

# The new ATLAS Fast Track Simulation engine (FATRAS)

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Various systematic physics and detector performance studies with the ATLAS detector require very large event samples. To generate those samples, a fast simulation technique is used instead of the full detector simulation, which often takes too much effort in terms of computing time and storage space. The widely used ATLAS fast simulation program ATLFAST, however, is based on initial four momentum smearing and does not allow tracking detector studies on hit level.

Alternatively, the new ATLAS Fast Track Simulation engine (FATRAS) that comes intrinsically with the recently developed track extrapolation package is capable of producing full track information, including hits on track. It is based on the reconstruction geometry and the internal navigation of the track extrapolation package that has been established in the restructured ATLAS offline reconstruction chain. Its modular design allows easy control of the inert material, detector resolutions and acceptance, the magnetic field configuration and the general noise level.

The application of the FATRAS simulation in a systematic detector performance study as well as a physics analysis will be presented.

## Summary

The new Fast ATLAS Track Simulation (FATRAS) has been developed in parallel to the new extrapolation engine to be used in the restructured ATLAS offline event reconstruction. The track extrapolation engine with its underlying full connective reconstruction geometry serves as the core part of the fast track simulation, providing mainly the intrinsic navigation of the inter-connected volumes to predict the track direction. The FATRAS simulation is fully embedded in the recently established new ATLAS Event Data Model (EDM) and guarantees full compatibility with the persistency services of the ATLAS offline software. Being designed with high granularity, the FATRAS simulation can be operated with different propagation modes, following a step-wise, helical or linear track model. It facilitates in addition the configuration of the inert material, the magnetic field configuration and the modelling of the underlying particle interaction with the traversed material.

Initially the FATRAS simulation has been intended to be used for validation and debugging of the recently developed reconstruction algorithm, as the idealistic track creation enables to factorize pattern recognition and track fitting, but includes - alternatively to the widely used ATLAS fast simulation ATLFAST - full hit information on the tracks. An additional interface to the standardized output of physics event generators to be used in ATLAS simulation enables in addition systematical physics studies with a high statistics that hardly reached with full detector simulation.

**Primary author:** Mr SALZBURGER, Andreas (UNIVERSITY OF INNSBRUCK)

**Presenter:** Mr SALZBURGER, Andreas (UNIVERSITY OF INNSBRUCK)

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