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

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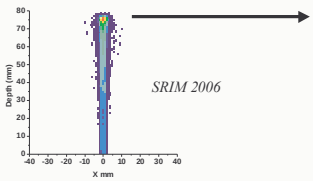
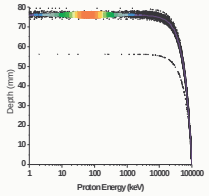
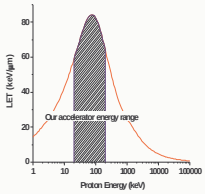
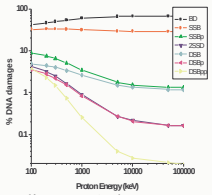
Damages induced by ionizing radiation can directly be linked to alteration of the DNA molecule. In this work, we investigate interactions between protons and phase gas DNA/RNA bases and nucleoside

Energy loss by a proton in matter? Example of transport of 100 MeV proton in liquid water









Important dose deposition in a well defined spatial zone Bragg Peack (BP): PROTONTHERAPY

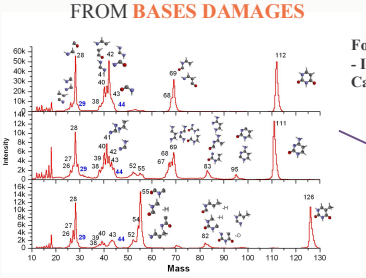
Maximum dose: proton decellerated around 100keV: maximum LET

Corresponding DNA damages: evoluated Monte-Carlo codes *(Nikjoo,O'Neill, Terrisol, Goodheart Rad.Env.Biophys (1999)38)*, we used more simpler *MCDS* program whose coefficients are fitted on MC codes. *(Semennenko, Steward Rad.Res. (2004) 161)*

Range around 100keV is interesting=> ultra thin target=> biomolecule in gaz phase

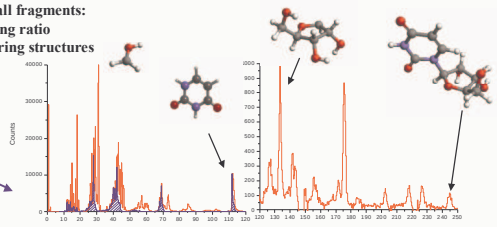
PHYSICAL STAGE OF THE INTERACTION (≈fs): PRODUCTION OF DATA

FROM **BASES DAMAGES** TOWARDS ELEMENTARY **STRAND BREAK**: Irradiation of URIDINE



Formation of numerous small fragments:
- Identification and branching ratio
Can interact with neighbouring structures

Additivity?



Many small molecules are formed

Destruction of the sugar=> SB

EMISSION OF SECONDARY ELECTRONS

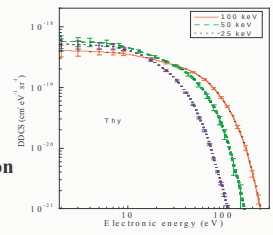
Damages induced by secondary electron depend on kinetic energy:

Low energy (<20eV): dissociative attachment

High energy(>20eV): ionization,fragmentation

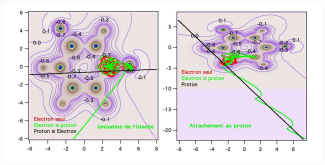
Need to know energy spectrum of the emitted electrons

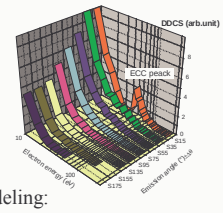
BUT also the absolute yield (cross section)



Measurment of electron spectra: majority of low energy electrons

Moretto-Capelle, Le Padellec, Phys.Rev.A (2006)





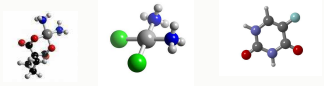
Caracterization by CTMC modeling:
-Total cross sections
-Yield in angle and energy

RADIOSENSITIZER? PHYSICAL MECHANISMS?

1-PHYSICAL Studies at molecular scale (… gaz phase)

fragmentation patterns, electronic emission, corresponding cross sections

Difference with 'standart' molecules?



Carboplatine Cisplatine Halo-Uracil (F,Br,I)

2-IRRADIATION of DNA (plasmid) deposited SURFACE

without **and** **with molecule**

LINKS?

ANALYSIS OF STRAND BREAKS:

Number of molecule / base pair ?