

CMS Fast Simulation

A framework for Fast Simulation of particle interactions in the CMS detector has been developed and implemented in the overall simulation, reconstruction and analysis framework of CMS. It produces data samples in the same format as the one used by the Geant4-based (henceforth Full) Simulation and Reconstruction chain; the output of the Fast Simulation of CMS can therefore be used in the analysis in the same way as other ones. The Fast Simulation has been used already for several physics analyses in CMS, in particular those requiring a generation of many samples to scan an extended parameter space of the physics model (e.g. SUSY). Other use cases dealt with by the Fast Simulation of CMS are those involving the generation of large cross-section backgrounds, and samples of manageable size can only be produced by events skimming based on the final reconstructed objects, or those for which in general a large computation time is foreseen. An important issue, related with the high luminosity achieved by the LHC accelerator, is the pileup. The Fast Simulation of CMS can further take into account the superposition of as many pileup events as the ones provided now or even expected in the LHC upgrades, in an extremely shorter computation time than the one required by the Full Simulation for the same task, with just a few shortcuts which will be also discussed here. Comparisons of the Fast Simulation results both with the Full Simulation and CMS data will also be shown, to demonstrate the level of accuracy achieved so far.

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