Tracking Software in MarlinReco

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ILD Software Workshop KEK

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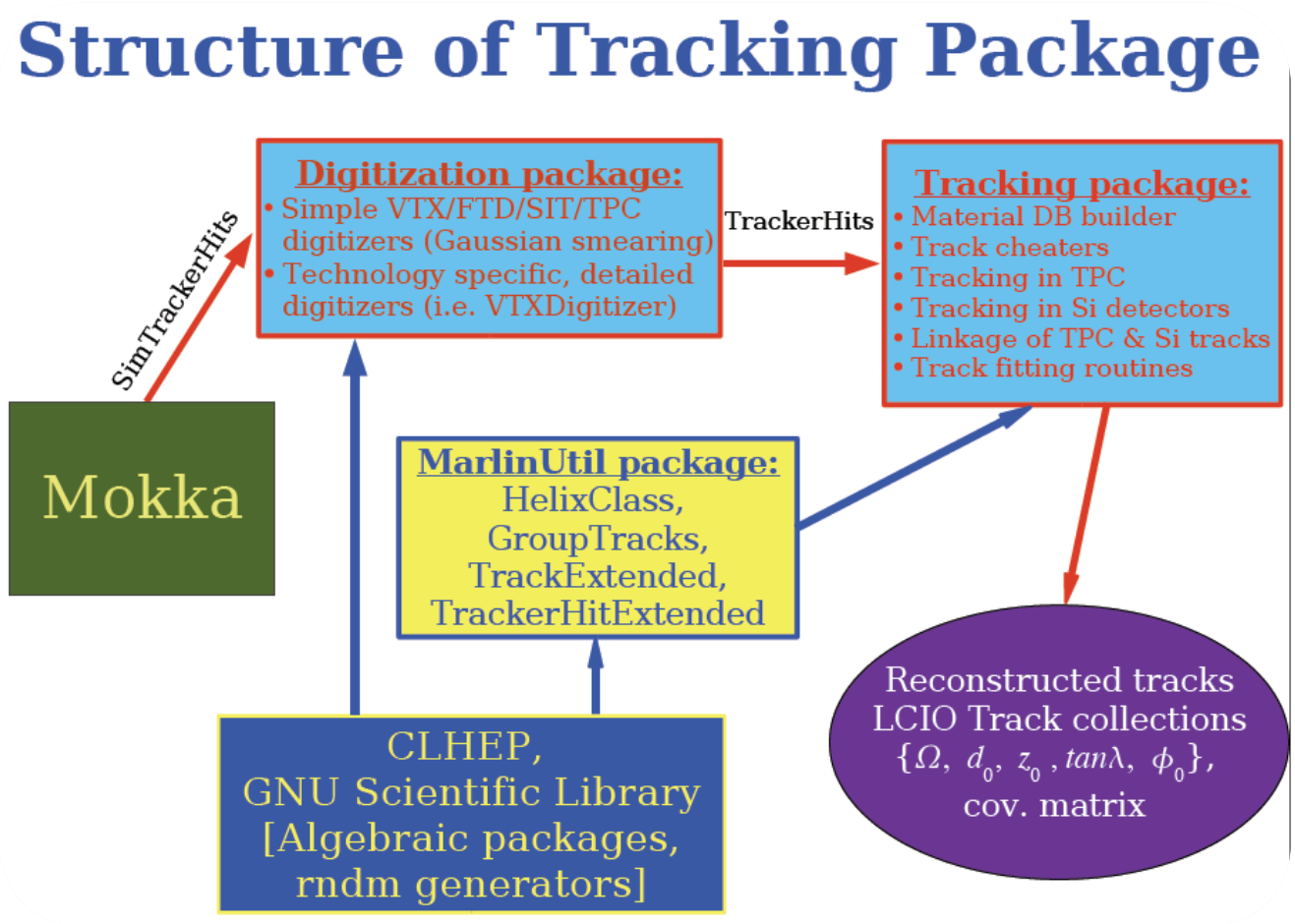
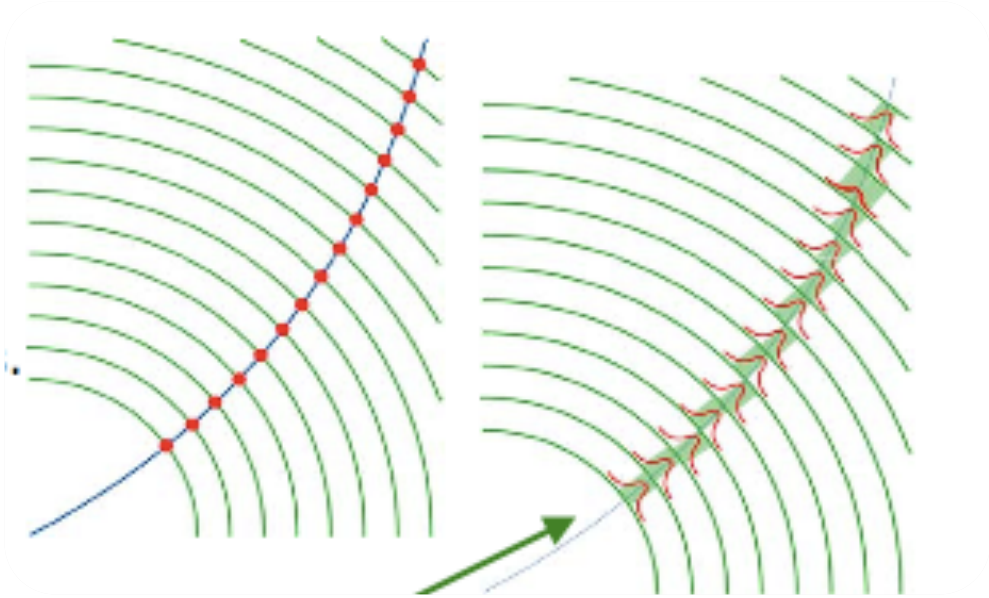
Overview

