SiD01 Plus Additional Disks

Richard Partridge

Brown / SLAC

August 1, 2008

Tracker Simulation of SiD01

◆ SiD01 is the version of SiD that is currently being simulated

◆ Considerable effort associated with getting us to our present situation

- Reasonably detailed conceptual design was developed for the SiD tracker
- Effort made to account for all sources of dead material
- Dead material translated into cylinders/disks that represent average amount of material traversed
- Locations of sensors and supports extracted from AutoCad layout generated by Bill Cooper
- A detailed text description of the simulation model was generated
- The simulation model was implemented in the SiD01 compact.xml file
- Lots of simulated events were generated
- Much effort devoted to simulation code
  - Virtual segmentation developed for versatile segmention of disks, cylinders
  - Planar tracker digitization provides realistic modeling of planar strip detectors
  - Pixel digitization provides realistic modeling of pixel detectors
  - SeedTracker provides pattern recognition code for track finding using either virtual or physical segmentation
  - HelicalTrackFitter performs simple helix fitting from any combination of 3 or more strip/pixel/stereo hits
- SeedTracker strategies were tuned to produce track seeds over the full solid angle
- We are working hard to understand how SiD01 + Hit Making + SeedTracker works
 - Efficiency, purity, hit resolutions, helix resolutions, etc.

SiD01 is Extensively Documented

What Level of Effort for SiD02?

◆ For purposes of discussion, consider 3 options

◆ Minimal effort
  - Continue to use SiD01 tracker geometry as is
  - Tracking volume will then end ~40 cm in front of ECAL

◆ Modest effort
  - Keep SiD01 tracker geometry for $|Z| < 1.7$ m
  - Add additional disks in front of ECAL so there are now 5 forward disks
    - Original SiD concept had 5 disks – one disk was dropped in the final SiD01 mechanical design
    - Improves forward coverage, where we start to lose hits and have tracks crossing numerous detector boundaries
    - Easy comparison between stretched and unstretched designs
  - Simulation and Mechanical design allowed to evolve semi-independently

◆ Major effort
  - Need to:
    - Bring mechanical and simulation designs into conformance in a new simulation model
    - Adjust dead material in simulation to account for stretched mechanical design
    - Develop simulation tools to support new layouts (such as conical supports)
  - Potentially long delay in getting out simulation results,
    - Mechanical design must converge, xml and documentation must be updated, simulation tools must be adapted as necessary, time needed to understand "features" that are introduced, and finally, produce LOI results
    - Who will do this work??
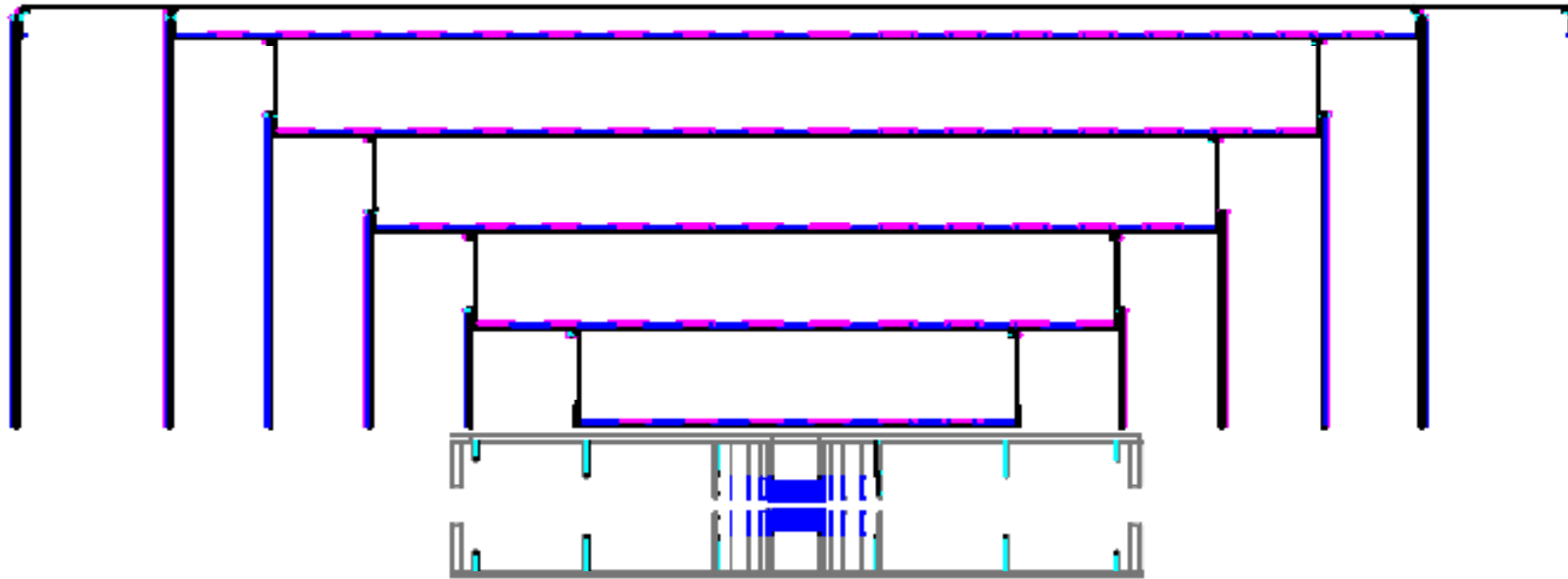
Hit Multiplicity vs Polar Angle

◆ Look at how many hits are assigned to tracks found in single muon events uniformly distributed in the polar angle

- Currently, tracker strategies require 7 or more hits on a track
- Preliminary indications that "purity" degrades as the number of hits decreases

Polar Angle for Tracks with 9 or more hits

Entries / 2 degrees

Entries : 8930
Mean : 89.832
Rms : 45.912

Polar Angle (degrees)

Polar Angle for Tracks with 8 or fewer hits

Entries / 2 degrees

Entries : 223
Mean : 82.195
Rms : 79.818

Polar Angle (degrees)