

Software tools summary

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- Not attempting a detailed review of the two sessions (11 talks) (one **Simulation**; other **reconstruction tools**)
- Start from introductory overview talk of Ties Behnke – raised several key issues
- Mention a few topics which were addressed in the meeting (apologies to those whose work isn't included).
- Helpful to hear a lot about activities in the US (N Graf)

Simulation

Two main full simulation tools in Europe:

➡ **MOKKA** (GEANT4 based)

➡ **BRAHMS** (GEANT3 based)

The transition GEANT3 → GEANT4 is in full swing (worldwide)

BRAHMS is still being used, and is still useful

Most development is concentrated on MOKKA

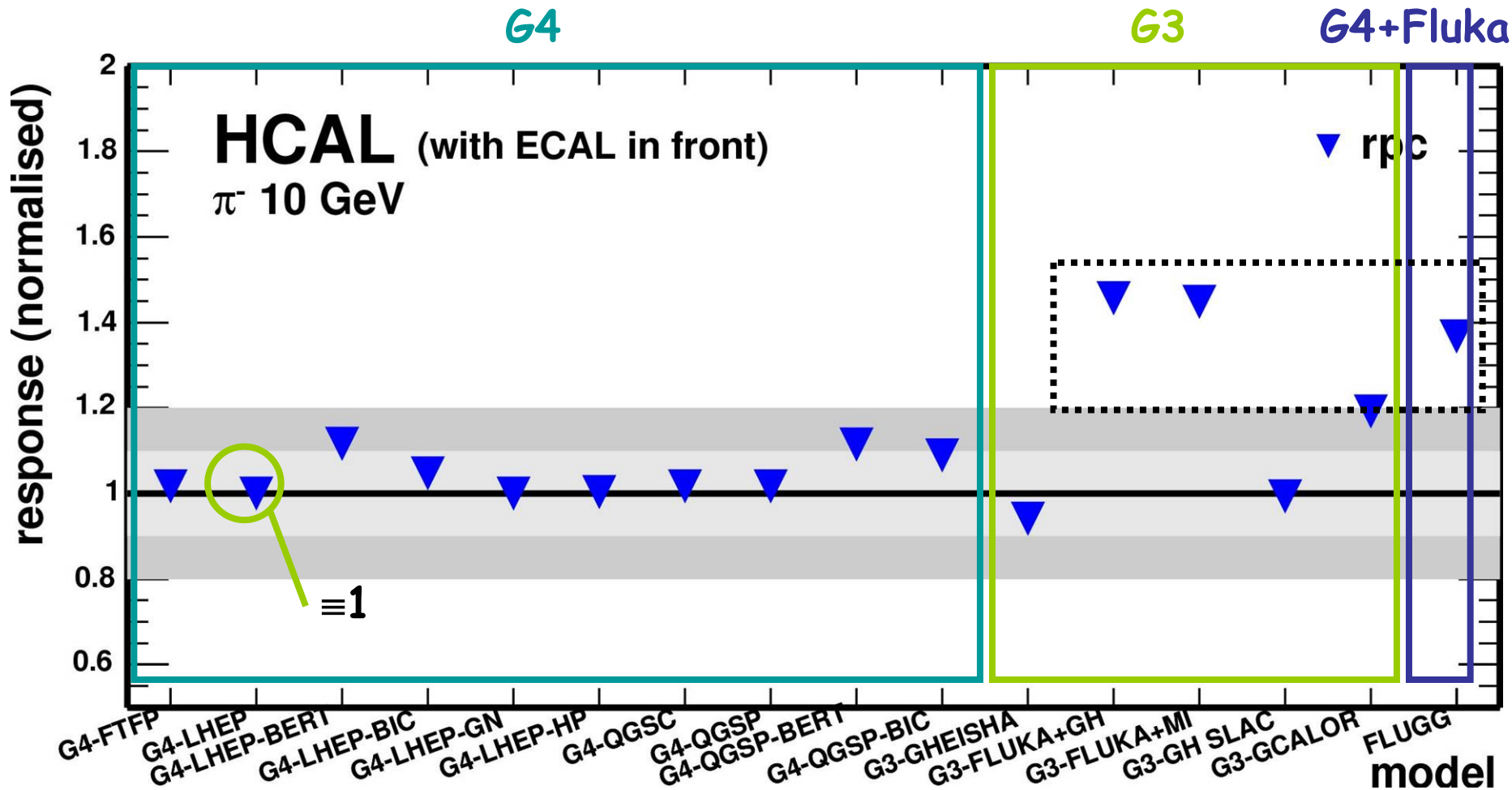
Latest Mokka (J-C Brient pp P Mora de Freitas)