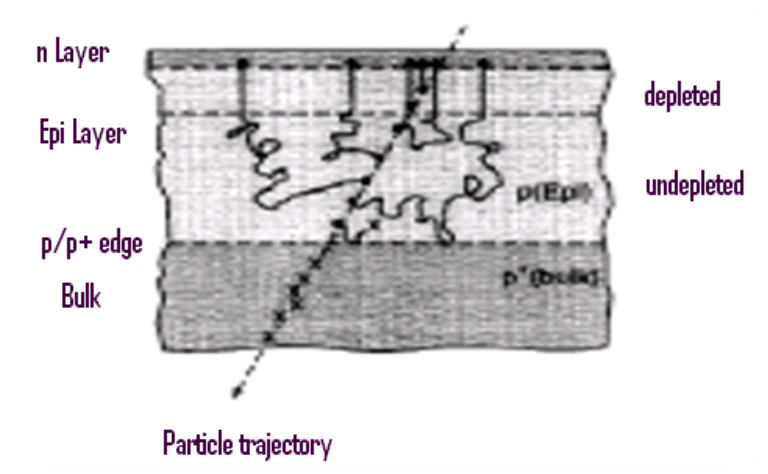
- Digitisation
- LEPTracking
- SiliconTracking
- FullLDCTracking
- Performance
- Current Issues
- Plans – Ideas

Overview


Structure of Tracking Package
Digitization package:
• Simple VTX/FTD/SIT/TPC digitizers (Gaussian smearing)
• Technology specific, detailed digitizers (i.e. VTXDigitizer)
TrackerHits
Tracking package:
• Material DB builder
• Track cheaters
• Tracking in TPC
• Tracking in Si detectors
• Linkage of TPC & Si tracks
• Track fitting routines
SimTrackerHits
Mokka
MarlinUtil package:
HelixClass,
GroupTracks,
TrackExtended,
TrackerHitExtended
CLHEP,
GNU Scientific Library
[Algebraic packages,
rndm generators]
Reconstructed tracks
LCIO Track collections
$\{\Omega,\ d_0,\ z_0,\ tan\lambda,\ \phi_0\}$,
cov. matrix

