CLAS12 Software User Environment

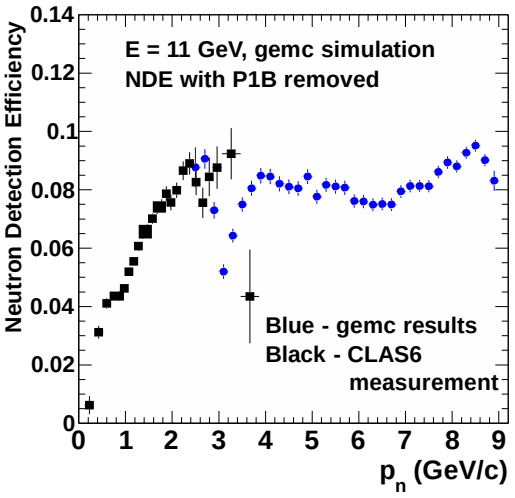
- Introduction: Software tasks, users, projects.
- Tools.
- Simulation.
- Reconstruction.
- Visualization
- Physics Analysis.
- Summary.

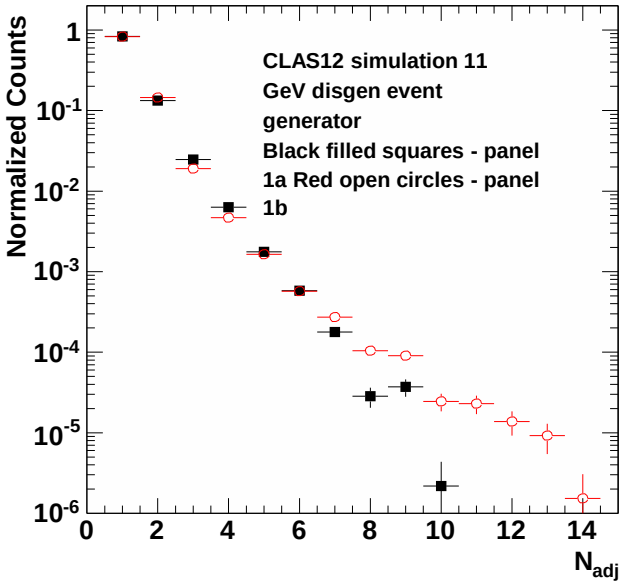
Introduction - Tasks and Users

- Software Categories:
  - Calibration (not discussed here)
  - Simulation
  - Reconstruction
  - Visualization
  - Physics analysis
- User Categories
  - A - environment developers.
  - B - service developers.
  - C - physics users.
- Focus on off-site physics users.
- Access, ease-of-use, extent of use, support.

Introduction - Physics Projects

- Experience with Richmond cluster, offsite users.
- Simulations for CLAS12 neutron magnetic form factor G_M^n experiment (E12-07-104).
  - Quasielastic neutron detection from ^2H with forward Time-of-Flight (TOF) (CN 2011-015).
  - Calorimeter (EC) simulation (CN 2011-019).
  - EC geometry simulation (BAPS, 2012).
  - G_M^n target simulation (BAPS, 2011).
- CLAS12 TOF Subsystems Reconstruction Software
  - Forward and central TOFs.
  - Tested with *gemc*.
  - Deep-inelastic scattering kinematics.





Software Tools

General

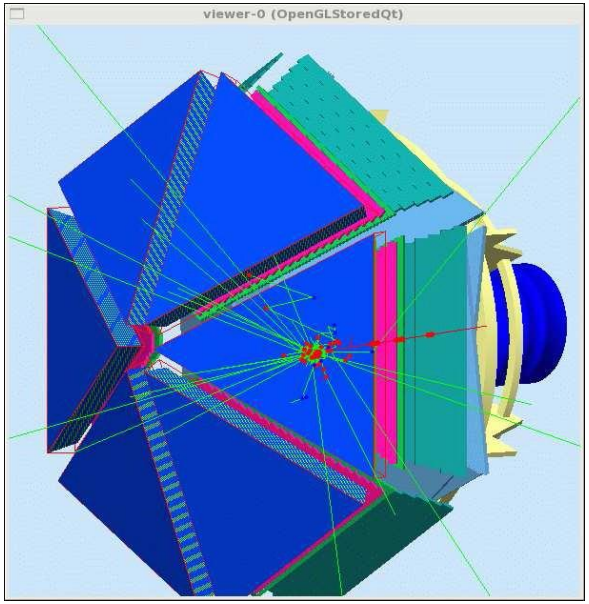
Package	Description	Package	Description
subversion	Version control utility	scons	software construction tool
mysql	Open source database	qt4	widget toolkit
clhep	C++ library of utility classes for HEP	geant4	simulation of particles passing through matter

Locally Developed

Package	Description	Package	Description
Clara	CLAS12 analysis environment	clasJLib	CLAS12 utilities - JMath, ced, cMsg
JToolbox	evio, bank handling classes, property lists	ccdb	mysql geometry and calibration database

