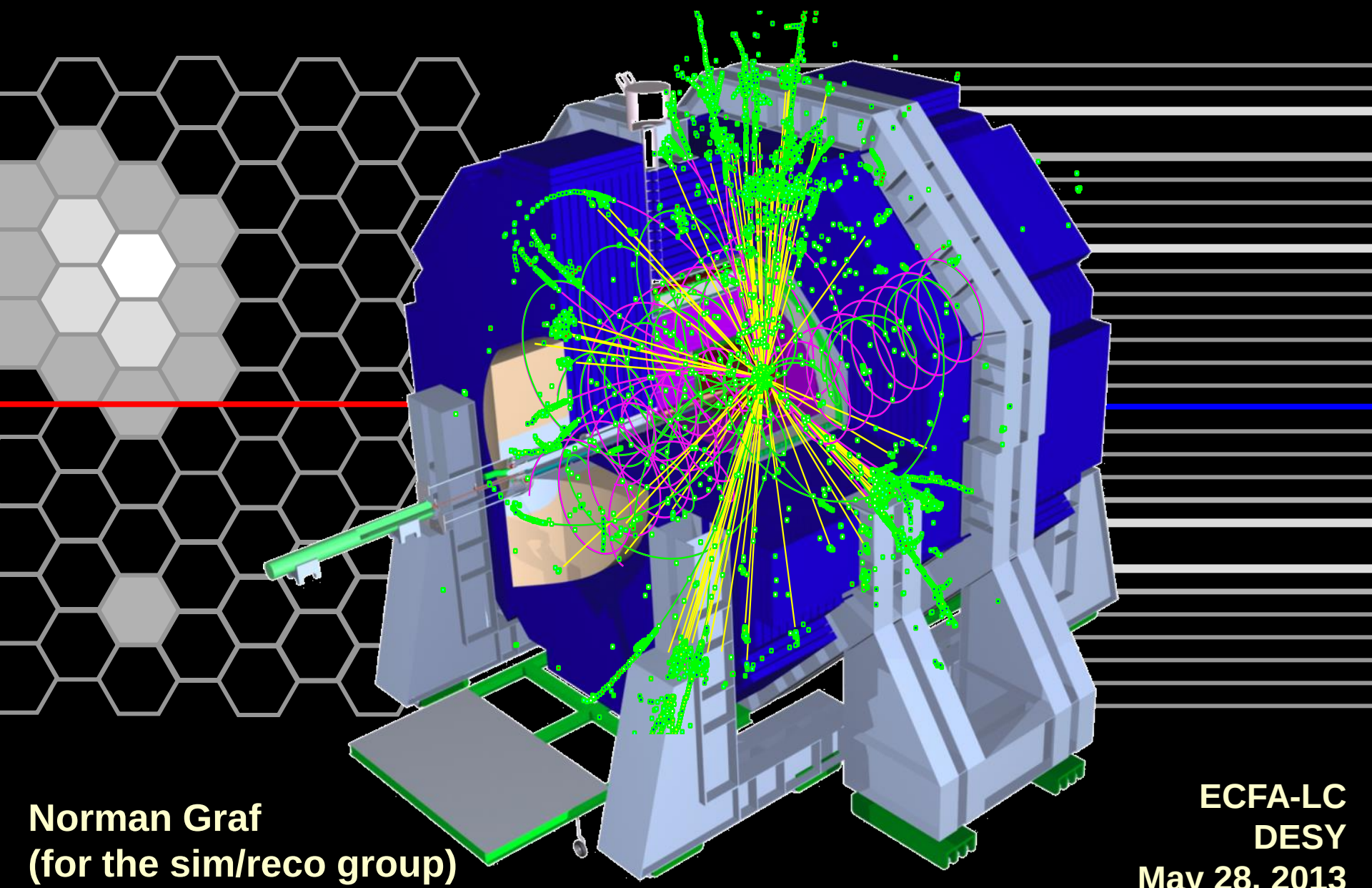
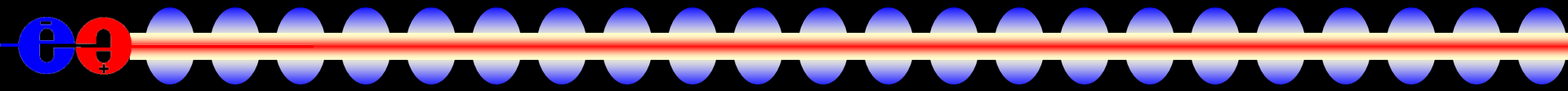
lcsim software: status and future plans



Norman Graf
(for the sim/reco group)

