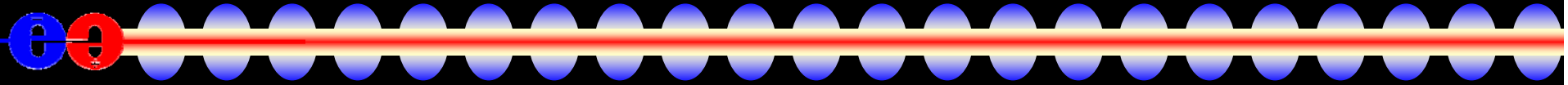# *Simulation/Reconstruction Overview*

Norman Graf

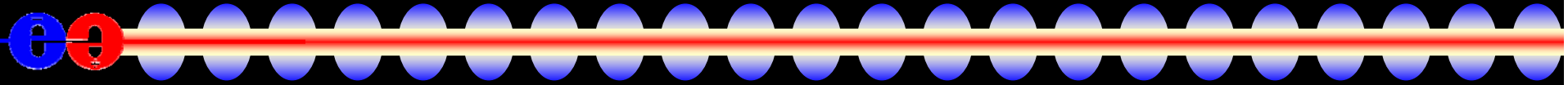SLAC

July 20, 2006

Introduction

- There are three simulation/reconstruction sessions at this ALCPG meeting:
    1. Wednesday: Joint with Tracking
        - primarily track finding & fitting
    2. Today: Infrastructure
    3. Friday: Joint with Calorimeter
        - primarily Individual Particle Reconstruction
- Transition to a dominance of reconstruction indicates a certain maturity in the simulation capabilities and infrastructure.

Event Generation

- Continue to support requests for diagnostic as well as physics event generation.

- Hardware acquisition at SLAC means full SM sample will become easily available.

    – No plans (yet) to process full sample through detector simulation, but small sets which pass filters could be.

- Takashi Maruyama has generated large number of GuineaPig files for ILC baseline configurations.

    – Are these generally acceptable? Do we need CAIN?

    – GuineaPig ASCII → stdhep available

Event Generation / Overlap
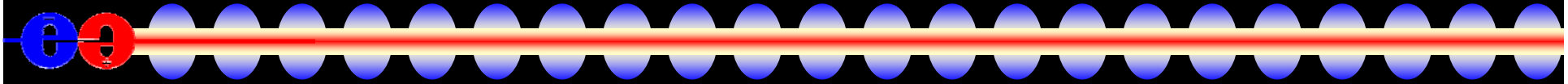
- GuineaPig events have been boosted 0, 2, 14, 20mr

- Do we need to boost physics events as well?

  – If so, at stdhep level or at input to full simulation?

- Have processed ~1000 bunch crossings to-date.

- Code to overlap signal and background at the hit level & accounting for time offsets in LCIO is available.

- All data samples available via anonymous ftp from lcsim.org portal.

Detectors
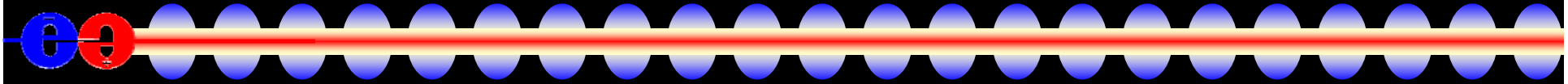
- Continue to support a broad variety of detectors.
- Following 15 detectors designed for systematic studies of Individual Particle Reconstruction.
- Span: HCal Absorber & Readout, Size, BField

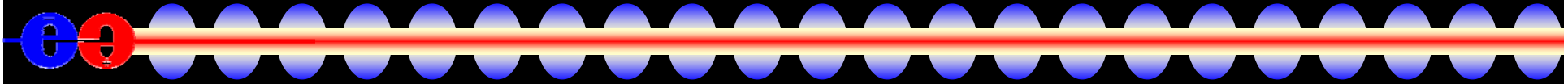| acme0605 (5T)	acme0605_ecal150	acme0605_ecal175
	acme0605_ecal150_4T	acme0605_ecal175_4T
		acme0605_ecal175_3T
acme0605_steel_rpc	acme0605_ecal150_steel_rpc	acme0605_ecal175_steel_rpc
acme0605_steel_scint	acme0605_ecal150_steel_scint	acme0605_ecal175_steel_scint
acme0605_w_rpc	acme0605_ecal150_w_rpc	acme0605_ecal175_w_rpc

Concepts

- Including approximations to LDC, GLD and others has been frustrated by a lack of easily accessible detailed detector descriptions.
  - Combination of runtime data, constants in databases and hardcoded values in Geant4 code.

- Welcome the opportunity to collaborate with others to get these concepts described within the ALCPG detector simulation & reconstruction environment.

