

Alignment Tools

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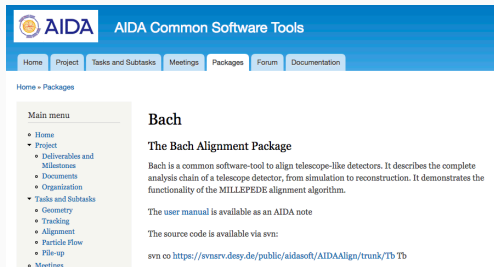
University of Manchester

AIDA-2020 WP3 Meeting

February 1, 2017



- An package for the alignment of telescope like detectors
- Minimal external dependencies (ROOT+boost)
- Developed as part of the previous AIDA project



The screenshot shows the AIDA Common Software Tools website. The header features the AIDA logo and the text "AIDA Common Software Tools". Below the header is a navigation menu with buttons for Home, Project, Tasks and Subtasks, Meetings, Packages, Forum, and Documentation. The main content area is titled "Home - Packages" and contains a "Main menu" sidebar with a tree view of site navigation options. The main content area displays the title "Bach" and the subtitle "The Bach Alignment Package". The text describes Bach as a common software-tool for aligning telescope-like detectors, detailing its role in the analysis chain from simulation to reconstruction and its use of the MILLEPEDE alignment algorithm. It also states that the user manual is available as an AIDA note and that the source code is available via SVN, providing the URL: <https://svnsrv.desy.de/public/aidasoft/AIDAAlign/trunk/Tb Tb>.

AIDA AIDA Common Software Tools

Home Project Tasks and Subtasks Meetings Packages Forum Documentation

Home - Packages

Main menu

- Home
- Project
 - Deliverables and Milestones
 - Documents
 - Organization
- Tasks and Subtasks
 - Geometry
 - Tracking
 - Alignment
 - Particle Flow
 - Pile-up
 - Meetings

Bach

The Bach Alignment Package

Bach is a common software-tool to align telescope-like detectors. It describes the complete analysis chain of a telescope detector, from simulation to reconstruction. It demonstrates the functionality of the MILLEPEDE alignment algorithm.

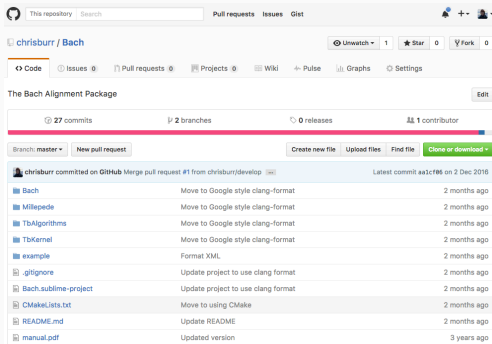
The user manual is available as an AIDA note

The source code is available via svn:

svn oo <https://svnsrv.desy.de/public/aidasoft/AIDAAlign/trunk/Tb Tb>

The Bach alignment toolkit - On GitHub

- Project source moved to github (<https://github.com/chrisburr/Bach>)
- Considering moving the repository to the AIDAsoft github organisation
 - Who is responsible for this?

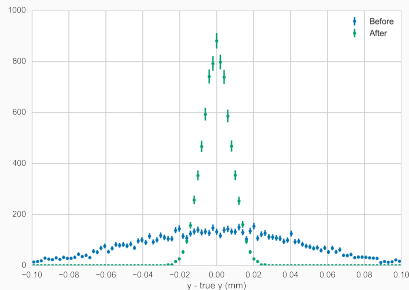
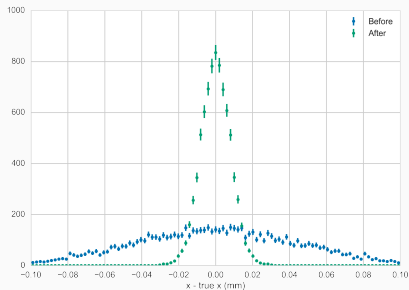


