

# GSI – BIOPHYSICS SEMINAR

**Prof. Dr. Marco Riboldi**

Ludwig-Maximilians-Universität (LMU) - Munich

**Thursday, September 27<sup>th</sup>, 2018 at 2 p.m.**

**Lecture hall, Theory SB3. 3.170a**

Planckstraße 1, 64291 Darmstadt

## **“Motion compensation in external beam therapy”**

Advanced treatments for cancer therapy with conventional X-rays and ion beams require accurate image guidance methods. In recent years, technological developments have led to the effective integration of image guidance in the treatment workflow, aiming at reduced uncertainties in treatment delivery. For treatment sites where breathing motion is significant, however, the acquisition of accurate 3D motion information in real-time is challenging. Severe limitations exist in terms of imaging dose requirements for X-ray based techniques, and due to the inherent trade-off between spatial and temporal resolution in non-ionizing imaging methods.

A number of model based approaches have been proposed to bridge this gap, relying on quantitative descriptions of breathing motion based on treatment planning images, which are updated as a function of external (or internal) surrogates measured during treatment. Modeling approaches allow also the evaluation of motion induced dosimetric alterations, providing a way to test the treatment plan robustness against motion uncertainties.

In this presentation, I will discuss recent developments in motion modelling for external beam radiation therapy applications, with a specific focus on validation issues. Potential drawbacks of motion modelling approaches will be overviewed, discussing their ability to capture breathing pattern changes over time. The ability of motion models to quantify dosimetric effects will be also discussed, focusing on application examples in respiratory gated carbon ion therapy: methods to quantify physical and biological dose changes will be presented and analyzed.

**Hosted by Prof. Dr. Marco Durante**

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