Research developments at Hasselt University

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Nuclear Technology Centre (NuTeC)

CMK CENTRUM VOOR MILIEUKUNDE

UHASSELT

Research group of Centre for Environmental Sciences

Research topics :

- Monitoring and Valorisation of (nuclear) Waste
- Medical Dosimetry

https://www.uhasselt.be/nutec

Prof. dr. Sonja Schreurs
Prof. dr. Wouter Schroeyers
Prof. dr. Brigitte Reniers

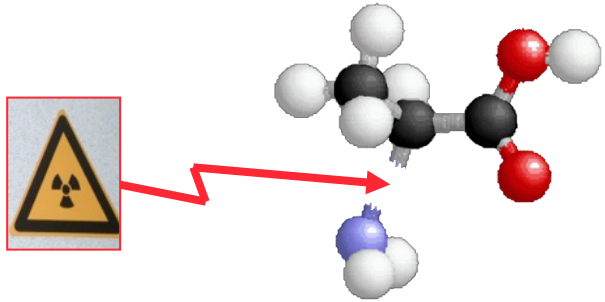
NuTeC Nucleair Technologisch Centrum

KU LEUVEN | universiteit hasselt

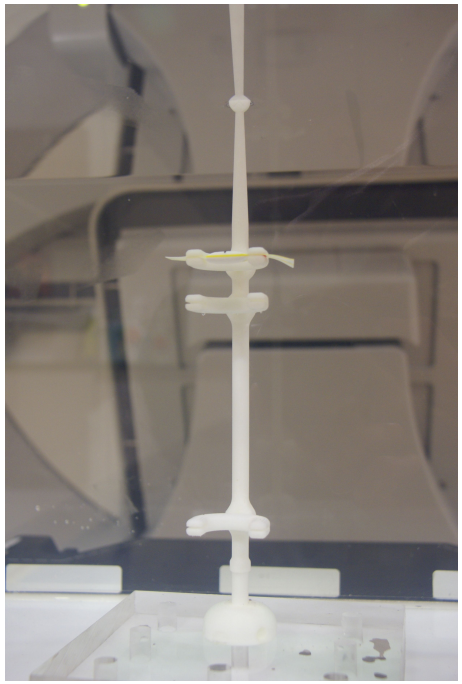
UHASSELT KU LEUVEN

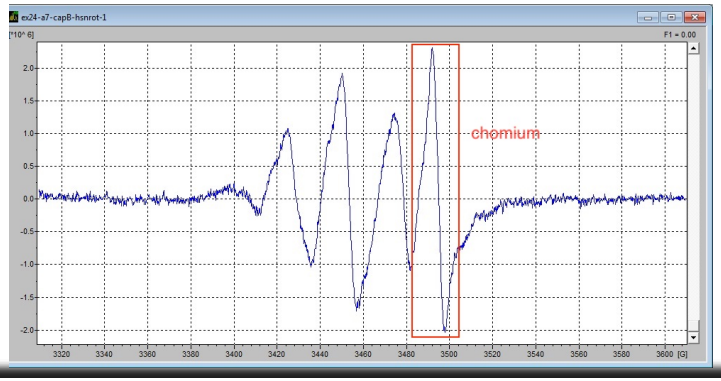
Present activities: Audits with films and alanine

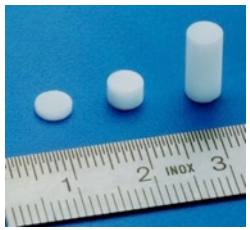
Dosimetry based on magnetic resonance of electrons: Zeeman effect



Basic tests in water







Present activities:
Audits with films and alanine

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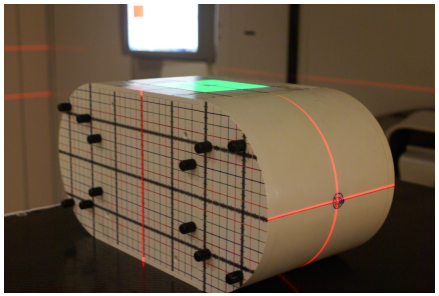
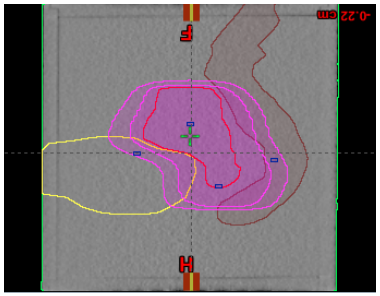
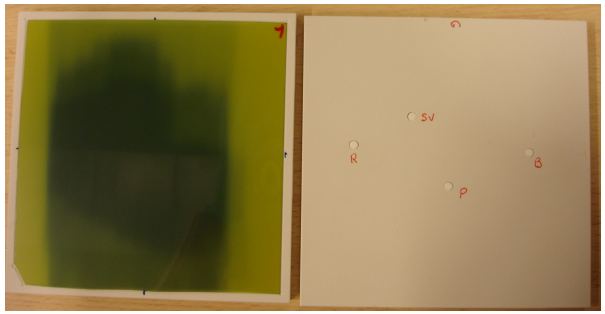
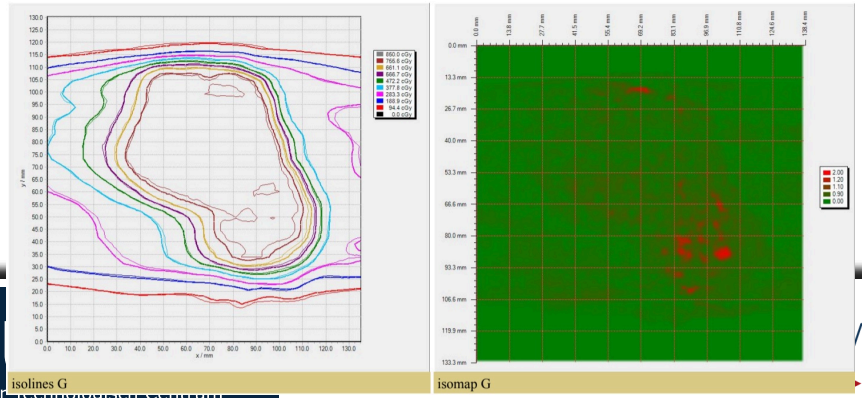
End-to-end tests for prostate



