

MONTE-CARLO SIMULATION OF PRIMARY ELECTRONS IN THE MATTER FOR THE GENERATION OF X-RAYS

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Abstract : The x-rays imaging chains components from the source to the detector, rest on the first part of simulation to the energy production of x-rays emission (source), which suggest us to identified the losses energies result from interaction between the fast electrons and the particles of metal : the energies losses due to “collisional losses” (ionization, excitation) and “radiative losses”. For the medium and the primary electron energy which interests us, the electrons slowing down in the matter results primarily from the inelastic collisions; whose interest is to have to simulate the x-rays characteristic spectrum. We used a Monte-Carlo method to simulate the energy loss and the transport of primary electrons. This type of method requires only the knowledge of the cross sections attached to the description of all the elementary events. In this work, we adopted the differential cross section of Mott and the total cross section of inner-shell ionization according to the formulation of Gryzinski, to simulate the energy loss and the transport of primary electrons respectively. The simulation allows to follow the electrons until their energy reaches the atomic ionization potential of the irradiated matter. The differential cross section of Mott gives us a very good representation of the pace of the distribution of the energy losses. The transport of primary electron is approximately reproduced.

Keywords : X-rays, Monte-Carlo method, inelastic collision, energy loss