ST 6 Strahlentherapie mit schnellen Ionen I

Zeit: Dienstag 10:00–11:00 Raum: D

Hauptvortrag ST 6.1 Di 10:00 D

Medical Physics aspects of the Heidelberg Heavy Ion Facility — •Oliver Jäkel — Deutsches Krebsforschungszentrum

At the German heavy ion facility GSI a pilot project for radiotherapy with a scanned beam of carbon ions is operational since 1997. Nearly 300 patients have been treated with carbon ions until the end of 2005 using the newly developed raster scan system. Many further developments in the field of medical physics will be necessary, however, before the hospital based facility at the university Heidelberg can start its clinical operation in 2007. Of special importance are the fields of dosimetry and treatment planning.

In the field of clinical dosimetry, the main task is to extend the measurement protocol developed for ionization chambers in a field of Carbon ions also to other ion species that will be used at the Heidelberg facility. Furthermore, the overall uncertainty of dose measurements, which is still higher than for conventional high energy X-ray therapy, has to be improved and efficient methods for dose verification have to be developed.

Concerning the treatment planning system the main tasks are to develop tools for fast optimization of multiple beam ports and to extend the database available for carbon ions towards the other relevant ions, like Helium, Oxygene etc.

ST 6.2 Di 10:30 D

Anforderungen an die Qualitätssicherung für eine klinische Schwerionentherapie-Anlage — •Christian Karger, Peter Heeg und Oliver Jäkel — Deutsches Krebsforschungszentrum, Heidelberg

Seit 1997 wurden an der Gesellschaft für Schwerionenforschung (GSI) mehr als 300 Tumorpatienten mit Kohlenstoffionen behandelt. Die vielversprechenden Ergebnisse führten zur Planung einer Klinik-basierten Schwerionentherapieanlage, die sich z.Zt. an der Universitätsklinik in Heidelberg im Bau befindet. Da diese Anlage eine Kapazität von bis zu 1000 Patienten pro Jahr besitzt, müssen einige der Qualitätssicherungsverfahren angepaßt und optimiert werden. Die wichtigsten Anforderungen sind: zeitsparende tägliche Prozeduren, wie z.B. eine automatisierte Monitorkalibrierung in mehreren Behandlungsräumen, Strahllage-Checks für einen gescannten Strahl in einem drehbaren Bestrahlungskopf (Gantry), Erfassung der Fluenzverteilung individueller Bestrahlungsfelder sowie eine Gantry-kompatible Dosisverifikationstechnik. Das bestehende Qualitätssicherungsprogramm muß daher für den effizienten Betrieb in einer klinischen Umgebung optimiert und für die Anwendung mit einer Gantry erweitert werden.

ST 6.3 Di 10:40 D

Rapid Calculation of Biological Effects and Multifield Treatment Planning for Ion Beams — •Michael Kraemer, Michael Scholz, and Alexander Schmidt — GSI Darmstadt, Planckstr. 1

Since 1997 a radiotherapy pilot project is running at GSI (Darmstadt) treating tumour patients with scanned beams of fast carbon ions. Treatments are planned with the dedicated TRiP98 software package. This includes modelling not only the physical properties of ion-matter interaction but also the radiobiological effects in complex irradiation configurations. For this purpose an implementation of the Local Effect Model (LEM) is incorporated, which unfortunately needs a lot of computing resources when applied in sophisticated treatment optimizations. It can be shown, however, that a suitable approximation vastly reduces computing time without sacrificing accuracy. As a consequence, simultaneous optimization of multiple ion fields is now feasible within reasonable turn-around times. This method allows significantly improved sparing of organs-at-risk. Since it is a good idea not to rely solely on computer calculations, patient-like irradiation configurations are verified experimentally by means of biological dosimetry. The method is not restricted to carbon ions but can be used for other ion species as well. Hence the TRiP98 software package can be used as a universal ion planning tool to allow fair comparisons of ion beam therapy with competing techniques like e.g. photon IMRT.

ST 6.4 Di 10:50 D

Multiple field optimization in heavy ion treatment planning - clinical aspects — •Malte Ellerbrock[1], Oliver Jäkel[1], Michael Krämer[2], Anna Nikoghosyan[3], and Daniela Schulz-Ertner[3] — [1]DKFZ Heidelberg — [2]GSI Darmstadt — [3]Univ. Clinic Heidelberg

Intensity modulated particle therapy (IMPT) evolves into a promising technology in cancer treatment. The carbon ion raster scanning technology at the GSI places high demands on treatment planning to obtain a homogeneous dose distribution in the target volume. The treatment planning software TRiP98 used so far for patient treatment optimizes different fields individually. An advanced version developed by Michael Krämer, TRiP98BEAM, allows the simultaneous optimization of multiple fields to improve the sparing of organs at risk and to enhance the conformity of the target volume.

On the way to establish the improved optimization in clinical treatment routine, a planning study is performed using actual patient data of deep seated head tumours close to critical structures. The physical dose absorbed by different tissues is compared for single and multiple field optimization using clinical quantities like dose volume statistics for organs at risk.