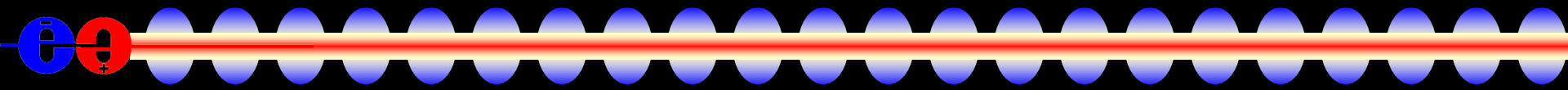
ECFA-LC
DESY
May 28, 2013

The DBD, Snowmass and beyond



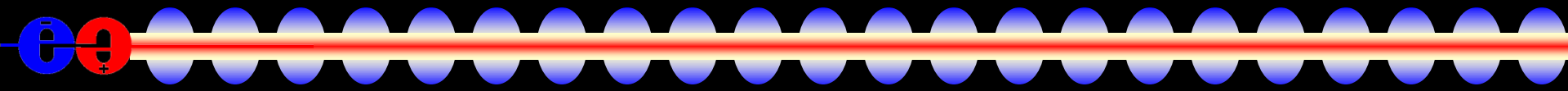
- ILC DBD has been the primary focus of our group
  - A lot of work done by a small number of dedicated individuals who deserve a lot of credit.
  - Robust set of end-to-end simulation tools
  - Grid submission, cataloging via ILCDirac
- Have also been supporting the needs of HPS
  - real data requirements mostly orthogonal to MC challenge, but will be useful for upcoming Ecal TB
- Currently engaged in “Snowmass” 2013 efforts
- Continued common software development

DBD Deliverables



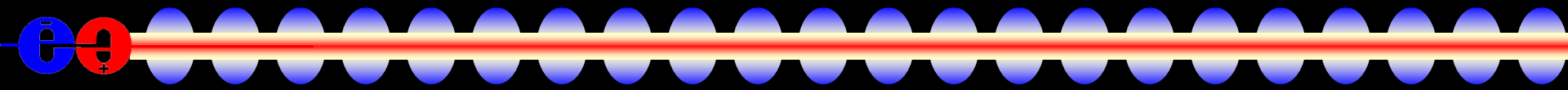
- Full simulation of realistic detector design including support structures.
- Overlay of correct admixture of expected beam-related backgrounds.
- Full tracker hit digitization and ab initio track finding and fitting.
- Use of common tools
  - Full PFA reconstruction using slicPandora
  - Vertexing and flavor-tagging with LCFIPlus

The Grid



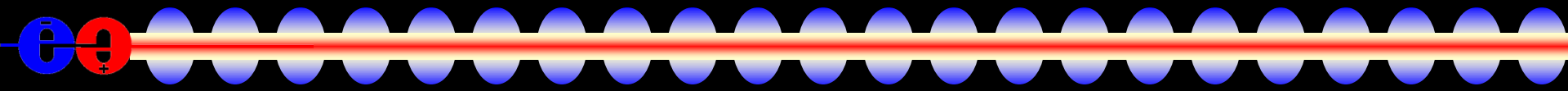
- SiD is making full use of Grid via ILCDirac.
- LCG and OSG ILC VOs merged
- Identifying OSG resources and making good use of them has been a challenge.
  - very idiosyncratic
  - large, steep and site-dependent learning curve
- But when it works it works very well.

Snowmass 2013



- The APS DPF will host a meeting in Minneapolis this summer.
- The ALCPG sim/reco group is providing support for physics and detector studies to be conducted leading up to and during the ~one week workshop.
- To facilitate studies by new groups and individuals we have tried to make things as easy as possible to generate or access detector designs and MC events.
- Using the DBD experience as a guide.

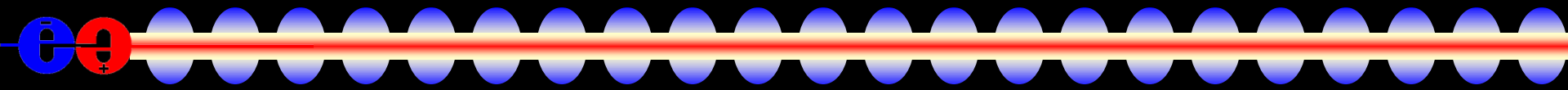
Snowmass 2013



- Providing fully simulated and reconstructed events at both 250GeV and 350GeV cms using the sidloi3 detector model (same as DBD), with tracking and PFA done. Awaiting flavor-tagging.
- Can't expect everyone to have Grid credentials or belong to the correct VO. Providing access to DBD and related event samples via ftp from SLAC nfs disks.

