



MarlinReco

A Marlin Based Reconstruction

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ILC Workshop,
Snowmass
August 17, 2005

Outline

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

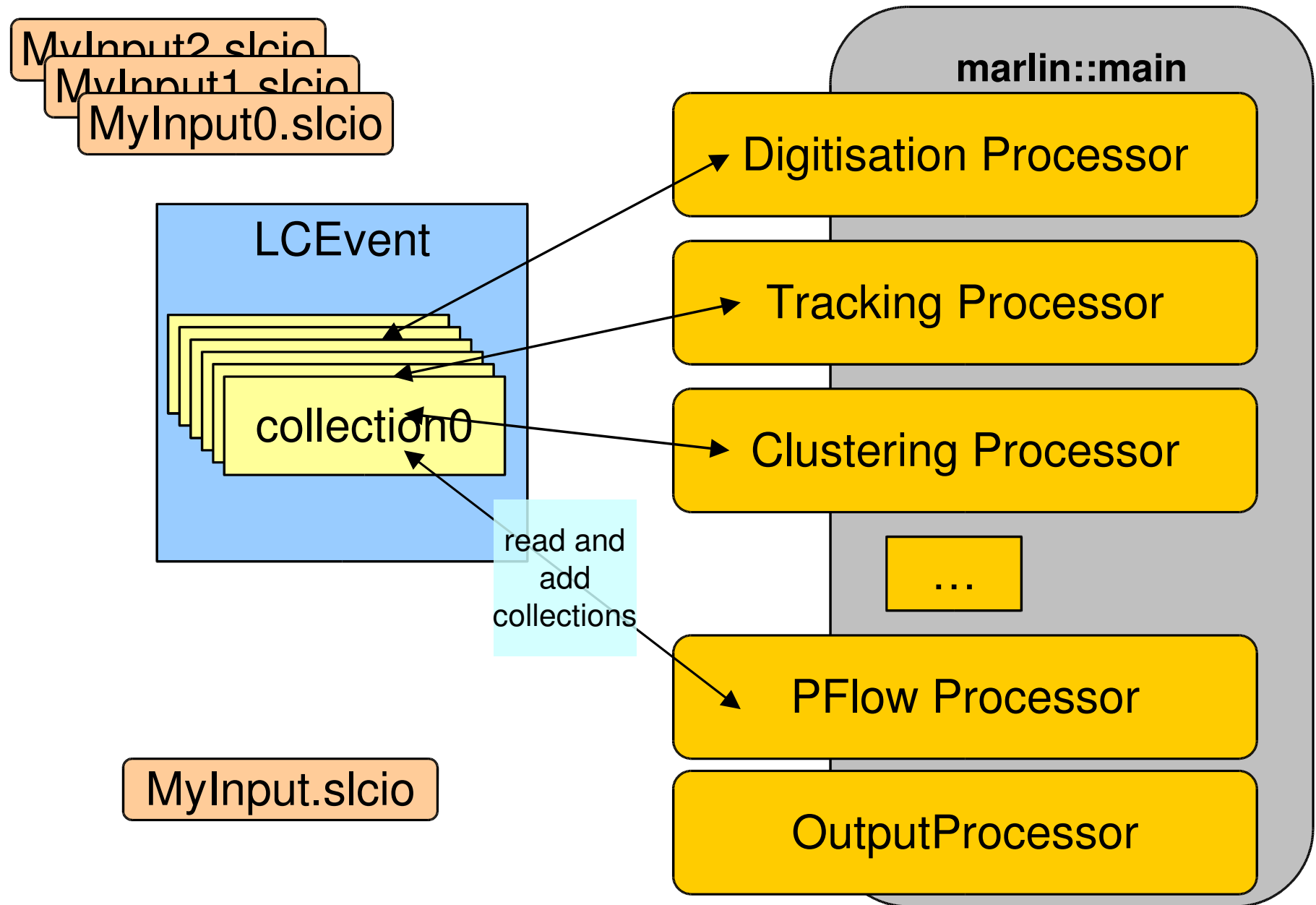
Overview

- MarlinReco is a suite of Marlin processors which aims to provide full reconstruction for detector concept studies
- Using Marlin provides a well defined modularity
- Consequently this means it is possible to use it seamlessly with other Marlin processors
 - e.g. MAGIC – a clustering algorithm written by C. Ainsley

