

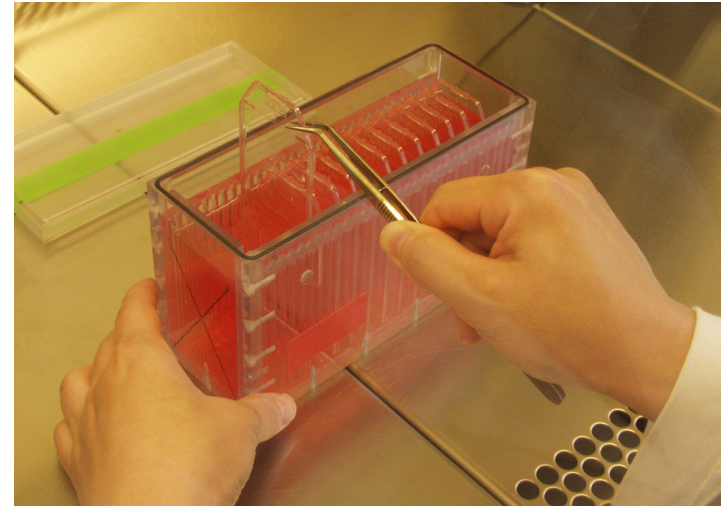
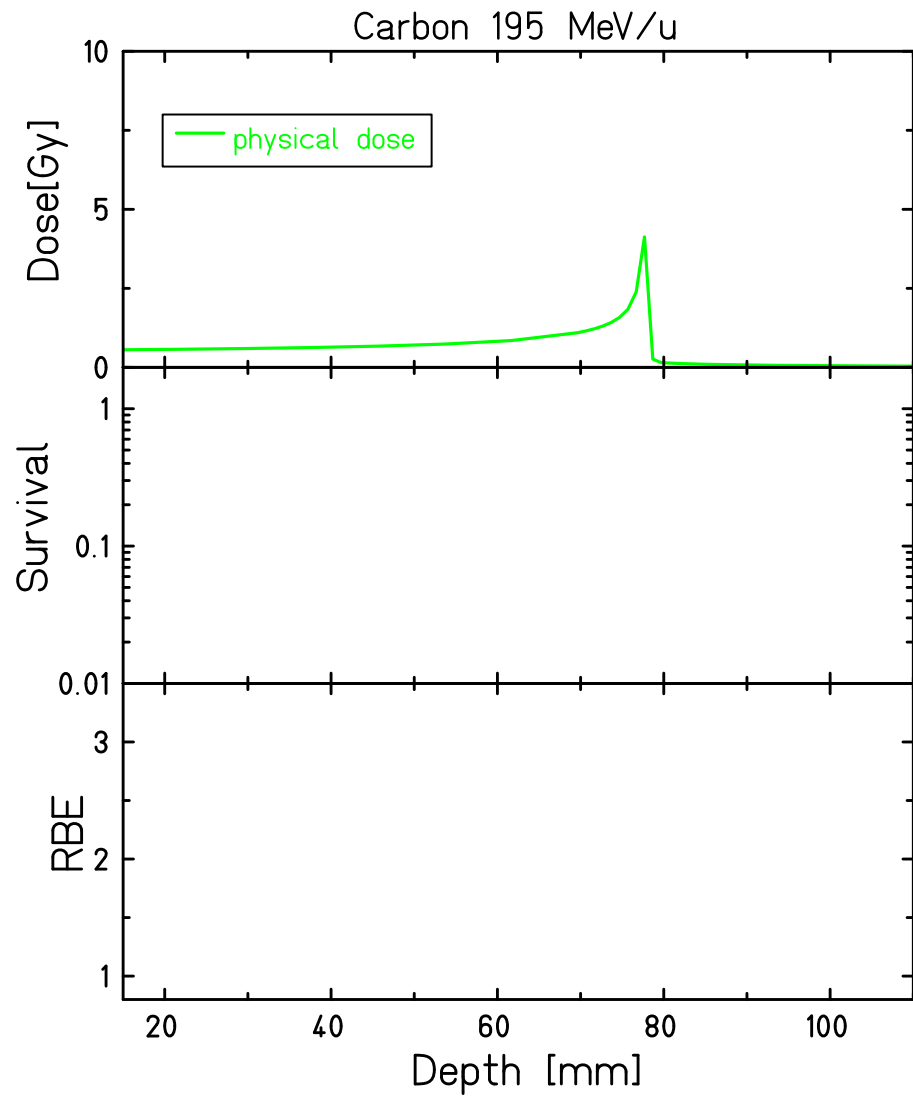
Carbon Ion Radiobiology

I. Cell Experiments

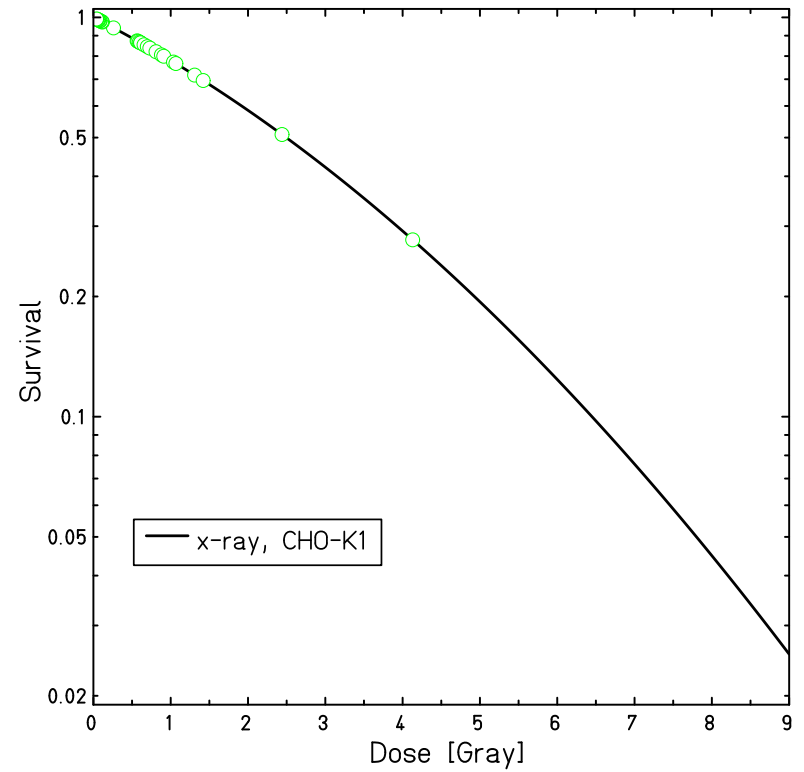
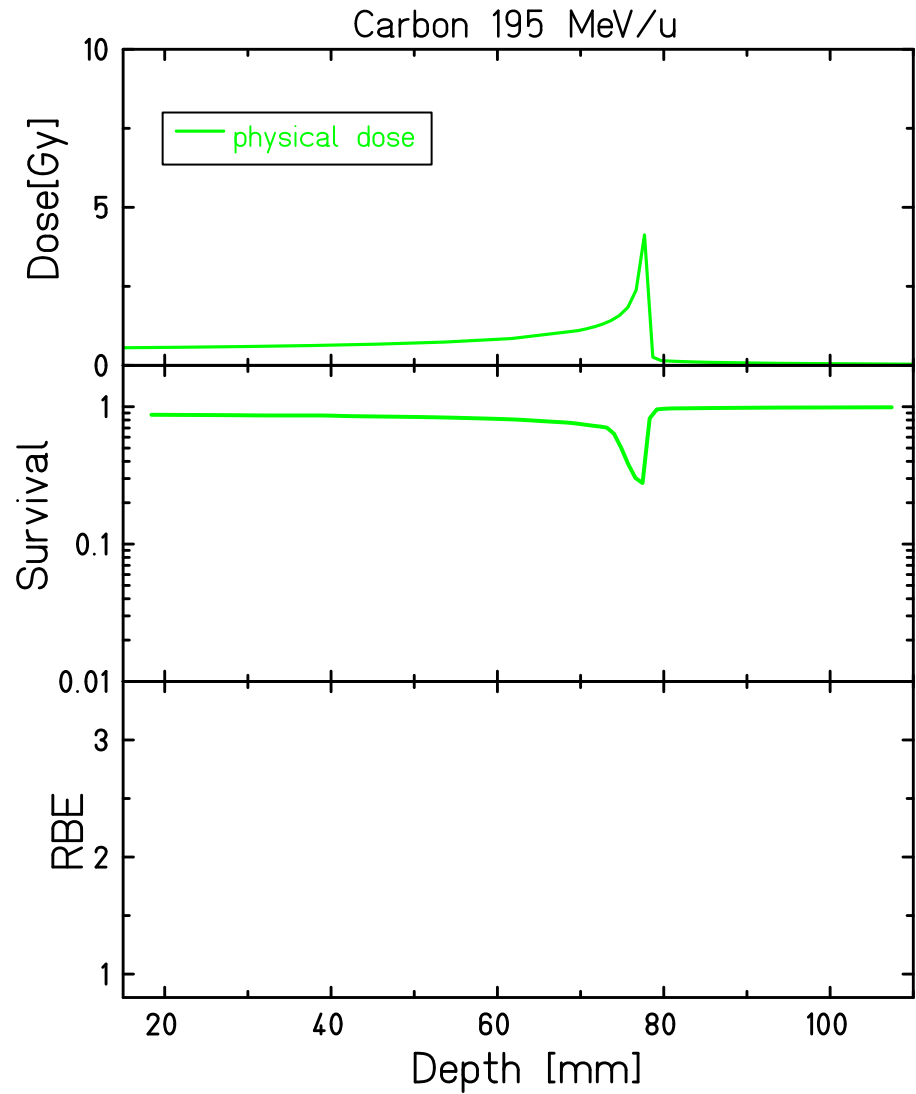
- The motivation
- The biological target
- The Relative Biological Effectiveness (RBE)
- Factors influencing RBE

