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Upgrading the ATLAS Fast Calorimeter Simulation

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Many physics and performance studies with the ATLAS detector at the Large Hadron Collider require very large samples of simulated events, and producing these using the full GEANT4 detector simulation is highly CPU intensive. Often, a very detailed detector simulation is not needed, and in these cases fast simulation tools can be used to reduce the calorimeter simulation time by a few orders of magnitude. In ATLAS, a fast simulation of the calorimeter systems was developed, called Fast Calorimeter Simulation (FastCaloSim). It provides a parametrized simulation of the particle energy response at the calorimeter read-out cell level. It is interfaced to the standard ATLAS digitization and reconstruction software, and can be tuned to data more easily than with GEANT4. The original version of FastCaloSim has been very important in the LHC Run-1, with several billion events simulated. An improved parametrisation is being developed, to eventually address shortcomings of the original version. It incorporates developments in geometry and physics lists of the last five years and benefits from knowledge acquired with the Run-1 data. It makes use of statistical techniques such as principal component analysis, and a neural network parametrisation to optimise the amount of information to store in the ATLAS simulation infrastructure. In this talk, we will review the latest developments of the new FastCaloSim parametrisation.

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