Running the Tracking in the Reconstruction

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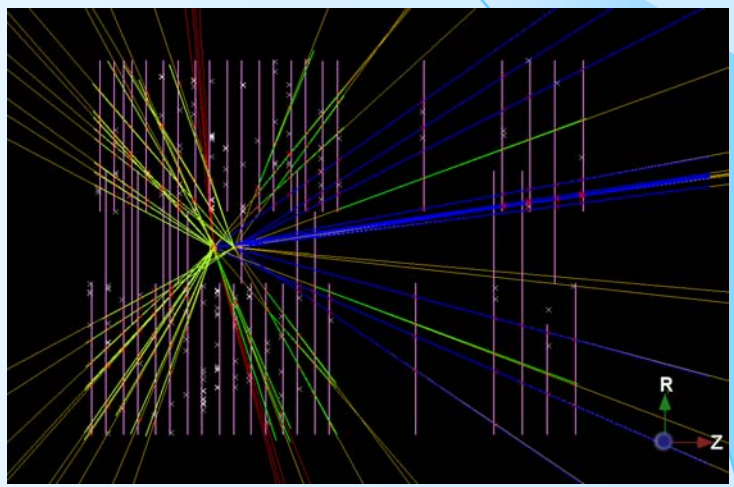
- ***Running the Tracking***
  - *What has to be / has been done*
  - *Overview of tracking packages*
  - *Running in Brunel*
  - *Options Files*
  - *new TrackSys package*
- ***Summary and Outlook***
  - *trajectories on the horizon*



What had to be done

Main Stream of Work December - January

- **Freeze all tracking code for LHCb v19r* series (Eduardo)**
- **Test & debug it (Eduardo, Edwin, Jeroen, ?)**
- **Prepare a new-TEM tracking sequence to run in Brunel (Eduardo)**

Main Stream of Work for the future

- **Prepare for DC'06 (all)**
- **Migrate all tracking code to LHCb v20r0**
  - ***Done for the Event Model Classes and the tracking interfaces (Matt)***
  - ***The rest of the TrackXxx packages will follow (Eduardo & Edwin share the work)***
- **Adapt pattern recognition to work with a realistic detector**
  - ***The team: Matt, Jose, Eduardo, Olivier, ?***
- **Adapt track fitting to work with a real detector**
  - ***The team: Eduardo, Edwin, Gerhard Raven, Jeroen van Tilburg, Marcel Merk***
    - ***Short report today. More next week …***

What has been done

- ✓ **Lots of testing / debugging / improvements / extensions done in past 2 weeks**
  - ❖ *too many to list here. Refer to release.notes files of all TrackXxx packages …*
- ✓ **All tracking code for LHCb v19r* series now frozen**
- ✓ **Tracking sequence with the new Track Event Model prepared**
  - ❖ *All the above required quite some changes here and there*
- ✓ **Finalize complete move to new TEM**
  - ❖ *Clone killing: old-TEM algorithm replaced now by clone finder tool + algorithm*
    - ▪ *tool is very general and can be used for other purposes*
  - ❖ *Seeding: waiting for C++ version: More news today from Gabriel*

Tracking Classes, Tools and Algorithms

Event Model

Event/TrackEvent
Kernel/LHCbKernel

General Tools

Pat/PatTools Pat/PatUtils
Tr/TrackInterfaces
Tr/TrackExtrapolators
Tr/TrackTools
Tr/TrackMCTools

Miscellaneous

Pat/PatFitParams
Pat/PatChecker

Tr/TrackPython

Tr/TrCConverters
Trg/TrgConverters

Pattern Recognition

Tr/Seeding
Pat/PatVelo
Pat/PatForward
Pat/PatVeloTT
Pat/PatKShort
Tr/TrackMatching

Fitting

Tr/TrackFitEvent
Tr/TrackProjectors
Tr/TrackFitter

MC Association

Pat/PatChecker
Tr/TrackAssociators
Tr/TrackCheckers

Tr/TrackIdealPR

Running the Tracking in Brunel

Reco.opts File

As of now:

- *Reconstruction phase set-up via Reco.opts file in Brunel*
- *Reco.opts has the structure*

```
Reco.DetectorList = { “VELO”, “IT”, “Tr”, “RICH”, “CALO”, “MUON” };

// ST reconstruction & Tracking: Velo, forward,…

// …

// RICH reconstruction

// …

// Muon coordinate reconstruction, MuonID, cleaning
// …
```

Running the Tracking in Brunel

New Reco.opts File

Proposal:

- ***Decouple (at least) the tracking sequence from the rest***
  - ✓ *More flexibility and clarity*
  - ✓ *Could do similar for RICH, Calo, Muon*
- ***Reco.opts would simply become***

```
// ST recontruction
// ...

// Tracking reconstruction phase: pattern recognition + fitting
#include "$TRACKSYSROOT/options/RecoOldTracking.opts“
#include "$TRACKSYSROOT/options/RecoTracking.opts"

// RICH reconstruction

// ...
```