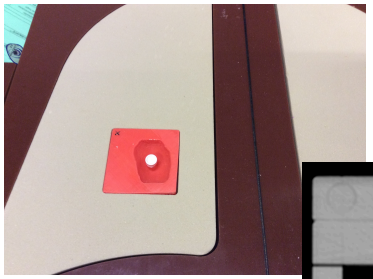


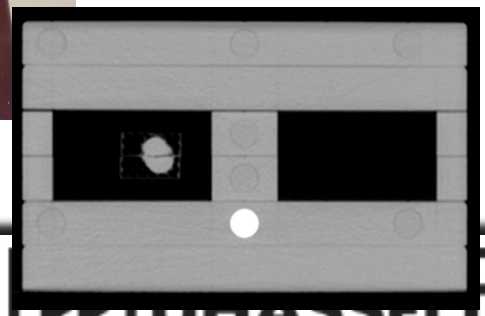




End-to-end tests for SRS

In preparation: end-to-end tests for SBRT lung





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Electronic Brachytherapy source

Xoft AxxentTM

Figure 1. X-Ray Source – Scaled to Size

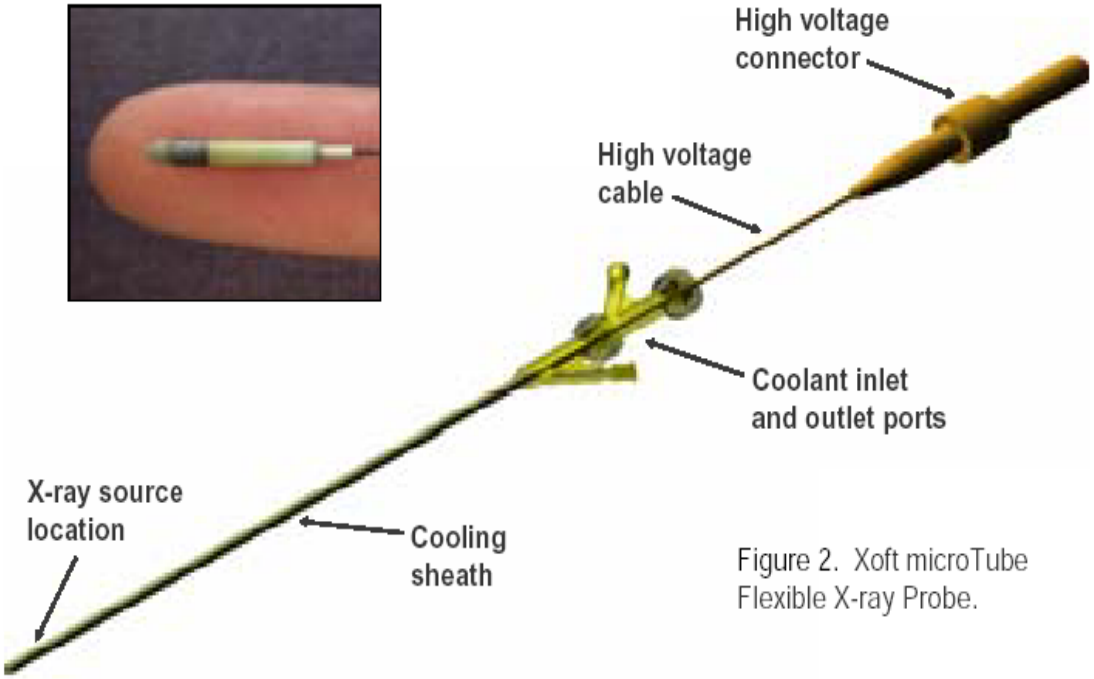


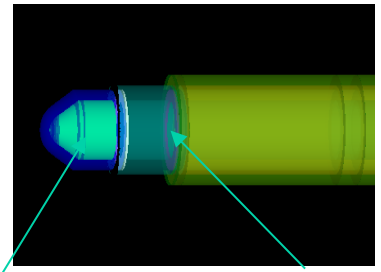
Figure 2. Xoft microTube Flexible X-ray Probe.

