

Invitation to the seminar on

# Medical Radiation Physics and Ion-Beam Therapy

by

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## Ultrahigh-Field MRI in preclinical ion-beam research: from technical challenges to translational insights

Ultrahigh-field (UHF) MRI offers strong potential for preclinical radiation research by providing increased sensitivity and spatial resolution for improved soft-tissue contrast and non-invasive tissue characterisation. However, at very high field strengths, it introduces significant technical challenges, including field inhomogeneities, susceptibility effects, and constraints associated with in vivo imaging, requiring dedicated optimisation strategies.

In this presentation, we will discuss the integration of a 15.2T preclinical MRI system at MedAustron into small-animal particle therapy research. We will outline the development of robust multiparametric MRI (mp-MRI) protocols for longitudinal in vivo studies, together with processing strategies to ensure quantitative consistency, including distortion correction and data harmonisation.

We will then present results from a recent PAIR pilot study, in which longitudinal mp-MRI was applied to a subcutaneous PDAC mouse model to assess response to proton and carbon ion irradiation. Quantitative imaging biomarkers and tumour volumetry were used to probe treatment-induced changes in the tumour microenvironment. In addition, we will present the implementation of proton MR spectroscopy (<sup>1</sup>H-MRS) at 15.2 Tesla, addressing challenges in data standardisation and processing, and its role as a complementary metabolic readout.

Finally, we will provide an outlook on ongoing developments, including methodological improvements and emerging UHF MRI applications for high-resolution ex vivo imaging and atlas construction.

**Tuesday, 19. May 2026, 9:00 am**

Zoom: <https://tuwien.zoom.us/j/69660150906?pwd=FQRS8TnWx4hGuNEqjmVLfYostoOXLW.1>

For updates, please register at: <https://list.tuwien.ac.at/sympa/info/medaustron-seminar>