



## **Out-of-field dose in proton therapy of cancer**

1 BSc thesis project available

Proton radiation therapy of cancer allows for a highly conformal dose to the tumor and significant sparing of surrounding healthy tissues. The dose outside of the treatment radiation field is called out-of-field dose. This out-of-field dose is dominated by neutrons which are either (1) created in the patient, by the interaction of the therapeutic beam with the patient body, or (2) created by the interaction of the beam with the beam shaping elements and with the treatment room structures. With the advancement of proton radiation therapy it has become important to estimate the out-of-field dose, as it is related to the risk of a treated patient developing radiogenic second cancer. This estimation can be used in enhancing the treatment planning procedure so as to minimize second cancer risk.

The LMU Department of Medical Physics is active in the research field of calculating out-of-field dose during patient treatment and estimating the associated patient risk, employing modern modeling and data analysis techniques. Our latest results have been summarized in high quality scientific publications, for example [here](#) and [here](#). As we have investigated separately the patient and room originated out-of-field dose, the next step would be to combine the two and conclude on their relative importance.

The goal of the proposed BSc thesis is to use the existing tools for simulating out-of-field dose in clinically relevant irradiation scenarios and quantify each component (room and patient).

The ideal candidate has:

- A strong interest in computational aspects
- Experience or willingness to learn some of the listed tools: Fortran, C++, Python or MATLAB, and Linux
- Any familiarity with Monte Carlo transport and interaction codes (Geant4/FLUKA) is welcomed, but not strictly necessary
- Good command of English (spoken and written)
- Technical proficiency, scientific creativity, team working skills

The LMU Department of Medical Physics is located in Forschungszentrum Garching, which is well connected with public transportation to the city of Munich. A flexible/hybrid working scheme including home office hours can be arranged. The BSc 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, and with outstanding research and clinical infrastructures.

In case of interest, please contact:

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