

Theoretical cross sections for ionizing processes of DNA bases impacted by H^+ , He^{2+} and C^{6+} ions: a classical Monte Carlo approach.

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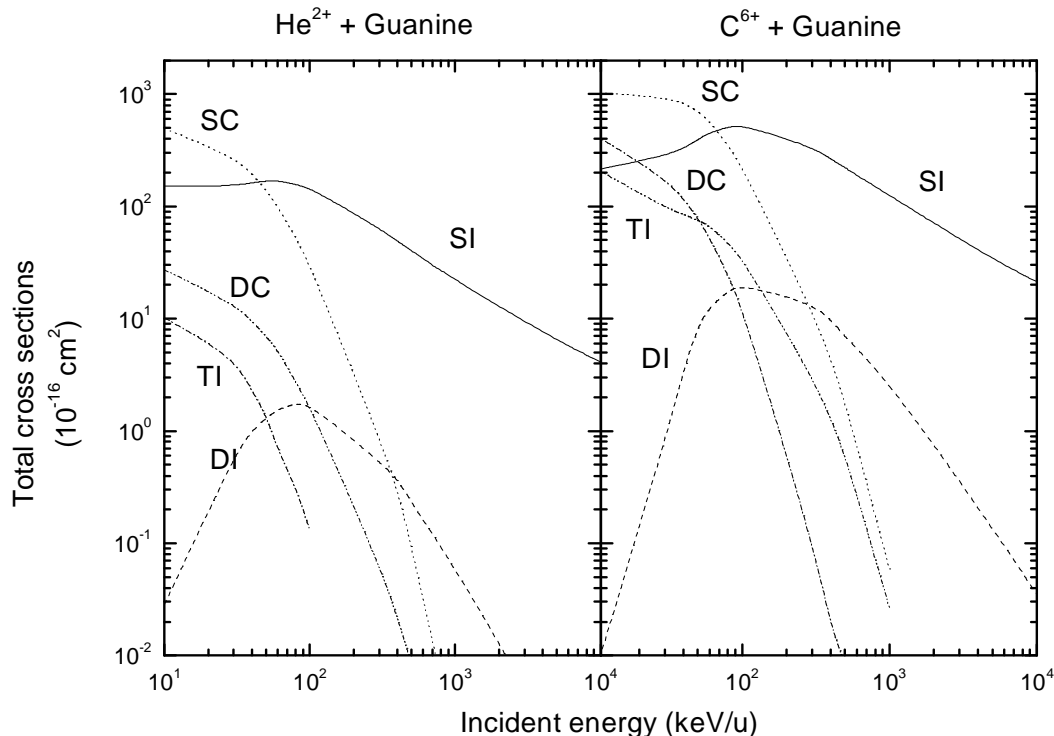
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Radiobiological effects like cellular death and chromosome aberration induction are now well documented and clearly highlight the absolute necessity to describe at the finest scale (atomic scale) the underlying physics of irradiations.

In this work, we present total and singly differential cross sections for multiple ionizing processes of biological systems (Adenine, Cytosine, Guanine, Thymine and Uracil) impacted by protons, α -particles and Carbon ions in the 10 keV/u -10 MeV/u energy range.

To do that, we used a Classical Trajectory Monte Carlo (CTMC) method, initially developed by Zarour *et al.* [1] for multiple electron transfer in slow collisions of highly charged ions with atoms, and more recently adapted by Abbas *et al.* [2] for studying the water ionization induced by proton and α -particle impact. In this kind of approach, all the particles are described in a classical way by assuming that the target electrons are treated as virtual particles whose creation is linked to the potential energy induced by the other particles (classical over-barrier (COB) approach).

The obtained results clearly exhibit the importance of the multiple processes with in particular single and double capture (SC and DC, respectively) which become the most preponderant processes in the low-energy range. Moreover, we observed that the different nucleobases provided very similar results in terms of total cross sections, for all the processes investigated here.



[1] B. Zarour *et al.*, *Nucl. Instrum. Meth.* **B 205** 610 (2003).

[2] I. Abbas *et al.*, *Phys. Med. Biol.* **53** N41-N51 (2008).