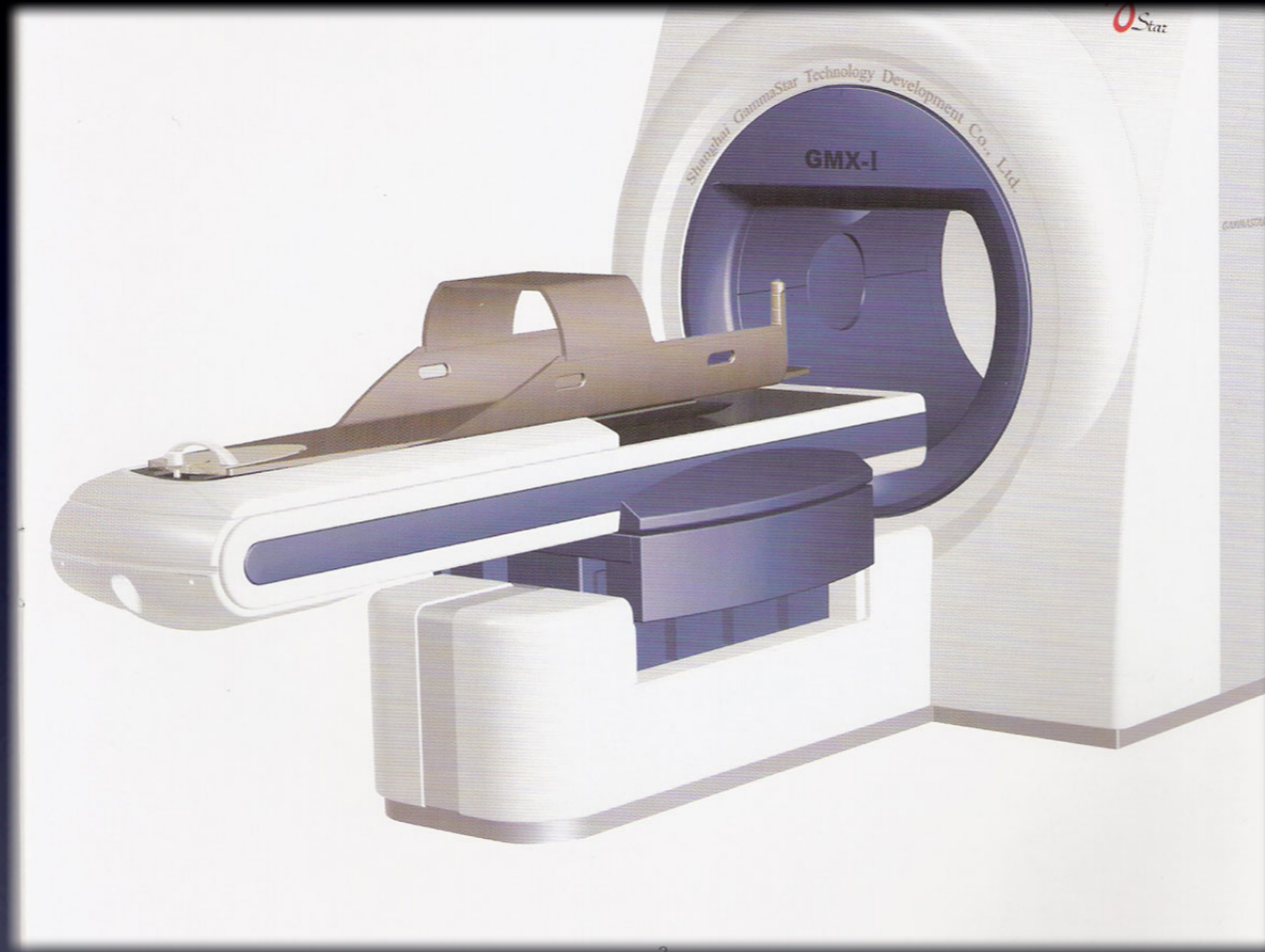


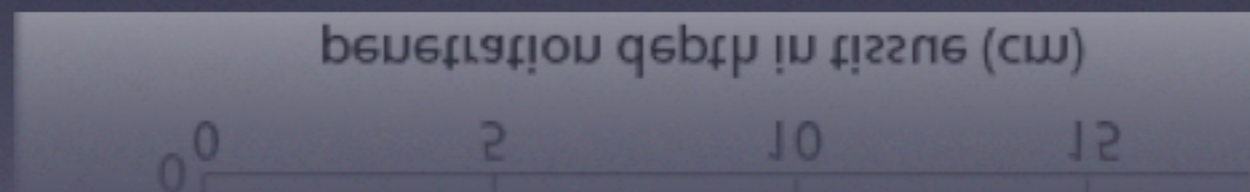
