



Track Fitting Investigations

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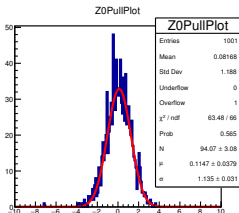
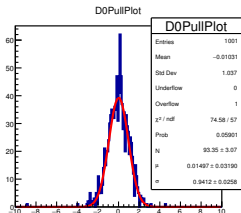
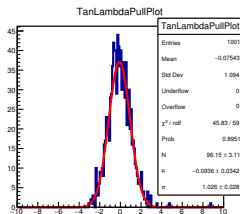
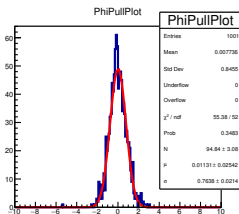
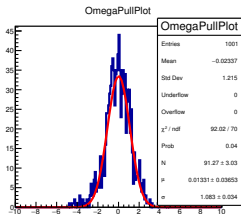
CLICdp Software Meeting
August 15, 2017

- 1 The TruthTrackFinder produced worse $d0$ resolutions than the ConformalTracking+ExtrToTracker
- 2 The resulting tracks have the same set of hits but significantly different track parameters
- 3 Both are at some point calling `MarlinTrk::MarlinTrkUtil::finaliseLCIOTrack`

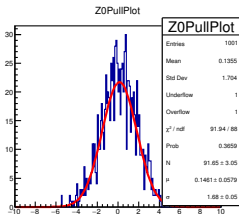
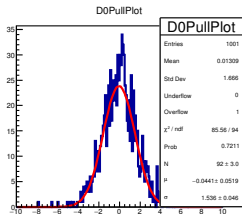
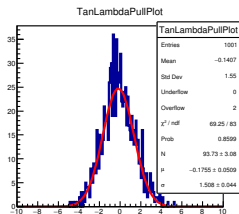
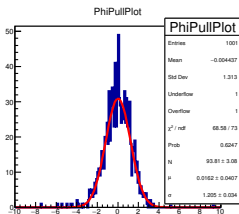
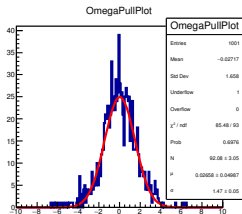
Where does this difference come from?

- If the approach in the `ExtrToTracker` gives better results, why not try to do the same thing with the hits produced by the `TruthTrackFinder`
- Created `RefitHitByHit` processor.
 - ▶ Takes the tracks from input collection.
 - ▶ Create new track object, add first N hits (or just hits from vertex endcap/barrel)
 - ▶ call `MarlinDDKAlTestTrack::addAndFit` for the rest of the hits
 - ▶ call `finaliseLCIOTrack`
- Pull distributions are broader for `RefitHitByHit`
- Using only 100 GeV muons at $\theta = 85^\circ$ with smearing over azimuthal angle
- See also results by Peter for $d0$

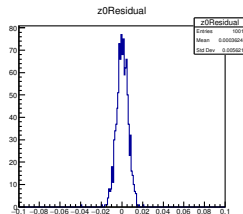
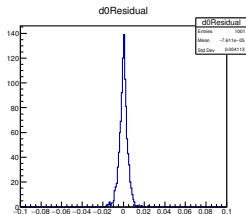
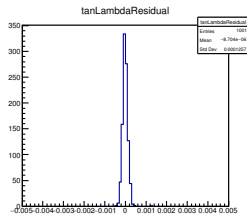
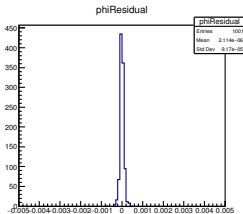
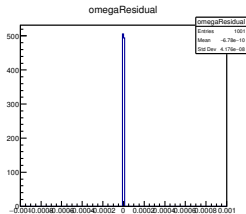
Pulls TruthTrackFinder



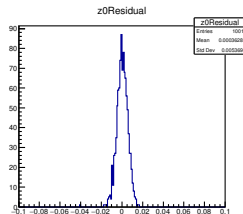
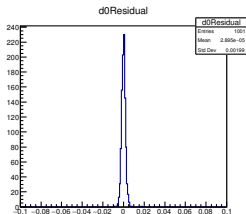
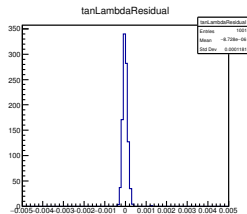
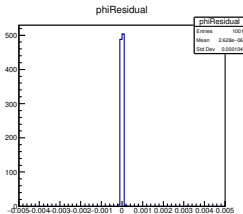
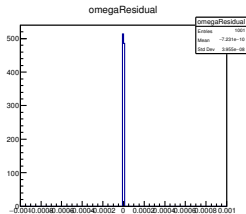
Pulls Refit