- The current Mokka release implements almost all needed interfaces for several input/output file formats (**HEPevt/STDHEP**)
- The Mokka **LCIO interface** is up to date
- Documentation particles from the generators should come with a LCIO standard feature in the future
- **LCPhys Physics List** also available in the current Mokka distribution (**D Wright – SLAC**)
- Work in progress for new detector description improvements, mainly concerning **test beam**

Physics models in Geant3/Geant4

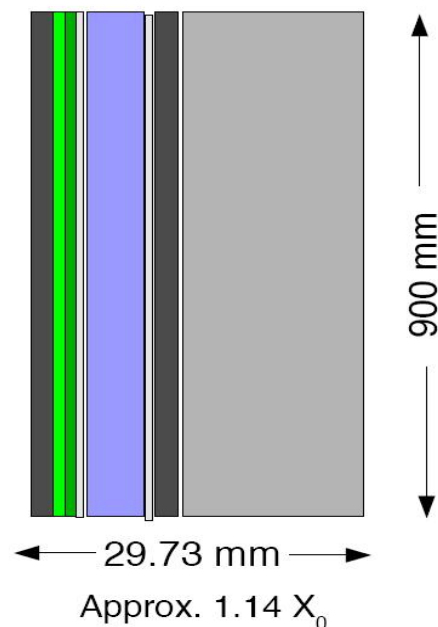
- Several talks addressed this (R Pöschl, N Watson, G Mavromanolakis).
- Significant differences between hadronic models, and for e/m showers between Geant3/Geant4.
- Major focus of calorimeter test beam program (e.g. CALICE).
- Impact on particle flow and detector design.
- New LCPhys physics list for Mokka “best guess”, but who knows?

<No. HCAL cells hit/event>, 10 GeV π^-



- RPC HCAL more stable vs. model than scint.
- Models incorporating FLUKA >20% above G4-LHEP

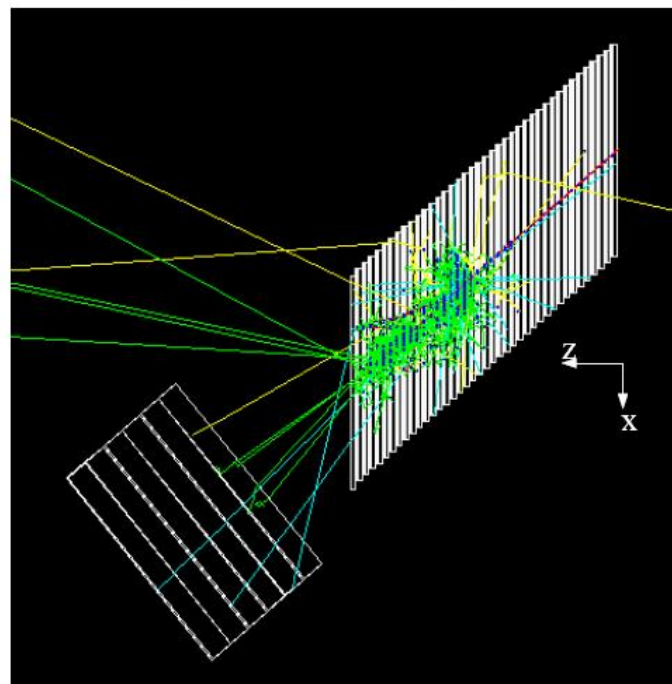
Example – CALICE prototype (R Pöschl)



39 Layers implemented

Approx. 4.7 λ_I

A Simulated Event



Much more detailed simulation than previously

MOKKA: Open Questions (T Behnke)

Continue to improve the sub-detectors

work is needed in particular in the area of tracking detectors

Need a flexible way of changing geometries in connection with studies of detector concepts

Conceptually we in Europe have adopted the database approach for the short and medium term developments.

Continue to discuss and develop the way the database is used, in particular during development (satellite databases? private databases? support for multiple databases)

note: we still maintain an interest in providing an interface to the XML based geometry systems used and developed in the US

General Software Framework

Proposed basic guidelines:

All software from simulation (or test beam data) to reconstruction:

- is based on the **LCIO data model**
- uses LCIO as a persistency mechanism
- uses LCIO as a transient data model between modules

A de-facto standard (Europe): core software (simulation, reconstruction) is based on plain C++ (c.f. Java in US)