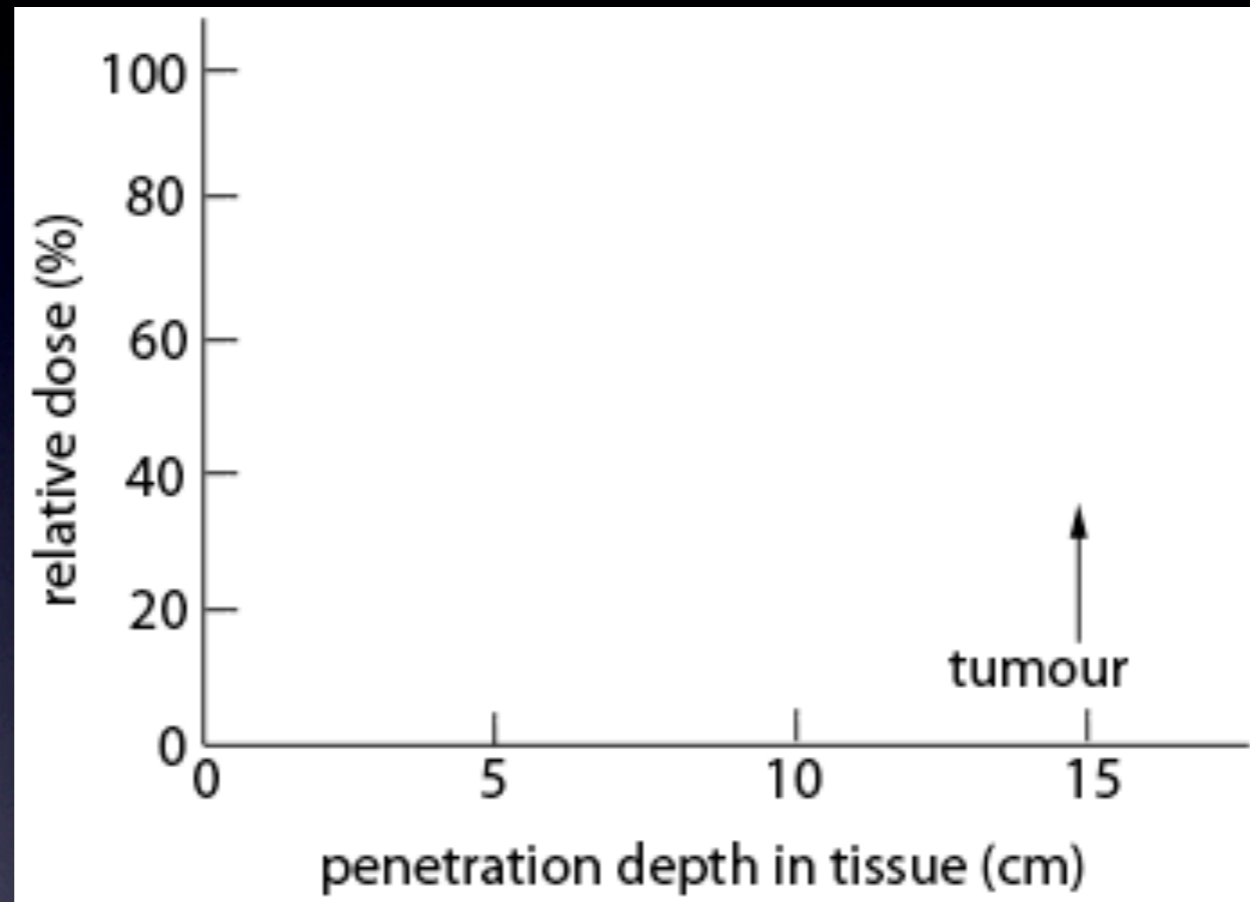


