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## Progress in Geant4 electromagnetic physics modeling and validation

The Geant4 electromagnetic (EM) physics sub-packages are key components of any simulation; in particular, the simulation of LHC experiments. A small variation of EM physics may affect prediction accuracy and CPU performance of large scale Monte Carlo simulations for HEP, medicine or space science.

In this work we report on recent improvements of the EM models and on new validations of EM physics of Geant4. Improvements were made in models of the photoelectric effect, Compton scattering, gamma conversion to electron and muon pairs, fluctuations of energy loss, multiple scattering, synchrotron radiation, and high energy positron annihilation. The results of these developments are included in the new Geant4 version 10.1 and in patches to previous versions 9.6 and 10.0 that are planned to be used for production for run-2 at LHC.

The Geant4 validation suite for EM physics has been extended and new validation results will be shown in this work. In particular, the effect of gamma-nuclear interactions on EM shower shape at LHC energies will be discussed.

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