Wilma K. Weyrather
GSI Biophysik

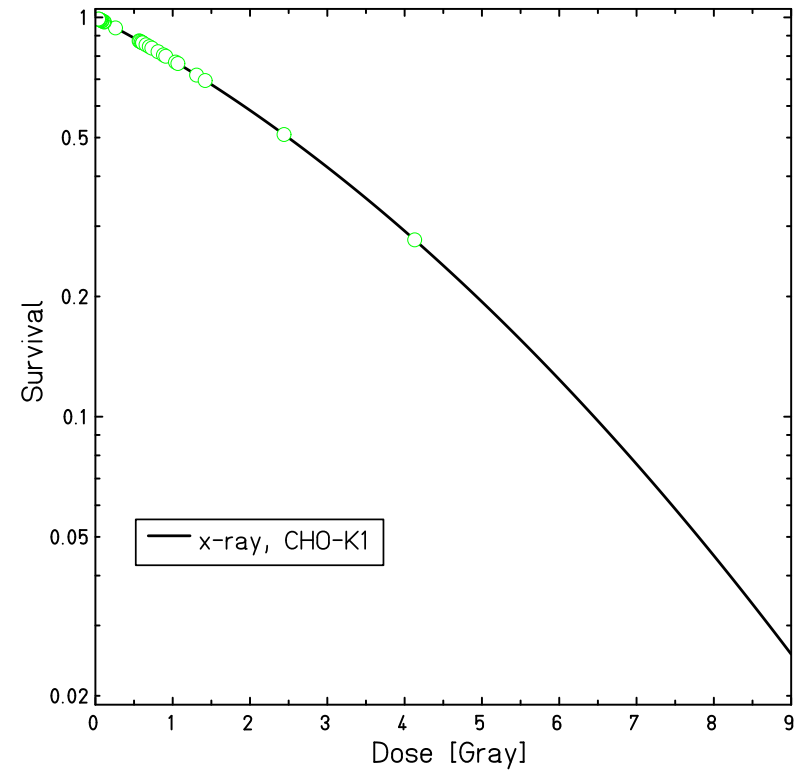
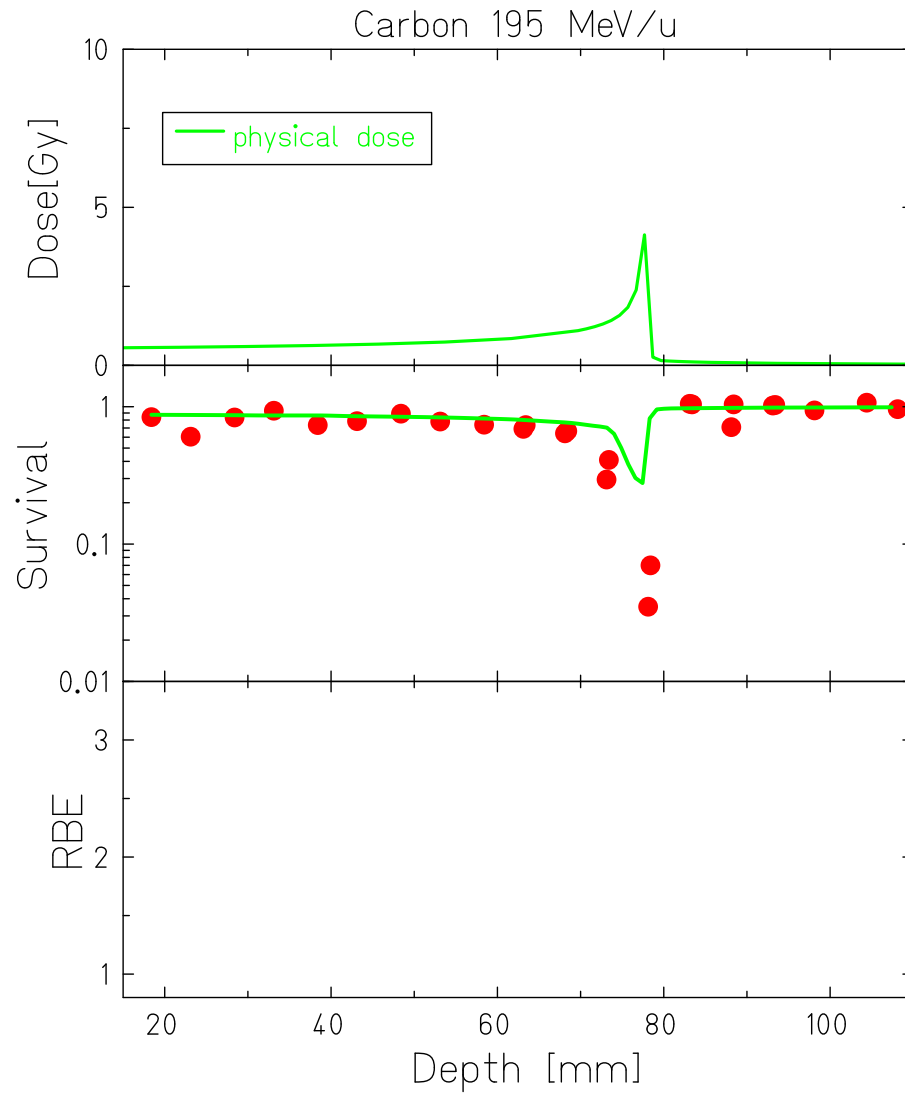
The Motivation



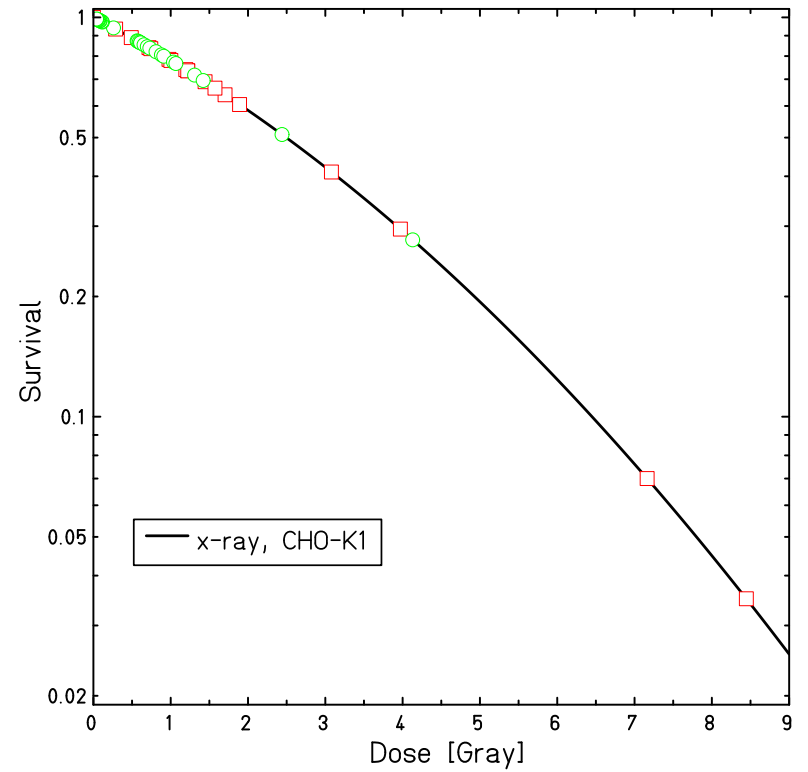
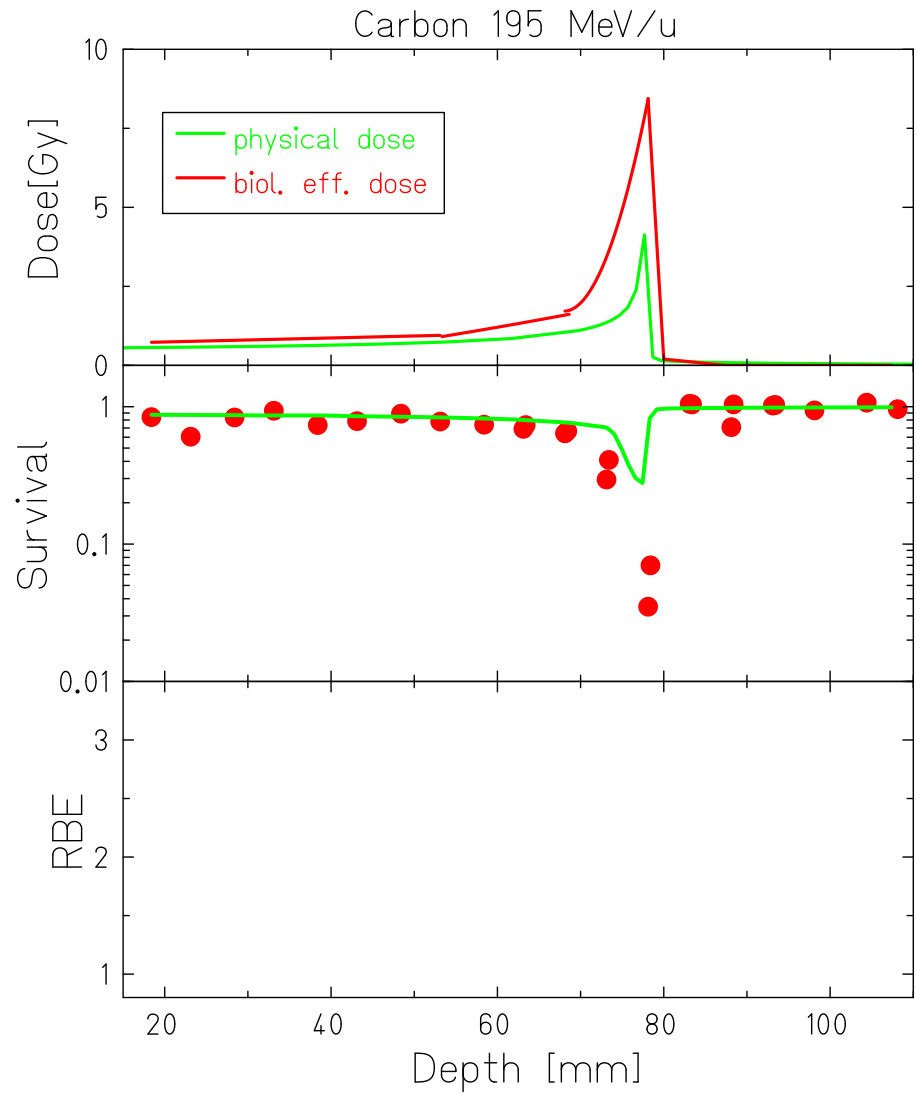
The Motivation