Overview

- MarlinReco currently provides
 - Digitisation
 - TPC Tracking
 - Clustering algorithms
 - Event Properties
 - PFlow algorithms
 - Cheaters
 - these are implemented to enable “Perfect PFlow” studies and to cover area of reconstruction not yet implemented, e.g. forward tracking

Overview



Common API

- LCIO
 - Uses LCIO as both transient and persistent data format
- GEAR
 - Geometric input is implemented using the GEAR API
 - This makes MarlinReco independent of the way in which the geometry is defined
 - particularly important for test beam studies (Real Data)

For the available MarlinReco Processors care has been taken to ensure algorithms are geometry independent – this allows MarlinReco to be applied to other Detector concepts

Implementation

- Implemented as a package under Marlin v.0.9.1
- Intended to take over from Brahms for optimisation studies
- MarlinReco is able to run under both Linux and Windows

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

- Under development

Tracking

- Full track finding and fitting algorithms taken from ALEPH and DELPHI optimised for TPC
 - 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
 - Output: LCIO track collection with full covariance matrix
- Track Cheater
 - Uses MC to generate road along which hits are taken, these are then fitted with a helix hypothesis
 - Output: LCIO track collection

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

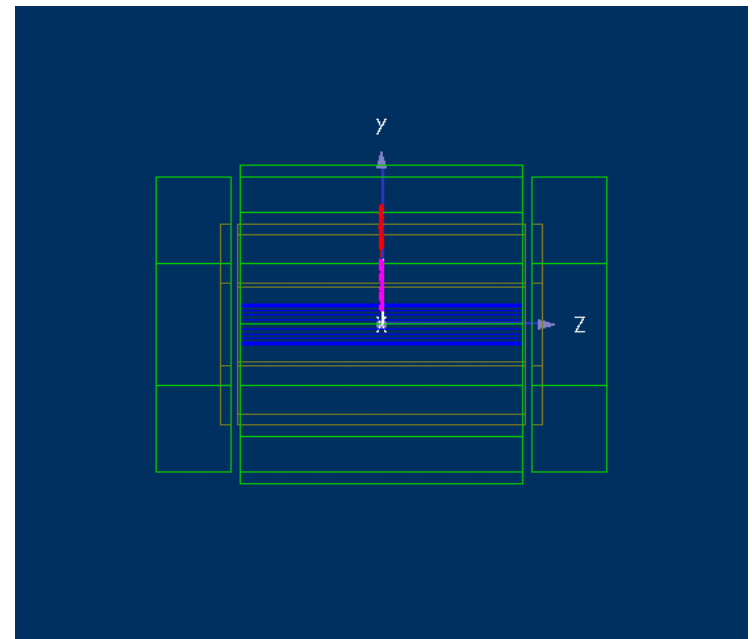
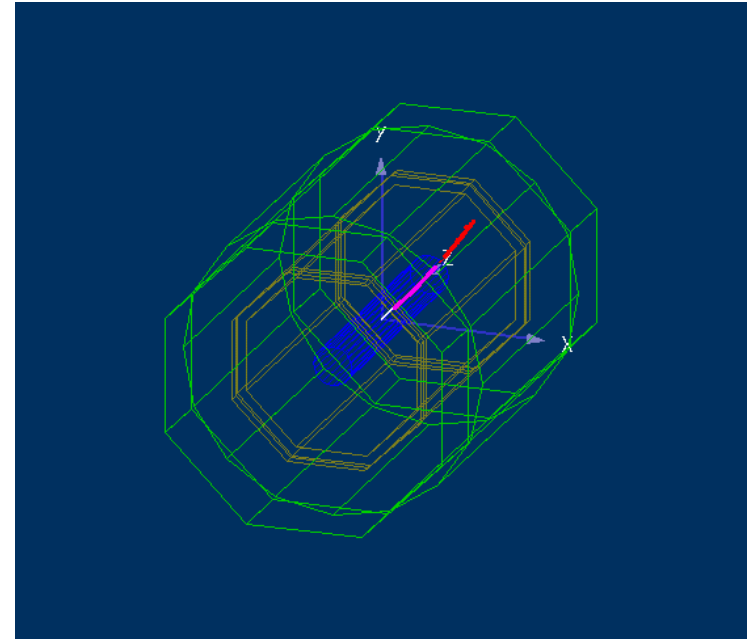
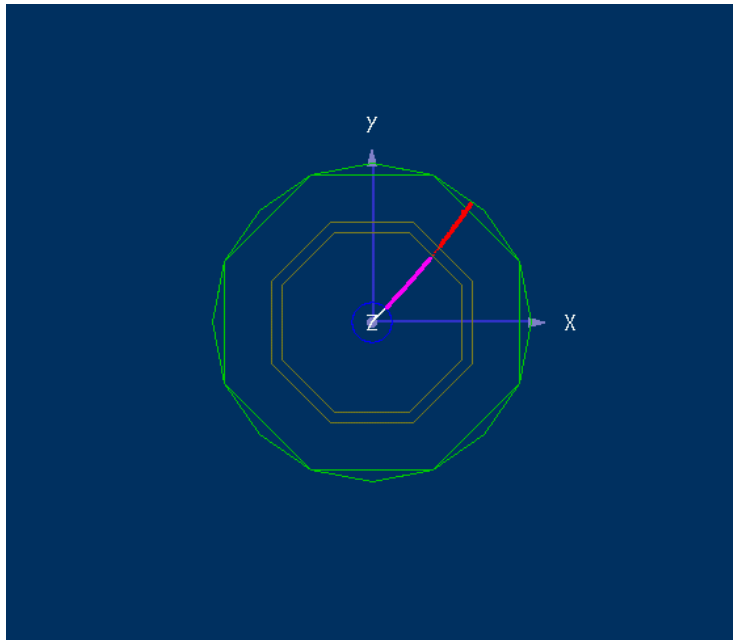
Event Properties and Utilities

