

## IONIZATION AND FRAGMENTATION OF DNA, RNA BASES INDUCED BY PROTON IMPACT

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### Abstract:

Damages induced by ionizing radiation can directly be linked to alteration of the DNA molecule. The role of elementary physical processes in DNA strand breaks, issued from atomic [1, 2] and molecular physics [3], have been already underlined showing the possibility of a bridge between interactions at the atomic/molecular level and radiobiology.

In this work, we characterize the response of small biomolecules (DNA, RNA bases) in gas phase irradiated by protons in the 100keV energy range. This energy range is of prime importance because it corresponds to the maximum Linear Energy Transfer (LET or Stopping Power) in biological medium and give rise to the formation of the Bragg peak used for the tumour treatment in Proton-Therapy.

In the energy range investigated, single and double ionization of biomolecule occurs resulting in base fragmentation and electronic emission. Those two aspects have been investigated by multicoincidence time of flight and electron spectrometries. Because of fragmentation, 'new' chemical species are created. Those molecules are identified and their corresponding branching ratio can be measured. Our results show also that low energy electron emission is favoured [4]. In dense medium (DNA molecule), those secondary particles (fragments and electrons) can be the source of other damages (for example, see [3] for specific damages due to low energy <10eV- electrons).

### References:

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- [2] C. Le Sech, K. Takakura, C. Saint Marc, et al., Radiation Research 153, 454 (2000).
- [3] B. Boudaïffa, P. Cloutier, D. Hunting, et al., Science 287, 1658 (2000).
- [4] P. Moretto-Capelle and A. Le Padellec, Phys.Rev.A 74 (2006) 062705  
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