* www.aapm.org/meetings/05SS/program/Radionuclides.pdf and Private communication from Xoft, Inc

Electronic Brachytherapy:

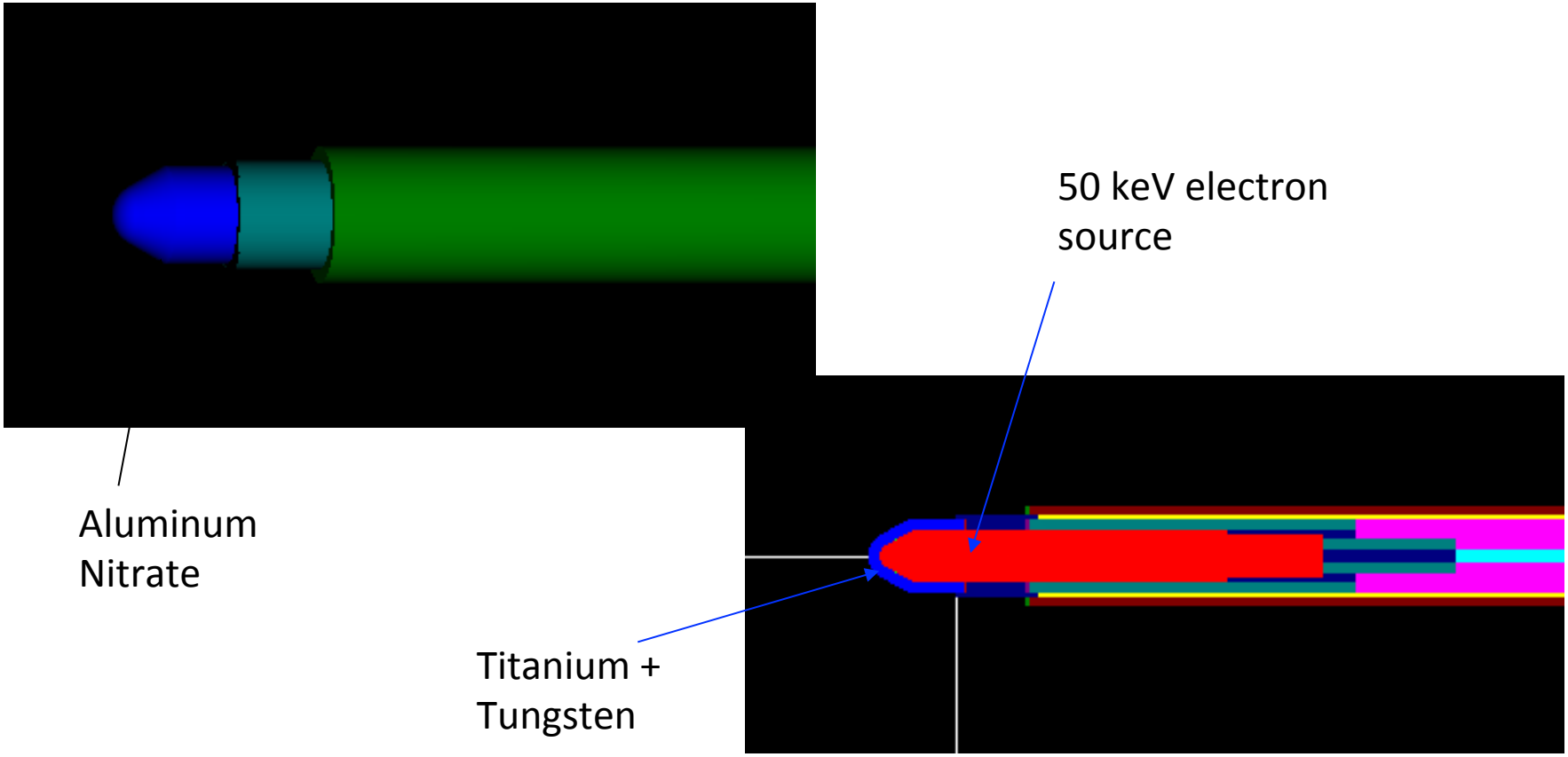
- Xoft Axxent
- Collaboration with Maastro Clinic in a European project: PRISM-eBT