- 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
- Utility and Helper classes
 - These reside parallel to MarlinReco currently implemented as a separate Marlin package named MarlinUtil
 - e.g. helix fitter, clustershape (O. Wendt)

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

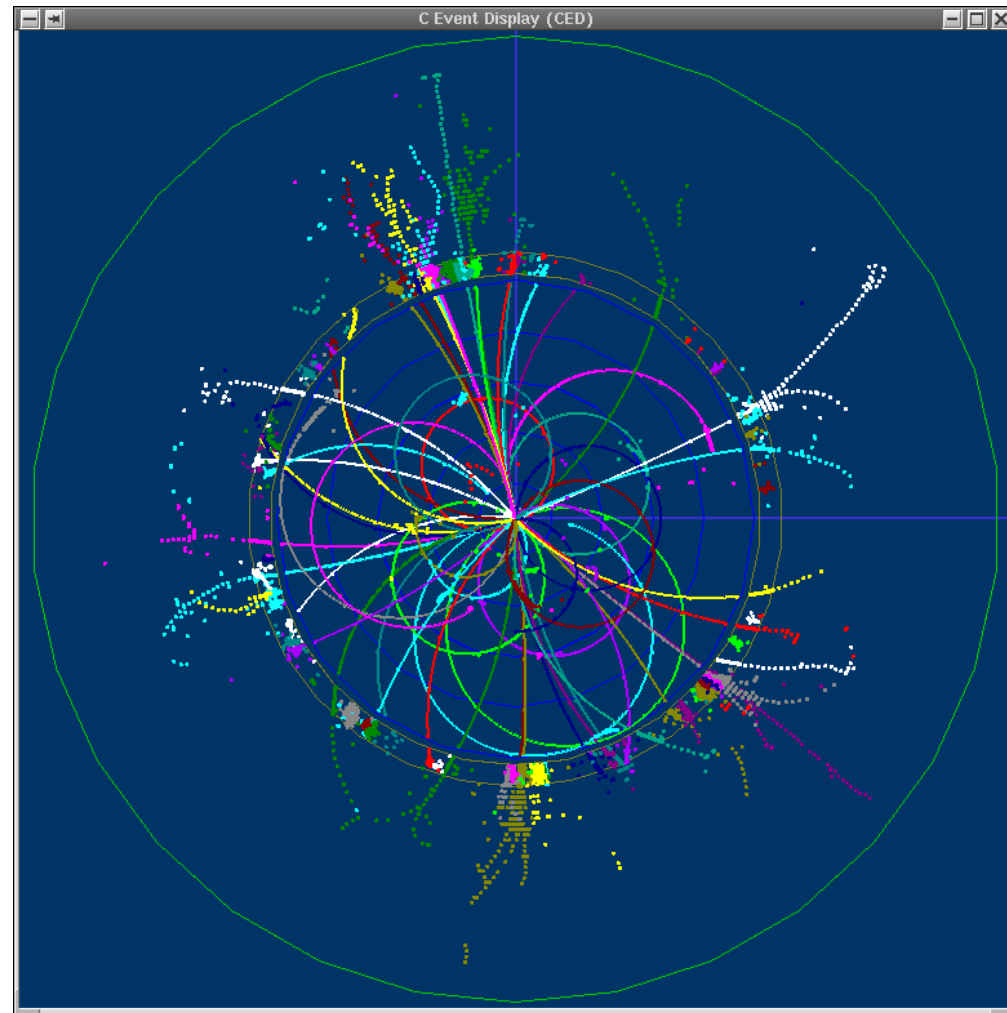
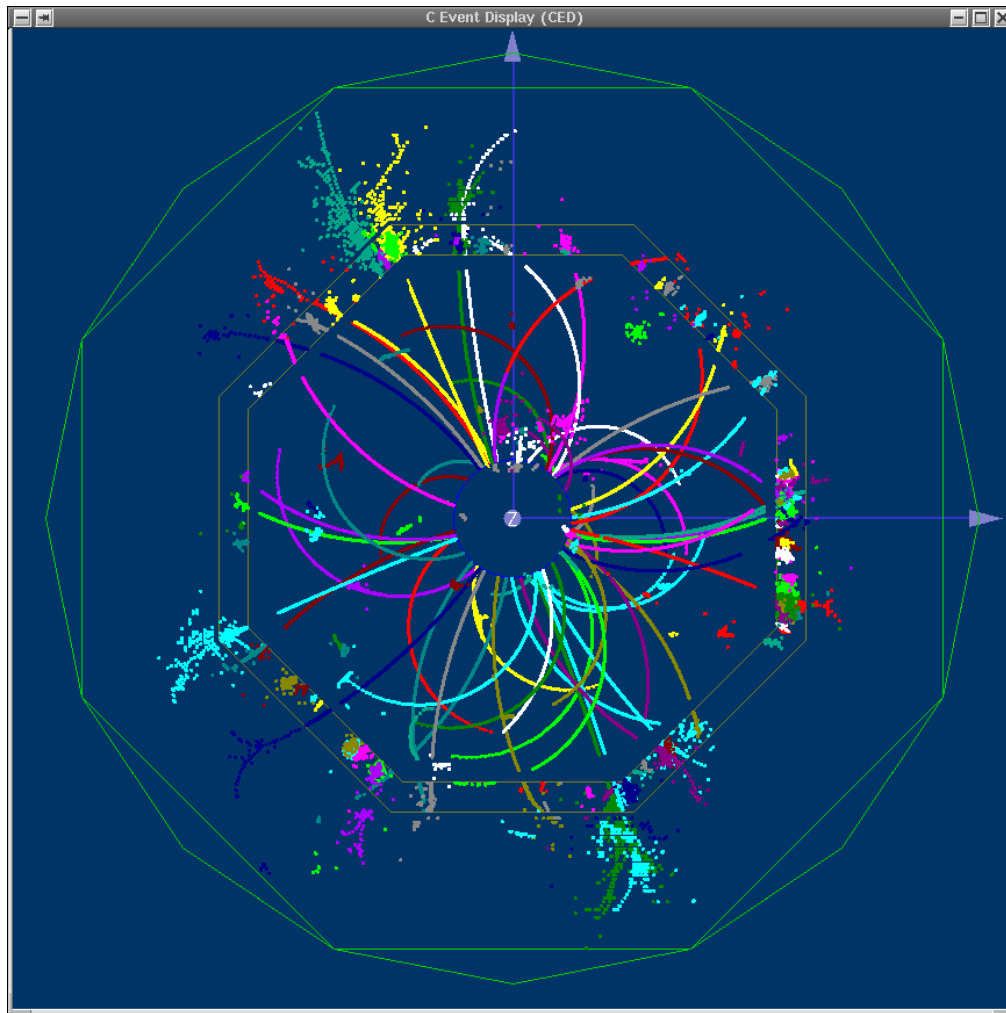