# PAMELA

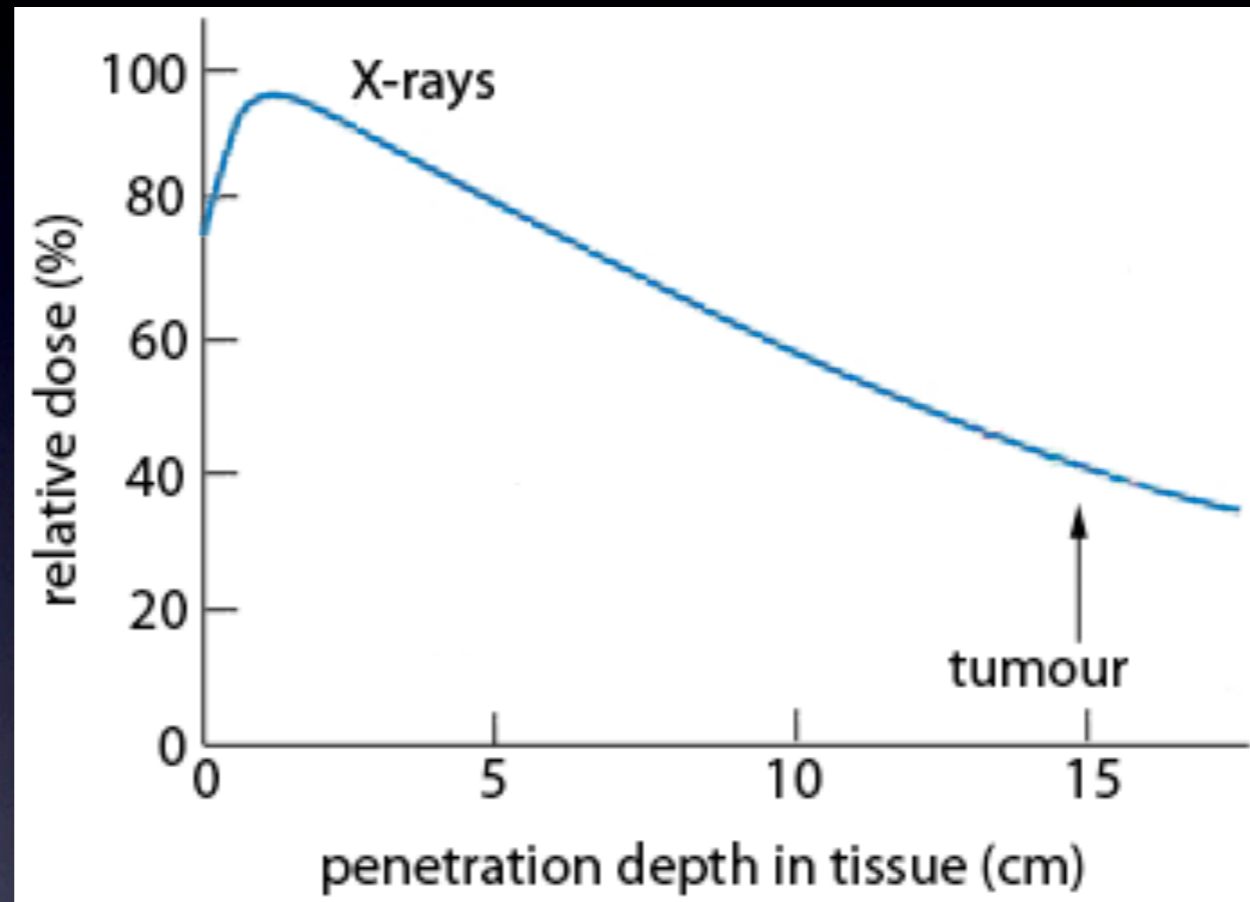
Injector Studies for Hadron Cancer Therapy  
using an ns-FFAG accelerator