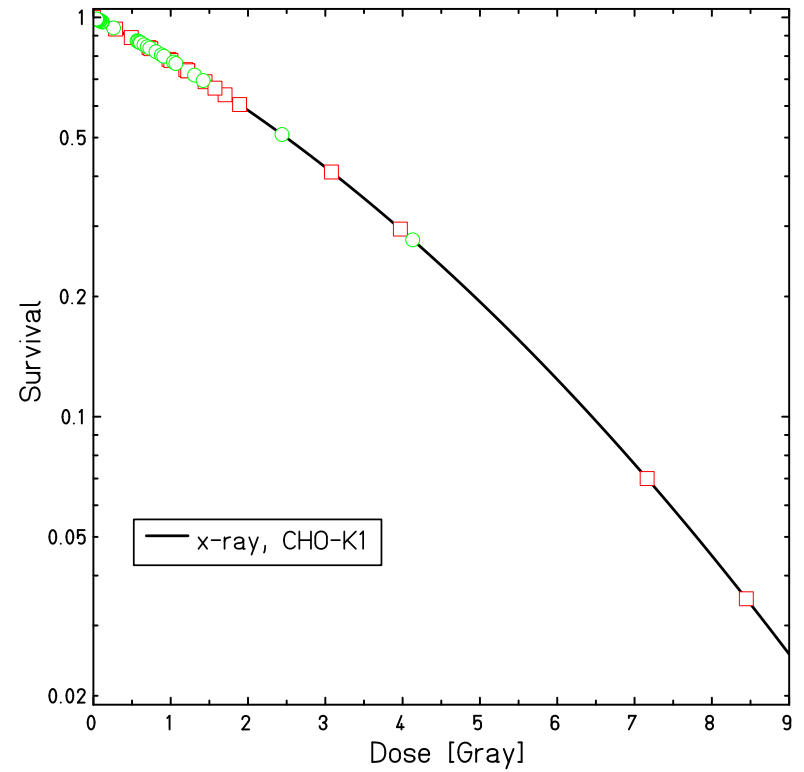
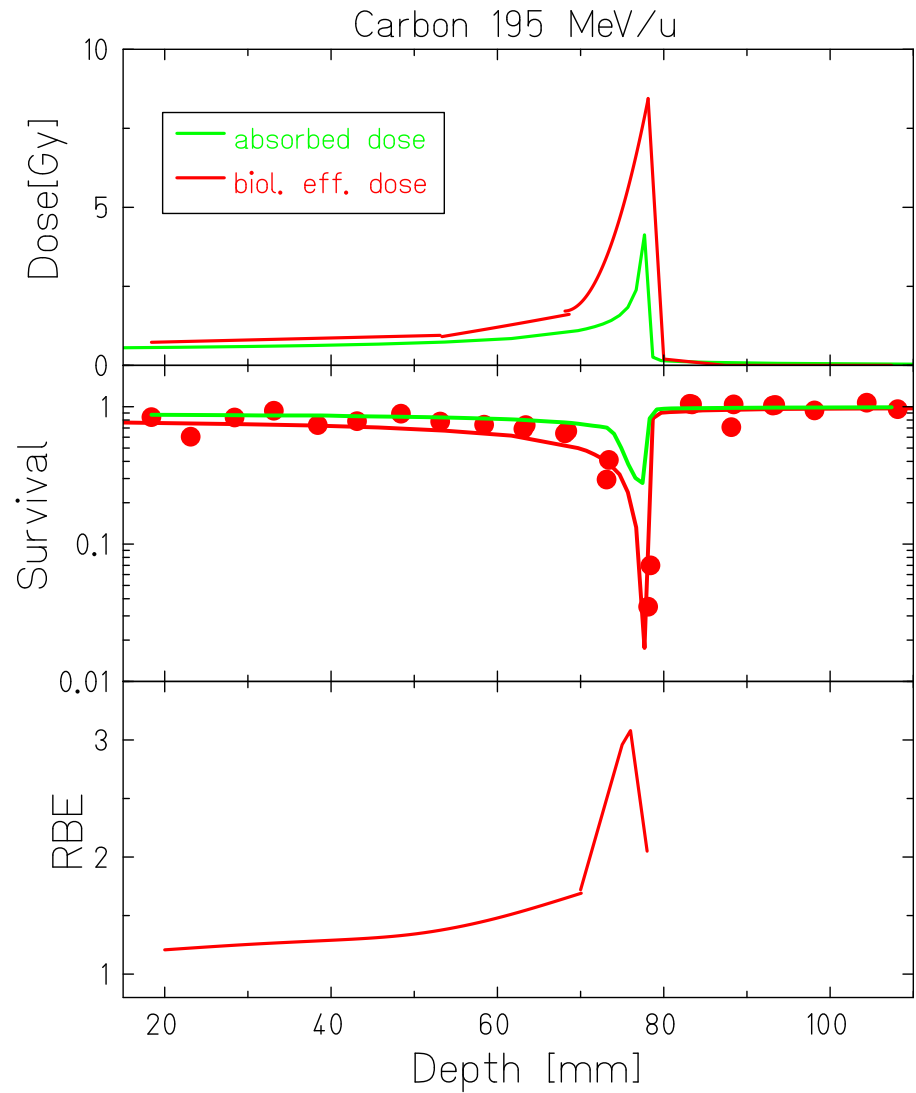
The Motivation



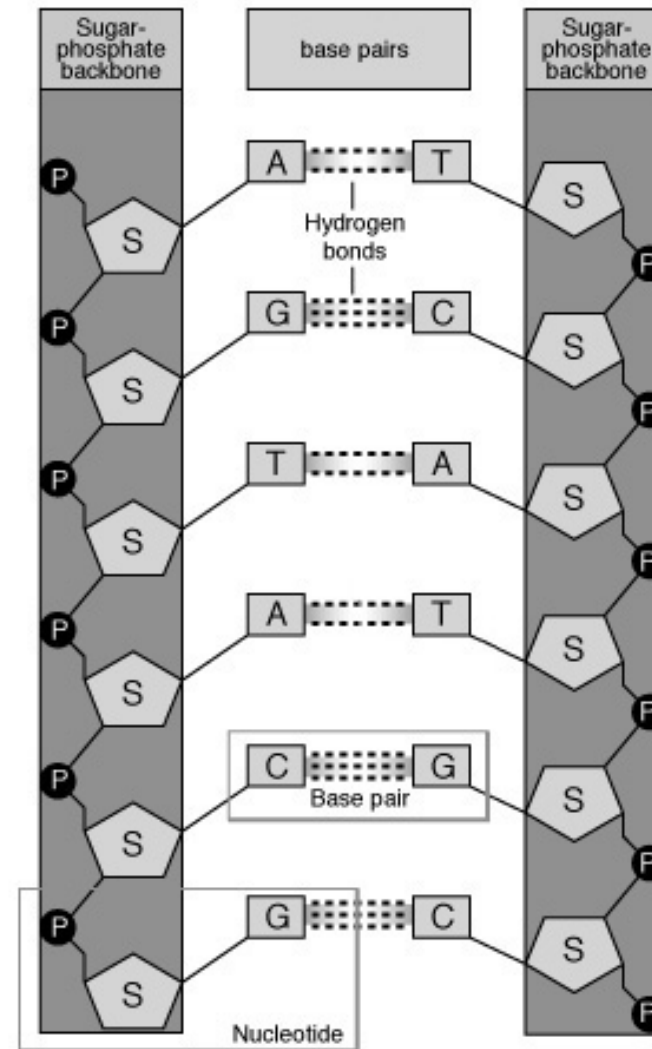
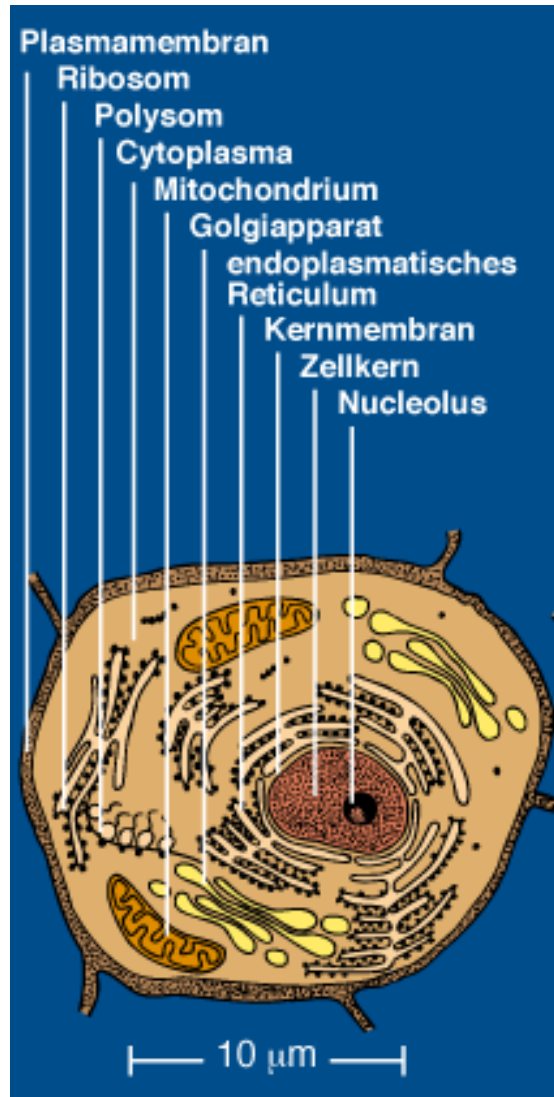
The Motivation