PFlow

- 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
 - currently based on calorimeter cluster shape analysis (fraction of energy in ECAL, longitudinal profile, transverse profile) and amplitude analysis (test of MIP hypothesis)

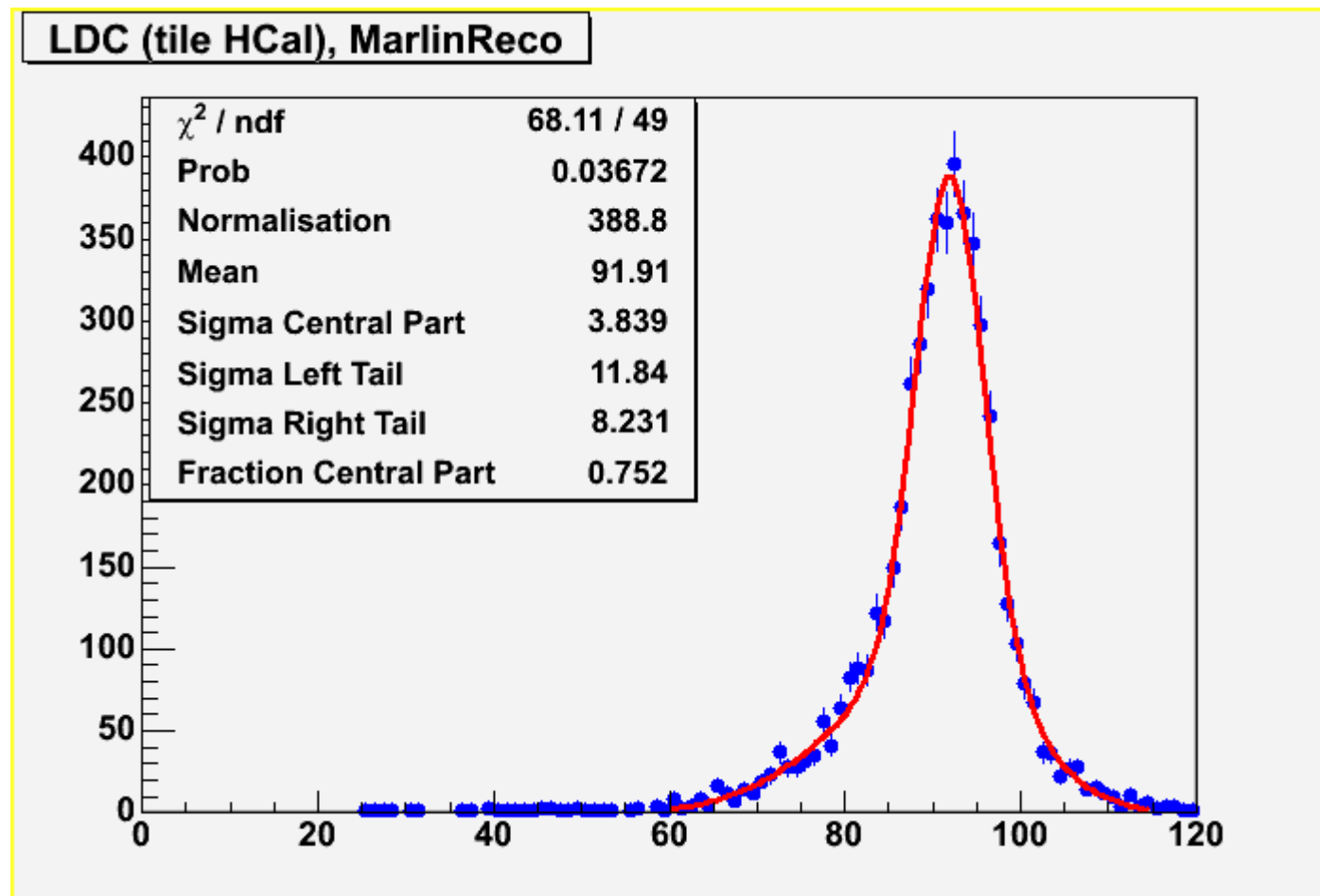
ttbar events for LDC and SID

No cheaters, only full reconstruction



Initial Results

- $e^+e^- \rightarrow Z \rightarrow q\bar{q}$ using full reconstruction
- see talks by Alexei Raspereza



Plans

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

Where to get MarlinReco

- Available from ilcsoft Savannah as a tarball or zip archive via
 - www-flc.desy.de/ilcsoft
- Available on the “ILC Software for the LDC” DVD for both Window and Linux
- These do not represent a “production release” of MarlinReco, they are meant to allow people to see whats there and to offer a starting point to get involved

Where to get MarlinReco