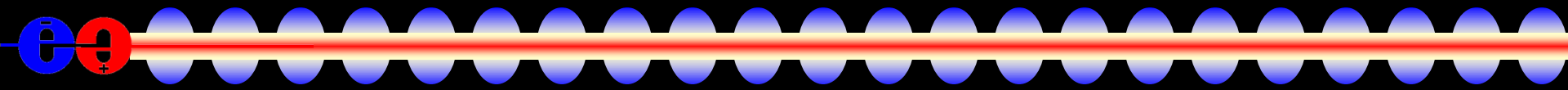
  ftp://ftp-lcd.slac.stanford.edu/ilc4/snowmass/ILC250/
- Events at 350 expected soon.
- See Tim Barklow's talk this afternoon for details of the higgs analyses.

and beyond…



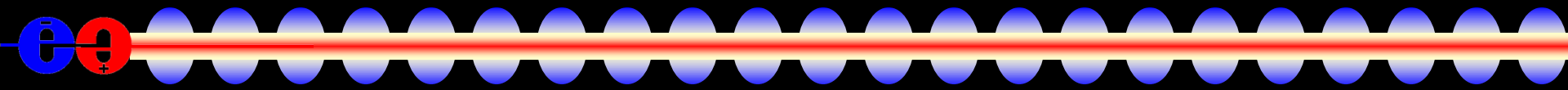
- Techniques developed for SiD @ ILC and CLiC are also being used for Muon Collider studies.
- Some additions to slic and GeomConverter specific to MuC
  - Geometry: e.g. tapered endcap calorimeters
  - Support for optical photons: dual-readout calorimetry
  - “Black hole” insensitive detector: kill particles when entering uninteresting regions e.g. conical tungsten masks.
  - timing cuts to kill particles after time window (in progress)
- Background overlay and timing cut functionality developed and tested at CLiC directly applicable.
- Supporting MuC studies leading up to and at the Snowmass 2013 meeting.

Detector Optimization



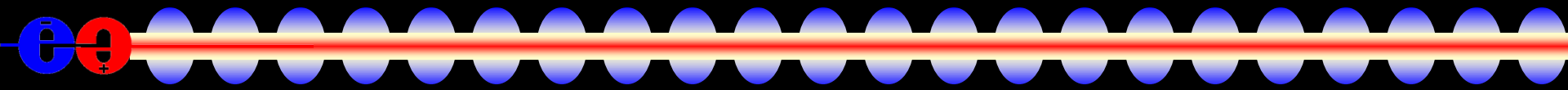
- Starting to define a new series of detector models for SiD to explore areas of optimization
  - better performance
    - e.g. analog Hcal, Silicon Pixel Tracker, different aspect ratio
  - lower cost
    - e.g. reduce amount of silicon in Ecal
  - better engineering
    - e.g. layout of barrel staves and endcap doors for calorimetery
- Need to revisit occupancy and timing studies
  - e.g. anti-DiD to reduce backgrounds

slic



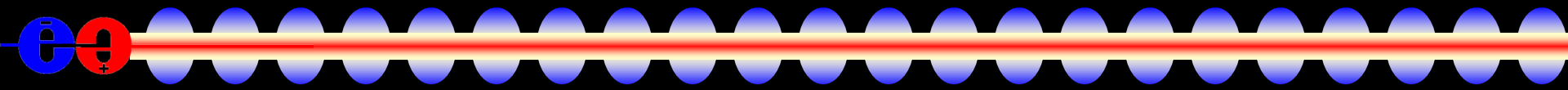
- SimDist build and distribution system replaced with ILCSoft as part of moving towards more commonality in the software.
- Work ongoing to allow termination of particles which are out of time or outside region of interest.
- Handling of secondaries in simulation being revisited.
- Looking into implementing “parallel” geometries as way of handling complex detectors.
- Working on improved, more realistic Sensitive Detector definitions.
- Updates to keep current with latest Geant4 release.

org.lcsim



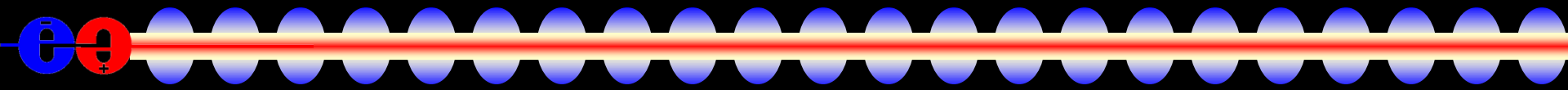
- ftf and trf packages released
- ftf being investigated as replacement for / addition to SeedTracker for pattern recognition.
- trf being adapted to GeomConverter geometry
  - propagation, MCS and energy loss
- trf being adapted to the LCIO track and hit models
  - Full Kalman fit
- Support for “tilted” planes being introduced

Other users



- HPS experiment at Jlab has adopted the lcsim software for its simulation and reconstruction.
- Ecal Testbeam scheduled for this summer
- Real data places different requirements on both the simulation and reconstruction software.
  - Conditions database improved
  - Full 3D field map implemented, being optimized
  - Runge-Kutta stepper implemented
  - Alignment code being implemented
  - Ecal hexagonal pixels being implemented

Summary



- Large amount of work done to complete the DBD.
- Next milestone is Snowmass 2013.
- Used by HPS during test run an for proposal
- Focus has been on using the existing software, few resources left over for improvements.
- Looking forward to working towards achieving the goals set forth at the CERN common software meeting earlier this year.