ST 3: Advances in X-Ray Imaging II

Time: Wednesday 16:40–18:00 Location: H41

ST 3.1 Wed 16:40 H41

Spectral phase-contrast CT using the LAMBDA detector — Sebastian Ehn[1], Michael Epple[1], Guillaume Potdevin[1], •David Pennicard[2], Sergej Smoljanin[2], Sabine Lange[2], Dieter Renker[1], Heinz Graafsma[2], and Franz Pfeiffer[1] — [1]Chair of Biomedical physics, TU München — [2]DESY, Hamburg

X-ray phase-contrast techniques offer significantly improved soft-tissue contrast compared to absorption-based measurements commonly used in clinical radiology. Grating-based phase contrast methods have proven to be fully compatible to standard laboratory X-ray sources and are currently being used in preclinical research.
However, the imaging quality in this method is strongly energy-dependent, which may result in poor signal to noise ratios when using beams with broad energy spectra.
One can overcome this disadvantage using energy sensitive detectors like the Medipix3, only taking into account the energies where the SNR is at a maximum. Thereby, an improvement to image quality and a reduction in radiation dose may be reached.
This presentation will give an overview over the new Medipix3-based LAMBDA detector, which is currently being developed at DESY, used in grating-based spectral phase-contrast tomography.

ST 3.2 Wed 17:00 H41

Der Dosepix-Detektor und seine Eigenschaften — •Ina Ritter[1], Thomas Gabor[1], Thilo Michel[1], Peter Sievers[1], Stefan Wölfel[2], Winnie Wong[3] und Gisela Anton[1] — [1]Erlangen Centre for Astroparticle Physics, FAU Erlangen-Nürnberg, Erwin-Rommel-Str. 1, 91058 Erlangen, Germany — [2]IBA Dosimetry GmbH, Bahnhofstrasse 5, 90592 Schwarzenbruck, Germany — [3]Medipix Team, PH-ESE-ME, CERN, Geneva, Switzerland

Der Dosepix-Detektor ist ein photonenzählender pixelierter Halbleiterdetektor. Er stellt eine Neuentwicklung in der Medipix-Familie dar und ist gleichermaßen hybrid aufgebaut wie die Medipix- und Timepix-Detektoren. Er bietet 256 Pixel, wobei der Pixelpitch 220 μm beträgt. Der Dosepix-Detektor ist damit auch für kleine Photonenflüsse geeignet. Das Hauptaugenmerk des Dosepix-Detektors liegt auf spektroskopischen Messungen im sogenannten Time-over-Threshold-Modus. Seine verschiedenen Arbeitsmodi eröffnen ihm einen weiten Einsatzbereich im Bereich der Medizinphysik, dazu zählen insbesondere Dosimetrie und energieabhängige Untersuchungen in der Bildgebung.

In diesem Beitrag werden die Eigenschaften des Detektors hinsichtlich seiner spektroskopischen Fähigkeiten vorgestellt.

ST 3.3 Wed 17:20 H41

Energy-dependence of visibility contrast in Talbot-Lau X-ray imaging — •Georg Pelzer, Florian Bayer, Florian Horn, Jens Rieger, André Ritter, Peter Sievers, Thomas Weber, Andrea Zang, Jürgen Durst, Thilo Michel, and Gisela Anton — ECAP - Erlangen Centre for Astroparticle Physics, Universität Erlangen-Nürnberg, Erwin- Rommel-Straße 1, 91058 Erlangen

A Talbot-Lau interferometer is a compact laboratory setup for phase-contrast imaging that can be used with a usual polychromatic X-ray source. Operating this setup with a broad spectrum is followed by a cutback in performance in comparison to monochromatic illumination. By evaluating the interferometer's complex energy-dependent response and using the information obtained by an energy-resolving detector, the performance might be increased again. Therefore, the energetic behaviour of the dark-field image was investigated. In simulations the energy dependence of the dark-field signal generated by small glass spheres was calculated and in order to verify these simulations, measurements using a Timepix detector were done. The results of the measurements show a good agreement with the simulations. In this contribution these results will be presented and the behaviour of the dark-field contrast will be discussed.

ST 3.4 Wed 17:40 H41

X-ray detection with GaN thin films — •Markus Hofstetter[1], John Howgate[2], Martin Schmid[1], Martin Stutzmann[2], and Stefan Thalhammer[1] — [1]Helmholtz Zentrum München, Institute for Radiation Protection, Ingolstädter Landstraße 1, D-85764 Neuherberg — [2]Walter Schottky Institut, Technische Universität München, Am Coulombwall 3, D-85748 Garching

In recent years precise miniature-dosimeters for real-time detection of x-rays in medicine have been developed with two aspects to monitor radiation in the region of interest and to improve therapeutic methods. Sensors include Germanium or Silicon photoconductive detectors, MOSFETs, and PIN-diodes. While miniaturization of these systems for spatial resolved detection is possible, they suffer from disadvantages. Sensor properties like material degradation, poor measurement stability and a limited detection range circumvent routine clinical applications. Here we show the development and evaluation of radiation detectors based on gallium nitride (GaN) thin films. While previous publications revealed relative low energy absorption of GaN, it is possible to achieve very high signal amplification factors inside the material due to an appropriate sensor configuration, which, in turn, compensates the low energy absorption. Our devices, which have detection volumes smaller than 10^(-6) cm^3, show a high sensitivity to x-ray intensity and can record the air kerma rate (free-in-air) range of 1 microgray/s to 10 mGy/s with a signal stability of 1% and a linear total dose response over time. The presented results show the potential of GaN-based thin films for dosimetry and imaging applications.