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A point library for the fast simulation of the LHCb Calorimeter

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The simulation of physics events in the LHCb experiment uses the majority of the distributed computing resources available to the experiment. Notably, around 50% of the overall CPU time in the Geant4-based detailed simulation of physics events is spent in the calorimeter system. This talk presents a solution implemented in the LHCb simulation software framework to accelerate the calorimeter simulation.

During the Geant4 transport, the simulation of particles entering the calorimeter is stopped and the corresponding showers are generated using libraries of pre-simulated energy deposits. The energy deposits subsequently undergo a series of transformations to improve the accuracy of the simulation without increasing the library size. This technique reduces the computation time of the calorimeter to a negligible level.

The use of machine learning techniques in conjunction with the libraries to further enhance the simulation accuracy is also discussed, and a comparison between the outputs of the fast and detailed simulations is shown.

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