Resolution TruthTrackFinder

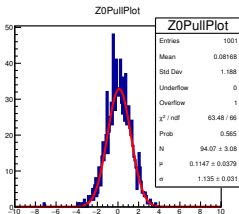
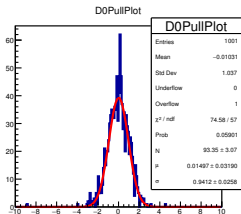
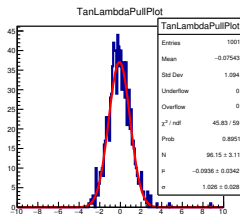
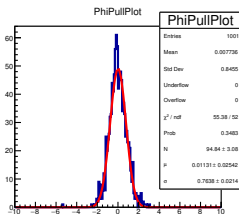
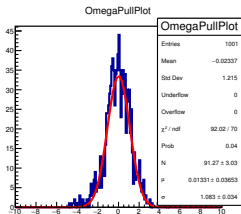


Resolution Refit

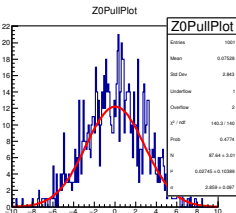
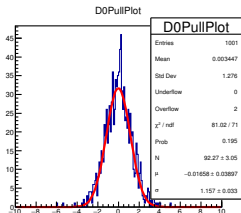
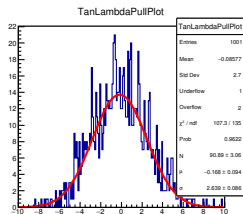
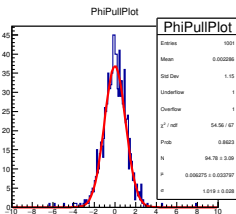
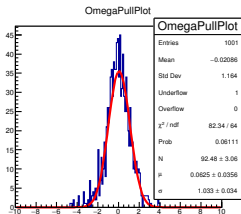


- It does not matter how many hits I `addAndFit`, giving all hits to the track objects also gives better resolutions
- The real difference seems to come from the initial parameters passed to the fit, especially the `referencePoint`
- In `ExtrToTracker` (and `RefitHitByHit`) the reference point is $(0,0,0)$. In the other case this comes from the `createPreFit` and is the position of the first hit
- Calling `moveReferencePoint(0, 0, 0)` for the `preFit` parameters also results in better $d0$ resolutions, but worse pulls for $Z0$ and $\tan\Lambda$
 - ▶ Need to understand if `moveReferencePoint` needs to have as argument a point on the helix or not...

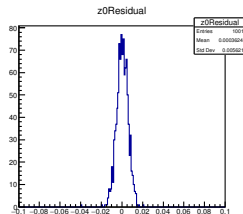
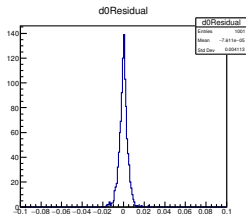
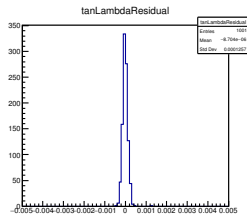
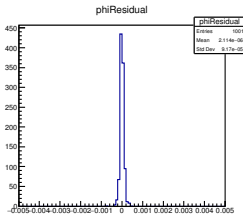
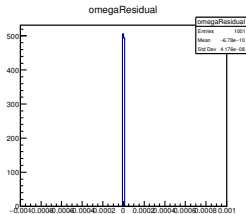
Pulls TruthTrackFinder



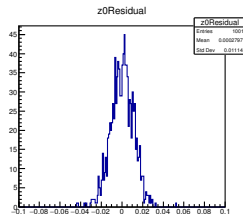
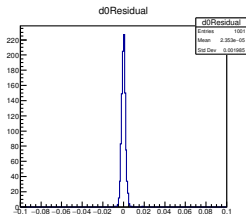
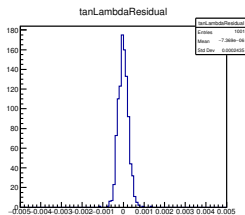
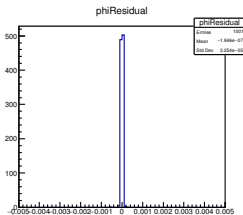
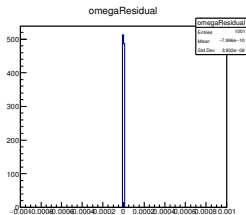
Pulls Moved ReferencePoint



Resolution TruthTrackFinder



Resolution Moved ReferencePoint



Further investigations



Understanding the initial track parameter influence on the final result