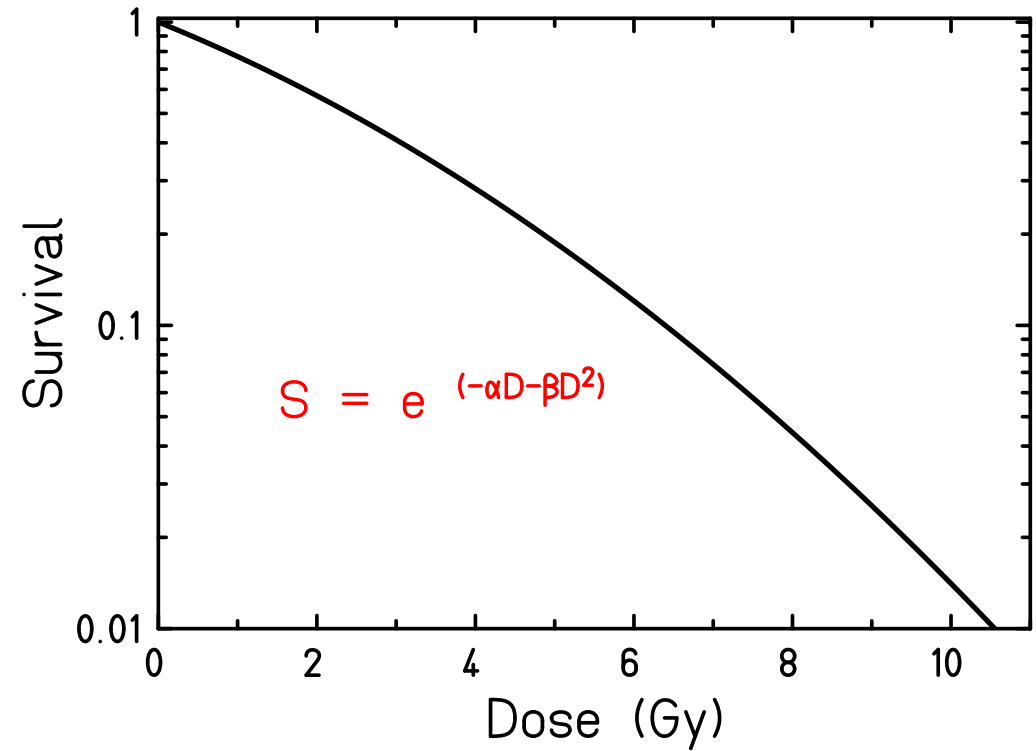
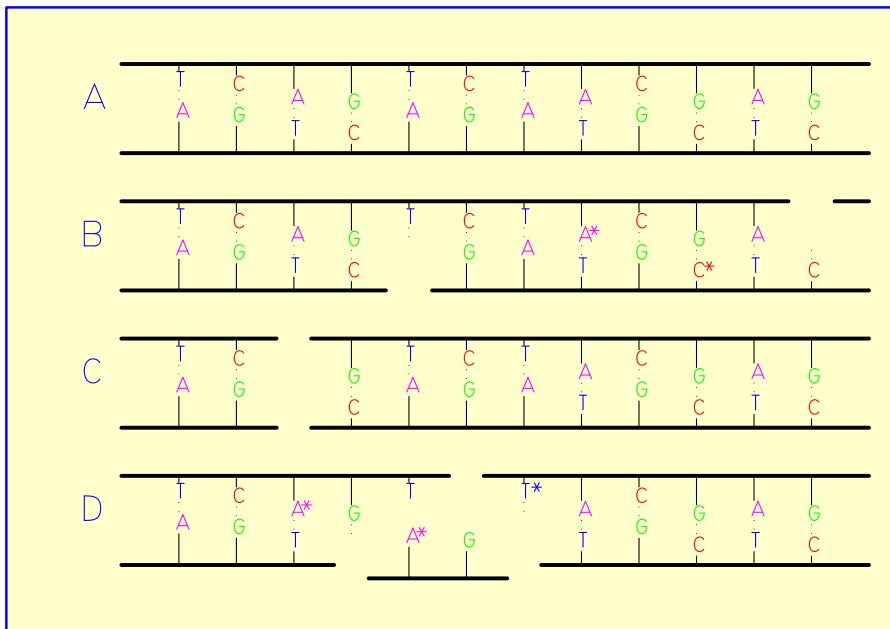
The Motivation



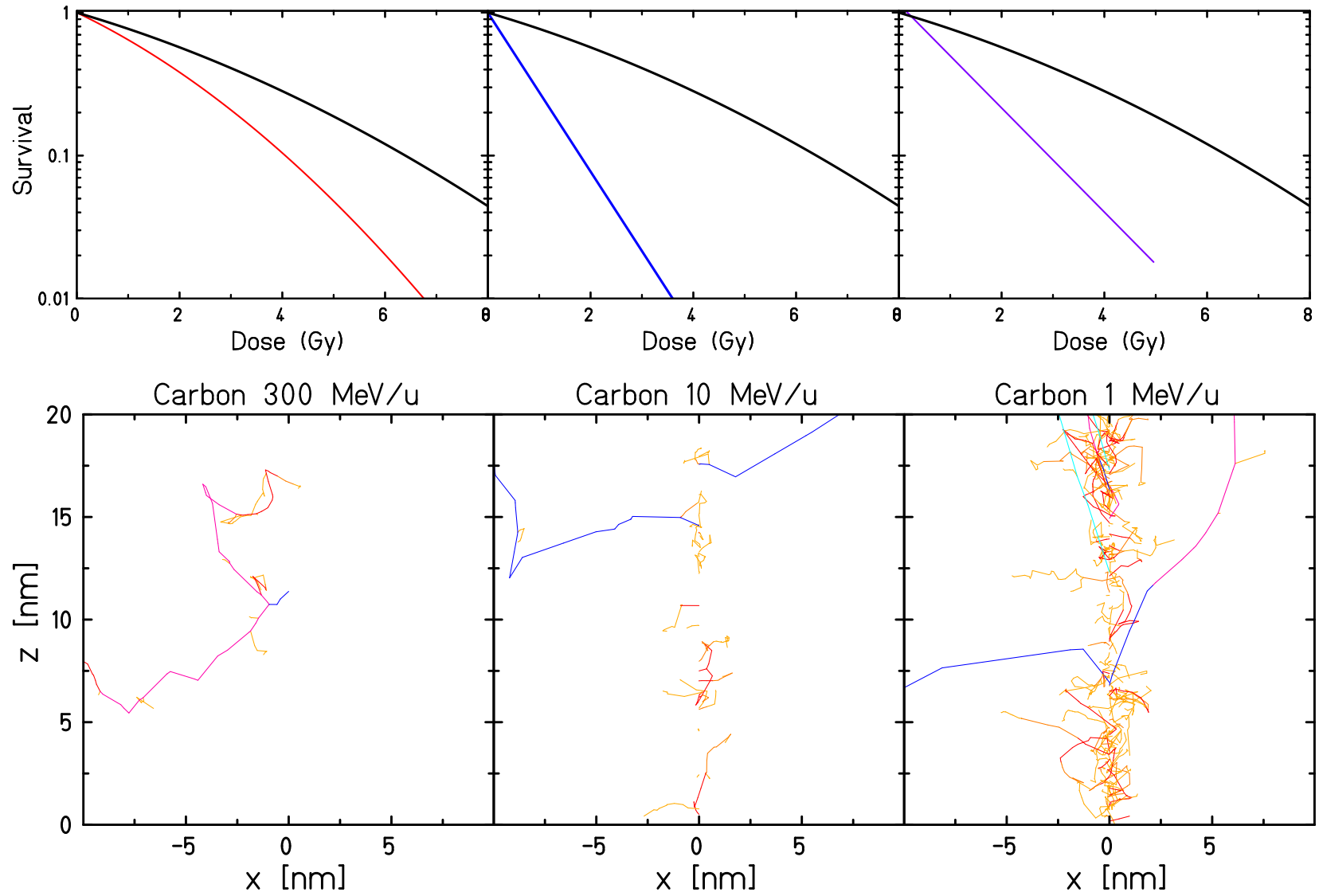
The biological target



The radiation action

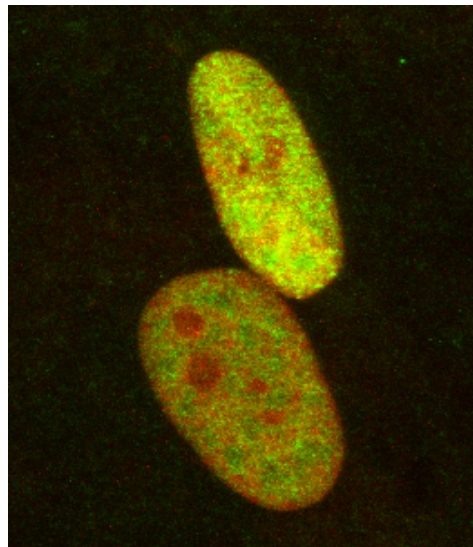
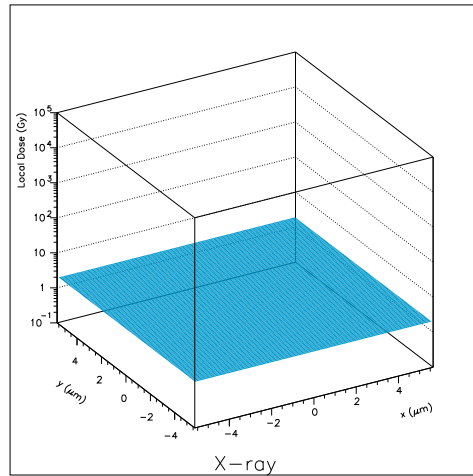


