GSI - **SEMINAR**

Im Theorieseminarraum, SB3 Raum 3.170a

Darmstadt, Planckstraße 1

Donnerstag, den 1. Oktober 2015, 14:00 Uhr

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Direct Measurement of the 3-Dimensional DNA Lesion Distribution Induced by Energetic Charged Particles in a Mouse Model Tissue

Charged particles are increasingly used in cancer radiotherapy and contribute significantly to the natural radiation risk. The difference in the biological effects of high energy charged particles compared with X- or γ-rays is largely determined by the spatial distribution of their energy deposition events. Part of the energy is deposited in a densely ionizing manner in the inner part of the track, with the remainder being spread out more sparsely over the outer track region. Our knowledge about the dose distribution is solely derived from modeling approaches and physical measurements in inorganic material. Here, we exploited the exceptional sensitivity of the γH2AX foci technology and quantified the spatial distribution of DNA lesions induced by charged particles in a mouse model tissue. We observed that charged particles damage tissue non-homogenously, with single cells receiving high doses and many others being exposed to isolated damage resulting from high energy secondary electrons. Using calibration experiments, we transformed the 3-dimensional lesion distribution into a dose distribution and compared it with predictions from modeling approaches. We obtained a radial dose distribution with sub-µm resolution which decreased with increasing distance to the particle path following a $1/r^2$ dependency. The analysis further revealed the existence of a background dose at larger distances from the particle path which arises from overlapping dose deposition events from independent particles. Our study provides the first quantification of the spatial dose distribution of charged particles in biologically relevant material and will serve as a benchmark for biophysical models that predict their biological effects.

Einladender: Prof. Dr. Gerhard Kraft

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