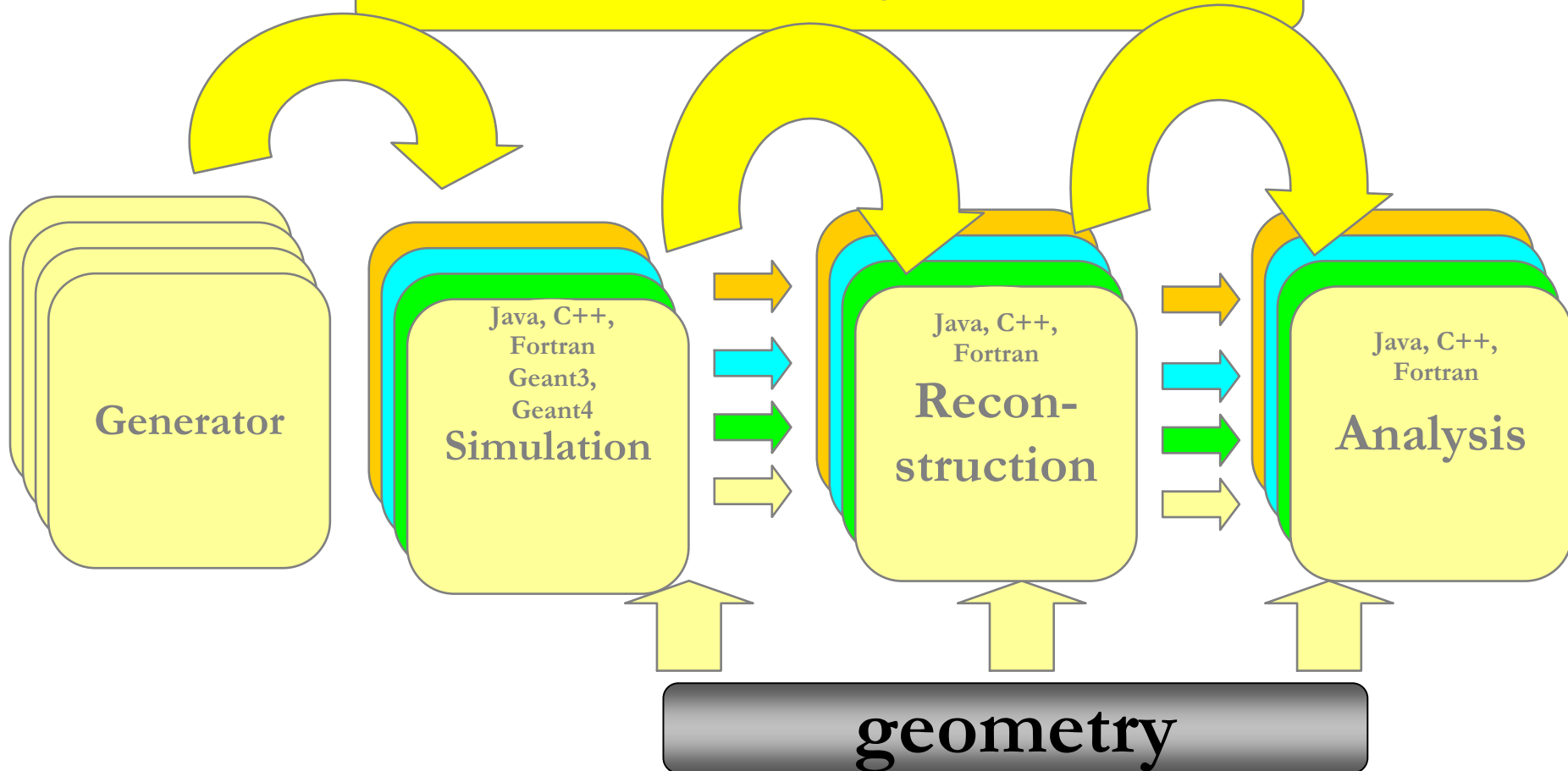
- no root dependencies in any central software
- other languages, if used, are integrated through wrappers from C++

We are very interested to provide a close integration of JAVA into this, but the technical side is not really solved.