The dose distribution

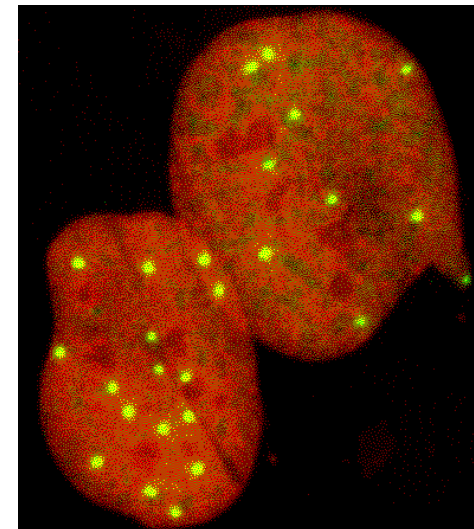
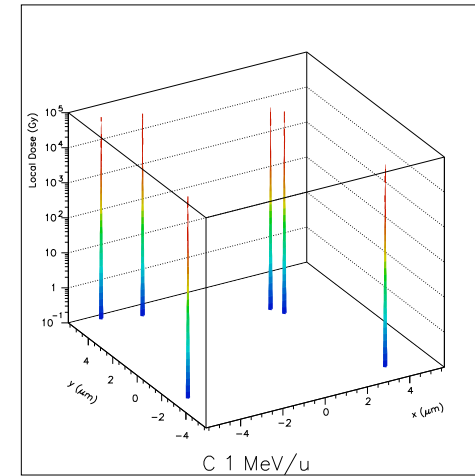


The dose distribution

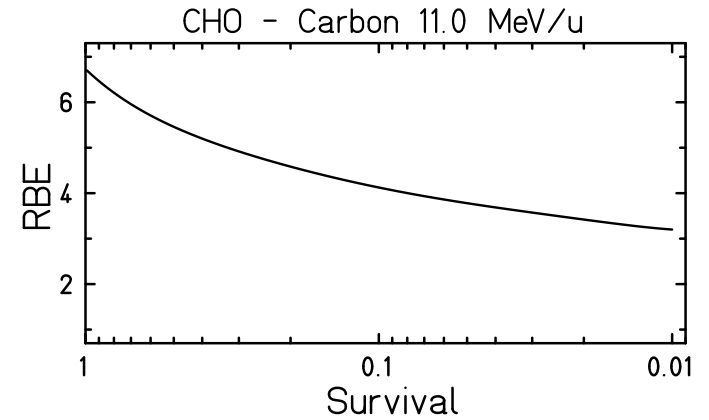
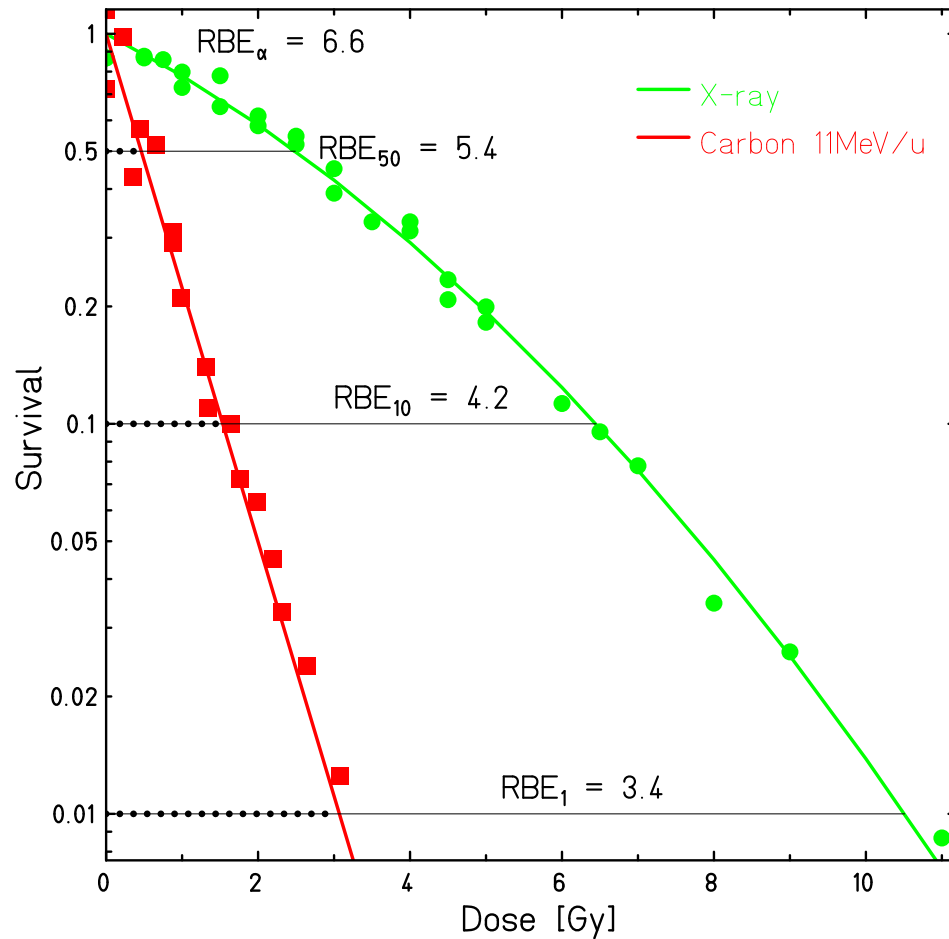
sparsely ionizing: photons



densely ionizing: particles



The Relative Biological Effectiveness (RBE)

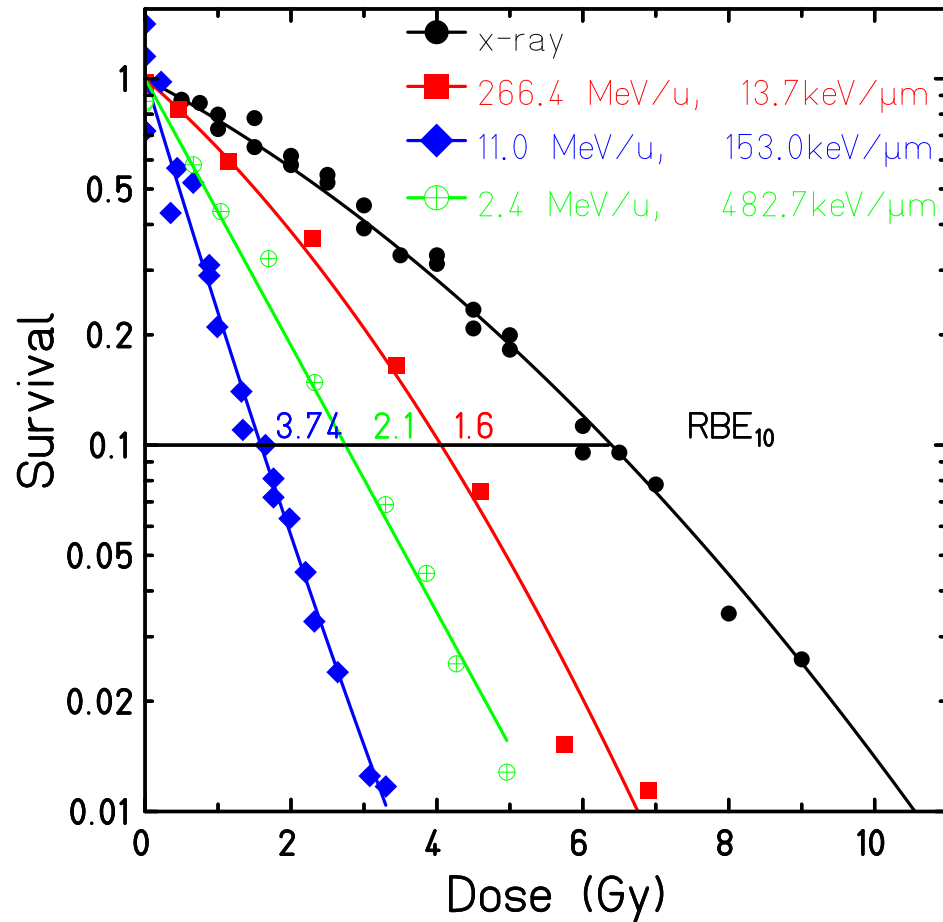


$$RBE = \frac{Dose_{x-ray}}{Dose_{ions}}$$

for the same level of effect

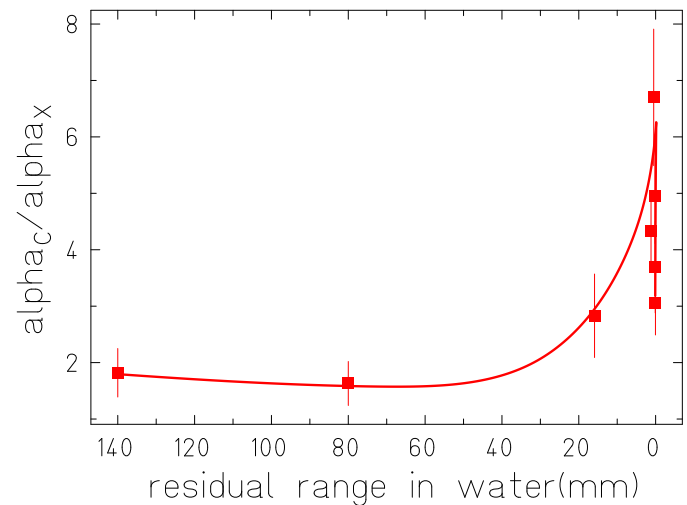
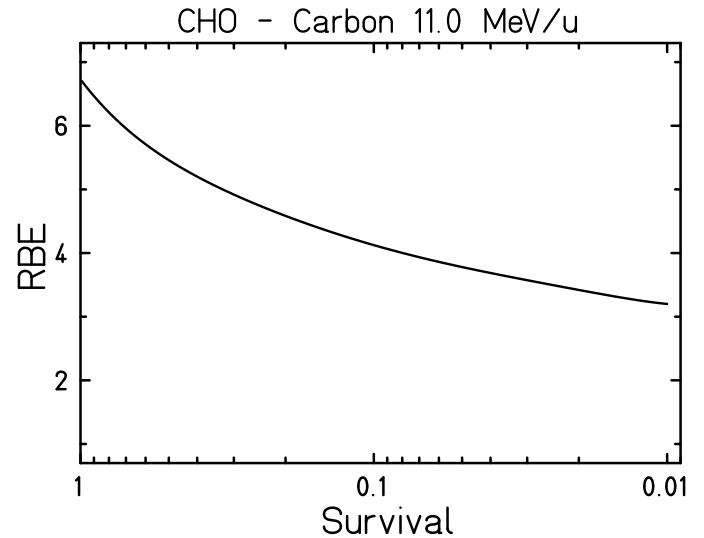