Digitisation





TPC: Parameterised Gaussian Smearing

$$\sigma_{r\phi}^2 = \sigma_0^2 + D^2.L_{drift} / N_{eff}$$

$$\sigma_z^2 = (400\mu m^2) + L_{drift}\ [cm] . (80\ \mu m^2) /cm$$

Silicon: Simple Gaussian Point Smearing

LEPTracking

- Original Tracking Code in MarlinReco
  - C++ wrapping for the Aleph/Delphi F77 Tracking Code – taken from BrahmsReco
- Today only provides TPC pattern recognition
- Out–In search using fast fitting
- Final TPCTracks fitted using Kalman Filter

Silicon Tracking

- Combined pattern recognition in all inner Si tracking devices VXD,FTD,SIT
- Searches for hit triplets in the outermost layers
- Inward extrapolation of triplets
- Fitting still using Delphi F77 code

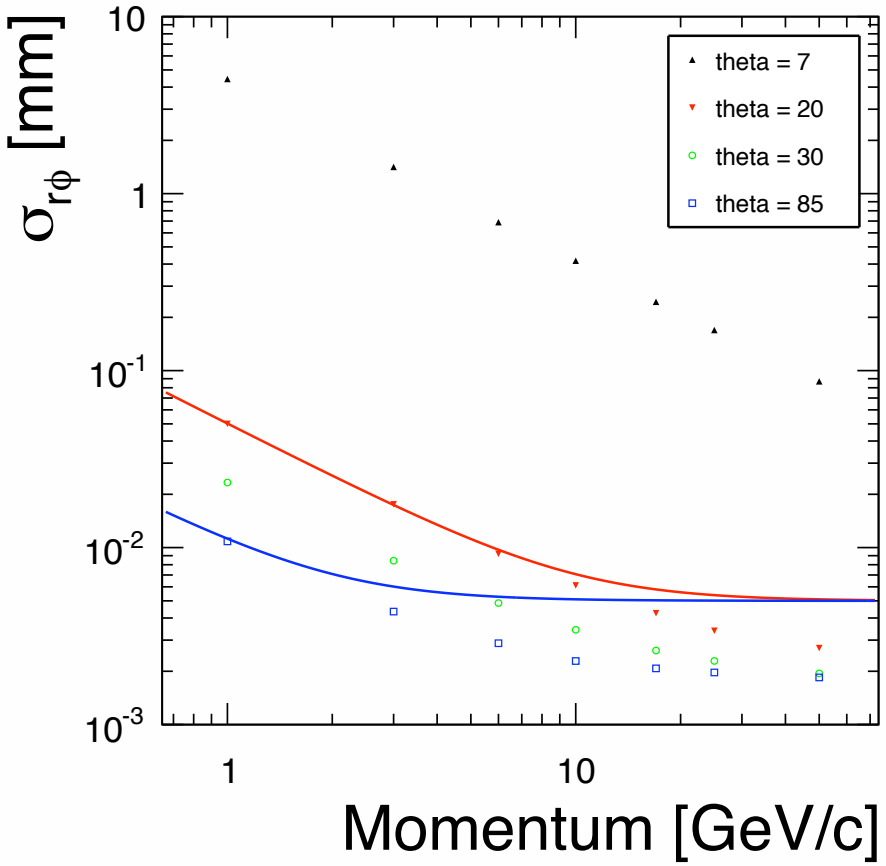
FullLDCTracking

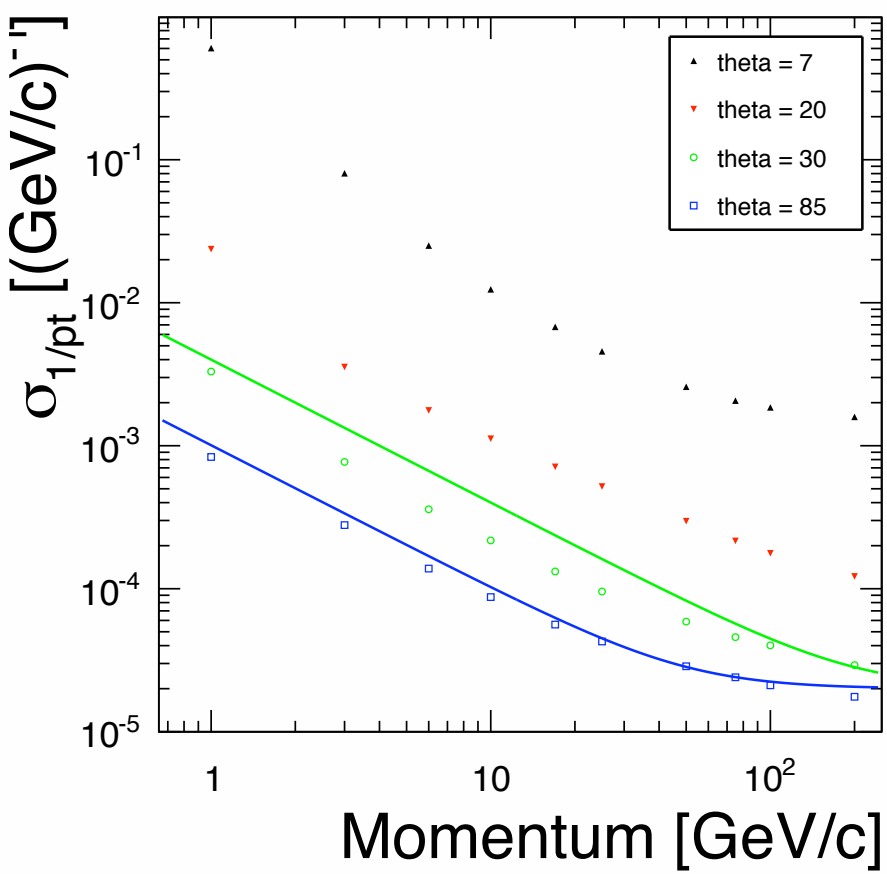
- Final step in full track reconstruction
- Associates SiTracks and TPCTracks
- Merges Split low pt loopers
- Adds Hits from SET and ETD
- Picks up unassigned hits
- Fitting still using Delphi F77 code

Geometry

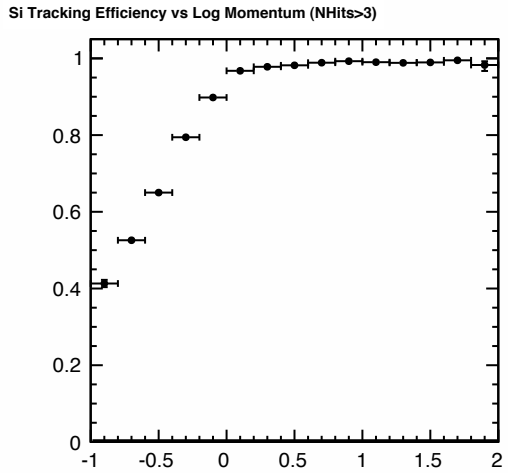
- Uses GEAR
- MaterialDB: Separate Marlin Processor to fill the F77 common blocks used by Kalman Filter in F77 tracking code