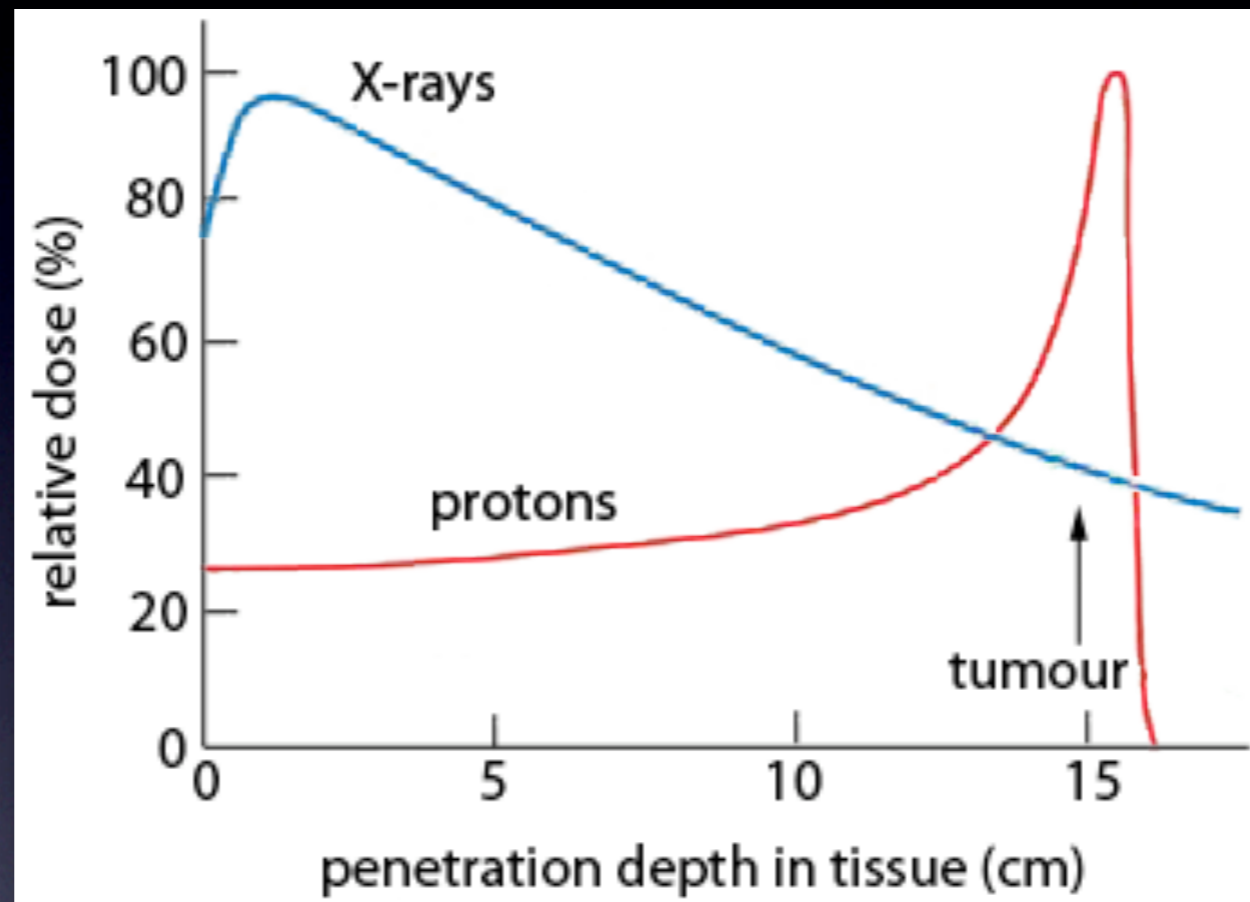
# Radiotherapy



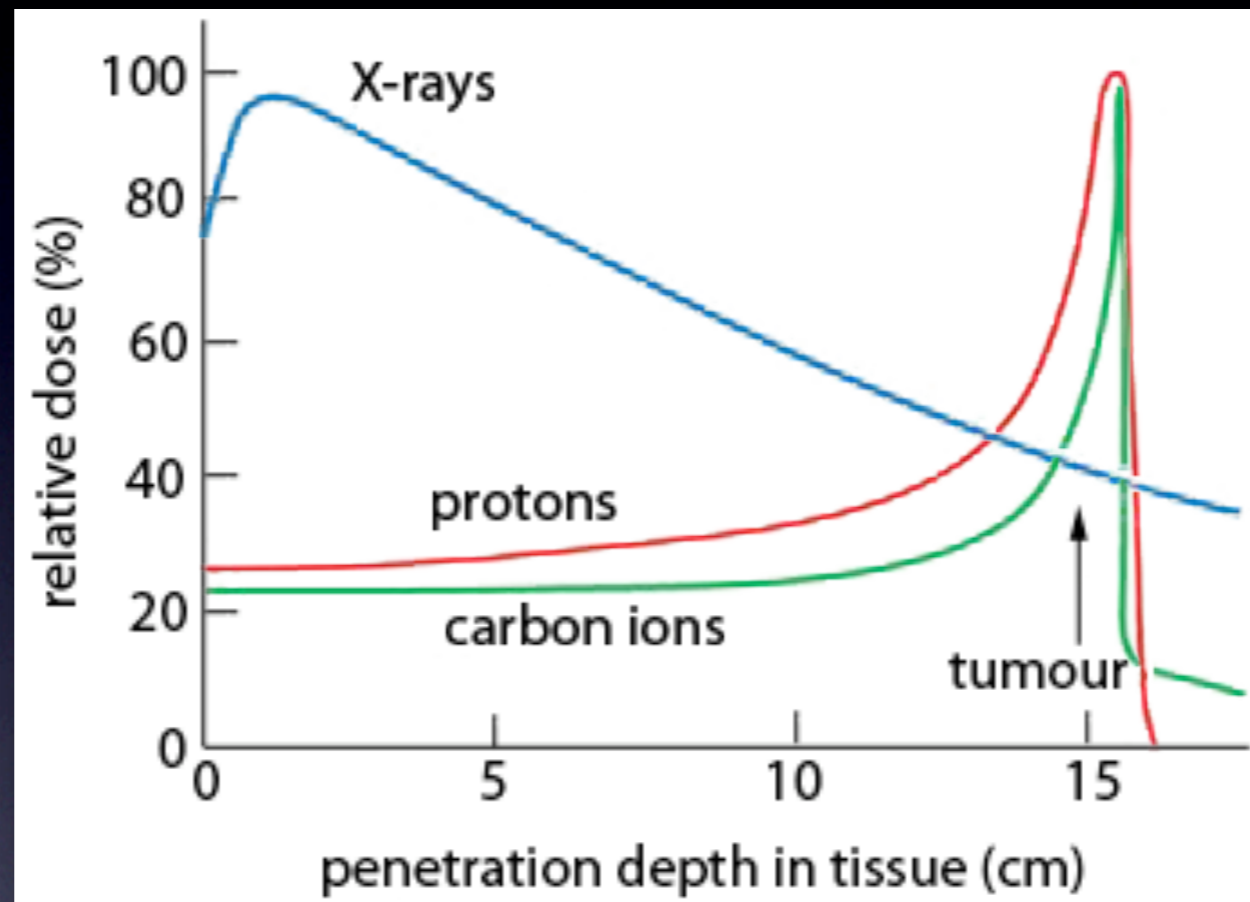
# Dose profile



Dose profile



Dose profile



penetration depth in tissue (cm)

