ST 6: Radiation Monitoring and Dosimetry II

Zeit: Donnerstag 9:45–10:30 Raum: JUR 1

ST 6.1 Do 9:45 JUR 1

Entwicklung eines Detektors zum empfindlichen Online-Nachweis von Radionukliden im (Trink-)Wassernetz — •Jorrit Drinhaus und Bastian Breustedt — Karlsruher Institut für Technologie (KIT), Sicherheit und Umwelt (SUM)

Zur Überwachung der Radioaktivität im Trinkwassernetz und zum Schutz vor einer möglichen erhöhten Strahlenexposition der Bevölkerung wird, im Rahmen des Kompetenzverbunds TransAqua, am KIT ein Detektor zum empfindlichen Online-Nachweis von Radionukliden (α, β, γ) entwickelt. Der Vortrag gibt einen Einblick in die Einsatzmöglichkeiten und die dazugehörigen Anforderungen, die bisherigen Ergebnisse der Prototypentwicklung sowie einen Ausblick auf geplante Weiterentwicklungen am Detektor.

ST 6.2 Do 10:00 JUR 1

Source term and activation calculations for the new cyclotron for medical applications at HZDR with MCNP6 and FLUKA — •Stefan E. Müller[1], Jörg Konheiser[1], Bärbel Naumann[1], Anna Ferrari[1], and Alice Magin[2] — [1]Helmholtz-Zentrum Dresden-Rossendorf, Dresden, Deutschland — [2]KIT, Karlsruhe, Deutschland

A new cyclotron is currently being commissioned at the Center of Radiopharmaceutical Cancer Research of the HZDR. The energy range of up to 28 MeV protons for the $^{18}O(p,n)^{18}F$ reaction required a recalculation of the neutron source terms needed in the shielding calculations, since the manufacturer supplied data was based on a 24 MeV proton beam. The radiation transport programs MCNP6 and FLUKA were used to calculate the neutron fluence emerging from the ^{18}O-enriched water target during operation. To validate the radiation fields obtained in the simulations, an experimental program has been started using activation samples which are placed close to the water target of a cyclotron which is currently used at HZDR to produce ^{18}F with 18 MeV protons. After irradiation, the samples are analyzed, and the resulting activation is compared to Monte Carlo calculations of the expected sample activation for this case. Once the new cyclotron is fully operational, these measurements will be extended to 28 MeV protons.

ST 6.3 Do 10:15 JUR 1

Detection of Cherenkov Photons from Compton-Scattered Electrons for Medical Applications — Hedia Bäcker, •Reimund Bayerlein, Ivor Fleck, Waleed Khalid, Albert Walenta, and Ulrich Werthenbach — Universität Siegen

Modern nuclear medicine and radiation therapy require imaging systems for higher energy gamma rays up to several MeV, where common detectors show insufficient detection efficiency. So called Compton cameras use a low-Z-scattering material where the incident gamma creates a high energetic electron and an absorption-layer for the scattered gamma. The greatest challenge in this attempt is the simultaneous detection of electron and gamma. Therefore, a new detector concept is proposed using the detection of Cherenkov light created by Compton-scattered electrons.

Coincident detection of the Cherenkov photons on an array of Silicon Photomultipliers allows a reconstruction of the characteristic Cherenkov cone and therefore also the electron momentum direction. The track of the Compton electron carries a large part of the information on the incident gamma. Fast analog read out and a FPGA enable timing resolutions of less than a nanosecond.

Recent work on this new concept comprises light yield measurements of different scattering materials as well as coincident Cherenkov photon detection on a 4-times-4-SiPM-array. In this talk, first steps in the development of the detector will be presented.