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Fast shower simulation in ATLAS Calorimeter

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Summary

The simulation of the ATLAS detector is largely dominated by the showering of electromagnetic particles in the heavy parts of the detector, especially the electromagnetic barrel and endcap calorimeters, when full showering is simulated by GEANT4. The ATLAS simulation includes a fast simulation option that achieves a significant improvement in simulation speed. In this technique, simulated showers from low-energy particles are "frozen" and stored in a library, that is distributed with each software release. These showers are then imported at runtime during physics simulation. The shower libraries are built and stored in separate "bins" in order to follow geometrical variations in calorimeter response. Simulation in the presence of frozen showers is then required to develop the shower down to ~ 1 GeV, at which point the shower is terminated by substituting a frozen shower. The procedure can now be applied in all of the electromagnetic compartments of the ATLAS calorimetry.

In this talk discuss mostly the frozen shower algorithms and their performance, but we also include a discussion of alternate approaches to fast shower simulation (e.g. Parameterization) that can have been applied in ATLAS.

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