

Geant4 Electromagnetic Physics for LHC Upgrade

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Electromagnetic physics sub-package of the Geant4 Monte Carlo toolkit is an important component of LHC experiment simulation and other Geant4 applications. In this work we present recent progress in Geant4 electromagnetic physics modeling, with an emphasis on the new refinements for the processes of multiple and single scattering, ionisation, high energy muon interactions, and gamma induced processes. These developments affect the results of ongoing analysis of LHC data, in particular, electromagnetic shower shape parameters used for analysis of $H \rightarrow gg$ and $Z \rightarrow ee$ decays.

The LHC upgrade to future 14 TeV run will bring new requirements regarding the quality of electromagnetic physics simulation: energy, particle multiplicity, and statistics will be increased. To address new requirements high energy electromagnetic models and cross sections are improved. Geant4 testing suite for electromagnetic physics is extended and new validation results will be presented. An evolution of CPU performance and developments for Geant4 multi-threading connected with Geant4 electromagnetic physics sub-packages will also be discussed.