The screenshot shows the GitHub repository page for 'chrisburr / Bach'. The repository has 27 commits, 2 branches, 0 releases, and 1 contributor. The current branch is 'master'. A pull request #1 is open, merging 'develop' into 'master'. The commit history is as follows:

File	Commit Message	Time
Bach	Move to Google style clang-format	2 months ago
Millepede	Move to Google style clang-format	2 months ago
TbAlgorithms	Move to Google style clang-format	2 months ago
TbKernel	Move to Google style clang-format	2 months ago
example	Format XML	2 months ago
.gitignore	Update project to use clang format	2 months ago
Bach.sublime-project	Update project to use clang format	2 months ago
CMakeLists.txt	Move to using CMake	2 months ago
README.md	Update README	2 months ago
manual.pdf	Updated version	3 years ago

The Bach alignment toolkit - Developments

- Developments:
 - Changed build system to use CMake
 - Rewritten to use DD4hep for geometry instead of ROOT



The Bach alignment toolkit - Milestone 40

- Milestone 40 due this month
- Sent report for review a couple of weeks ago

 Grant Agreement No: 654168

AIDA-2020

Advanced European Infrastructures for Detectors at Accelerators
Horizon 2020 Research Infrastructures project AIDA-2020

MILESTONE REPORT

RUNNING PROTOTYPE FOR ALIGNMENT TOOLKIT


MILESTONE: MS40

Document identifier:	AIDA-2020-MS40-Deliverable-1.0.0
Due date of milestone:	End of Month 21 (Jan 2017)
Justification for delay	<i>(if delays occurred)</i>
Report release date:	AIDA-2020-MS40
Work package:	WP3: Advanced Software
Lead beneficiary:	UNIMAN
Document status:	Valid (Final when fully approved)

Abstract:
This milestone report documents the modifications made to the Bach software package in order to provide a prototype alignment package with tight integration to the DD4hep toolkit.

AIDA-2020 Consortium, 2017

Grant Agreement 654168 [Home](#) 1 /

 Milestone: MS40

RUNNING PROTOTYPE FOR ALIGNMENT TOOLKIT

Date: [AIDA-2020-MS40](#)

Executive summary
A prototype alignment package has been produced that is capable of correcting misalignments in DD4hep geometries. This work has been based on the BACH alignment package produced in the original AIDA project. Preliminary validation has been performed to show the true alignment can successfully recover and future work will perform additional validation and further improve the integration with DD4hep.

1. INTRODUCTION

Experiments in high energy physics depend upon the accurate measurement of the trajectories of particles passing through detectors in order to calculate a wide range of physical quantities. In order to allow these quantities to be reconstructed with the greatest precision the exact position of the detector elements must be computed. The alignment constants describing this exact position are typically calculated in software by minimising the track residual, that is the difference between the position of the detected hit and the intercept of the fitted track. An overview of alignment methods used in high energy physics can be found in [1].

The BACH alignment package [2] was developed during the first AIDA project and provides a complete standalone package for the reconstruction of data in telescope like detectors, including: simulation, clustering, pattern recognition, track fitting and alignment. The minimisation is performed using MILLEPEDE [3]. The package has been used for the AIDA Temex telescope [4] and is being considered for use by the LHC beam gas vertex group and the Muon Ionisation Cooling Experiment (MICE).

DD4hep [5] is software framework designed to provide a comprehensive solution for the detector description of high energy physics experiments. Despite BACH providing everything required for the reconstruction of data, integration with DD4hep allows for more advanced usage, such as arbitrarily nested detector elements and integration with other packages supported by DD4hep such as GEANT4 [6]. This milestone document describes the status current prototype.

Grant Agreement 654168 [Home](#) 4 /

Bach

- Move to AIDAsoft organisation(?)
- Fix a bug with aligning rotations
- Allow multiple iterations of the alignment algorithm to be ran
- Add support for writing the alignment constants to a file

LHCb VeLo upgrade

- Model alignment affect of distortions seen in lab tests

Test beam

- Plan to provide alignment support for 2017 test beams