The screenshot shows the MarlinReco - Summary page in a Mozilla Firefox browser window. The page is titled "MarlinReco - Summary" and is part of "The ILCSoft Savannah" project. It features a navigation menu with links to Public Areas, Main, Docs, Files, Support, CVS, Bugs, Tasks, and News. The main content area includes a "Public Areas" section with links to Documentation, Filelist (Download area), and Project Memberlist (8 members). There is also a "Latest News" section with a "No news items found" message. The page is powered by Apache and includes a "CVS Repository" link.

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Where to get MarlinReco

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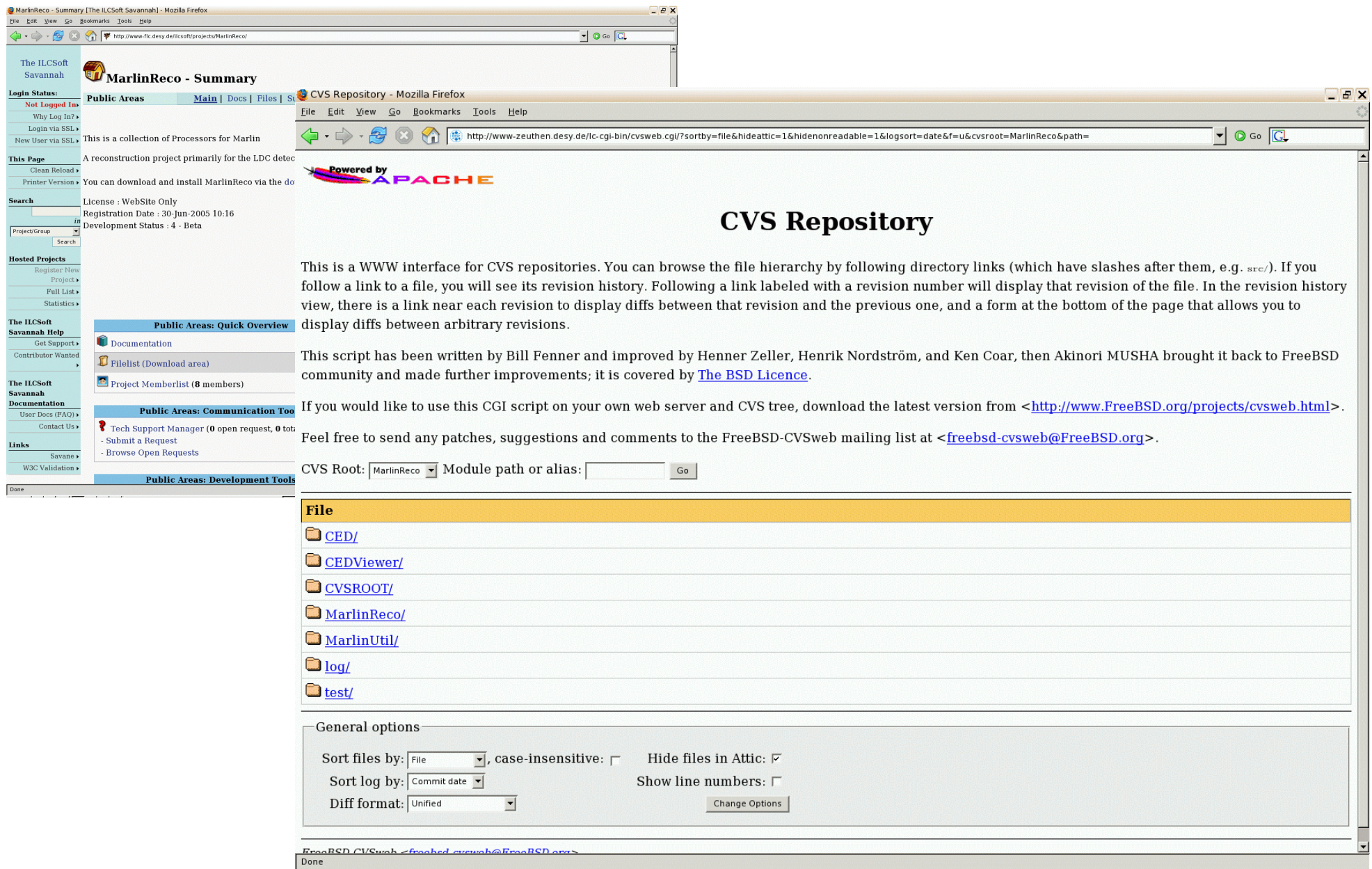
lowing directory links (which has slashes after them, e.g. `ufs`). If you
 evision number will display that revision of the file. In the revision history
 revious one, and a form at the bottom of the page that allows you to

