

FATRAS –A Novel Fast Track Simulation Engine for the ATLAS Experiment

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Monte Carlo simulation of the detector response is an inevitable part of any kind of analysis which is performed with data from the LHC experiments. These simulated data sets are needed with large statistics and high precision level, which makes their production a CPU-cost intensive task. ATLAS has thus concentrated on optimizing both full and fast detector simulation techniques to achieve this goal within the computing limits of the collaboration. At the early stages of data-taking, in particular, it is necessary to reprocess the Monte Carlo event samples continuously, while integrating adaptations to the simulation modules to improve the agreement with the data taken from the detector itself.

We present a new, fast track simulation engine which establishes a full Monte Carlo simulation which is based on modules and the geometry of the ATLAS standard track reconstruction application. This is combined with a fast parametric-response simulation of the Calorimeter. This approach shows a high level of agreement with full simulation, while achieving a relative timing gain of about 100. FATRAS was designed to provide a fast feedback cycle for tuning the MC simulation with real data: this includes the material distribution inside the detector, the integration of misalignment and conditions status, as well as calibration at the hit level. We present the concepts of the fast track simulation, although will concentrate mainly on the performance after integrating the feedback from first data taken with the ATLAS detector during the 2009-10 winter months.

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