0 5 10 15

# Dose profile



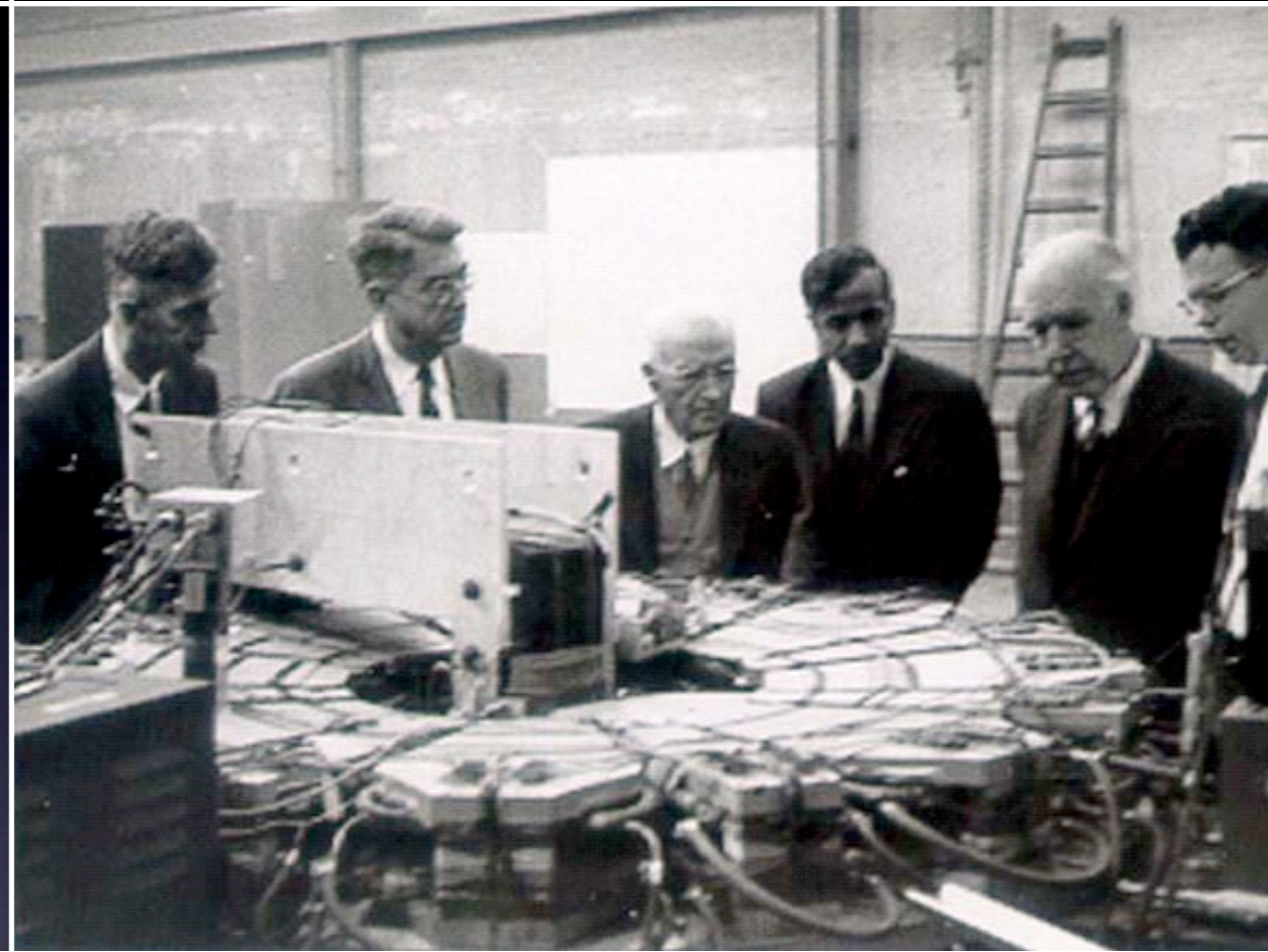
- British Accelerator Science and Radiation Oncology Consortium
- Academic, industrial and medical contributors
- Aim:  
“ The aim of BASROC is to build a complete hadron therapy facility using a novel accelerator technology called a Non-Scaling Fixed Field Alternating Gradient accelerator (ns-FFAG).”