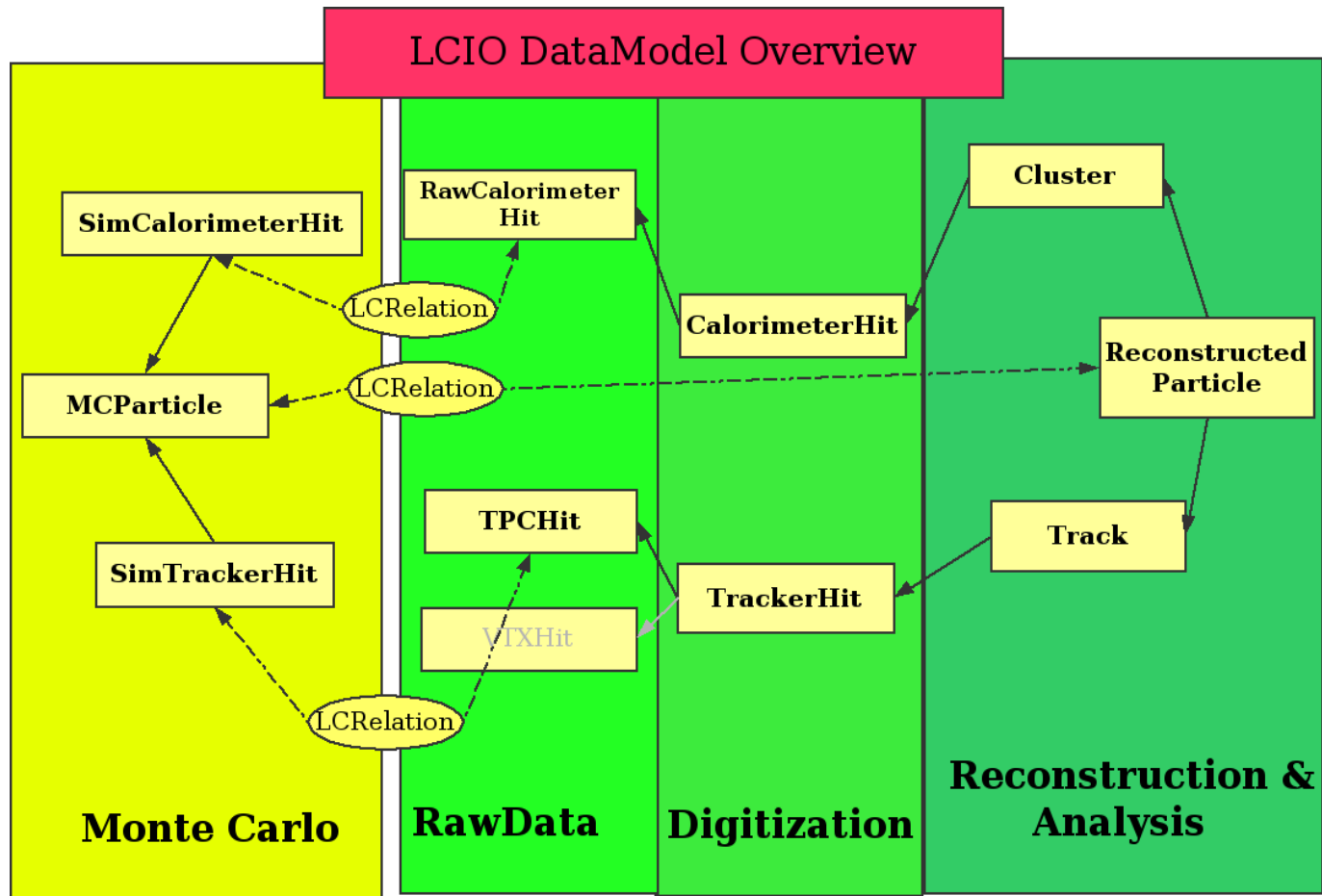
The user backend is totally open: Root, JAS, PAW,

