

LCD Simulations

Norman Graf
(SLAC)

January 11, 2003

Event Generators

- Standard packages available within LCD environment (interfaced with CIRCE and writing out stdhep binary files) updated:
 - PYTHIA 6.210, HERWIG 6.5
- New version of pandora soon.
- HADES available as PYTHIA plugin or standalone to simulate $\gamma \rightarrow \text{hadrons}$.
- Diagnostic single-particle generator interfaced to PYTHIA, allows arbitrary combinations of particles and decay channels.

Background samples

- Using PYTHIA to simulate $\gamma \rightarrow \text{hadrons}$.
 - Standalone for full simulations.
 - HADES interface for fast simulations.
- Using GUINEAPIG for beam-beam simulations.
 - T. Maruyama has detailed BDS simulation in GEANT3 plus scoring planes for LD and SD.
- Contact with JLC Geant4 BDS group.
- Large samples of fully simulated events exist.
 - SIO output can be overlaid onto “signal” events.

Detector Designs

- Current focus on LD and SD from March 2001.
- Need to revisit designs and review them!
 - Is material what we want?
 - Are readouts and segmentation credible?
- What upgrades do we want to consider?
 - Remove gap between EM and HAD in SD.
- T detector to enable comparisons with TESLA.
- Aim for 03 series of detectors?

Intermediate Fast Simulations

- Produce hits in detector elements which can be used by the reconstruction programs, but are faster (and more flexible) than full G4.
- Swim tracks, account for MS and dE/dx , record intersections with detector elements.
 - No secondary productions or decays in flight.
- Simulate calorimeter showers via analytic parameterizations & populate cells.
- Work ongoing (S. Pathak and W. Langeveld)

GEANT4

- Release 5.0 out in December 2002.
- Default Physics Process Lists are available.
- Patches & upgrades to hadronic models.
- SLAC installation includes GEISHA fixes.
- Working on support for more complicated geometries. Evaluating GDML as replacement for existing XML.
- More in talk by T. Abe.

GEANT4 cooperation

- Working with European colleagues to define common elements.
- Active work on a common simulation output format (LCIO talk by T. Johnson).
- Discussing geometry packages.
- Looking for best aspects of current implementations
 - flexibility of LCD system vs detail of Mokka

Testbeam Support

- Working on GEANT4 package to support generic testbeam setups.
- Flexible geometry setup, hits, digitization.
- AIDA Interface for analysis.
- Aid in design of R&D prototypes.
 - Depth, lateral extent, etc.
 - Study thresholds, ADC bits, dead channels, etc.
- Useful for analysis of TB data.

Tracking

- Central tracking algorithms working fairly well.
- Pattern recognition for forward regions developed recently, working on fitting.
- Remaining issues are those of hit merging and ghosting in high track-density environments.
 - Need realistic digitization!
- Need to revisit and quantify efficiencies, fake rates and resolutions.

New Functionality (Tracking)

- Tracker simulation package provides flexible framework for rapid detector prototyping.
 - Fits into existing simulation pipeline (stdhep→sio)
- Pattern recognition package for SVX and forward (3D) trackers being developed.
- Incorporation of 2D detector elements (axial in barrel SD or forward μ -strips) ongoing.

New Functionality (Calorimetry)

- Ganging of calorimeter cells during analysis.
- Simple (NN) clustering across EM-HAD.
- User-defined neighborhood size for clustering.
- Cone algorithm + HMatrix for EM showers.
- Neural Net applied to ClusterID.
- ReconstructedParticle definitions arising.
- Integrated Eflow package being developed.
- T Detector implemented for comparison.
- LCDRoot updates in talk by T. Abe.

Muon Id

- Rich Markeloff's hep.lcd package to identify muons part of latest release.
- Works well in central (barrel) region for high pT muons. Extend into endcaps!
- Needs to be augmented to find muons which range out before making it to the muon system for low pT muons.
- Need to characterize efficiencies, fakes, etc.
- Essential to recover punchthrough π energy!

Informational Mailing Lists

■ lcd-sim

- This list is directed to those **using** the simulation, reconstruction and analysis software.

■ lcd-dev

- This list is directed to the simulation and analysis software **developers**.

- Simulation group planning to institute regular meetings to discuss “nuts and bolts” issues.