FAKULTÄT für PHYSIK
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MÜNCHEN/GARCHING

PHYSIK-DEPARTMENT
TECHNISCHE UNIVERSITÄT MÜNCHEN
MÜNCHEN/GARCHING

MLL-KOLLOQUIUM

Donnerstag, 17.10.2013, 16^{15} Uhr

Hörsaal der LMU in Garching, Am Coulombwall 1
Treffen zum gemeinsamen Kaffee 16 Uhr

Dr. Guntram Pausch

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Prospects and challenges of Prompt Gamma Imaging (PGI) for monitoring tumor treatments with hadron beams

Proton and ion beams open up new vistas for the curative treatment of tumors, in particular in close proximity to organs of risk. In contrast to gamma rays or electrons their energy deposition is well confined to a region defined by the particle range. This allows concentrating a high dose in the treatment volume while sparing healthy tissue, supposed the particle range is well under control. Range verification by appropriate in-vivo measurements turns out to be a key factor for tapping the full potential of proton and ion therapies.
The talk recapitulates secondary radiation signatures of the therapy beam that provide means for range verification, as well as reasonable technical approaches to assess these signals. Gamma rays originating from collisions of beam particles with nuclei of the tissue, or from consecutive decays of radioactive remnants produced by the beam, are considered the most suitable probes. Particle-therapy PET is a well proven approach but suffers from an asynchronism between initial beam interaction and the delayed positron annihilation signature deployed for imaging. Mapping the origins of energetic prompt gamma radiation due to nuclear collisions could overcome this drawback as a matter of principle, but it is much harder to accomplish. Two complementary concepts of Prompt Gamma Imaging (PGI) - passive collimation with pinhole or slit apertures on the one hand and Compton-imaging systems on the other hand - are discussed and compared. Furthermore, concept and status of a prototype Compton imager being developed at OncoRay/HZDR are presented.

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