<http://basroc.rl.ac.uk>

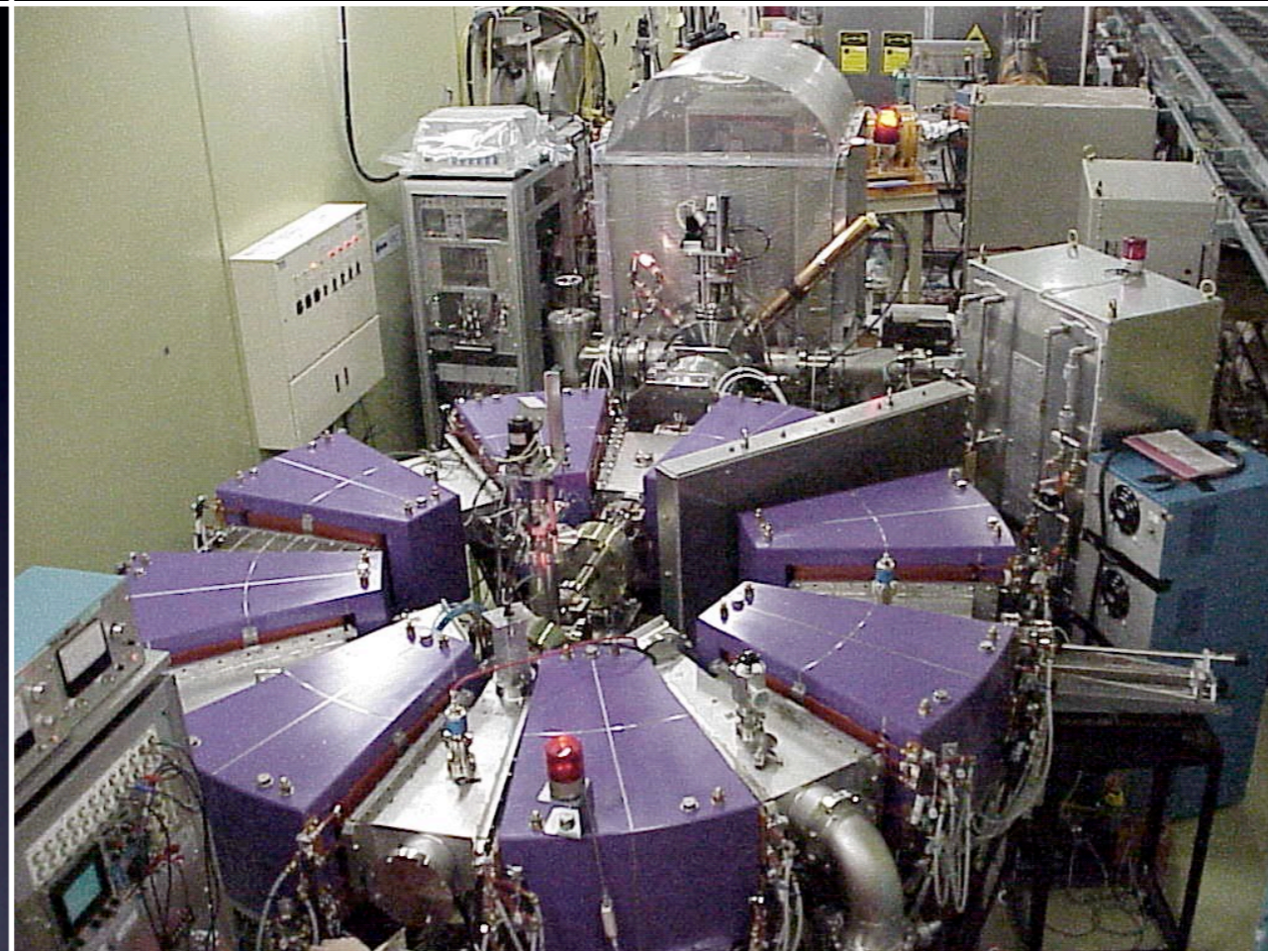




- EMMA  
Electron Model for Many Applications
- PAMELA  
Particle Accelerator for Medical Applications
- Full clinical facility