EGSpp

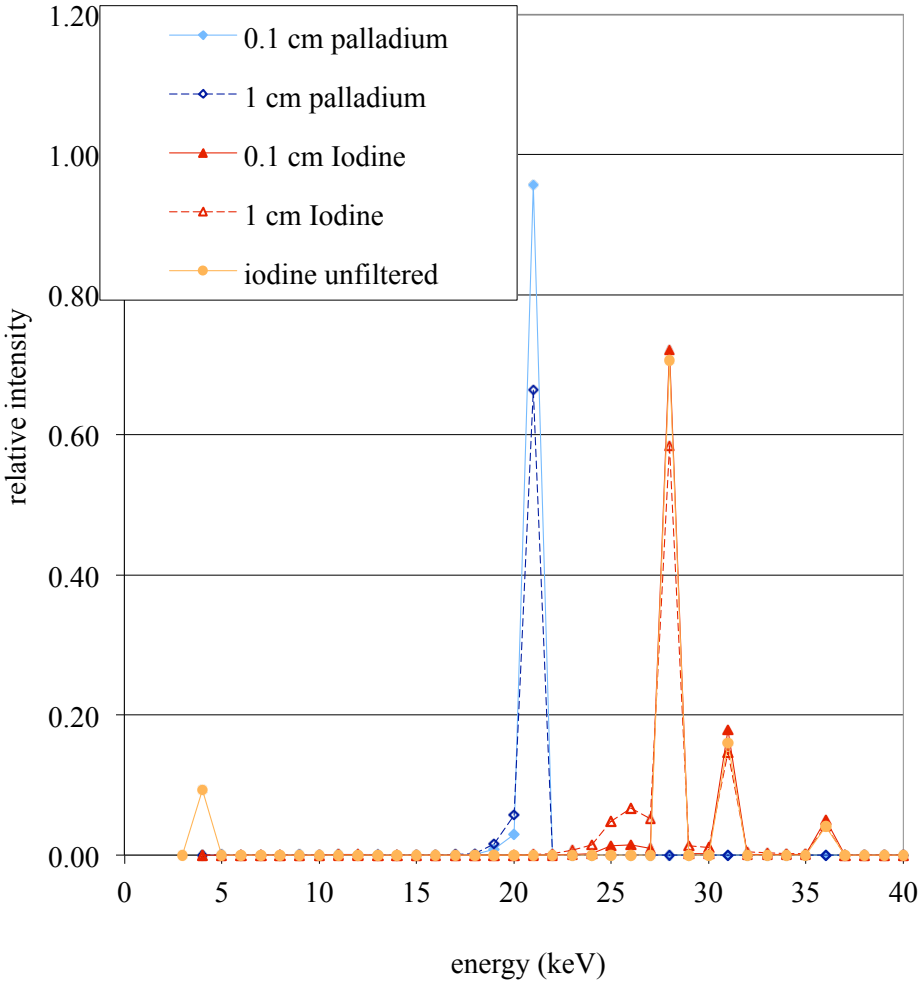


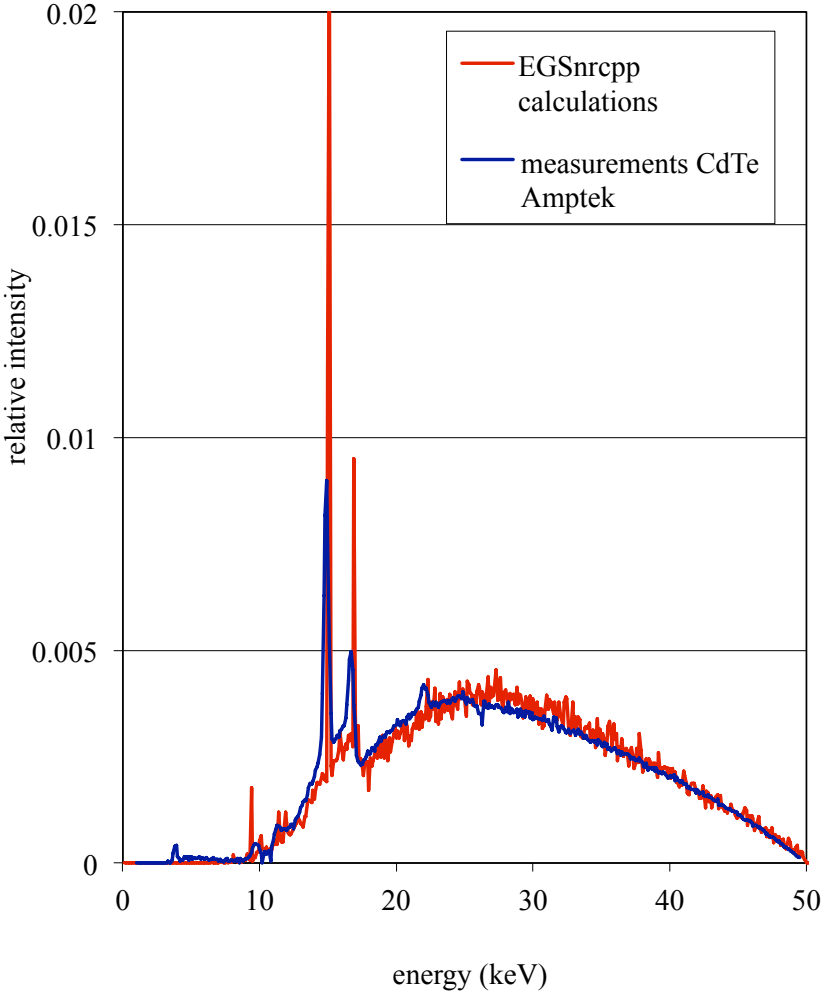
MC Model

- Model of the xoft Axxent probe in EGSnrc++

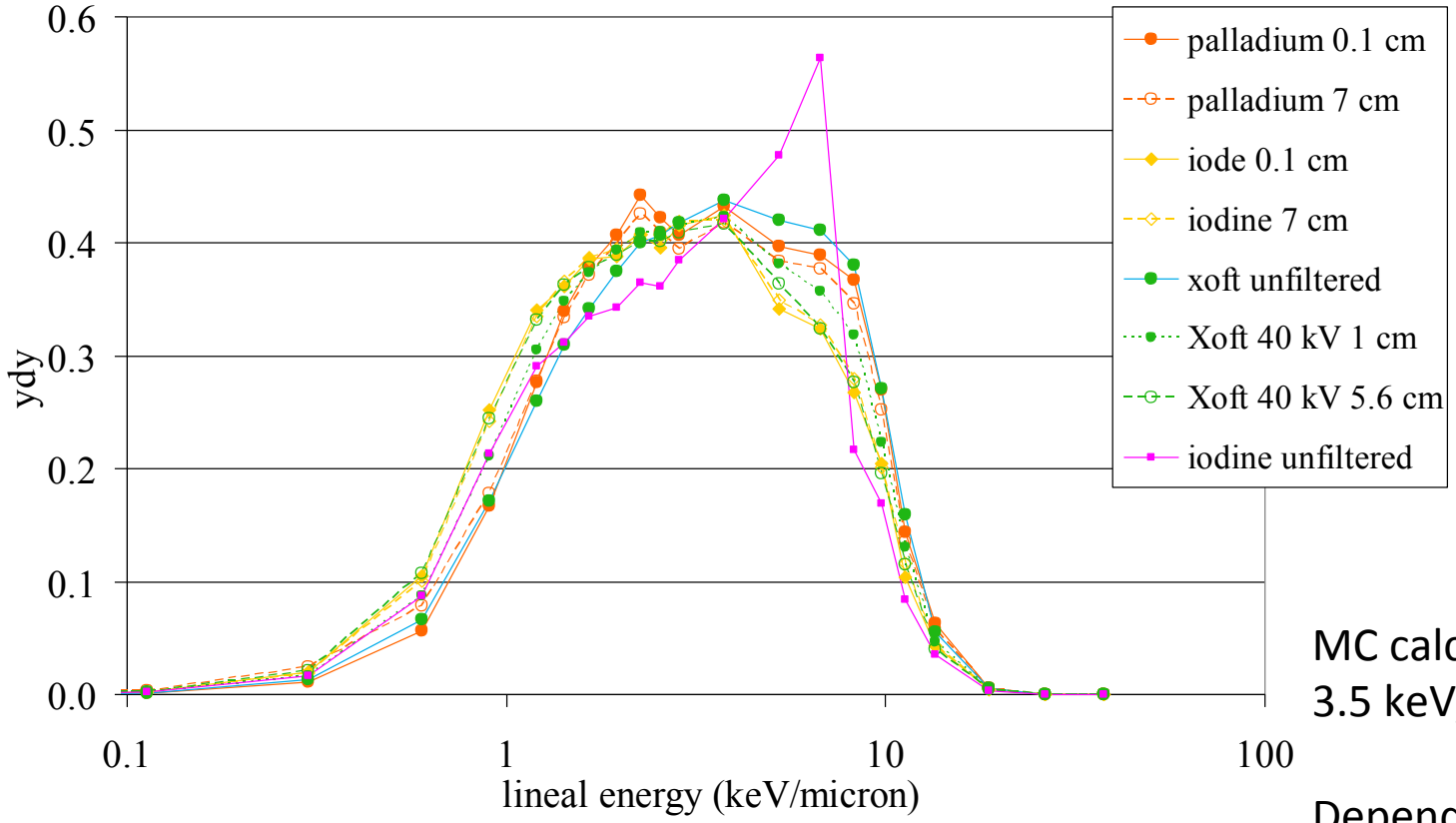


Photon spectra





Microdosimetric spectra in 1µm sphere