RBE: Dependence on Dose and Energy

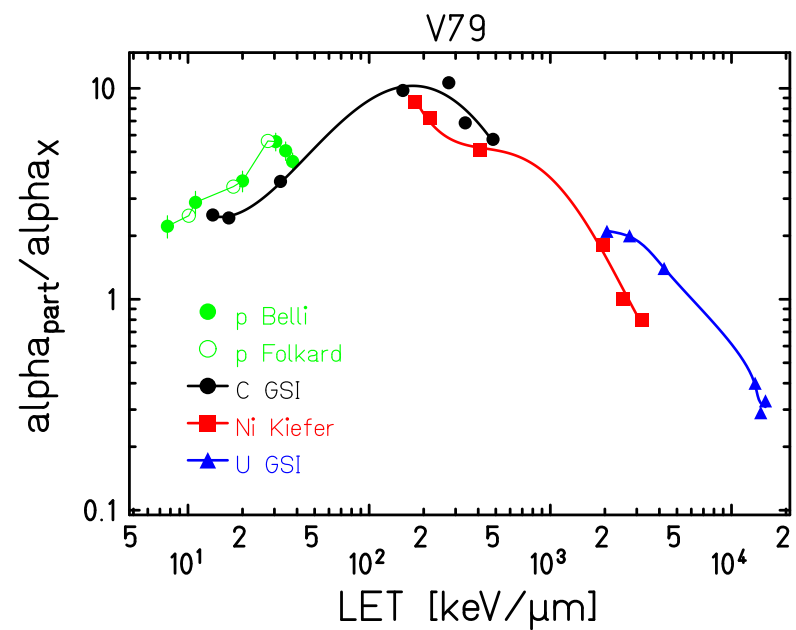
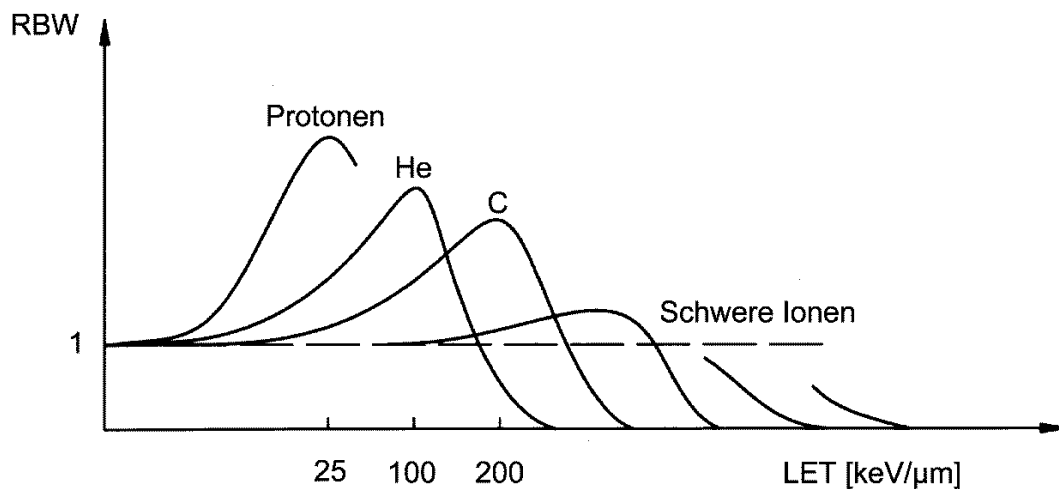


$$RBE = \frac{Dose_{x-ray}}{Dose_{ions}}$$

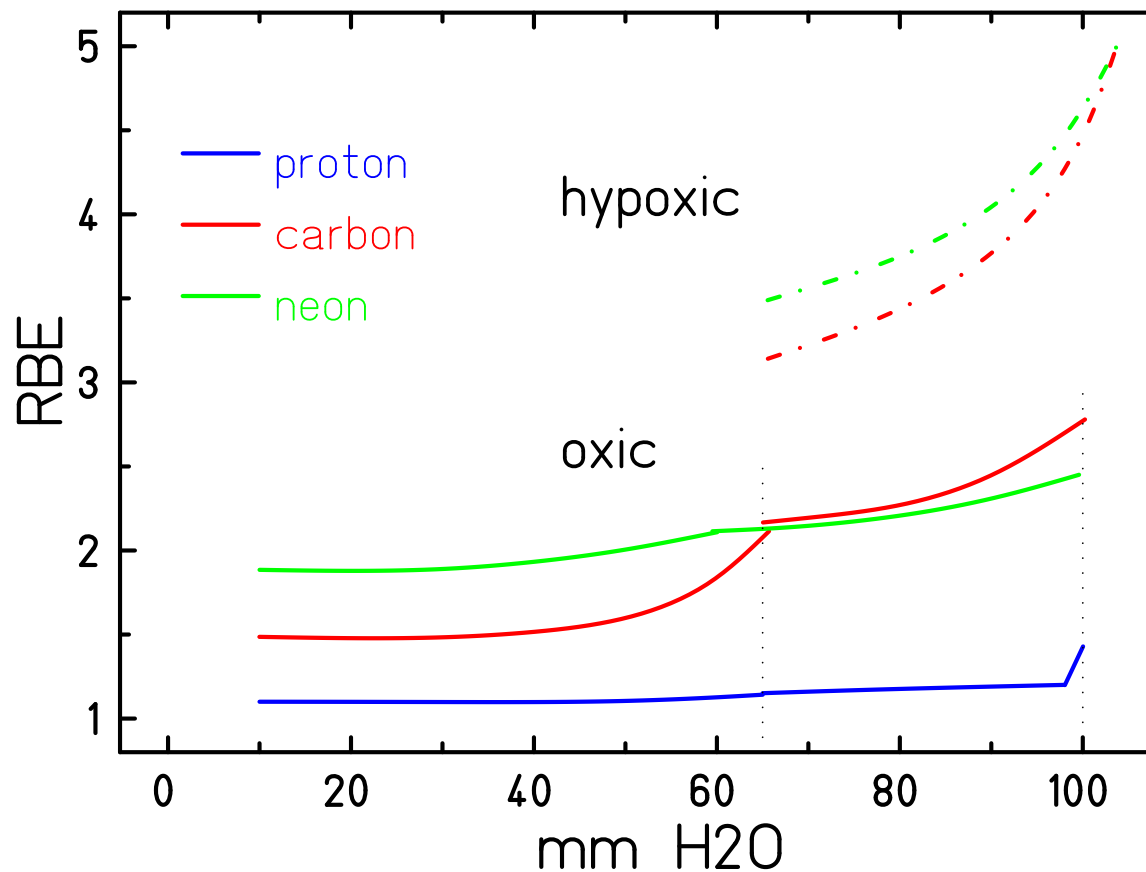
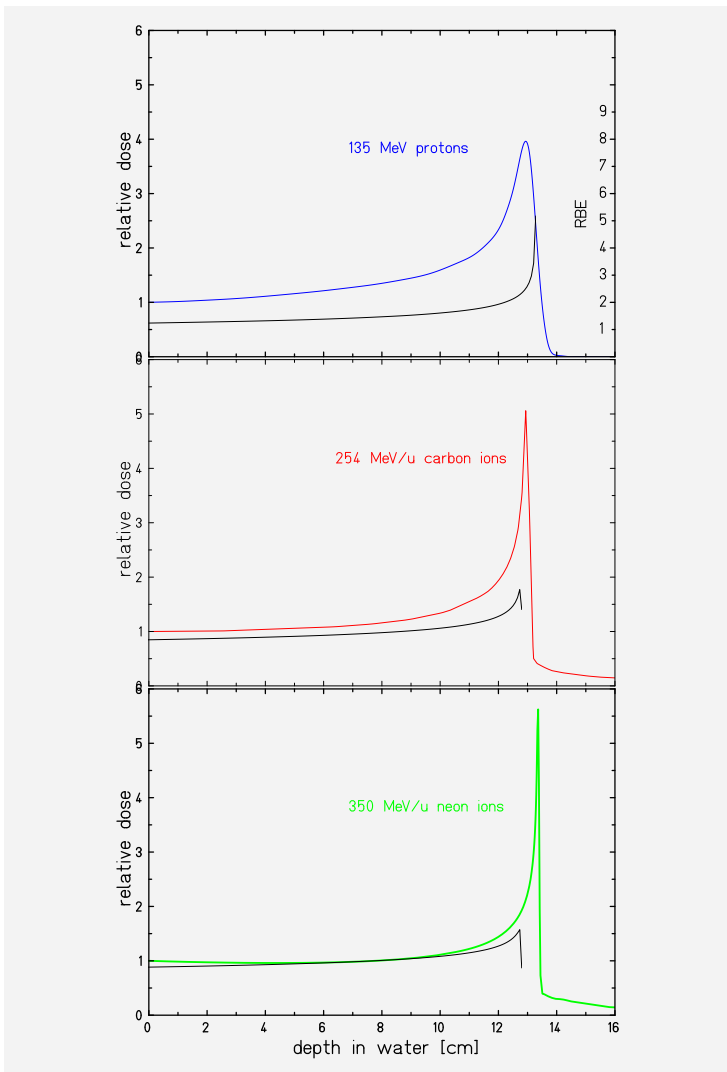
for the same level of effect