LCIO

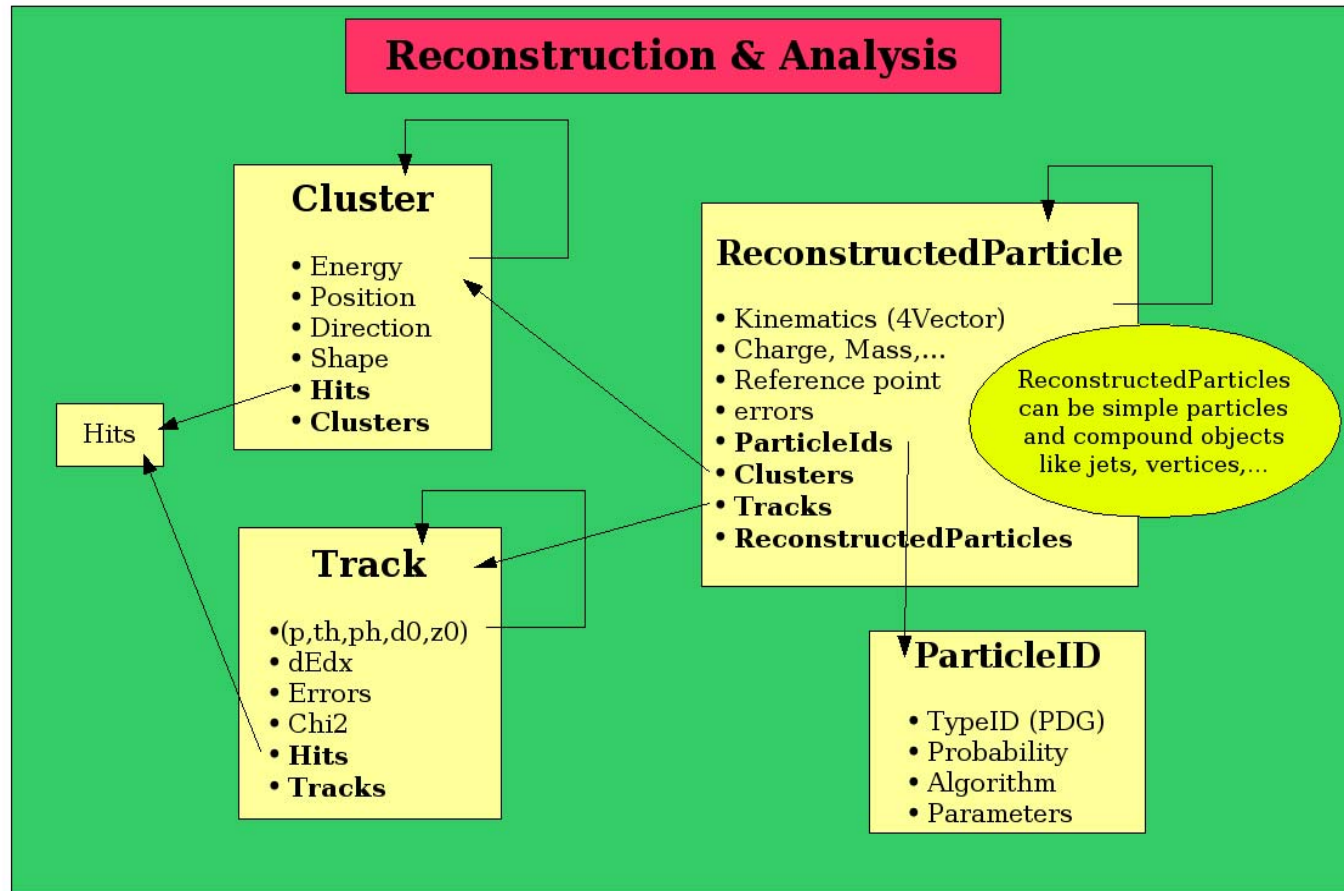
LCIO Persistency Framework



LCIO data model



LCIO data model



LCIO status

- V1.0 available, stable, supports MC info and hits. Implemented in MC packages.
- V1.1 beta available, first implementation of reconstruction objects.
- Next release imminent. Needed to enable progress in packaging standard reconstruction tools in a nice way.

Reconstruction + analysis

- First “reconstruction framework” exists: MARLIN

Modular Analysis and Reconstruction for the LiNear Collider

- see talk by J. Samson in this meeting
- simple, open framework
 - dynamically configured through steering file
 - defines a standard structure for a module
 - LCIO based
- It's a starting point, lots still needs to be done

existing modules:

