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A simulation model for reproduction of the background radiation flash produced by high energetic H-like ions during their stopping in matter: I. The contribution of the electron capture processes - Radiative Electron Capture and Primary Bremsstrahlung.

The background radiation flash produced by stopping of ions in matter is a main obstacle for detection of lower energy gamma-rays transitions emited by short-lived excited states in unstable nuclear systems obtained in experiments with relativistic ion beams. The large number of produced X-rays blinds the detectors and their pile-up in the detector's crystal volume may change the profile of the energy lines of interest in experimental data. In this sense, the ability to reproduce the background radiation would be extremely valuable in experimental data analysis, preparation of new experiments, and during development of new detectors and instruments.
Current work presents a first part of a more generic task to develop complete set of GEANT4 extension libraries to enable fast simulation of the bremsstrahlung background radiation produced as a result of stopping of highly energetic ions passing through matter and reproduce its influence on the detector system in terms of spacial and energy distributions and rates of the produced X-radiation.
This work is focused on the implementation of the electron capture processes - in the ion's bound states (Radiative Electron Capture in K, L, M shells) and in the continuum (the Primary Bremsstrahlung process) based on the known theoretical developments. Each process is represented by a separate GEANT4 physics class. The simulations using the developed physics process classes will be compred to the background radiation detected during 'fast'and 'stopped'beams RISING experimental campaigns at GSI. Results will be discussed.

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