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## Precision electromagnetic physics in Geant4: the atomic relaxation models

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Various experimental configurations - such as, for instance, some gaseous detectors, require a high precision simulation of electromagnetic physics processes, accounting not only for the primary interactions of particles with matter, but also capable of describing the secondary effects deriving from the de-excitation of atoms, where primary collisions may have created vacancies. The Geant4 Simulation Toolkit encompasses a set of models to handle the atomic relaxation induced by the photoelectric effect, Compton scattering and ionization, with the production of X-ray fluorescence and of Auger electrons.

We describe the physics models implemented in Geant4 to handle the atomic relaxation, the object-oriented design of the software and the validation of the models with respect to test beam data.

In particular, we present a novel development of an original model for particle induced X-ray emission, to be released for the first time in the summer of 2004.

We illustrate applications of Geant4 atomic relaxation models for physics reach studies in a real-life experimental context

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