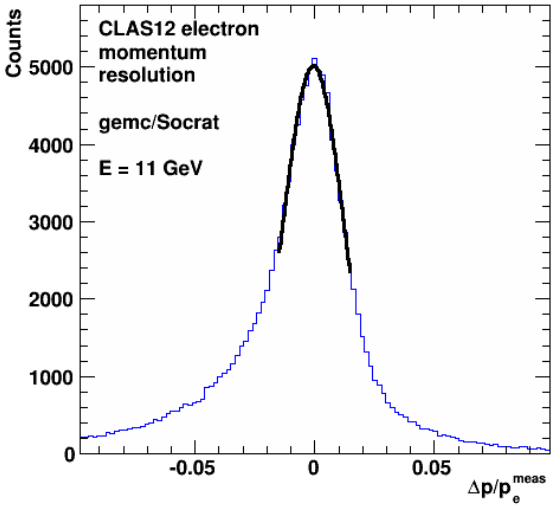
Simulation

- Event Generators
  - pythia
  - local programs: disgen, ppgen, genev, ...
  - Use - Pythia is a mature, widely-used program. Other codes vary in ease of use.
  - Support - Pythia well supported by Lund and CERN. Varied support for others.
  - Single JLab staff member (H.Avakian).
- CLAS12 Simulation - *gemc*
  - JLab program for CLAS12 and others.
  - Uses evio data format common among the halls.
  - Use - Scripts used for building offsite - time-consuming, but reliable.
  - Support - Complete web-page, bug reporting.
  - Single JLab staff member (M. Ungaro).
  - See Veronique Ziegler's talk.



Reconstruction

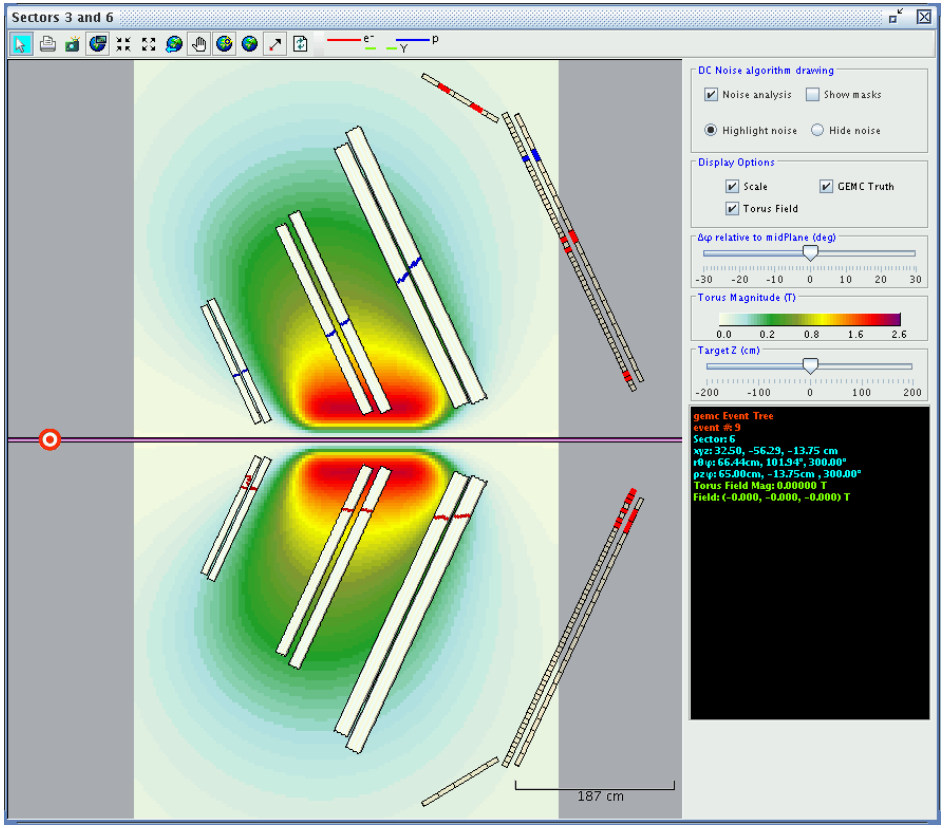
- Socrat (SOftware for Clas12 Reconstruction And Tracking)
  - Local, generation one, C++ code for electrons in forward detector (author - Sebastien Procureur).
  - Use - Compiled with Root libraries (ACLiC), complex code.
  - Support - CLAS-NOTE 2008-015, limited Collaboration support.



- TRAC (Track Reconstruction Application for CLAS12)
  - Current focus of main development effort on full CLAS12 reconstruction.
  - See Veronique Ziegler's talk.
  - Use - Applied to other reconstruction projects - Forward tagger - R. De Vita, Barrel Silicon Tracker - Y. Gotra.
  - Support - CLAS-NOTE in preparation.
  - Single JLab staff member (V. Ziegler).

Visualization - ced12

- ced12 (cLAS eVENT dISPLAY) is the 12 GeV version of the 6 GeV application.
- Use - Built on top of the bCNU libraries. Easy to use.
- Support - Single Collaboration member (D.Heddle).



Physics Analysis

- The evio data format is common to all halls.
- Different groups have their own analysis codes.
- evio2root
  - Converts evio data into root ntuples.
  - Generation 2 version in development.
  - Use - Generation 1 is easy to build, but cumbersome to adapt to new banks.
  - Support - Generation 2 being developed by one JLab staff member (M.Ungaro).
  - Generation 1 no longer supported.

Summary

- Event generators - pythia, ppgen, disgen, and other locally developed ones.
- Simulation - *gemc* is complete, mature and in wide use.
- Reconstruction - generation 3 development far along.
- Visualization - ced12 event display well developed and widely used.
- Physics analysis - common data format among all halls with many tools under development.
- Use - Many packages accessible to offsite users. TRAC just starting to spread offsite.
- Support - single Collaboration or JLab staff support for each software subsystem (often the original author).