ACTS Tracking Software Status

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for the ACTS developers

Université de Genève

2016-10-19 FCC-hh detector meeting

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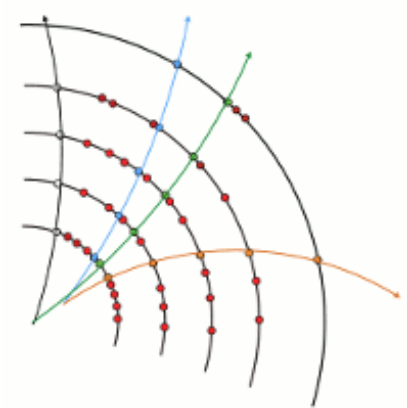
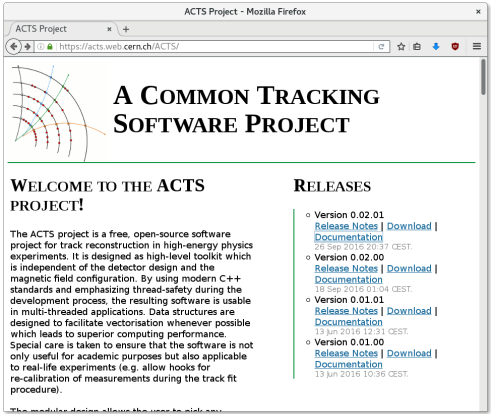
ACTS — A Common Tracking Software



- Experiment independent tracking tools
- Derived from current ATLAS reconstruction

- Standalone
- Minimal dependencies

ACTS — Framework



What's new?

- Website
- Issue Tracker
- Continous Integration
- Unit tests
- Mailinglists
  acts-developers, *acts-users*

`https://acts.web.cern.ch/`
`https://gitlab.cern.ch/acts/a-common-tracking-sw`

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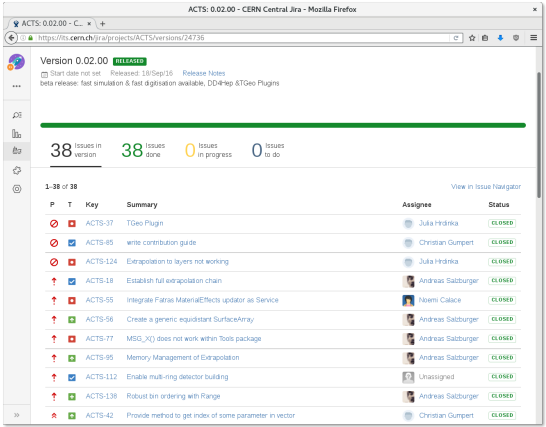
ACTS — Releases



Latest release 0.02.01

- Updated DD4Hep, TGeo Plugins
- Updated extrapolation
- Bugfixes

Upcoming 0.03.00

- Generic example detector
- Digitization
- Seeding
- Propagator

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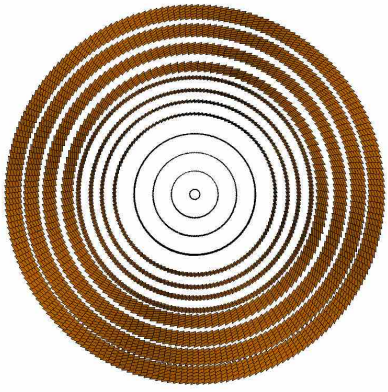
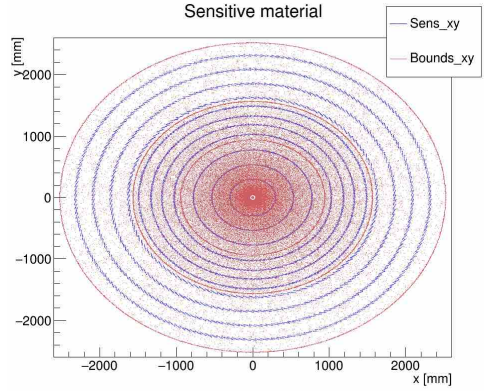
DD4Hep Geometry



DD4Hep detector model



Fast navigation & extrapolation

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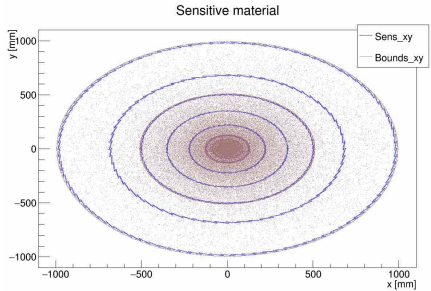
Generic Detector Example



