

# Simulation News



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ANL Simulation Workshop

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# Full Simulation

- Geant4 now the default kernel.
  - Talks by Makoto & Dennis.
- Samples of canonical SM processes, backgrounds + diagnostic events on server.
  - lcdg4 -> SIO (Guilherme)
  - lcs -> LCIO (Ron)
- Need to validate output!
- Next steps are to handle more realistic detector geometries and include Beam Delivery System elements.

# Event Generation

- Full SM sample ( $1000 \text{ fb}^{-1}$  @ 0.5 TeV &  $2000 \text{ fb}^{-1}$  @ 1.0 TeV) have been generated so far.
- 7000 stdhep files, 3 TB on SLAC MSTORE.
- 100% electron and positron polarization is assumed in all event generation. Arbitrary electron, positron polarization is simulated by properly combining data sets.
- Working on convenient user interface.
- May run preselection using fastMC, full sim on output.

# Event Generation II

- Default has been to run with all decays on, to support fastMC. Causes systematic error in full sim if particle would have interacted before decaying.
  - Needs mechanism to handle this.
- Events generated with no beam crossing.
  - Doing so at generator-level precludes sharing events with 0 crossing angle proponents.
  - Need to introduce a boost to correctly simulate far forward detector and BDS regions.

# LCIO

- v01-00 released.
- lelaps and lcs both write Sim output
  - need to standardize on collection names for sensitive detectors!
  - (lcs needs head cvs version for status words)
- Also being adopted by hardware groups for their data.
- Beta versions of reconstruction output available, need feedback.

# Persistent Data: MC

- Event definition and framework.
- Generic definitions for ideal MC information implemented in SimTracker- and SimCalorimeter-Hits in LCIO.
- Monte Carlo Particle hierarchy classes.
  - Status codes in cvs, implemented in lcs.
- Documentation/more info:
  - <http://www-it.desy.de/physics/projects/simsoft/lcio/>
- Active discussions @ forum

