Needs for ion beams
The ion-therapy research program in Lyon

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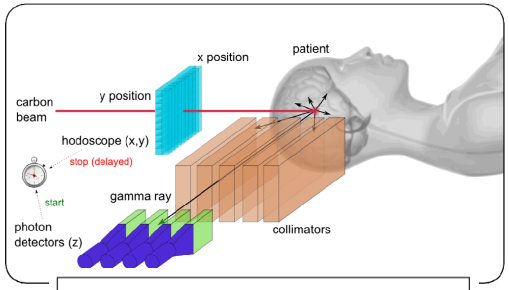
Frameworks

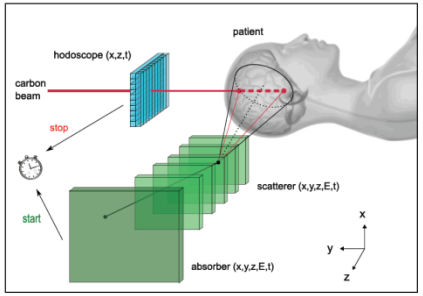
- Rhône Alpes Program for ion-therapy research : PRRH
- GDR MI2B (CNRS) (IMN5, IMN9)
- France HADRON (WP3, WP4), Lyon node
- LabEX PRIMES (WP1, WP3)

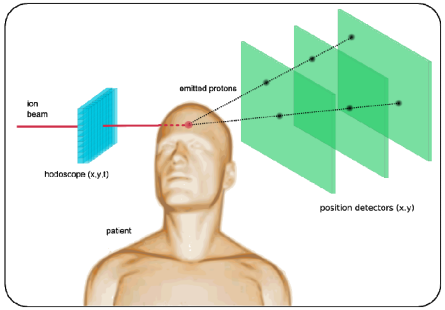
- Ongoing projects:
  - FP7 ENVISION, ENTERVISION
  - ANR Gamhadron
  - INCA QAPIVI, Protom

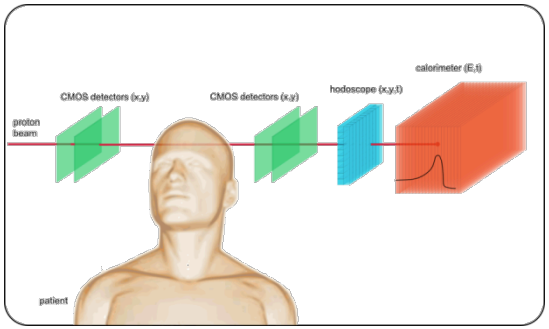
New instruments and methods for in beam control

- In-beam beta+ decay (Envision WP2)
- Prompt-gamma imaging (ENVISION WP3)
  - Collimated
  - Compton Camera
- Secondary protons (ENVISION WP3)
  - Interaction vertex imaging
- Proton radiography









Radiobiology

- Cellular response to carbon and proton irradiations :
  - Quantification of radiobiological efficiency
  - DNA damage and repair
  - Cell death signaling
  - Radioresistance mechanisms
  - Analysis and prediction of radiobiological data

- Existing in Lyon
  - Radiograaff: 3 MeV protons (implemented 2012)

Typical needs for beams

- In beam imaging: Detector developments and tests
  - Carbon and proton ions
    - energies relevant for ion therapy (> 60 MeV/u) (100 hours/year)

    Allow detector and electronics tuning: (a few hours at once may be useless)

- Radiobiology: cell irradiation
  - Carbon ion beams:
    - Low enegy : 10-12 MeV/u (60–180 hours/year)
    - Medium energy : 50-75 MeV/u (60–180 hours/year)

    Accelerator stability and planning reliability are strong issues