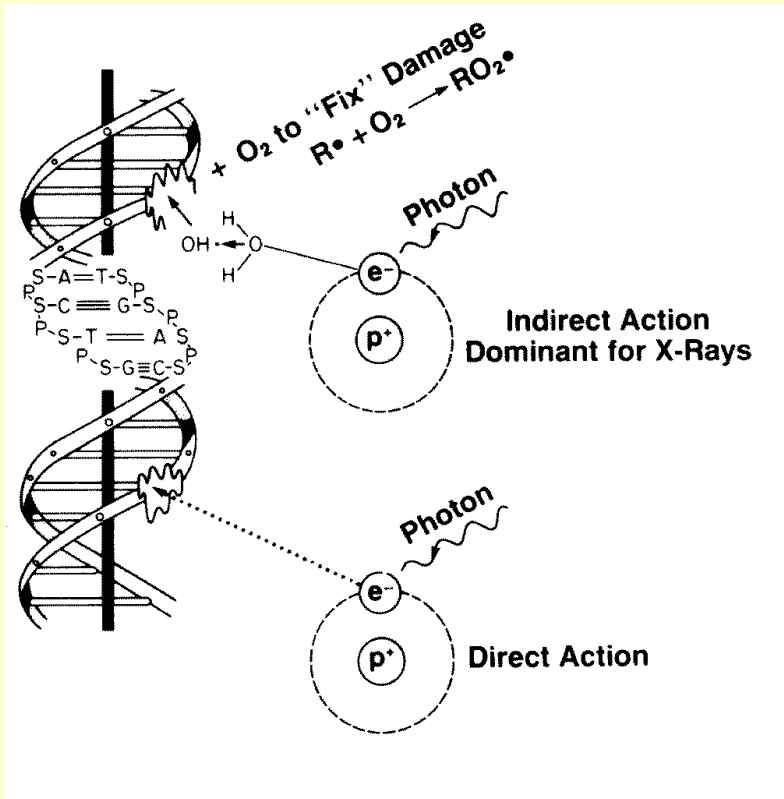
RBE: Dependence on Particle



RBE: Dependence on Particle

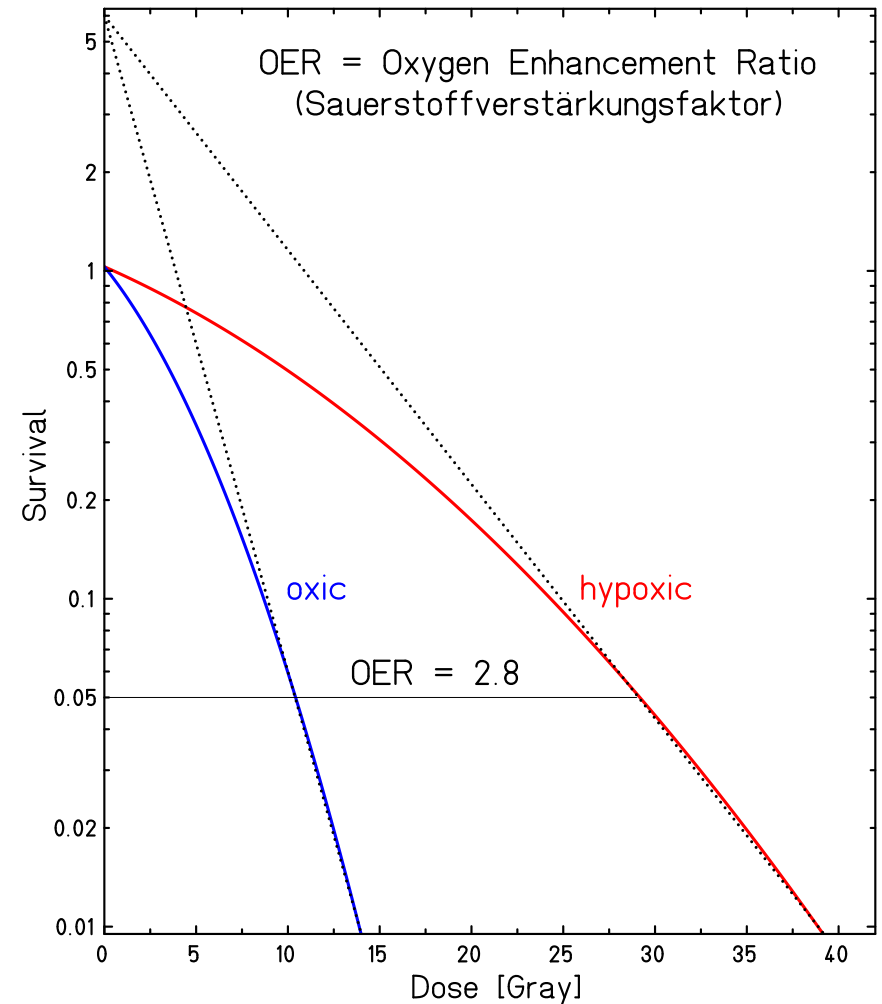


The Oxygen Effect

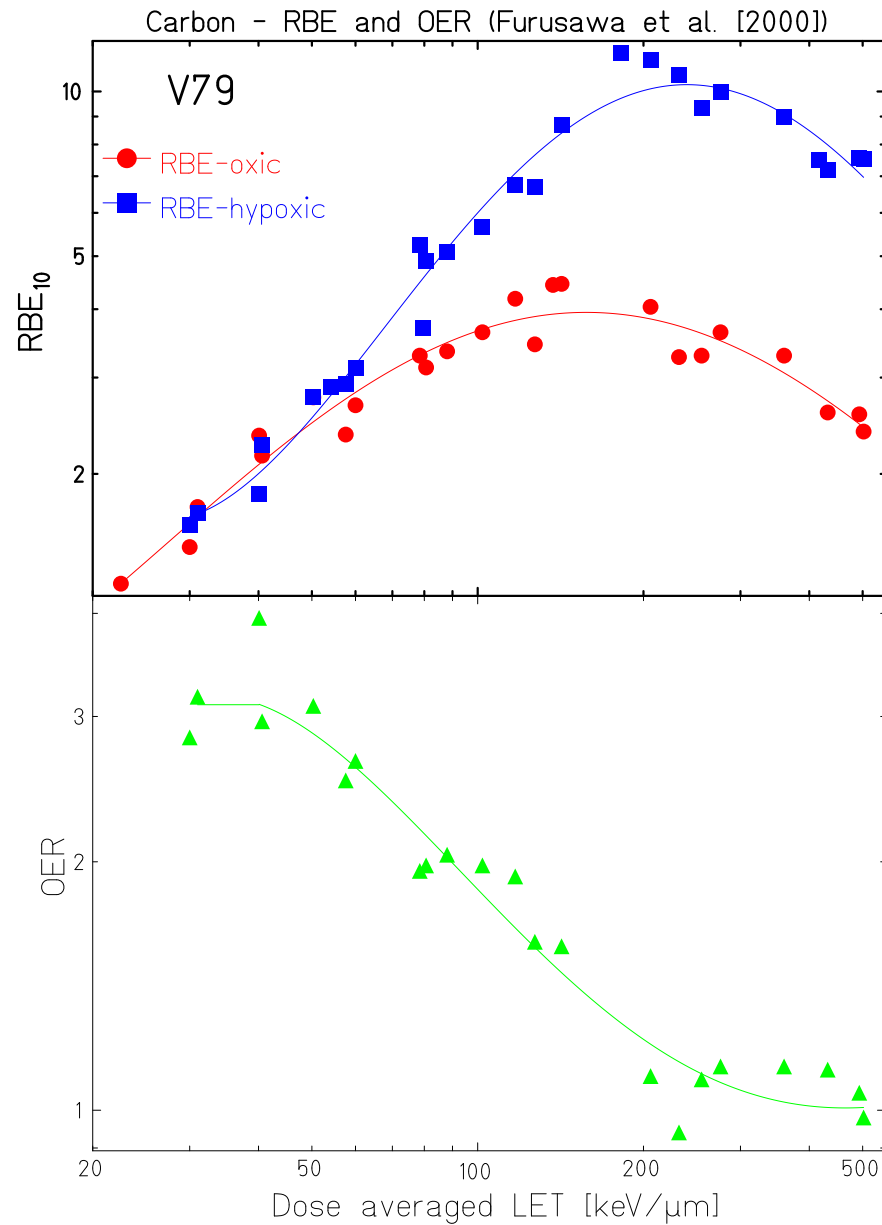


from: E.Hall

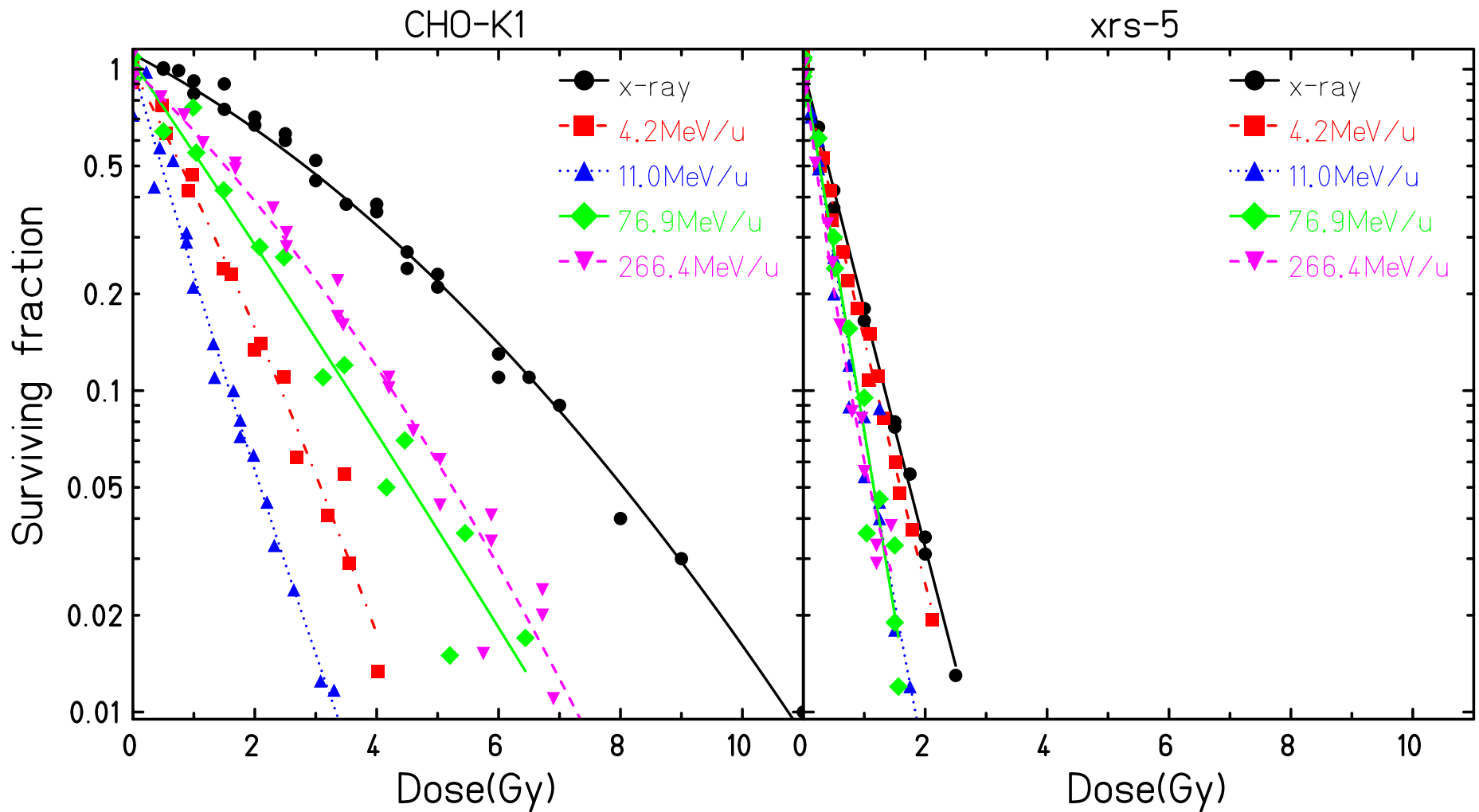
Radiobiology for the Radiologist



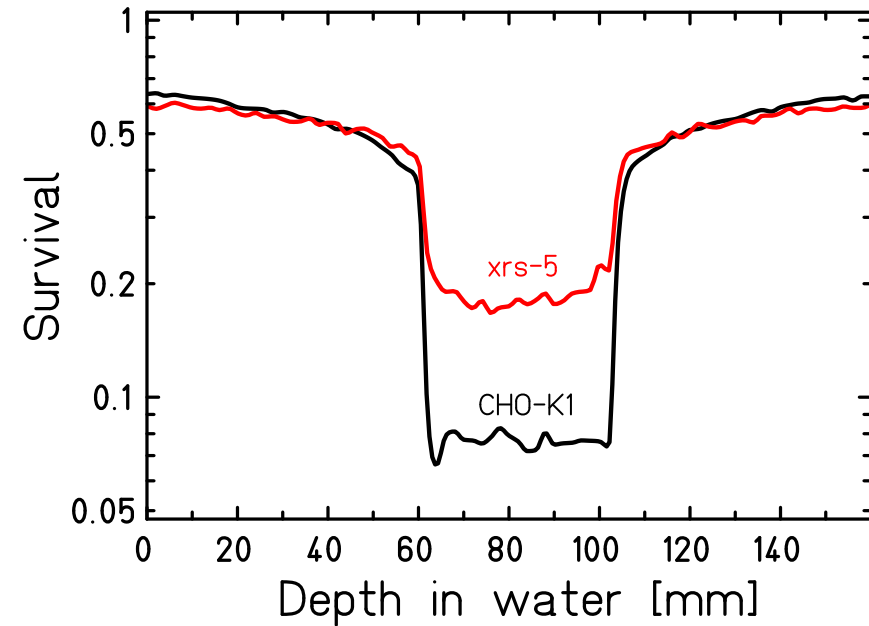
