



Energy-modulated proton computed tomography for image guided proton therapy

1 MSc project available

In a research project funded by the German Research Foundation (DFG) based at the Department of Medical Physics, Faculty of Physics of the Ludwig-Maximilians-Universität München (LMU), a MSc project investigating energy modulation in proton computed tomography is available.

At LMU we have proposed the concept of fluence-modulated proton CT in a recently published article (<https://doi.org/10.1088/1361-6560/aa7734>). The idea of modulating the proton fluence during the proton CT acquisition opens the door to high accuracy proton stopping power images for treatment planning and patient positioning at lower imaging radiation dose. An alternative to improve proton CT is to jointly modulate the proton beam energy with the fluence, which has the potential of mitigating image artifacts and further reduce imaging dose in certain cases.

The general goal of the project is the development of an energy modulation scenario for proton CT using our highly realistic simulation platform. Based on prior knowledge of the object, an energy modulation plan is to be generated. Changes to the software processing for both simulated and experimental data will be required to account for energy modulation.

The research project will offer a broad spectrum of tasks including the further development of the LMU's extensive simulation infrastructure and investigating physical causes of image artifacts. If successful, energy modulation will be attempted experimentally.

The ideal candidate has

- A strong interest in computational aspects
- Experience in programming with either C/C++, Python or MATLAB, and Linux
- Experience with Monte Carlo transport and interaction codes, preferably Geant4
- Knowledge of imaging physics and image reconstruction
- Highly ranked BSc in Physics, preferably in Medical Physics or Biomedical Engineering
- Fluent English knowledge (spoken and written)
- Technical proficiency, scientific creativity, team working skills

The working place will be at the Forschungszentrum Garching, which is well connected with public transportation to the city of Munich. The MSc student will work in a highly motivated and well-established team within a multidisciplinary and international network embedded in a stimulating scientific environment with a long tradition of collaboration and excellence in biomedical research, with outstanding research and clinical infrastructures.

Please contact both supervisors:

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