HCAL prototype ganging module

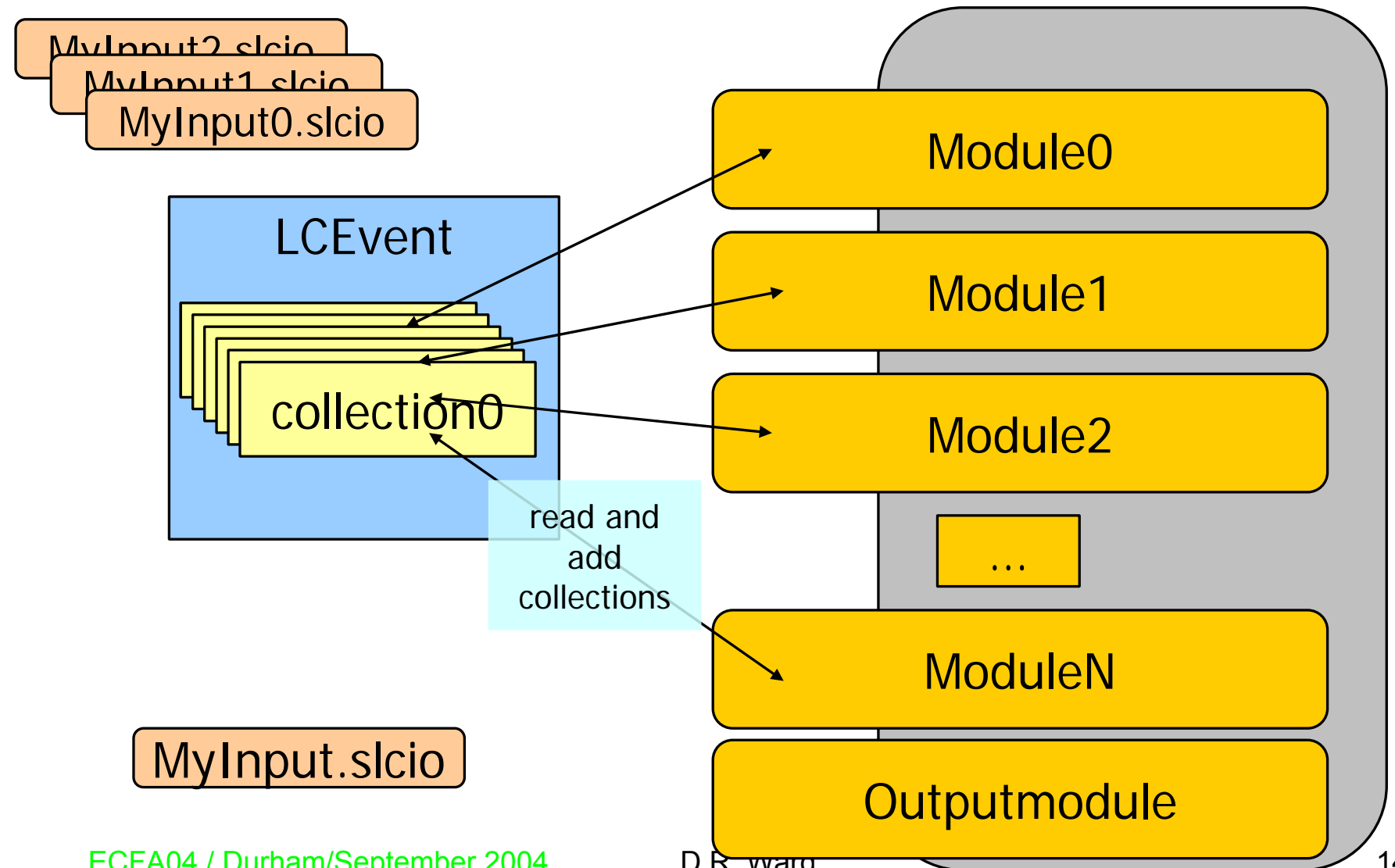
Jet Finder, Lepton Finder, ZVTOP module

soon: wrapped reconstruction software (tracking, ...)

Cluster finding

