package named MarlinUtil
 - helix fitter
 - clustershape

Initial Results

- $e^+e^- \rightarrow Z \rightarrow q\bar{q}$ using full reconstruction
- see talk by Alexi Raspereza tomorrow



Plans

- Immediate Plans
 - Extend tracking into the vertex detector
 - Neutral Vertex and Kink finding algorithms
 - More realistic digitisation
- Future Plans
 - Vertex tracking
 - Forward tracking
 - Vetexing
 - Particle ID
 - Dedicated SID tracking

Where to get MarlinReco

- Currently available as anonymous ccvssh checkout from DESY
 - CVSROOT :ext:anonymous@cvssrv.ifh.de:/marlin
- Soon to be available as a tarball or zip archive via web interface
- Available on the “ILC Software for the LDC” DVD for both Window and Linux
- None of these represent an “official release” of MarlinReco, they are meant to allow people to see whats there and to offer a starting point to get involved

Summary

- MarlinReco provides a first important step towards the full reconstruction software needed to answer questions raised by the detector concept studies
- Initial studies using MarlinReco are underway
- Plans to extend functionality exist
- If you have reconstruction code we would like to hear from you