



Department of Radiation Oncology, Medical University of Vienna

Entwicklung eines standardisierten Phantoms für strahlenbiologische Experimente in
Röntgen und Teilchenstrahlen

Development of a standardized phantom for radiobiological experiments using X-ray and particle irradiation

Project description:

Biological research is one of the main pillars in radiation oncology. This involves understanding how ionizing radiation, e.g., X-rays or charged particles such as protons or carbon ions, interact with biological tissues and how they impact the biological response to radiation.

Most irradiation experiments are conducted with X-rays in a vertical set-up, e.g. with the radiation coming from above the cell samples. Unfortunately, not all radiation types are available in such a configuration. Especially for particle therapy, most research lines are equipped with a horizontal beam line, providing a lateral irradiation field. Unfortunately, this different irradiation geometry has a pronounced impact on experimental design. Per-se standardized biological containers such as well-plates cannot be tilted upright. Consequently, a large effort is put into developing phantoms and procedures allowing to perform experiments in horizontal irradiation conditions.

Our department has the possibility to perform research at the MedAustron Ion Therapy Center, providing us with the rare opportunity to perform combined theoretical and experimental research in this area.

This master thesis aims to develop a modular, standardized phantom to perform radiobiological experiments for particle therapy as well as reference X-ray irradiations for horizontal irradiation geometries. A focus will be put on dosimetric accuracy e.g., the possibility to design a suitable radiation dose distribution and verify it by measurements.

Master – Thesis Outline:

- Development of dedicated phantom and holders for specific cell culture containers
- 3D manufacturing of the designed holders using Fused Deposition Modeling (FDM) or Stereolithography (SLA)
- Optimize structures for optimal usability and dosimetric performance
- Perform dosimetry measurements with X-rays and particle irradiation

Duration: 6-8 months, the position is open immediately_____



Research team and infrastructure

The Department of Radiation Oncology at the Medical University of Vienna is a high-end equipped photon and brachytherapy department with 5 linear accelerators, CT, an open MR and access to PET/CT and MR/PET imaging devices in the general hospital of Vienna. MSc, PhD students and post-doctoral researchers are performing research in the context of precision radiotherapy with photons, protons or ions in the medical radiation physics group of Univ.-Prof. Dr. Dietmar Georg.

The MedAustron Centre for Ion Therapy and Research in Wiener Neustadt is one of only four synchrotron-based facilities in Europe, which can treat patients with ion beams heavier than protons. Since 2016 patients are treated using proton beams and in 2019 operation with carbon ion beams started.

Within this project the student will contribute to experimental measurements at the MedAustron ion beam therapy centre and will have access to state-of-the-art design software as well as 3D printing machinery [Fused Deposition Modeling (FDM) and Stereolithography (SLA)].

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