# FFAG Accelerators



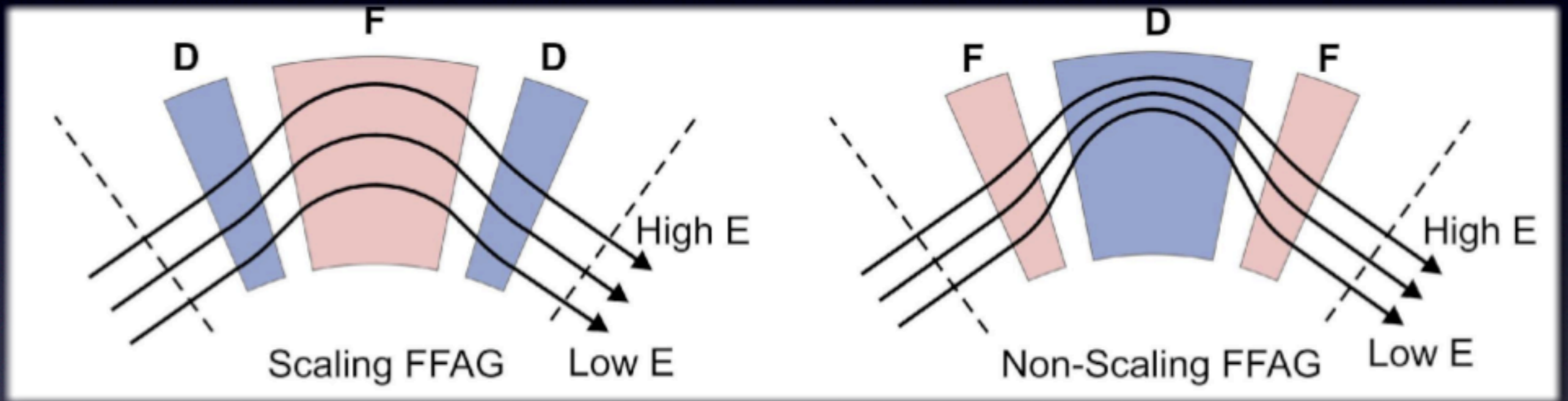
# FFAG Accelerators



# FFAG Accelerators

# FFAG Accelerators

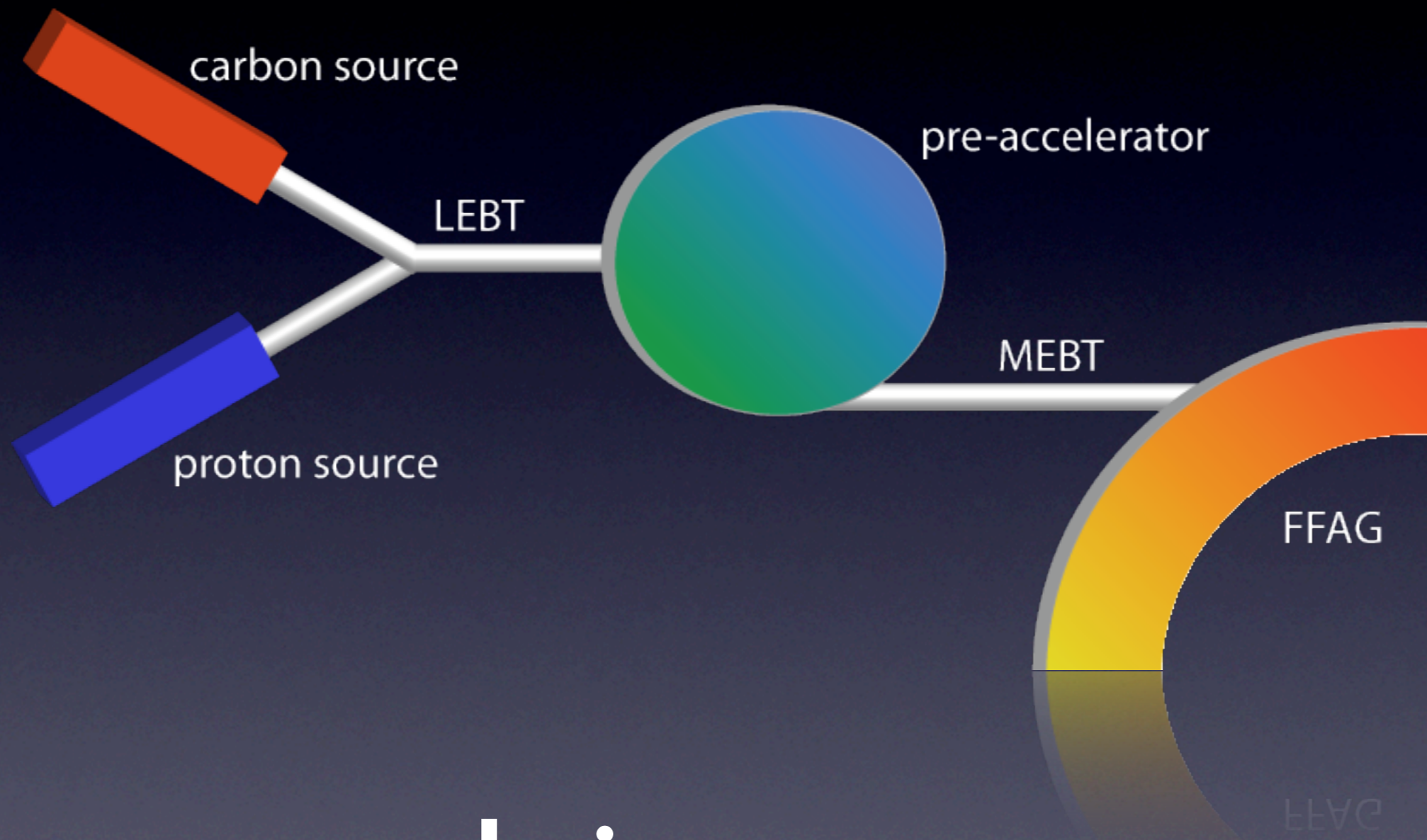
- Fixed field
  - No field ramping as in a synchrotron
  - Field increases with radius to keep beam orbits within beam pipe at all energies
- Alternating gradient
  - Alternating horizontal and vertical focusing controls betatron oscillations
  - Alternating field directions invoke scalloped orbit shapes