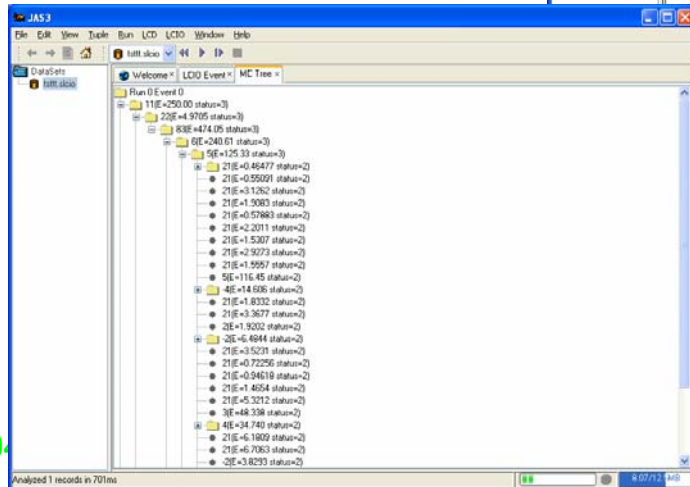
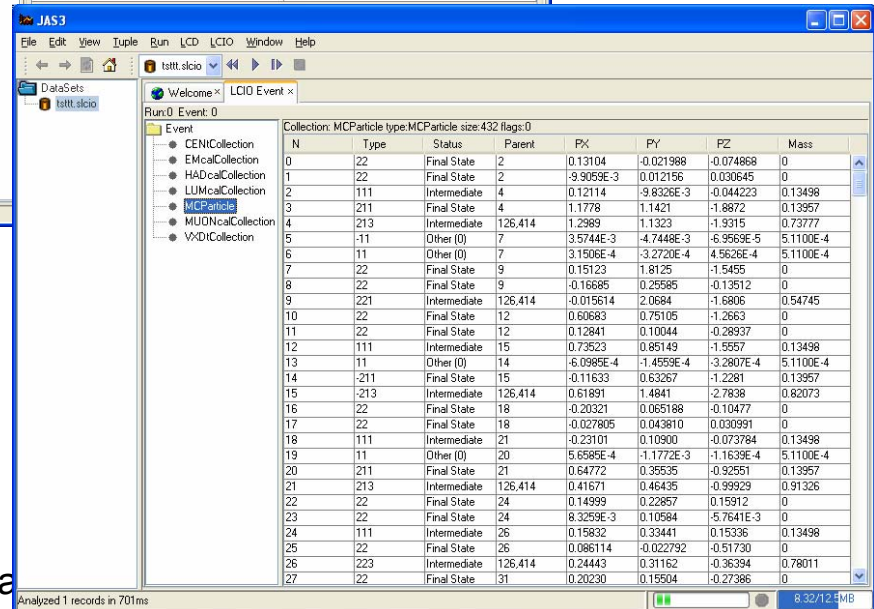
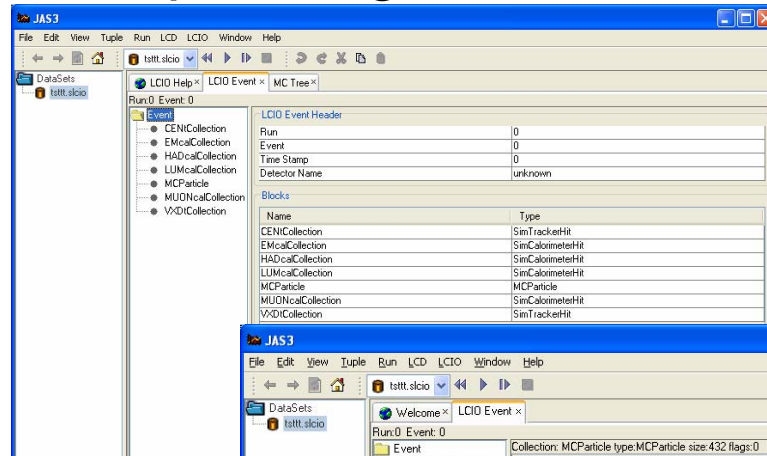
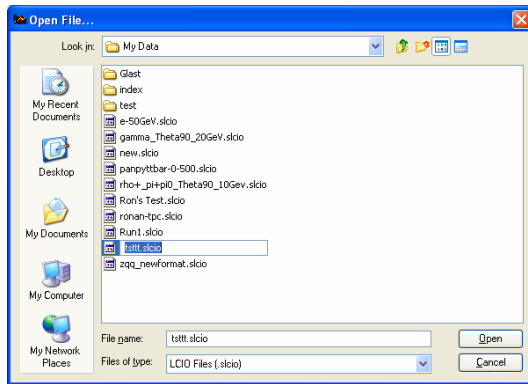
Need to make all this work together; make it usable.