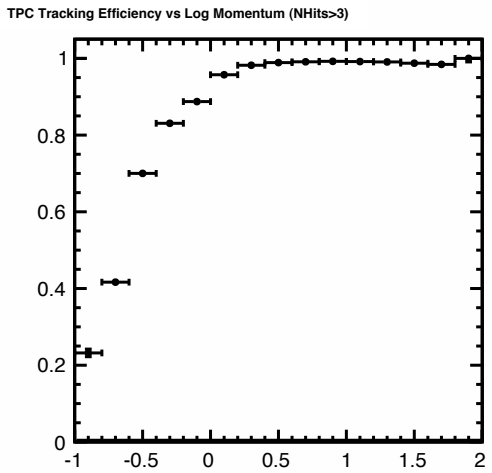
Track Parameter Resolution

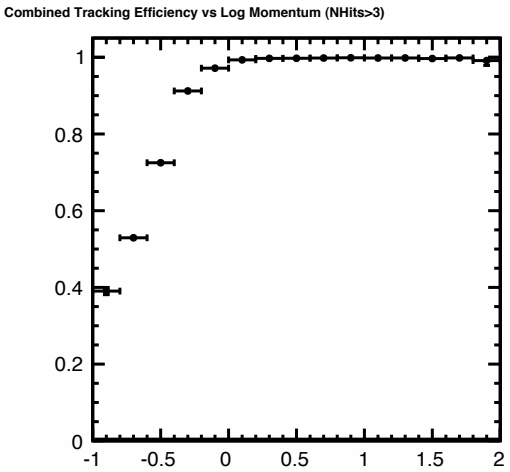




Track Efficiency vs momentum

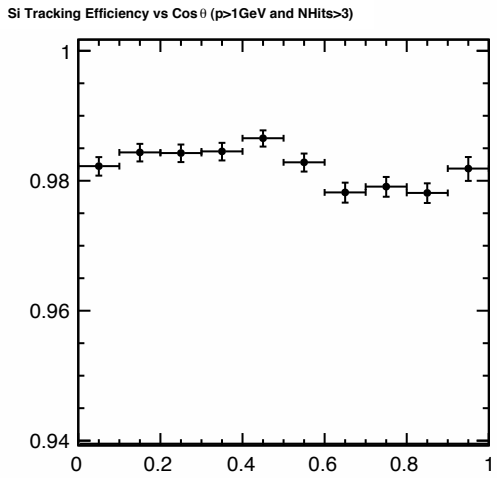


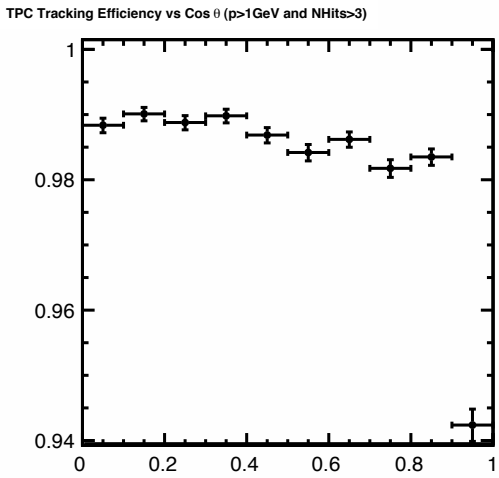


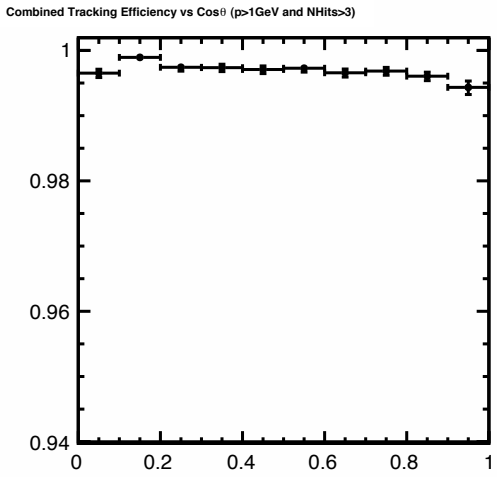


ttbar events @ 500 GeV

Track Efficiency vs angle







ttbar events @ 500 GeV

Outstanding Issues

- Barely manageable code base
- Error Description – impact parameters only determined by the Si Tracks due to problems with errors for full tracks
- Material Description
- Background

Plans

- Move to a new Tracking System
- Track Model
- MarlinTPC <=> MarlinReco
- Keisuke’s Kalman Filter
- Atlas Inner Tracking Software