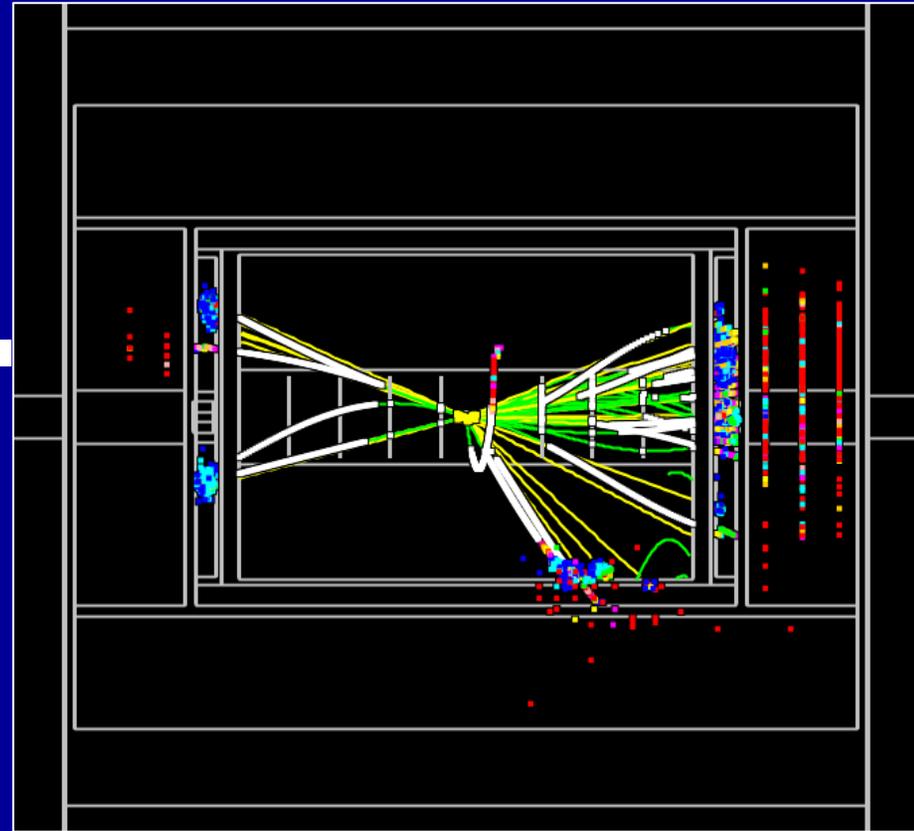
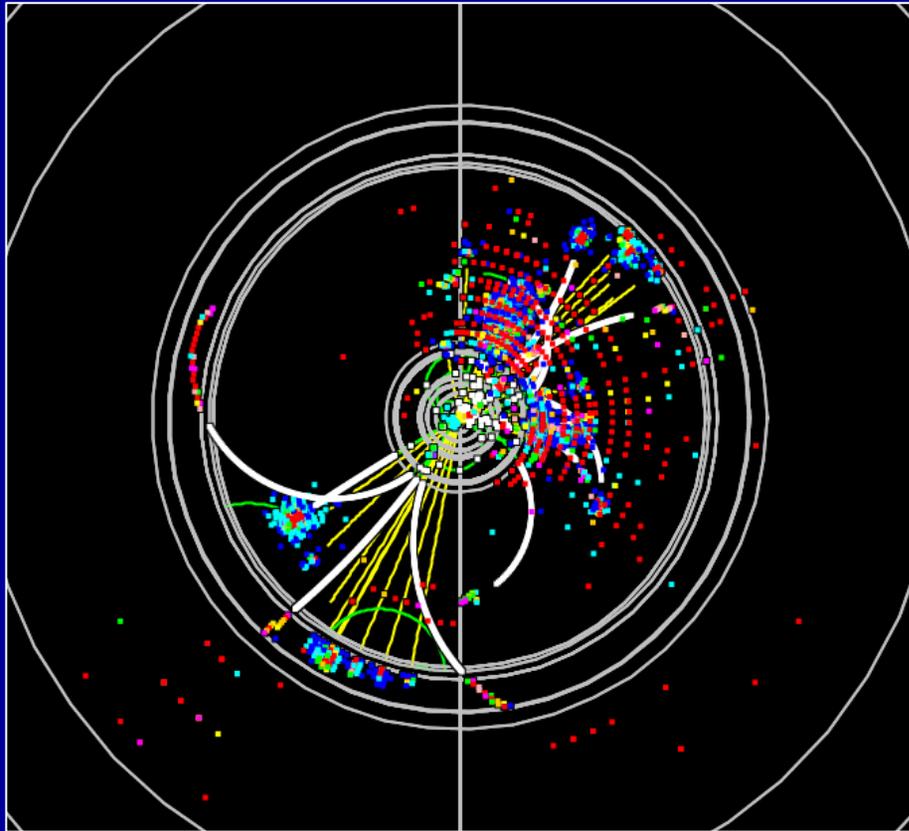
# Persistent Data: Reconstruction

- Tracks & Calorimeter Clusters
  - Requirements well understood
  - First implementation written
  - Use cases being assembled
- ReconstructedParticle<sup>■</sup>
  - Requirements still need to be fleshed out.
  - Persistent implementation in beta release.

# Intermediate Fast Simulations

- Fast Monte Carlo systems which generate hits in trackers and calorimeters.
- Lelaps (W. Langeveld) (in cvs)
  - Standalone C++ program
  - internal diagnostic or stdhep input
  - Conversions and simple decays
  - MCS and dE/dx for tracks
  - Parameterizations for calorimeter showers
  - SIO & LCIO output, SDJan03 & LDMar01
  - Working on flexible detector description input.

