Alignment overview

Status and plans

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Belle II f2f tracking meeting,
Prague, 19.01.15

HELMHOLTZ ASSOCIATION

Belle II

DESY

Outline

- Alignment status and plans
  - Alignment method
  - Misalignment and alignment in VXD and CDC
  - Alignment monitoring and validation
  - Alignment in the common calibration framework
  - Alignment parameters in database
  - DST alignment data format
  - Alignment online integration
  - IP profile determination and monitoring
  - Preparation for CDC cosmic test
- Plans for discussions during this meeting

Alignment method

- Millepede II (MPII) using General Broken Lines (GBL)
- Status
  - GBL in GENFIT, tested for VXD and CDC
  - MPII in externals, tested for VXD
- Plans
  - Implement derivatives to CDCRecoHit
  - Monte Carlo tests with VXD and CDC
- Details in the talk of Tadeas Bilka

Detector (mis)alignment

- Agreement to have differences between design detector geometrical parameters and survey measurements on geometry level (displacement)
- Detector (mis)alignment should be implemented on reconstruction level (RecoHits)
- Possibility to use misalignment and alignment simultaneously

Detector (mis)alignment in VXD and CDC

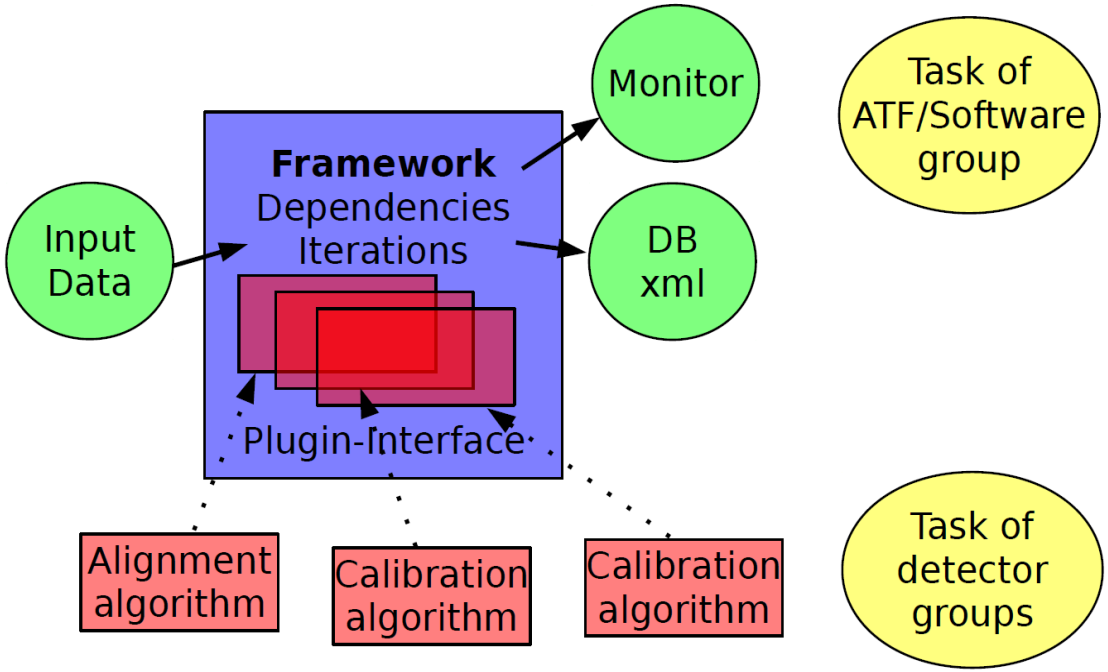
- Status of (mis)alignment in VXD
  - Implemented in RecoHit level (Peter Kvasnicka)
  - Not yet in basf2 svn, issues with slanted sensors (solved?)
- Status of (mis)alignment in CDC
  - First version of (mis)alignment in basf2 (one can apply simple (mis)alignment, e.g., shifts of wire positions on both sides of CDC)
  - Treatment of track-related (mis)alignment/(mis)calibration parameters are not yet finalized
  - Discussed at B2GM, final decision on implementation after discussion with Oliver and Victor working on CDC track finders
  - Not yet implemented in CDCRecoHits

Alignment monitoring and validation

- Monitoring of track residuals is already provided by the tracking group
- Alignment validation status (Simon Wehle)
  - Validation for cosmics done
  - Validation for the physics process $D^0 \rightarrow K3\pi$ done
  - Will be on svn by B2GM
- Plans
  - Implement to the basf2 common validation framework

Common calibration framework

- Idea to have a common calibration framework (Thomas Kuhr)



- Discussed with detector representatives during the software workshop in Camogli

Alignment in the common calibration framework

- First version of the calibration framework ready (Sergey)
  - Calibration manager (singleton)
  - Calibration module with several virtual functions to be finally overridden within an inheriting individual calibration modules
- Plans to test it with the alignment module
  - Define possible tests
- Provide it as an example for detector calibration modules
- Further improve the calibration framework using feedback from detectors

Alignment in database

- Currently use xml files (VXD) and ASCII files (CDC) for (mis)alignment
- Should be in the database at the point when the database access is officially provided
- Experience from the first database testers (VXD?) can be very useful

DST alignment data format

- DST data format should be provided
- Low-level information (detector hits) is needed
- Events (tracks) for alignment can be selected at higher level (uDST?)
- Get hit information only for these events (tracks)
- Currently nobody assigned for this task
- Volunteers?