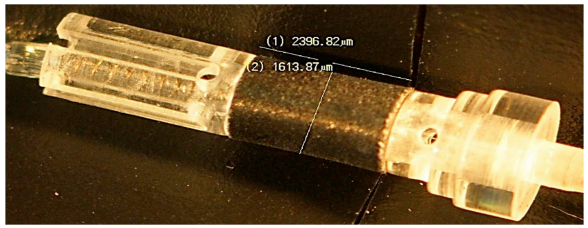


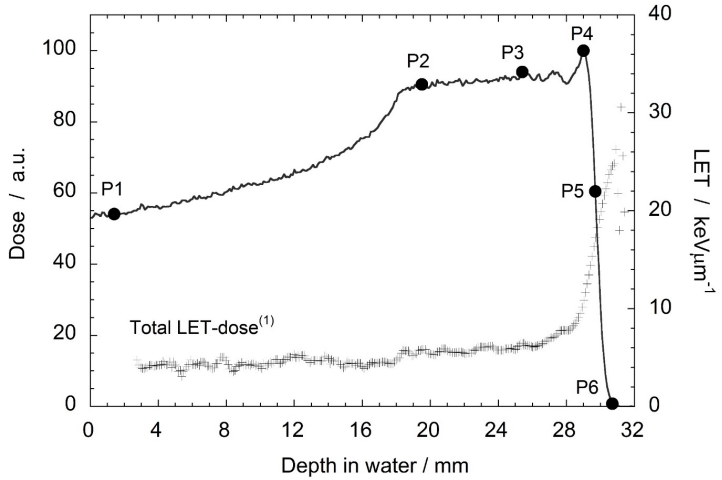
MC calculation:
3.5 keV/µm < y_D < 4 kev/µm

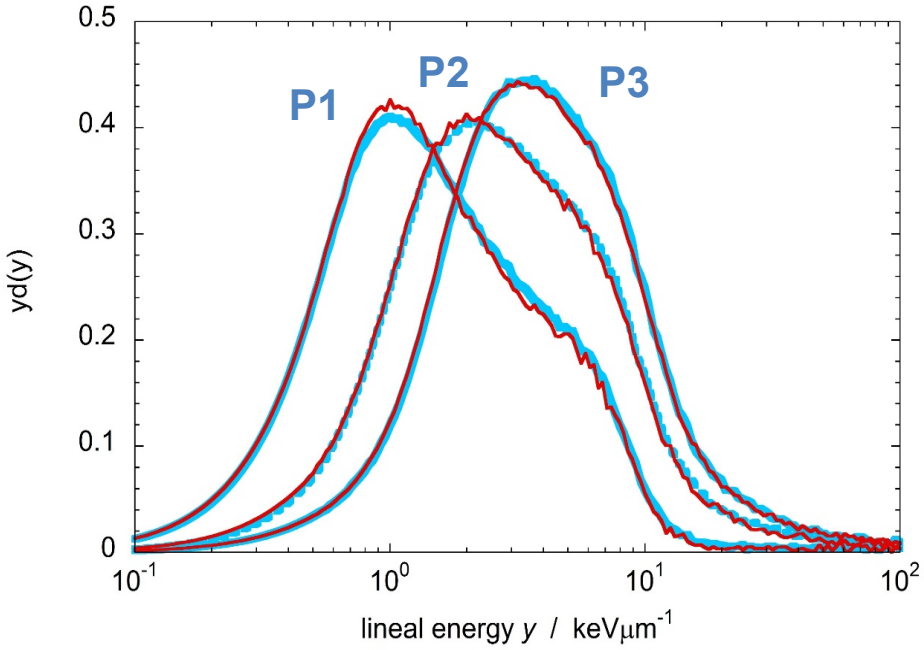
Depending on the filtration and distance

