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

Denis Dauvergne
Institut de Physique Nucléaire de Lyon
CNRS/IN2P3  Université Lyon 1
PRRH ETOILE – GDR MI2B
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 energy: 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*