Alignment online integration

- Activity not yet started
- Alignment in the calibration framework will be the first step
- Volunteers?

IP profile determination and monitoring

- Do we need to determine and monitor the IP profile?
  - What precision is needed?
  - How often should it be updated?
  - Compare with information from the accelerator group?
- A separate task, can be done by somebody from the tracking or the alignment groups
- Volunteers?

Preparation for CDC cosmic tests

- Track finding and track fitting should be ready by the tests
  - Oliver will probably talk about this tomorrow
- CDC survey measurements will not be ready in the CDC geometry by the cosmic tests
- Try to reproduce survey measurements by track-based alignment
- Common effort of the tracking, alignment and CDC people involved

Plans for discussions during this meeting

- VXD (mis)alignment (Peter, Tadeas, Sergey)
- CDC (mis)alignment and preparation for the CDC cosmic tests (all involved in CDC tracking and alignment)
- Alignment implementation in and tests of the calibration framework (Tadeas, Sergey)
- Possible discussions on open tasks are welcome

Backup

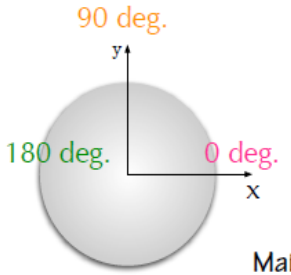
CDC measurements prior to alignment

- Taniguchi-san presentation during the joint CDC-alignment session on Tuesday
- CDC measurements
  - Wire hole positions: 3D measurement probe (σ ~ 50 μm)
  - Endplate rotation and shift: level survey (σ ~ 50 μm)
  - Endplate distance: 3D measurement arms (σ ~ 50 μm)
  - Wire sag: ρ (sense wire) = 0.14g /10m (σ ~ 1%)
  - VXD load
- Plans for the cosmic ray test

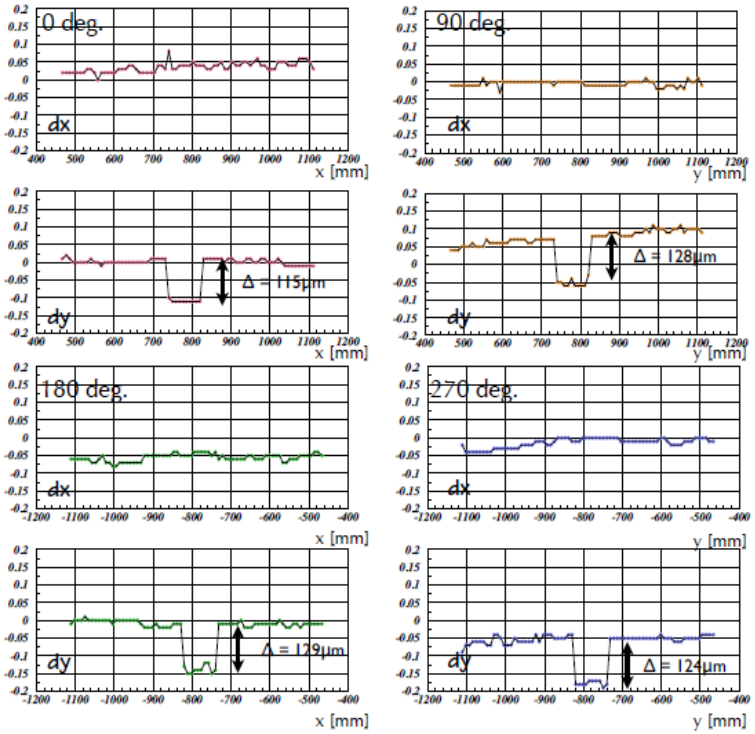
Wire hole position measurement

Nanae Taniguchi 141103

wire hole position



Main part of Fwd. endplate



3D measurement probe is used (~σ50um)

measure 444 wire hole position along x-y axes (~1 % of whole wire holes)

deviation from design value < 50um

Δy ~120um shift in several layers of Main part Fwd. endplate due to an earthquake

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Plans for the CDC cosmic ray test

Nanae Taniguchi 141103

cosmic ray test

March 2015

B = 0

Not in Belle structure. Side room at Tsukuba B4

We can't use PS located in E-hut.

We can operate ~50 FEs (16%) with spare PS.

+2.0V	+2.0V
+2.0V	+2.0V
+2.5V	+2.5V
+4.3V	+4.3V
+6.0V