# ST 5: Detector Physics

Time: Wednesday 16:15–17:15 Location: ZHG003

ST 5.1 Wed 16:15 ZHG003

**Neutron Dosimetry with Diamond Sensors** — •Jennifer Schlüss[1], Christian Bäumer[2], Kevin Kröninger[1], and Jens Weingarten[1] — [1]TU Dortmund University — [2]West German Proton Therapy Center Essen

Neutron dosimetry is increasingly important in proton therapy, as neutron emissions provide valuable information on energy deposition within the body. However, neutron dosimetry presents challenges due to the complex interaction characteristics of neutrons. Diamond detectors offer a promising approach, as natural carbon-12 captures fast neutrons ($E_{kin} > 6.2$ MeV) and emits detectable alpha particles directly within the diamond sensor. This makes diamond detectors exclusively sensitive to fast neutrons. Enhancing the detector's sensitivity to both fast and thermal neutrons is a key objective. To achieve thermal neutron detection, we propose coating the diamond sensor with a converter layer, such as $^6$LiF, with a high thermal neutron absorption cross-section. Using the Geant4 simulation platform, we examined neutron interactions and energy deposition in the detector, with simulations covering both thermal and fast neutron interactions to assess the response under different neutron energy ranges. Simulation results indicate that a $^6$LiF-coated diamond sensor effectively measures both thermal and fast neutrons. A prototype is ready for initial neutron flux measurements in proton therapy, with further testing planned to fully characterize its detection capabilities across the neutron spectrum.

ST 5.2 Wed 16:30 ZHG003

**Hardware Testing for the Construction of a Compton Camera Prototype** — Yazeed Balasmeh, Daniel Berker, Ivor Fleck, and •Lars Maczey — Experimentelle Teilchenphysik, Center for Particle Physics Siegen, Universität Siegen

Well-established detector systems for medical imaging such as PET or SPECT can only efficiently resolve source positions for gamma energies up to 600 keV. Compton cameras have been able to exceed the range to higher energies, but to date are limited to energies below 1 MeV. The Compton camera under construction at the University of Siegen pursues the novel approach of tracking the electron of a Compton scattering process based on its production of Cherenkov radiation, in the hope of overcoming the current limitations and creating new fields of study.

In this talk, I present first results obtained towards the construction of a Compton camera prototype, focusing mainly on the characterisation of hardware components, including UV-sensitive SiPMs from Broadcom Inc. and Hamamatsu Photonics, scintillation crystals such as GAGG and LGSO as well as readout ASICs such as the TOFPET2 ASIC from PETsys Electrionics or the KLauS chip developed by the University of Heidelberg. Regarding SiPMs, bias optimisation is discussed to ensure both a good noise behaviour and good detection efficiency. Results from depth of interaction measurements and energy calibrations performed by scintillator-based setups and the development of a multi-channel SiPM detection system are also presented.

ST 5.3 Wed 16:45 ZHG003

**Studies for the development of a pixel detector for proton therapy** — •Alina Hild, Kevin Kröninger, Hendrik Speiser, and Jens Weingarten — TU Dortmund University

For various applications in proton therapy, it is important to know the deposited energy and the linear energy transfer (LET), as the latter directly relates to the relative biological effectiveness (RBE) of the protons. Due to their good spatial resolution and radiation hardness, pixelated silicon detectors are a suitable choice for the measurement of these quantities.

This talk presents some ideas for determining specifications for a new monolithic active pixel sensor (MAPS) that is being developed specifically to meet the requirements of proton imaging. The detector should be capable of simultaneously measuring the LET and the deposited dose, while handling the high fluxes and relatively high deposited energies that occur.

In an initial study, measurements of the signal current in a silicon detector were taken at the Westdeutsche Protonen Zentrum (WPE) to evaluate the mean energy dose. The talk summarizes these measurements and provides an outlook on other required quantities.

ST 5.4 Wed 17:00 ZHG003

**MaPSA quality control for the CMS phase-II detector upgrade** — •Leticia Rosa[1,2], Andreas Nuernberg[1], Doris Eckstein[1], and Andreas Mussgiller[1] — [1]Deutsches Elektronen-Synchrotron DESY, Hamburg — [2]University of Hamburg, Hamburg, Germany

The Phase-II upgrade of the CMS detector aims to equip the outer tracker with new silicon sensor modules to handle the increased luminosity of the LHC. These modules integrate strip and pixel layers to enable precise position measurements, which will be placed in the inner layers of the outer tracker. The pixelated silicon sensor layer, paired with its readout chips, forms the macro-pixel sub-assembly (MaPSA). This presentation discusses the quality control procedures performed at DESY by the CMS Phase-II Tracker Upgrade group in Hamburg.