The ATLAS Integrated Simulation Framework

Fast and Flexible Large Scale Detector Simulation

The Integrated Simulation Framework (ISF)

The ISF is an ATLAS detector simulation framework optimized to simulate particles within one event with different simulators. Some of the simulators might be very accurate but slow, whereas others might be very fast but less accurate. The framework allows the user to configure routing rules that can be tailored to the needs of various physics groups.

Motivation to speed up ATLAS Detector Simulation

Various efforts have been undertaken to speed up ATLAS detector simulation. The Calorimeter is by far the most computationally intensive part of the ATLAS Geant4 [1,2] detector simulation. This motivated the development of the following ATLAS detector simulation setups used in MC production as of now:

- Geant4
- Geant4 with Frozen Shower Libraries
- Geant4 with FastCaloSim (parameterized Calorimeter)

Fast ATLAS Detector Simulators

For EM calorimeter simulation, low energetic particles get replaced by pre-simulated EM showers from a lookup library [1]. ATLAS Geant4 simulation uses these shower libraries by default in the forward calorimeters.

FastCaloSim

FastCaloSim [2,4] is a parameterized ATLAS calorimeter simulation. The parametrization is based on Geant4 simulation results.

Fatras

Fatras [3] is a fast tracker simulation for the ATLAS inner detector and muon spectrometer. The gain in speed comes from a simplified geometry description and simplified interaction models.

Parameterized Calorimeter Punch-Through and In-flight Decay

A tunable parameterized calorimeter punch-through and decay in-flight simulation [5] is capable of reproducing fake muon signatures.

References