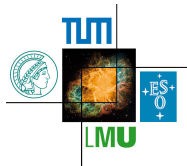# Status of VXD Tracking

Tobias Schlüter (2013-06-13)
LMU Munich

VXD-only Track Finding

Status:

- ► stable
- ► but too slow with BG enabled

Example timings:

- ► CircleFit + Hopfield: 87.3%, 37ms/ev
- ► CircleFit + Hopfield + BG: 61%, 141 ms/ev

(where Jakob explains that especially the times have to be taken with a grain of salt, as he was using his laptop during the measurements.)

- ► could use some testing by other people
- ► but it requires a lot of RAM currently due to the way `basf2` reads the XML files containing the pre-calculated information
- ► should become much less awkward once we have a database

Alignment

Alignment Task Force established, headed by Sergey Yashchenko (DESY).

- ▶ ATF document in the works
- ▶ some studies of Belle 1 SVD re-alignment undertaken: questions about viability of the selected dataset
- ▶ Sergey will start implementing the GBL track fit, which is required for Millipede, in `genfit2` in the days to come
- ▶ also generators for cosmic muons are about ready
- ▶ cosmic muons are very important for alignment due to the small size of the beam spot

Also, parametrization and simulation of misalignment are very important. These are worked on by our Prague colleagues.

Track Merging, Extending

Combined tracking in VXD + CDC is of prime importance.

- ▶ since we can have independent track finding in VXD and CDC, we need to be able to merge tracks found in both the VXD and the CDC
- ▶ Abdelouahab Abdesselam (Tabuk) has written a first version of a module for this purpose
- ▶ his first performance studies only finished recently mixed up cm and mm, so they have to be repeated

We will also need to be able to extend tracks found in the CDC into the VXD. Practical implementaition of this will have to wait for `genfit2`.

Status of `genfit2`

Issues with `genfit`:

- ▶ no data structure reflecting the entirety of the track. Thus no easy merging of track-segments, adding of tracks post-fit, no easy way of extracting residuals.
- ▶ no well-defined convergence criteria
- ▶ no caching of materials (required for GBL)
- ▶ Kalman fit implementation makes sub-optimal use of pattering information

Thus we (mainly Johannes Rauch (TUM)) have undertaken a re-write of `genfit` to address these issues.

- ▶ main idea: track is a sequence of `TrackPoint`s which can be hits, or material
- ▶ the fitters then attach information to these `TrackPoint`s
- ▶ a track is extended by adding `TrackPoint`s and deleting only the information that needs to be updated

Status of `genfit2`

Status:

- ▶ we have implemented and are testing a Kalman fitter equivalent to the one in `genfit` and a Kalman fitter which uses pattering information throughout ("reference track")
- ▶ Christoph Rosemann (DESY) has joined the project and will work on the material caching
- ▶ we maintain a branch of `basf2` that connects with `genfit2`
- ▶ the DAF still needs to be ported, work on GBL will start soon

One result seems to be that the advanced Kalman with the reference track deals much better with 2D hits. This promises to be very useful for the VXDTF.

Tracking and Framework Review

We will have a "Tracking and Framework Review" at MPI next week on Wednesday and Thursday.

- ▶ two external reviewers will evaluate the status quo and our plans for Belle 2 tracking and the software framework
- ▶ each item will be presented in an half-hour presentation
- ▶ the reviewers will comment and ask questions after each presentation
- ▶ the second day is mostly devoted to going through each of the topics in detail with the reviewers

We are looking forward to this opportunity to gain valuable insights from experienced outside people.

Thanks!