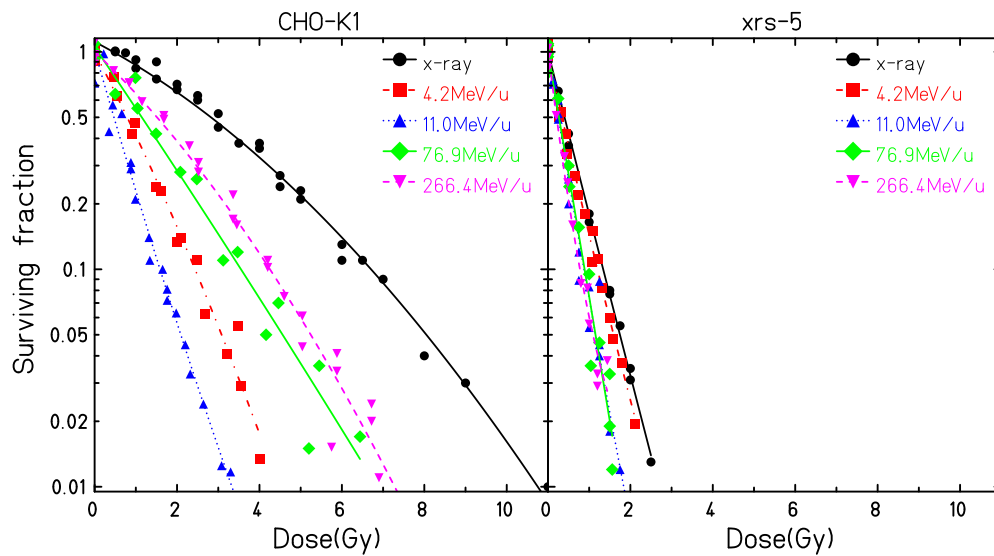
The Oxygen Effect



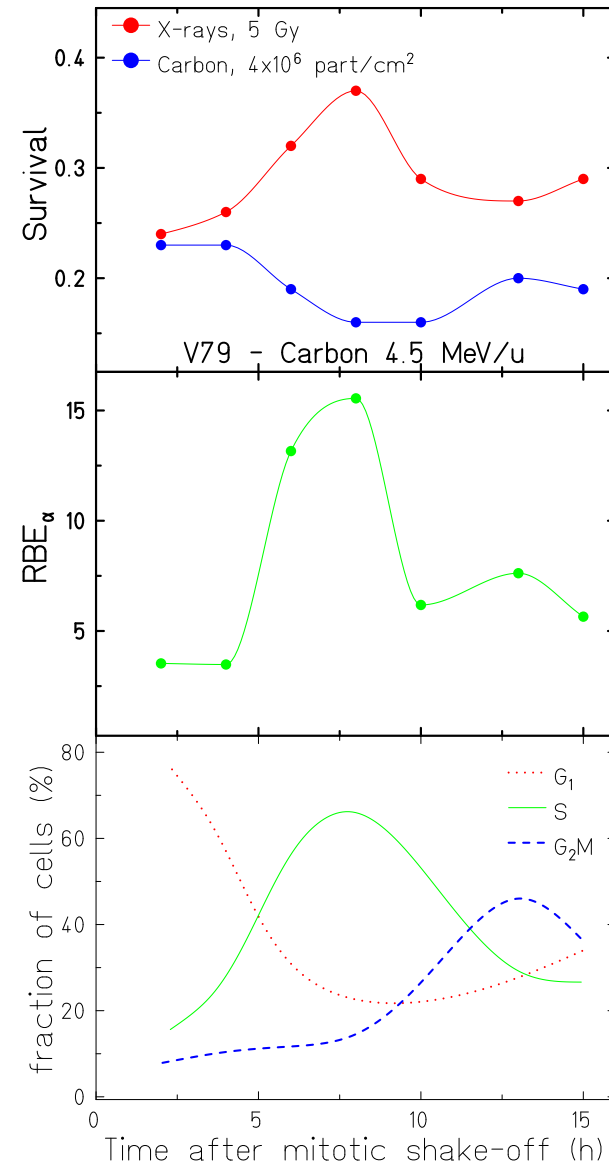
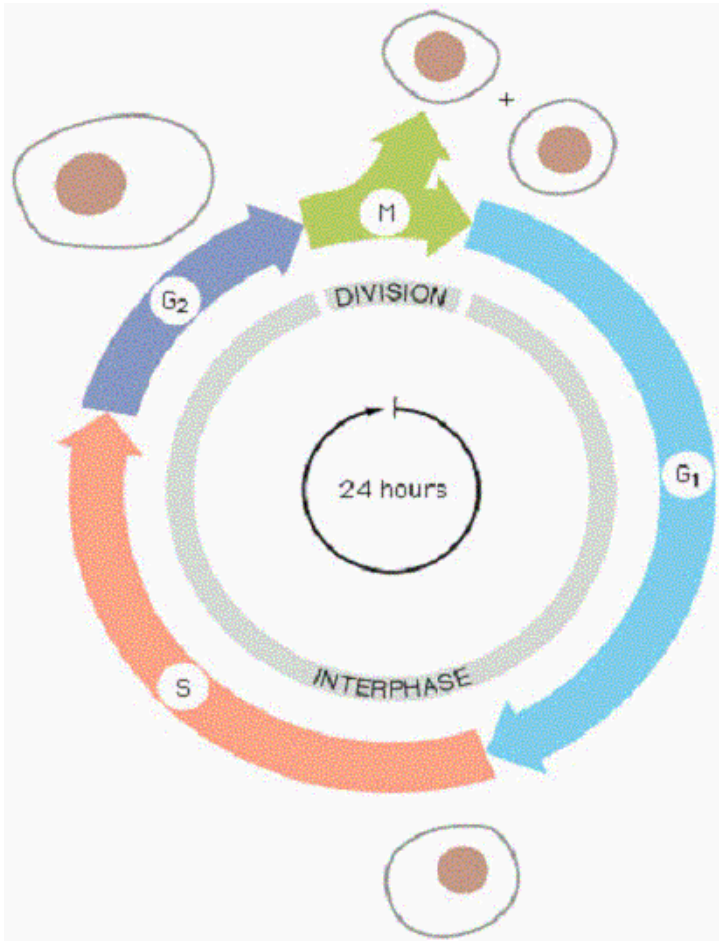
RBE: Dependence on Repair Capacity



RBE: Dependence on Repair Capacity



The cell cycle



Summary

RBE depends on

- Dose
- Energy
- Particle type
- Oxygenation
- Repair capacity of the cell
- (Biological endpoint)