

# 1. SPD Tracking → Acts project: A Common Tracking Software

General considerations:

- Detailed documentation [acts.readthedocs.io](https://acts.readthedocs.io)
- It requires a C++17, CMake >= 3.14, Boost >= 1.71, Eigen >= 3.3.7
- Old GIT repository at [gitlab.cern.ch/acts/acts](https://gitlab.cern.ch/acts/acts)
- New GIT repository [github.com/acts-project/acts](https://github.com/acts-project/acts)
- Really fast development: v3.0.0 on 19 Nov 2020, v6.0.0 on 2 Mar 2021, ..., v23.0.0 on 18 Jan 2023
- v6.0.0 is available from LCG release, [lcginfo.cern.ch/pkg/acts/](https://lcginfo.cern.ch/pkg/acts/) for x86\_64-centos7-gcc11-opt
- The latest version can be built LCG\_102b/x86\_64-centos7-gcc11-opt (25 Oct 2022), see [/afs/cern.ch/work/l/lyubushk/public/ACTS/](https://afs.cern.ch/work/l/lyubushk/public/ACTS/) (to be compared: spdroot requires x86\_64-centos7-gcc62-opt)

## **Задача:**

- Трекинг с ACTS в Gaudi-based фреймворке (описание геометрии трекера SPD, трекинг, быстрая геометрия в ACTS)
- Tracking optimization
- работа кальмана, факторы влияющие на разрешение

# Acts project: track extrapolation

- definitions [acts.readthedocs.io/en/latest/core/propagation.html](https://acts.readthedocs.io/en/latest/core/propagation.html)
- Various algorithms are available:
  - Acts::StraightLineStepper for linear propagation without magnetic field;
  - Acts::AtlasStepper is RungeKutta algorithm for track parameters propagation through magnetic field;
  - Acts::EigenStepper provides same functionality as AtlasStepper, but it is rewritten with Eigen primitives
- Different realizations of RungeKutta algorithm:
  - ATLAS (original variant): [Tracking/TrkExtrapolation/TrkExRungeKuttaPropagator](#)
  - SPDROOT (GenFit2): [GenFit/.../trackReps/src/RKTrackRep.cc](#)
  - Acts (pure transcript from the ATLAS): [acts/.../Core/include/Acts/Propagator/AtlasStepper.hpp](#)
- Acts is ready for MT (algorithm contains no data itself, operates with states)  
GenFit2 is not MT ready

## 2. Физические задачи

- Эксклюзивные процессы  $pp \rightarrow pp V$ ,  $V = \omega, \phi, (J/\psi)$  (околопороговое рождение и рождение во всем спектре энергий) - пока в SPD нет анализов эксклюзивных процессов
- Дважды странные гиперядра ( $dd \rightarrow K^+ K^+ (n, n, \Lambda, \Lambda)$ ) сигнал/фон (генератор, сигнал/фон, возможность наблюдения)
- <https://inspirehep.net/literature/1984299>