Geometric Components

- Pixels
- Short/long strips
- Barrels
- Discs

- Debugged extrapolation
- Validation

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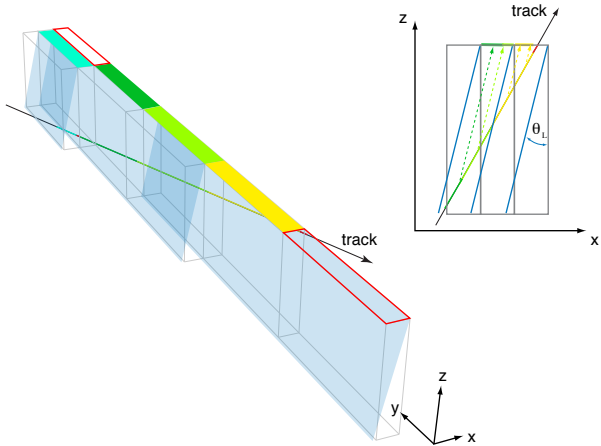
Fast Digitization



Features

- Purely geometric
- Variable segmentation
- Includes Lorentz-angle

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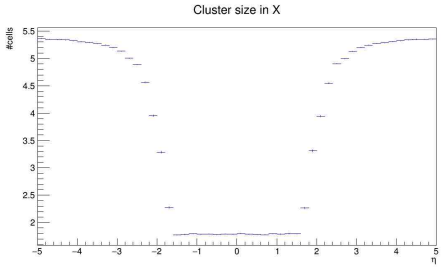
Fast Digitization



Preliminary results

Clustering in ϕ-direction

Features

- Purely geometric
- Variable segmentation
- Includes Lorentz-angle

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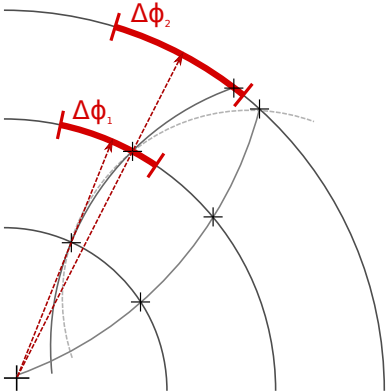
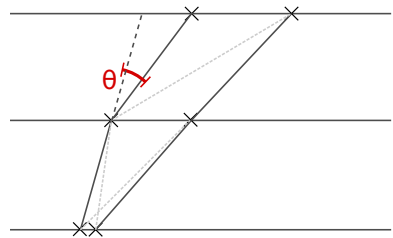
Seeding — Status

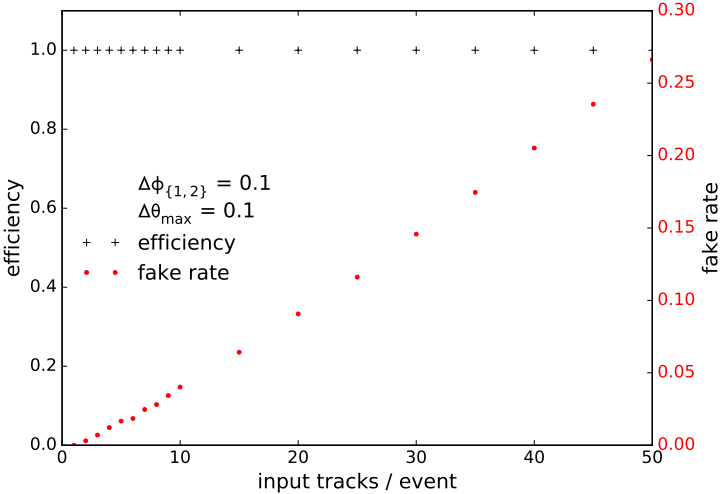


Helix Seed Finder

- Circle + line
- Combinatorial seed finder:
  Search window $\Delta\phi_{\{1,2\}}$
  Cut $\Delta\theta_{\text{max}}$



Seeding — Validation



Input:

- Flat track parameters
- $p_\perp$ = 1–100 GeV
- Truth hits from ACTS extrapolation

Efficiency vs number of tracks

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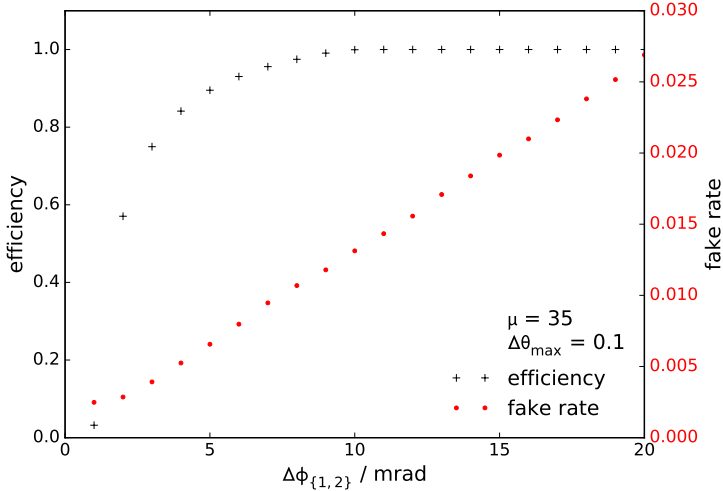
Seeding — Validation