rdström, and Ken Coar, then Akinori MUSHASHA brought it back to FreeBSD

the latest version from <<http://www.FreeBSD.org/projects/cvsweb.html>>.

iling list at <freebsd-cvsweb@FreeBSD.org>.

Where to get MarlinReco



MarlinReco - Summary

Public Areas | [Main](#) | [Docs](#) | [Files](#) | [Search](#)

This is a collection of Processors for Marlin

A reconstruction project primarily for the LDC detector

You can download and install MarlinReco via the [do](#)

License : WebSite Only
Registration Date : 30-Jun-2005 10:16
Development Status : 4 - Beta

Public Areas: Quick Overview

- Documentation
- Filelist (Download area)
- Project Memberlist (8 members)

Public Areas: Communication Tools

- Tech Support Manager (0 open request, 0 total)
- Submit a Request
- Browse Open Requests

Public Areas: Development Tools

CVS Repository

This is a WWW interface for CVS repositories. You can browse the file hierarchy by following directory links (which have slashes after them, e.g. `src/`). If you follow a link to a file, you will see its revision history. Following a link labeled with a revision number will display that revision of the file. In the revision history view, there is a link near each revision to display diffs between that revision and the previous one, and a form at the bottom of the page that allows you to display diffs between arbitrary revisions.

This script has been written by Bill Fenner and improved by Henner Zeller, Henrik Nordström, and Ken Coar, then Akinori MUSHASHI brought it back to FreeBSD community and made further improvements; it is covered by [The BSD Licence](#).

If you would like to use this CGI script on your own web server and CVS tree, download the latest version from <http://www.FreeBSD.org/projects/cvsweb.html>.

Feel free to send any patches, suggestions and comments to the FreeBSD-CVSweb mailing list at frebsd-cvsweb@FreeBSD.org.

CVS Root: Module path or alias:

File

- [CED/](#)
- [CEDViewer/](#)
- [CVSROOT/](#)
- [MarlinReco/](#)
- [MarlinUtil/](#)
- [log/](#)
- [test/](#)

General options

Sort files by: , case-insensitive: ☐ Hide files in Attic: ☒

Sort log by: Show line numbers: ☐

Diff format:

FreeBSD CVSweb frebsd-cvsweb@FreeBSD.org

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