Experimental Microdosimetry

- portable sealed mini-TEPC optimized for therapeutic proton beams





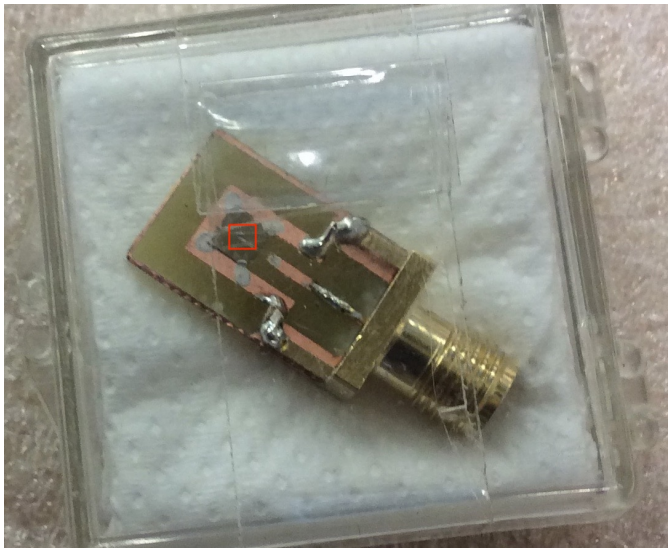


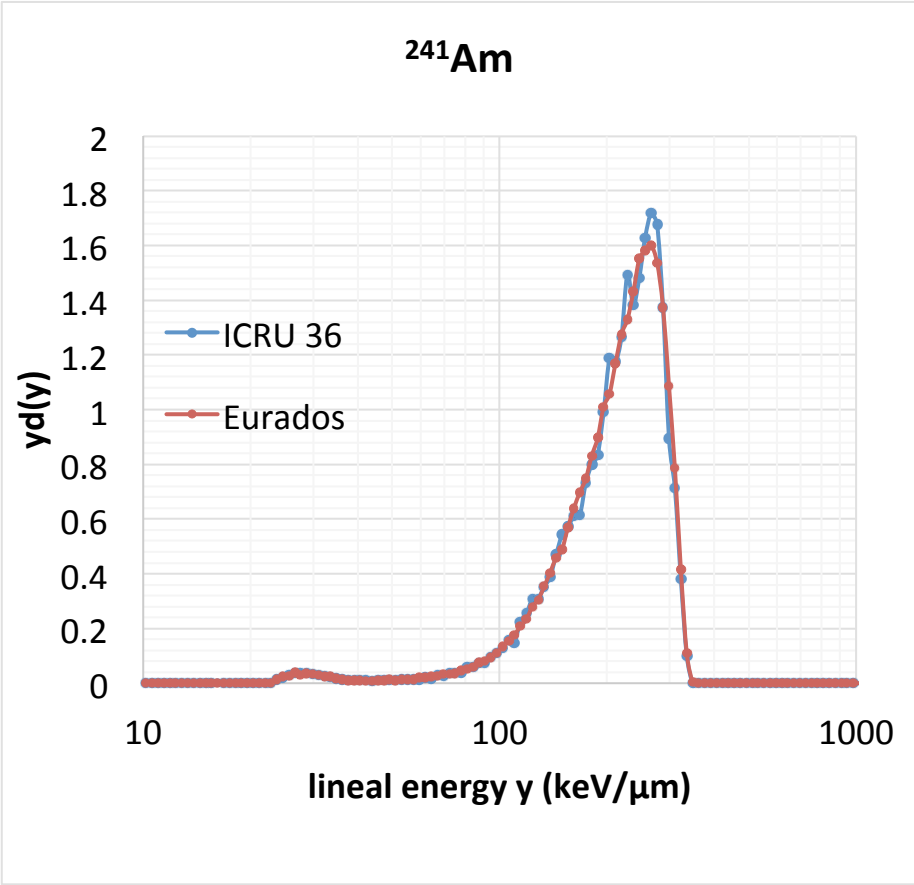
- Light blu: first shift
- Red: 2 months later