# Lelaps (LDMar01)



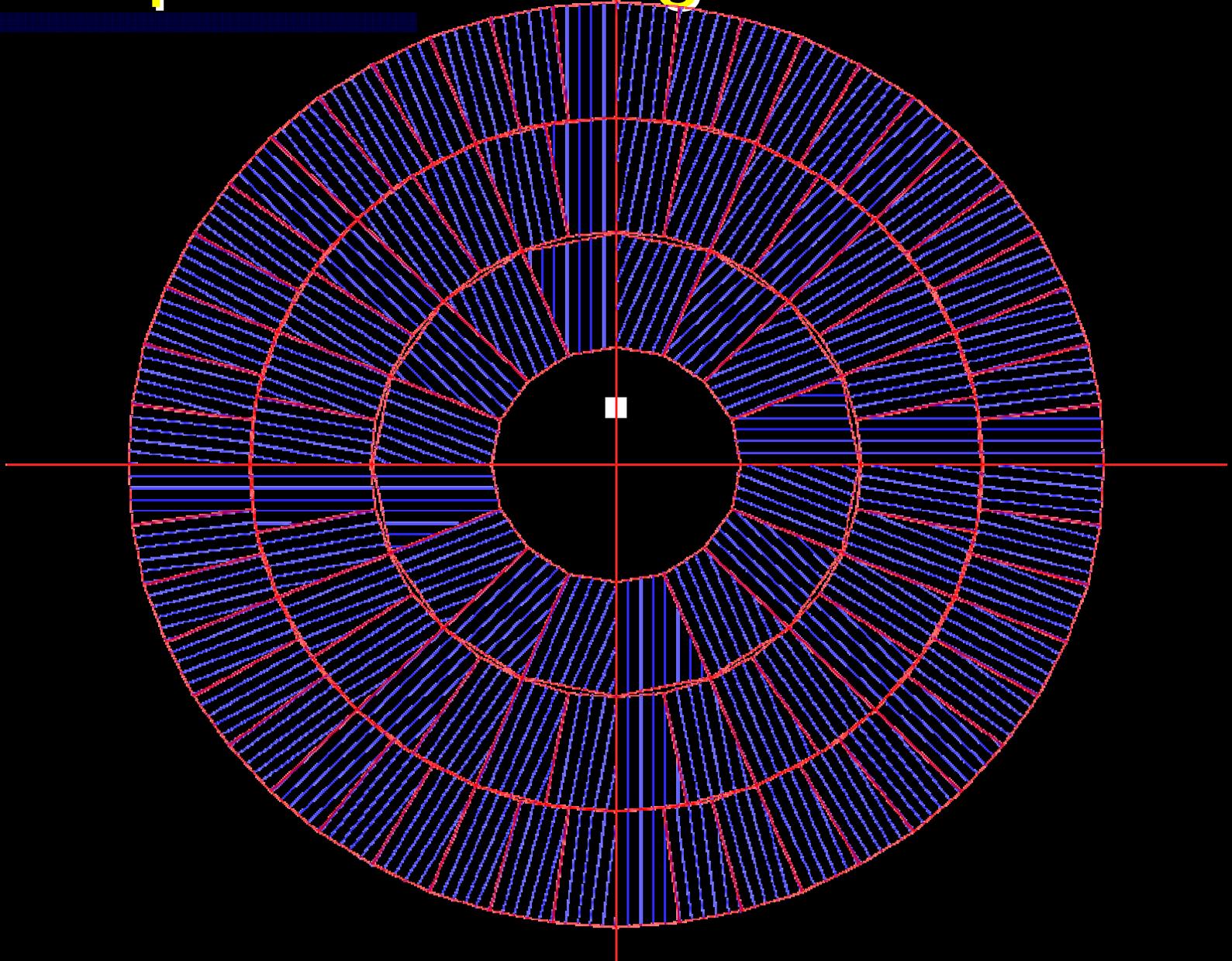
# Tracking Detector Response

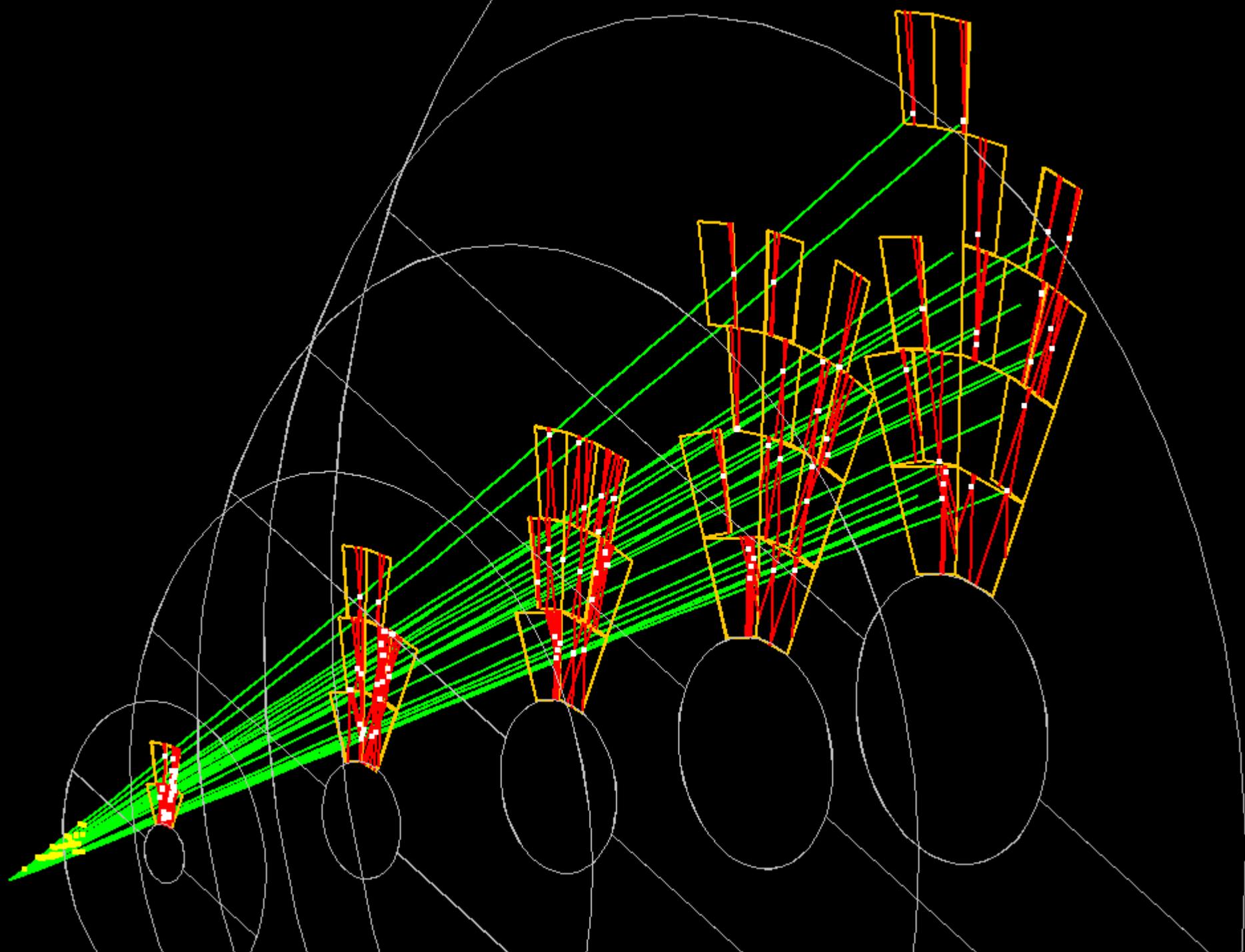
- Geant4 provides more realistic simulation of physics processes, many more secondary hits.
- No longer as appropriate to simply smear individual tracker hits by expected resolution, need to provide better detector response simulation.
- CCD digitization, clustering, hit position and uncertainties package developed by N. Sinev.
- Similar work being done at UCSC (Schumm, Flacco) for silicon strips.

# Forward Tracker Digitization

- Developing classes to represent more realistic forward tracking detector elements.
- First implementation uses wedges of silicon microstrip detectors with shallow angle stereo to tile forward disks. ■
- Evaluating occupancies for different tiling scenarios.

# Example Disk Tiling





# Forward Track Reconstruction

- First version of forward track finding code in CVS.
  - Implemented for hep.lcd & sio.
  - Accesses C++ code via JNI.
  - Pure java version for next generation.
- Simple helix fit, nothing fancy.
- Have not yet qualified efficiencies, resolutions and fake rates.

# Calorimeter Response

- Currently store ~all energy depositions in each sampling layer, use sampling fraction to convert to energy deposited.
- Will need to introduce digitization package which converts GeV to ADC, applies thresholds, crosstalk, efficiencies, noise, etc. to produce "raw" hits.
- Add corresponding ADC to GeV handling in reconstruction.
- Aimed primarily at TB efforts.

# Reconstruction

- LCD event model being refactored to improve design and to utilize newer features of Java.
- Analysis examples being modified to access LCIO data instead of SIO.
- Comprehensive “geometry” package still lacking.
- Much work still to be done in clustering, tracking and ReconstructedParticle.
- Flavor-tagging package being worked on in UK.

# "Particle Flow"

- Would like to see coherent picture emerge from the various ongoing Particle Flow analyses.
- Survey at this meeting.
- Synthesis & release by Victoria?
- Goal is to have *ab initio* reconstruction and analysis results presented @ ALCPGWinter05.

# LCIO Browsing & Visualization

- JAS3 LCIOPlugin allows event browsing.
- First version of LCIO event display using Wired released.
- See Tony's talk for details.

# Continuing Communication

- <http://forum.linearcollider.org>
- Critical mass for standing ecs meetings?
  
- <http://lcsim.org/> ■
  
  
  
  
  
  
  
  
  
  
- Two simulation sessions @ Victoria
  - Please submit abstracts soon.