# FFAG cells



Injector



# Injector



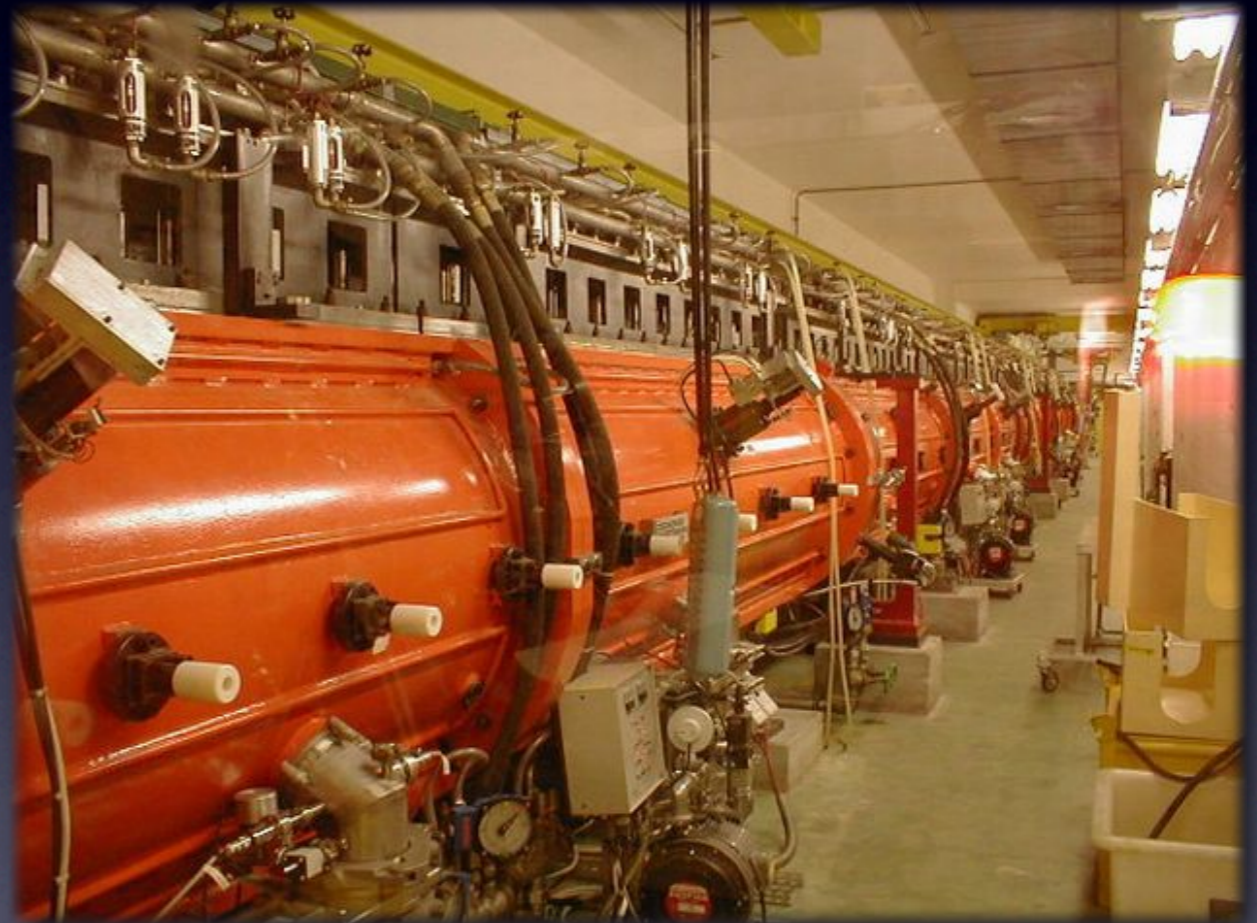
# Cyclotron

- Commercially available for proton therapy
- Adjustments required for carbon therapy
- Compact
- Simple to use



# Linac

- Used in carbon therapy centres as injector for synchrotrons
- Simple to design
- Take up more space
- More maintenance required



# PhD Research

- Comparative survey of ion sources
- Comparative survey of pre-accelerators
- Final design of source section, pre-accelerator and beam transport lines

# PAMELA

Injector Studies for Hadron Cancer Therapy  
using an ns-FFAG accelerator