TrackSys package further detailed …

Running the Tracking in Brunel

RecoOldTracking.opts File

- Still need to run the FORTRAN SEEDING algorithm that outputs old-TEM tracks
- Seeding also needs old-TEM velo and forward tracking to be run
- New version of Seeding almost finalized (see Gabriel's talk today)
- Temporary file

Old Track Event Model Tracking

- Velo tracking
- Forward tracking
- Seeding algorithm

Ouput converted to new-TEM Tracks in /Event/Rec/Track/Seed

Running the Tracking in Brunel

RecoTracking.opts File

New Track Event Model Tracking

PATTERN RECOGNITION & FITTING

- Velo tracking
- Forward tracking
- Velo-Seed matching
- KShort tracking
- Velo-TT tracking

Ouput Tracks in:

/Event/Hlt/TrackSpaceVelo

/Event/Rec/Track/Forward

/Event/Rec/Track/Match

/Event/Rec/Track/KsTrack

/Event/Rec/Track/VeloTT

The TrackSys Package

Purpose

Define the global tracking set of packages

- *Takes care of setting up the consistent set of tracking packages to use*
- *Single place where the tracking sequence for Brunel can be set-up*

Contents

Requirements file:

- *List of consistent set of TrackXxx packages (+ Seeding)*

Options directory:

- *BrunelReco.opts: equivalent of Reco.opts but with new structure*
- *RecoOldTtracking.opts: runs necessary algo. for FORTRAN Seeding in the old Track Event Model*
- *RecoTracking.opts: contains the whole tracking sequence for Brunel in terms of the not-so-new Track Event Model*
- *TrackLoad.opts: loads all necessary DLLs for track ftting*

TrackSys v1r0 for LHCb v19r* & Brunel v28r2 ready

On the Horizon …

Fitting in a realistic detector

Concept of Trajectory introduced:

- *See e.g. Edwin's talk in Cambridge Workshop*

First tests:

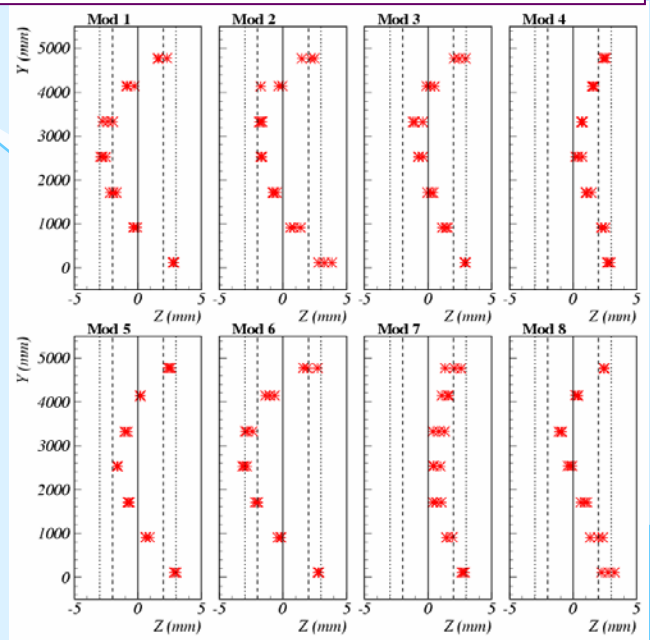
- *Rapid and good progress*
- *Done for the OT*
- *Standard projector state -> measurement compared with projector translated in "trajectories language"*
- *Results (residual & error, χ^2) agree within 10^{-2} - 10^{-5}*

Next steps:

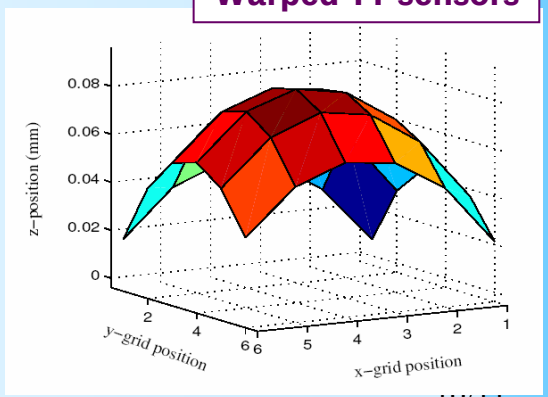
- *Do the same for Velo (R and Φ) and ST (code inside the projectors)*
- *Proposal to move detector-specific parts out of the track fit and into the detector elements (at this point most will have been worked out)*

Detailed report to be presented next week …

"banana-shaped" Outer Tracker modules



Warped TT sensors



In short …

- A lot of testing / debugging / improvements in the past 2 weeks

- 1st time we have a tracking sequence in Brunel that replaces the «old one», and runs with the «new Track Event Model»

⇒ end of « old vs new » TEMs …

From now on there is only

THE TRACK EVENT MODEL

- Work on tracking for LHCb v19r* and Brunel v28r2 wrapped-up
- Move to LHCb v20r0 (MathCore, LHCb namespace, etc.) under way …