ST 7: Poster Session

Time: Thursday 13:45–15:45 Location: ZHG Foyer 1. OG

ST 7.1 Thu 13:45 ZHG Foyer 1. OG

Update on the Development of a ^{10}BNNT-based Neutron Detector — •Kim Tabea Giebenhain[1], Anna Becker[2], Lara Dippel[1,2], Markel Fix Martinez[2], Dzmitry Kazlou[1], Hans-Georg Zaunick[1], Klemens Zink[2], and Kai-Thomas Brinkmann[1,2] — [1]II. Physikalisches Institut, Justus-Liebig-Universität, Gießen, Germany — [2]LOEWE Research Cluster for Advanced Medical Physics in Imaging and Therapy (ADMIT), Technische Hochschule Mittelhessen, Gießen, Germany

BNNT (Boron Nitride Nanotubes) is a material with excellent mechanical and thermal properties. Enriched with ^{10}B, an isotope of Boron with a high thermal neutron capture cross-section, it can be used as a neutron-sensing element by measuring the decay products of the ^{10}B(n,α)-reaction.
Two prototypes based on a ^{10}B-enriched BNNT mat coupled to inorganic scintillators (BGO and GaGG, respectively) have been developed. The detector systems are read out by a Photomultiplier tube.
Both systems were tested initially for their capabilities as neutron detectors at the DT neutron source at HZDR, Dresden. Those tests and their results will be discussed in the contribution.
This work is part of the ADMIT consortium and financed with funds of LOEWE

ST 7.2 Thu 13:45 ZHG Foyer 1. OG

The influence of tumor tissue vascularization on temperature in Magnetic Hyperthermia — •Viorica-Monica Moisiuc and Iordana Astefanoaei — Faculty of Physics, Alexandru Ioan Cuza University of Iasi, Romania

Magnetic hyperthermia is an innovative and promising method in cancer treatment, based on the ability of magnetic nanoparticles to generate heat under the influence of a high-frequency electromagnetic field, aiming to destroy cancer cells by locally increasing the temperature [1, 2]. This work investigates the impact of tumor vascularity on the thermal heating process in therapy, considering that the structure and density of blood vessels in the tumor can significantly influence nanoparticle distribution and, therefore, the uniformity of temperature distribution in the tissue. A model has been developed to allow a detailed analysis of heat transfer in vascularized tumor tissue, taking into account the magnetic field parameters and the properties of the magnetic systems used. The study highlights the potential of magnetic hyperthermia to generate optimal therapeutic temperatures and contribute to the selective destruction of tumor tissues, emphasizing the advantages of this method in oncological therapy through its ability to provide more precise control over thermal effects on the target tissue.

ST 7.3 Thu 13:45 ZHG Foyer 1. OG

Development of a BaF-Plastic Phoswich Detector for Fast Neutron Detection — •Lara Dippel[1,2], Kai-Thomas Brinkmann[1,2], Hans-Georg Zaunick[1,2], and Dzmitry Kazlou[1] — [1]II. Physikalisches Institut, JLU Gießen — [2]LOEWE Research Cluster for Advanced Medical Physics in Imaging and Therapy (ADMIT), TH Mittelhessen University of Applied Sciences, Giessen, Germany.

This poster presents the initial development steps of a Phoswich detector designed for fast neutron detection. The detector comprises a Barium Fluoride (BaF) crystal optically coupled to a thin plastic scintillator, with the system read out via a photomultiplier tube (PMT) on the BaF side. Particle discrimination is evaluated using pulse shape discrimination (PSD) techniques and integral versus amplitude histograms, enabling the identification of different particle types. The system was tested using Na-22, Sr-90, and an AmBe neutron source, as well as cosmic particles. For comparison, reference measurements were conducted with a standalone BaF detector to assess the particle identification capabilities and potential advantages of the Phoswich configuration. This work is part of the ADMIT consortium under Project Part A, which focuses on estimating spectral neutron fluxes for therapy in tumor treatment applications.
This project is financed with funds of LOEWE - Landes-Offensive zur Entwicklung Wissenschaftlich-ökonomischer Exzellenz, Förderlinie 2: LOEWE-Schwerpunkte.

ST 7.4 Thu 13:45 ZHG Foyer 1. OG

Reconstruction Techniques for electron CT Measurements using Multiple Scattering — •Aenne Abel[1,2], Leticia Braga da Rosa[1,2], Paul Schuetze[1], Malinda De Silva[1], and Simon Spannagel[1] — [1]Deutsches Elektronen-Synchrotron DESY, Hamburg — [2]University of Hamburg, Hamburg, Germany

Electron CT (eCT) is a new imaging method, which uses multiple scattering of electrons to determine the material budget of objects. This method could be used as the imaging method for flash radiotherapy with Very High Energy Electrons (VHEE, 50-250 MeV). A pencil beam of MeV range electrons passes through the sample under test. The beam widening caused by Coulomb scattering in the sample is dependent on the sample's material budget and is measured using a single planar silicon pixel sensor (Timepix3) placed downstream of the sample. First studies have been performed at DESY Hamburg to test this method. The results and the current status are presented in this poster with a focus on reconstruction algorithms.

ST 7.5 Thu 13:45 ZHG Foyer 1. OG

Development of a Real-Time PbWO4-based Detector System for Depth Dose Distribution Measurement in Clinical Proton Therapy — •Niclas Fiedler[1], Kai-Thomas Brinkmann[1], Dzmitry Kazlou[1], Hans-Georg Zaunick[1], and Kilian-Simon Baumann[2] — [1]Justus Liebig University, Giessen, Deutschland — [2]Technische Hochschule Mittelhessen, Giessen, Deutschland

Proton therapy has emerged as a highly precise form of radiotherapy, leveraging the unique dose deposition characteristics of ions to maximize tumor dose while sparing surrounding healthy tissues. However, the presence of heterogeneous media can significantly broaden the Bragg peak and obscure the distal fall-off, a phenomenon quantified by the modulation power.

This project introduces a novel PbWO4-based detector system designed for real-time measurement of the depth dose distribution in proton therapy. The clinical aim is to employ a high-energy, low intensity beam and position the detector posterior to the patient, where the system achieves accurate and most importantly fast quantification of the modulation power, whilst minimizing patient radiation exposure. The real-time measurement capabilities provide rapid feedback, allowing the substitution of slow, conventional peak finders, whilst enhancing treatment adaptability in clinical settings without compromising workflow efficiency. *Supported by THMconnectsFCMH.*

ST 7.6 Thu 13:45 ZHG Foyer 1. OG

Work towards a small scale detector array for cosmic showers based on scintillation detectors — •Erik Euler, Hans-Georg Zaunick, Kai-Thomas Brinkmann, Marvin Peter, Simon Glennemeier-Marke, and Mohammed Hassan — Justus Liebig University, Gießen, Germany

The detectors from the MuonPi Cosmic Detector Project are used to measure muons from cosmic air showers (secondary cosmic radiation). A MuonPi utilizes a plastic scintillation detector with a silicon photomultiplier (SiPM) for signal read out by RaspberryPi-based data acquisition. A larger, distributed detector array with 16 single detectors based on the MuonPi hardware, but with large plastic scintillator bars (100 x 100 x 10 cm), is currently under construction in Giessen. Its final goal, beside the mere detection of shower events, is to determine the direction of the shower through time-of-flight measurements and its special orientation in combination with the MuonPi Network.
Over the course of the last year a working prototype of the detector array was built and tested in the lab. The current setup consists of three working detector bars, the main part of the array's central data acquisition with a prototype of the FPGA-based event analysis. The current status of the project as well as the next steps will be presented.