MARLIN – modules and LCIO



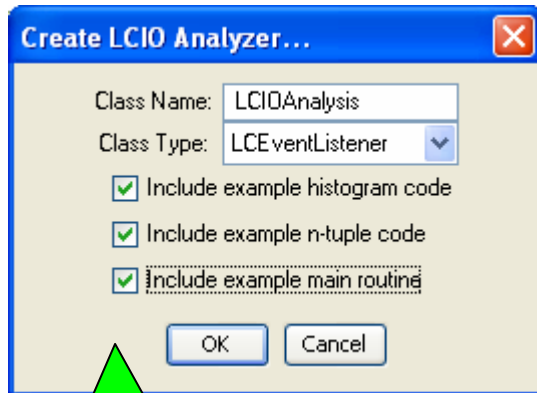
US reconstruction framework: LCIO plugin for JAS3

- Works with any LCIO file
- Diagnostic tools allow to step through and view events

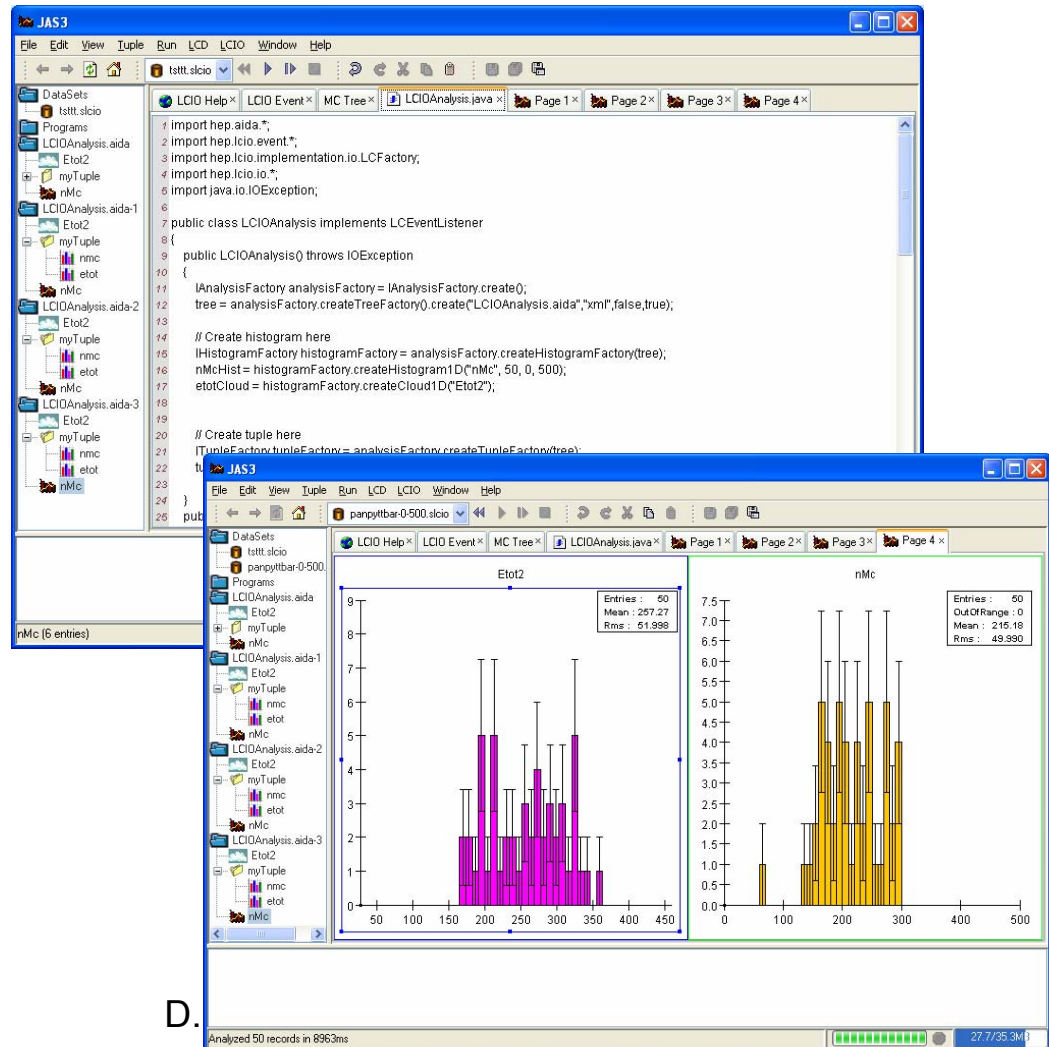


LCIO plugin for JAS3

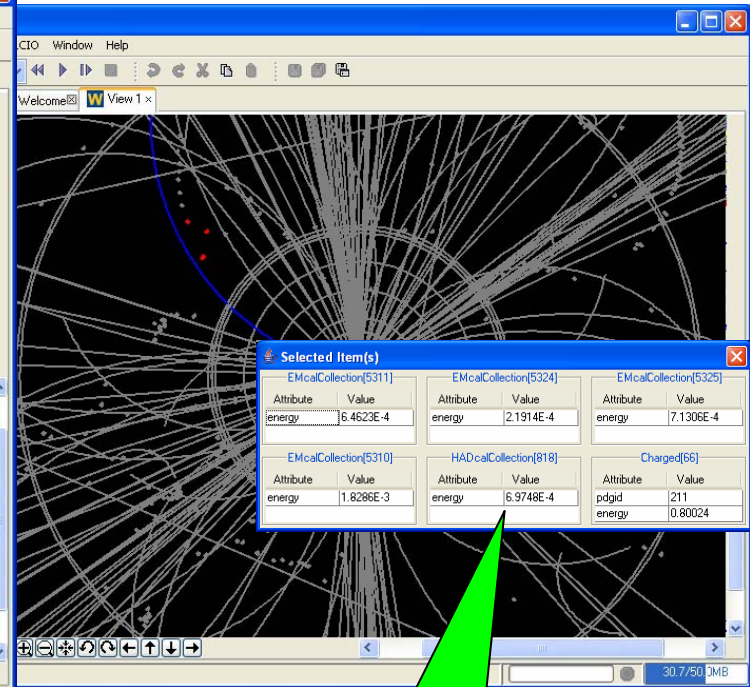
● Event Analysis



Wizard will create outline of analysis, and can include sample analysis code. Main routine allows running outside of JAS



WIRED3 with LCIO Plugin



Tree controls
visibility. (HepRep2
support in WIRED3
is preliminary)

Picking supports
viewing physics
attributes

Interfaces

- Need to develop common tools – the wider the user community, the better
- First attempts to agree on common programs have not converged
- Proposal: concentrate on the definition of interfaces

LCIO: interface between data and programs:

an example for a very successful collaboration (SLAC-DESY-LLR)

CGI: Common Geometry Interface

define access methods for the basic geometry items

examples:

→ getmaterial

→ getX0

→ getposition

→

prepare a concrete
proposal based on the
existing CGA

Have to get the discussion started a.s.a.p.!

Data Access

Agreement on LCIO facilitates the sharing of data:

now we need to develop the tools to actually share the data

Use GRID tools to access data transparently from different servers around the world?

Work has not really started on this need to make a real effort in the near future to get things going.

Information + plans

- Info re. LCIO <http://lcio.desy.de> and <http://forum.linearcollider.org>
- Info re MARLIN <http://www.desy.de/~gaede> (real site to come soon)

User feedback is extremely important on all these projects!

Use the forum: <http://forum.linearcollider.org>
or send e-mail to one of the suthors

- Need to know what is needed for the conceptual design studies. e.g. what level of flexibility in geometry/reconstruction?
- Envisage working meeting in Europe late-autumn to review progress and plan.
- More general software workshop preceding LCWS in Stanford March 2005.

Summary

We are making progress – some at least

- LCIO development is converging. Good prototype of interregional development.
- Several groups are using LCIO both in test beam experiments and in simulation.
- MARLIN is starting point for a modern reconstruction system. Also Java-based tools in US.
- First tools for modern reconstruction framework starting to appear. Some way from a complete system.
- Need reconstruction to be as geometry independent as possible. But still access to geometrical info is a major unsolved problem – address through common interfaces?
- Data access issue?
- **Still very few people available to work on general tools.**