Experimental Microdosimetry:

- Diamond:

Dries Colson PhD
Nov 1st





Diamond microdosimetry

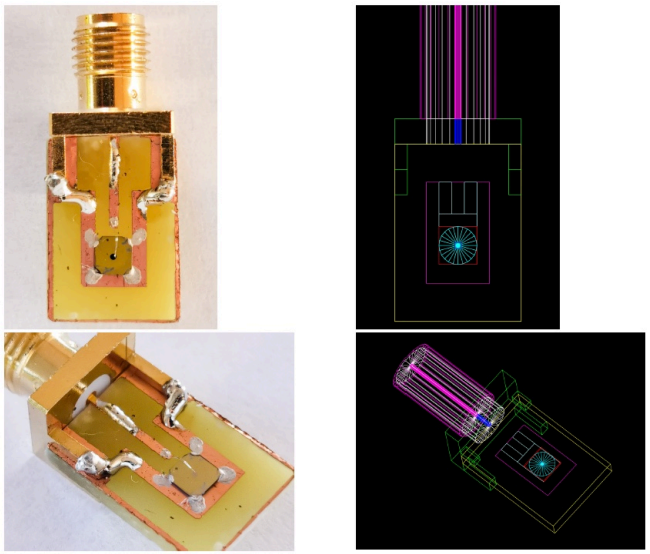
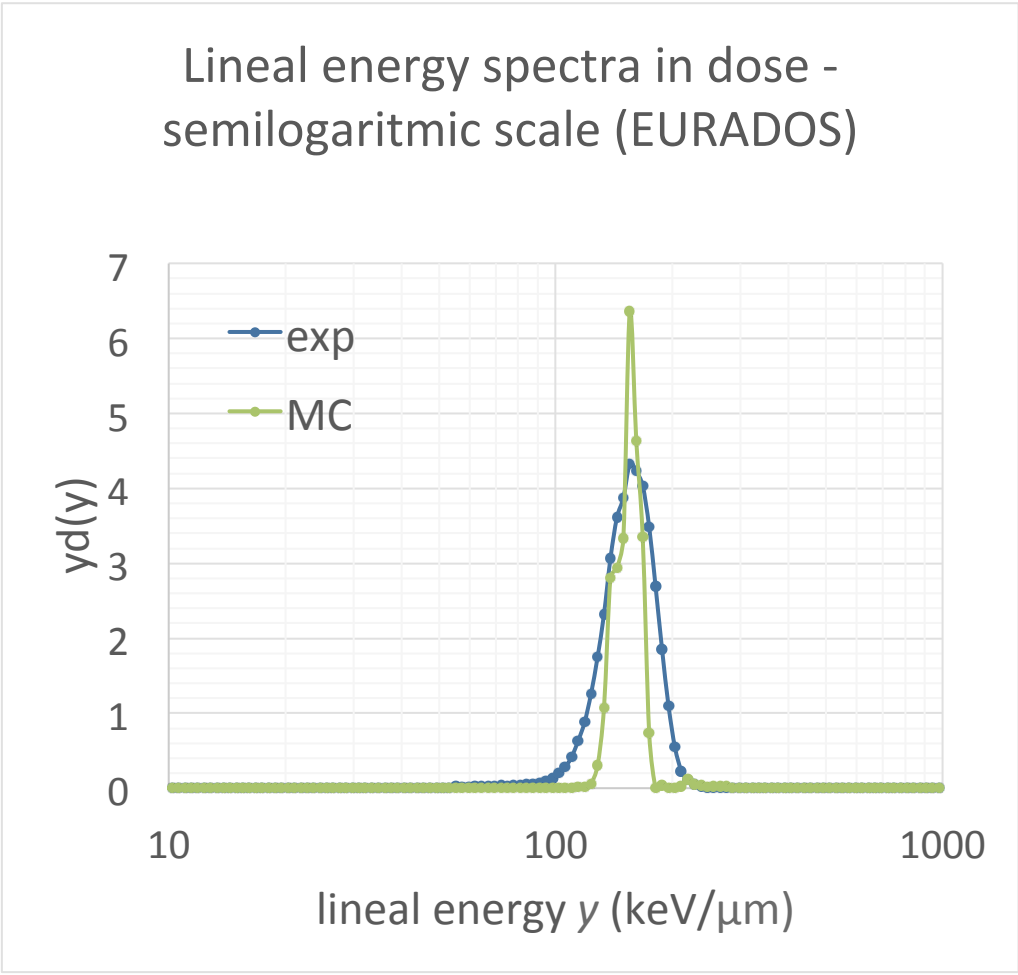
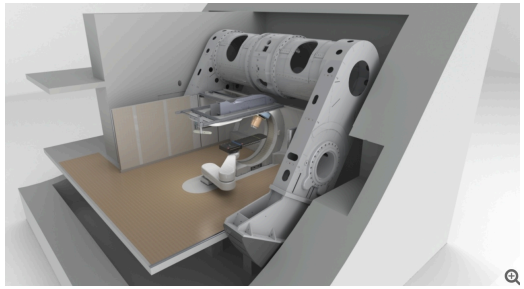