Crossing Angles & Additional Fields
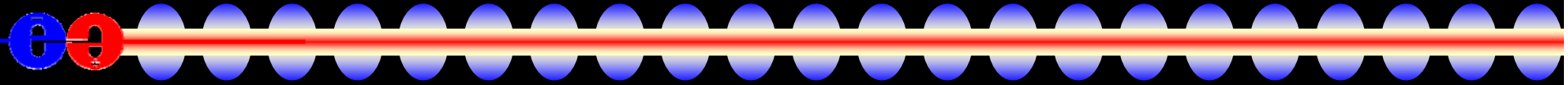
- Have strawman implementations of far forward calorimeters for 0, 2 & 20 mr, but these regions need much more attention!
  - Institutional responsibility lacking
- Have introduced multiple fields into slic:
  - Can have arbitrarily large number of different fields
  - Currently use simple solenoidal approximation plus:
    - DID for 20mr
    - anti-DID for 14mr
- Could use full field map if provided.
- No current implementation in reconstruction!

Tracking
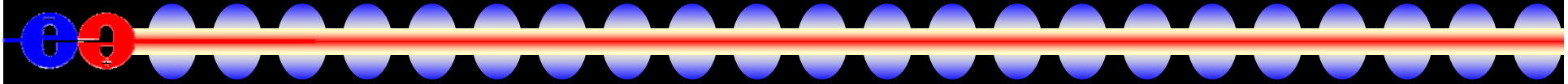
- The number of track finding/fitting talks is encouraging, but:
    - Still no plug-and-play package which handles complete chain of:
        - SimTrackerHit $\rightarrow$ RawTrackerHit $\rightarrow$ TrackerHit $\rightarrow$ Track
        - Pixel vertex detector OK, strip digitization still needed.
        - Tiling solution and designs for forward region still missing.
    - Too many separate implementations of Track interface.
    - Encourage discussion between the various developers to maximize the amount of common code.
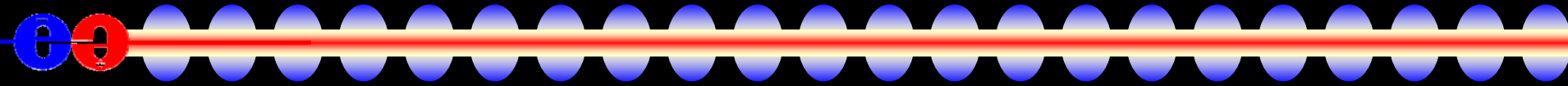
Individual Particle Reconstruction
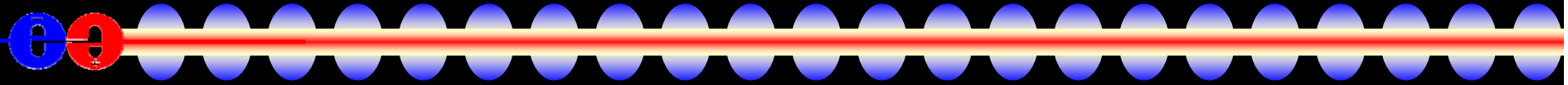
- Large number of talks on calorimeter reconstruction encouraging, but again, still lacking a complete package of
  - SimCalorimeterHits $\rightarrow$ ReconstructedParticle
- Clustering interface defined, released algorithms now respect this.
- Still no clean separation between clustering and identification.
- "Template" approach sketched out at the Boulder meeting being worked on but not yet complete.

Comments
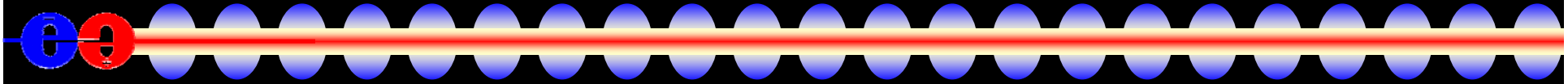
- A number of additional features in simulation infrastructure to support background studies.
  - GuineaPig→stdhep , DID, LCIO background overlaps
- Larger emphasis on reconstruction than on sim.
  - Number of tracking & calorimeter projects nearing completion. Aim to have full sim/reco chain of MCParticle → ReconstructedParticle by end of year.
- Very little input from physics groups or benchmarking groups on what targets have to be!
- Still critically manpower limited!

More Comments

- Strongly encourage developers to use cvs as a development tool, not an archiving system for polished final products.
  - improves communication by reflecting ongoing work
  - improves collaboration by sharing work
  - refactoring of code is automatically propagated to users
- Weekly phone meetings! lcd-dev mailing list.
- Should we have another simulation mini-workshop:
  - if so, where & when?
- Document work on wiki pages, discuss on forum. 11