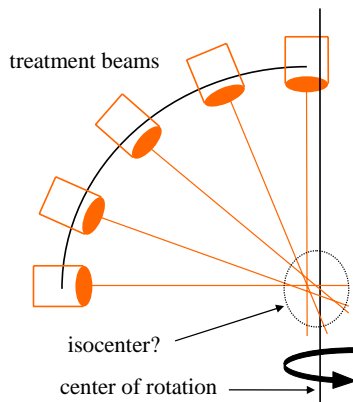


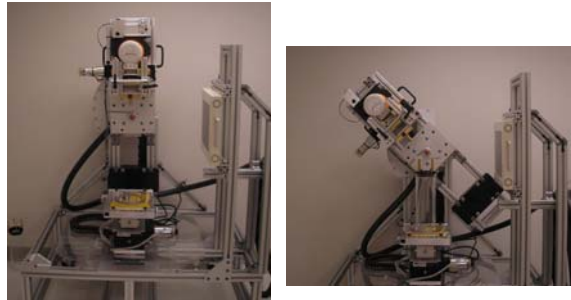
Small Animal Radiation Research Platform (SARRP): Mechanical Design and Calibration

The Problem

- Cancer research with small animals allows detailed study of biological processes, disease progression, and response to therapy.
- Image-guided radiation therapy systems for small animals are needed to bridge “mice to men” translation.
- Smaller scale requires high accuracy for radiation delivery (e.g., 0.5 mm beam diameter)



Where is the isocenter and can we compensate for misalignment (offsets)?



General views of SARRP

THE SOLUTION

- Construction of SARRP which integrates imaging, radiation delivery and treatment planning capabilities:
 - Robotic system to position animal for imaging and treatment
 - X-ray source and shutter for radiation treatment
 - X-ray source and panel for 2D imaging
 - Software package to reconstruct 2D projection images into 3D volumetric representation
 - GUI for display and manipulation of 2D/3D images
- Calibration procedure using X-ray camera:
 - Measure center of rotation (COR)
 - Determine intersection of each beam axis with COR
- Compensate for isocenter offsets by moving XYZ stages

THE IMPACT

- Development of algorithms for precise small animal irradiation
- Full combinations of imaging and irradiation capabilities
- Highly localized treatment planning, dose calculation and verification
- Mobile system allows operation within animal containment barrier

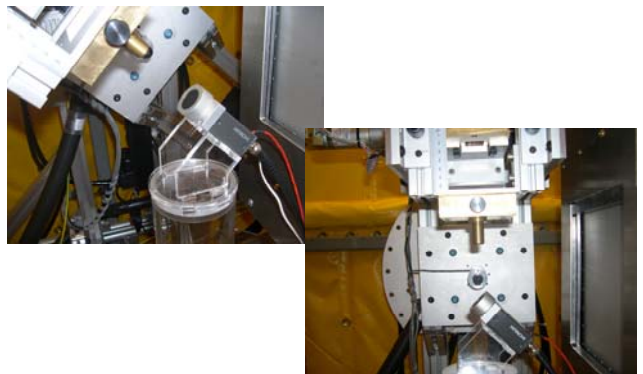
THE FUTURE

- Engineering validation and calibration of the system
- Gantry characterization: Measuring offset of beam and stages
- Gantry version for larger animals

PUBLICATIONS

Three abstracts published at AAPM 2006:

- The Small-Animal Radiation Research Platform (SARRP): Focused Pencil Beam Dosimetry
- The Small-Animal Radiation Research Platform (SARRP): Commissioning a 225 KVp “small-Field” X-Ray Source for Monte Carlo-Based Treatment Planning
- The Small Animal Radiation Research Platform: Benchtop Cone-Beam CT



Calibration of treatment isocenter

PEOPLE INVOLVED

- Graduate Student: Babak Matinfar
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- Radiation Oncology: John Wong, Chris Kennedy, Todd McNutt, Eric Ford, Elwood Armour

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