Figure 62: Comparison diamond microdosimeter (left) with MC model (right)



New proton centers:



- Maastricht:
  - Installed
  - Mevion
  - First patient February 2019
- Delft:
  - Installed
  - Varian
  - First patient: September 2018

- Leuven (Belgium):
  - Proteus One from IBA
  - Planned first patient 2019

Status April 25 2018

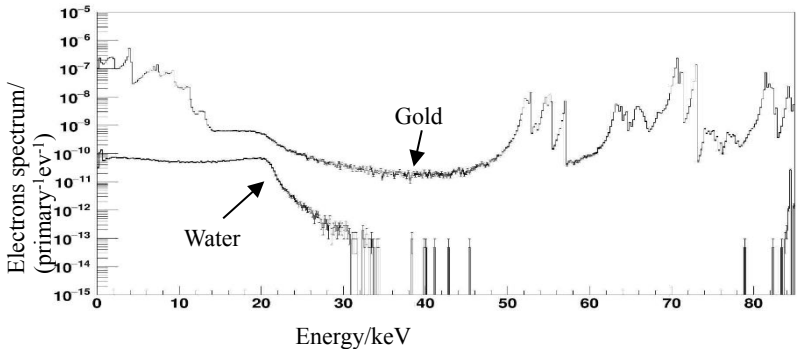
- Charleroi? (Belgium): IBA

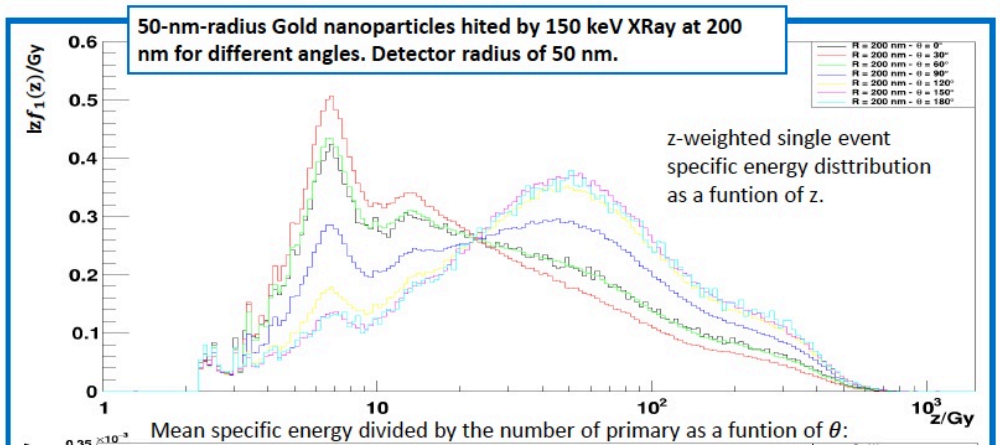
Project alanine with SCK: to be published

Nanoparticles

Jonathan Derrien

- Use of Geant-DNA
- Calculate dose distribution and microdosimetric spectra around AuNP





Comparaison between the secondary electrons spectrum in water with and without Gold NP. The X-Ray energy is 85 keV and the AuNP has a diamter of 100 nm.