FAKULTÄT für PHYSIK
LUDWIG-MAXIMILIANS-UNIVERSITÄT
MÜNCHEN/GARCHING

PHYSIK-DEPARTMENT
TECHNISCHE UNIVERSITÄT MÜNCHEN
MÜNCHEN/GARCHING

MLL-KOLLOQUIUM

Donnerstag, 09.07.2015, 16^{15} Uhr

Seminarraum 127, TUM, Physik II, Erdgeschoss/Nord
Treffen zum gemeinsamen Kaffee 16 Uhr

Prof. Uwe Schneider

(Univ. of Zürich and Radiotherapy Hirslanden/Zürich, Switzerland)

Neutrons and second cancer induction in proton therapy

In proton therapy, high energy proton beams cause the production of secondary neutrons. This leads to an unwanted dose contribution, which can be considerable for tissues outside the target volume regarding the long term health of cancer patients. Due to the high biological effectiveness of neutrons with regard to cancer induction, small neutron doses can be important. The neutron doses for active and passive proton therapy is quantified and compared to the scatter dose which occurs in 3D-conformal and IMRT-photon therapy. Dose measurements were performed in terms of neutron dose equivalent inside an anthropomorphic phantom. The neutron dose equivalent was determined using track etch detectors as a function of the distance to the isocenter, as well as for radiation sensitive organs. The neutron dose distributions for active and passive proton therapy were compared to the scatter dose of photon-treatment techniques (3D conformal, volumetric modulated arc therapy and intensity-modulated radiation therapy for photons). Second cancer models were applied to the proton dose distribution including neutrons. The neutron dose equivalent for proton therapy was higher than for photons in general and in particular for double-scattered protons. However, the overall neutron dose equivalent from proton therapy was an order of magnitude lower than the photon stray dose of treatments using 6 MV photons, suggesting that the contribution of the secondary neutron dose equivalent to the integral dose of a proton radiotherapy patient is small. Using secondary cancer models, the yield of second malignancies from proton therapy was estimated to be lower than that of conventional photon therapy.

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