

Tracking and Fitting with SODTracker & KFFitter

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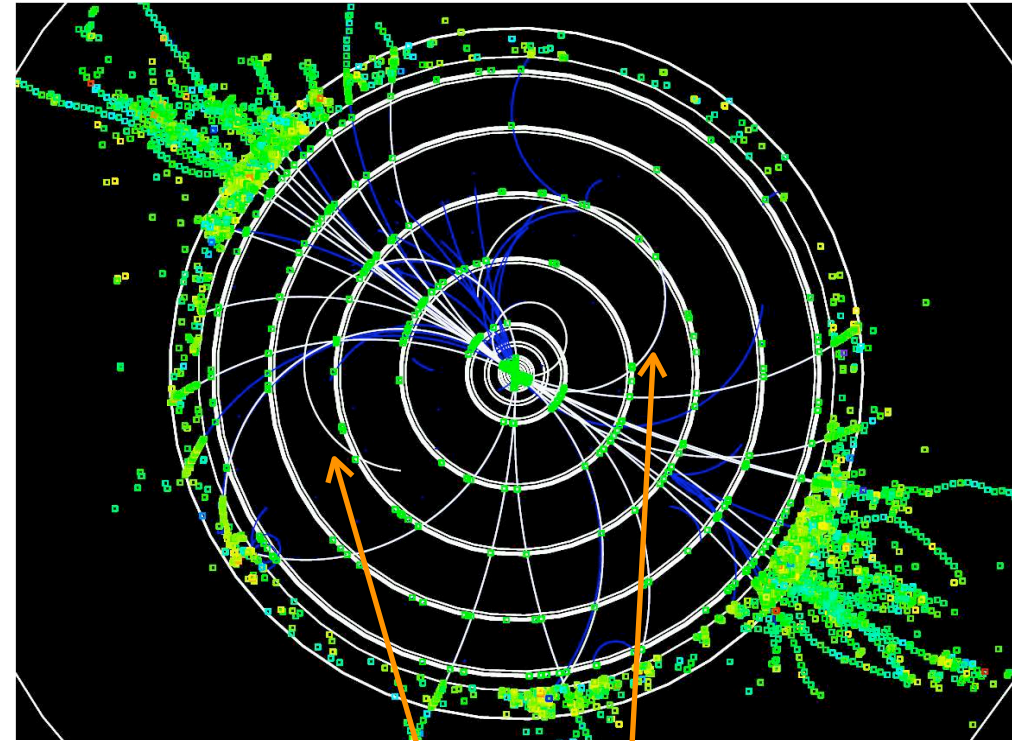
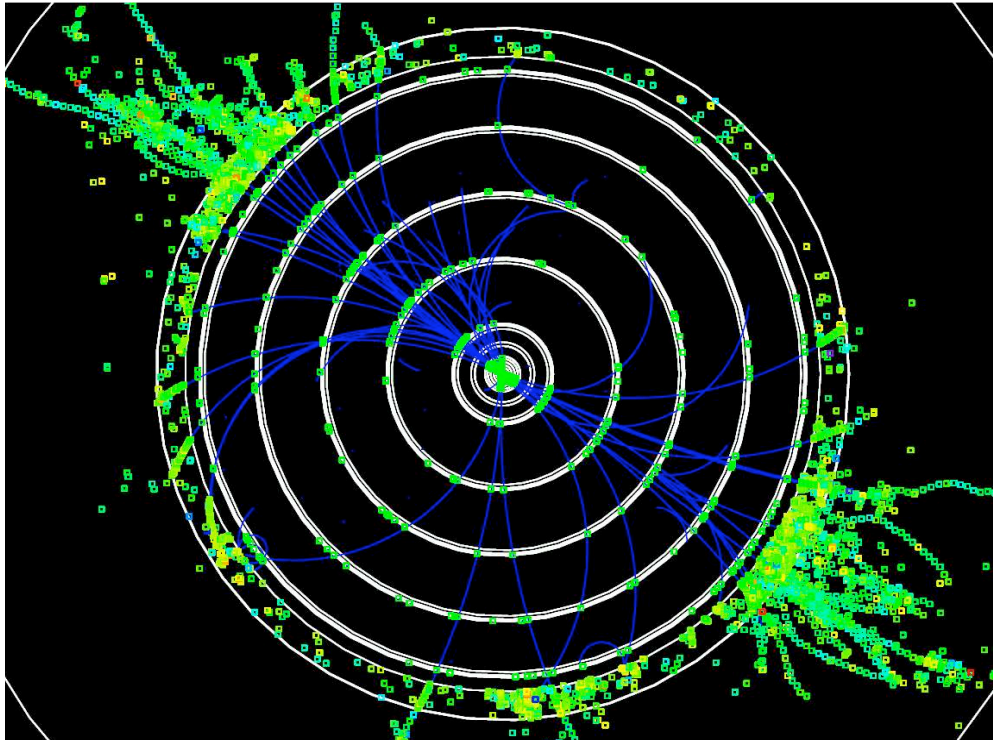
Tracking: SODTracker

- Track finding in the Silicon Outer Detector (SOD)
- Tracking method:
 - 1. Obtain seed track in the Vertex Detector (VD)**
 - ▶ seed tracks from hit combinations in VD or from MCParticle true information (cheat track).
 - ▶ can use Tracks from any track finder when available.
 - 2. Add hits from the Tracker**
(Barrel only for now; Endcaps coming soon)
 - 3. Fit track**
 - ▶ **Helix fit** (or Kalman Filter with KFFitter)
 - 4. Insert SODTrack in event**

SODTracker package

- Code ported from *hep.lcd* to *org.lcsim*
- Results stored in **SODTrack** object (implementation of *org.lcsim.event.Track*)
- SODTracker package in CVS (*org.lcsim.contrib.SODTracker*)
- Tested on single track and physics samples
 - ▶ runs without crashing
 - ▶ allows visualization of SODTracks on event display and event browser (see next page)
- Package contains test driver in *test/TestSOD.java*

Event display for $e^+e^- \rightarrow Zh$ MC



- **MCparticles in blue**
- **SODTracks in white**
- Show barrel only
- Most barrel tracks are reconstructed (including curlers)

Kalman Filter Fit: KFFitter

KFFitterDriver

Creates KFTracks from SODTracks
Calls KFTrack's fit method
Monitors fit results

- Apply Kalman filter to SODTracks
- Modular design loosely inspired by BABAR fitter
[D.Brown CHEP'97 <http://www.ifh.de/CHEP97/abstract/a341.htm>]
- Package in development

KFTrack

List of KFSites
KFTrackParameters (seed track)
Fit method:
 loops over KFSites
 in- and outward swimming

KFSite

3-D point in space
Site type: hit and/or scattering point and/or field
Covariance matrix and its inverse at Site
KFTrackParameters at this site
Kalman filtering method:
 weighted average of track and site properties

KFTrackParameters

Fit, Helix, Point representations
Covariance matrices and their inverse
Kalman prediction method:
 Extrapolation 3D to 3D point

KFHit

measurement

KFScatterPoint

material

KFField

B-field irregularity

KFFitter: development status

- Infrastructure: **done**
 - classes + methods + calls between objects
- Prediction and Filtering methods
 - **almost done**: chasing bugs
- Being developed in barrel
- Scattering points not included yet

Summary

- **SODTracker:**
 - efficient hit adder for the outer detector (with Helix fit)
 - available in `org.lcsim.contrib.SODTracker`
- **KFFitter:**
 - Kalman filter fitting package
 - modular design
 - at final stages before successful fit!
- Packages to be combined for **Kalman-based hit adding**