Input:

- Flat track parameters
- $p_\perp = 1$–$100\,\text{GeV}$
- Truth hits from ACTS extrapolation

Efficiency vs ϕ window

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Multithreading Tests

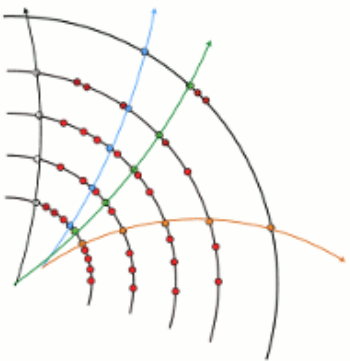
Setup

- 4-cores/8-threads Xeon CPU
- `ExtrapolationTest` with generic detector (test framework)
- Using OpenMP
- Without I/O

threads	time / ns	speedup
1	47	
2	24	2.0
4	12	3.9
8	9	5.2

work by Hadrien Grasland @IN2P3

Summary



Status

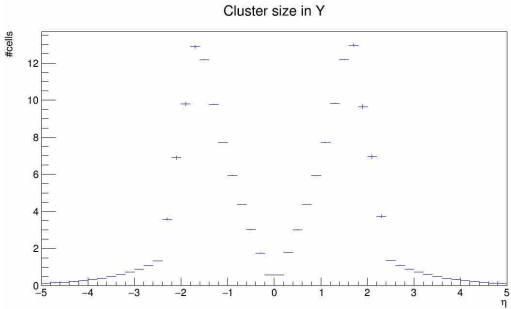
- Geometry, e.g. from DD4Hep
- Propagation
- Basic seeding
- Parallel-ready codebase

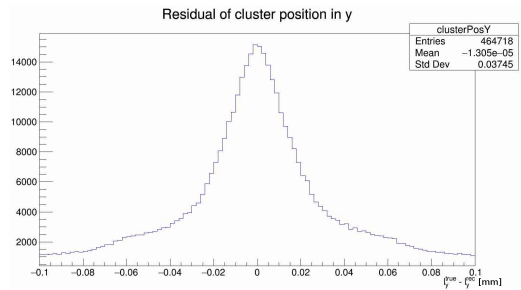
Outlook

- Full pipeline: from fast simulation to reconstructed tracks
- FCC demonstrator

Backup

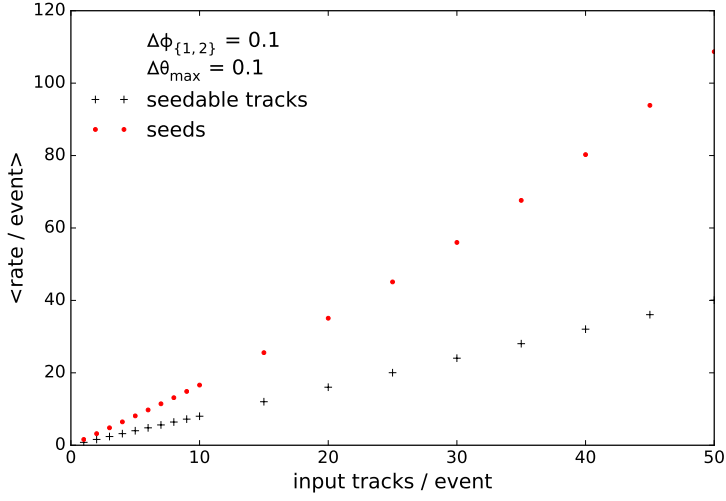
Fast Digitization — Along Z





Preliminary Results

Helix Seeding — Rates



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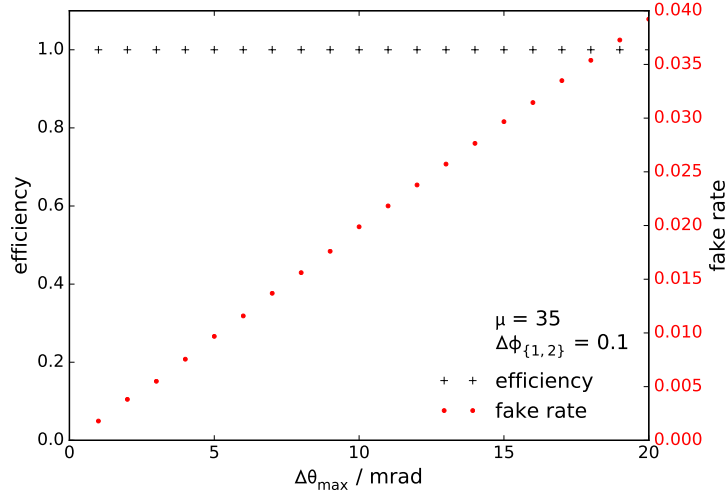
Helix Seeding — Efficiency vs θ Window