ST 3: Radiation Detectors and Imaging (Poster Session)

Time: Monday 14:30–15:30 Location: H41

ST 3.1 Mon 14:30 H41

Prediction and analysis of the time and energy resolution of scintillation-detectors by Monte-Carlo simulations — •Matthias Nagl[1], Arnold Krille[2], Ulrich Vetter[1], Reinhard Krause-Rehberg[2], and Hans Hofsäss[1] — [1]Georg-August-Universität Göttingen, II. Physikalisches Institut, Friedrich-Hund-Platz 1, 37077 Göttingen, Germany — [2]Martin-Luther-Universität Halle-Wittenberg, Institut für Physik, von-Danckelmann-Platz 3, 06120 Halle, Germany

A Monte-Carlo model for the emergence of scintillation-detector-signals is presented that allows for the prediction of certain scintillator-photomultiplier combinations' time and energy resolutions while relying primarily on their basic data-sheet properties like light yield, decay time, quantum efficiency, and transit time spread. At the same time the model provides a deeper understanding of the performance limiting factors and stimulates the development of improved methods for the analysis of detector output signals. The simulation results are compared to high-speed digitizer measurements of signals from a number of widely used scintillation materials like LYSO, BaF_2, $LaBr_3$, NaI, and others.

ST 3.2 Mon 14:30 H41

Dynamical behaviour and spectroscopic studies on inorganic scintillators for high current ion beam operation — •Beata Walasek-Hoehne[1], Eiko Guetlich[1,2], Peter Forck[1], and Wolfgang Ensinger[2] — [1]GSI Helmholtz Centre for Heavy Ion Research, Darmstadt, Germany — [2]Technical University Darmstadt, Germany

Scintillation screens are widely used for qualitative transverse beam profile monitoring in accelerator facilities. However, precise measurements might yield ambivalent results, especially for high beam current operation. At GSI, Helmholtz Centre for Heavy Ion Research, the optical properties of different inorganic scintillating screens under irradiation with ion beams are studied. Various ion beams in the energy range from 4.8 to 11.4 MeV/u are applied with currents up to some mA.

Investigations are not only focused on the well-known sensitive scintillators but also on ceramics offering a higher radiation tolerance.

For the data evaluation the image of each ion beam pulse was recorded and individually analysed. The obtained results as light yield, beam width and higher statistical moments are discussed. The light yield and the beam width show a dependence on the used scintillator material and change significantly with the screen temperature, which increases during beam impact. As a comparison to the obtained screen profiles, scraper based method was used. Furthermore the optical spectra in the range of 350-750 nm of the scintillating screens were recorded with an imaging spectrograph. For some materials the spectra of scintillating light differs significantly for light and heavy ion impact.

ST 3.3 Mon 14:30 H41

Medical imaging with laser-driven x-ray sources — •Bernhard Müller[1,2], Christoph Hoeschen[1], Florian Grüner[2], and Helmut Schlattl[1] — [1]Helmholtz Zentrum München, German Research Center for Environmental Health, Institute of Radiation Protection, Neuherberg, Germany — [2]Ludwig-Maximilian-University, Department for Physics, Garching, Germany

Brilliant X-ray sources offer a variety of new possibilities in medical imaging. The development of laser-driven X-ray undulator sources will provide radiation with properties superior to that of conventional X-ray sources resulting in an optimized relation between image quality and applied dose. In addition to optimized absorbtion imaging new techniques are possible with these sources. The properties of laser-driven X-ray source with regard to medical imaging have been investigated and the process of image formation has been simulated with Monte-Carlo techniques. The first feasible applications lie in the field mammography and are therefore the main subject of the first investigations. These show the advantages of brilliant x-ray radiation in medical imaging and the application of imaging techniques like energy resolved imaging and coherent scatter imaging.

ST 3.4 Mon 14:30 H41

MAR in CBCT using reconstructed data and mutual information realigment — •Manuel Meilinger[1,2], Christian Schmidgunst[2], OIiver Schütz[2], and Elmar Lang[1] — [1]Computational Intelligence and Machine Learning Group, Institut für Biophysik, Universität Regensburg, Regensburg, Deutschland — [2]Siemens Healthcare, Erlangen, Deutschland

High-density objects, especially metal implants or particles, generate various artifacts in cone-beam computed tomography (CBCT) images much like in computed tomography images. We present a novel method for metal artifact reduction in CBCT images via virtual replacement of the corrupted information in the 3D volume with objects of identical geometry but convenient attenuation coefficients. An additional correction based on mutual information needs to be applied to the distorted reconstruction and projection in case of CBCT images to compensate for artifacts due to mechanical instabilities of mobile C-arm systems. A reconstruction of the adapted 2D projection images generates a second 3D volume, where the original metal objects are replaced by tissue and the streak-like artifacts are clearly reduced. After that the segmented metal parts of the first 3D volume must be transfered into the metal and artifact free 3D volume of the second reconstruction. The proposed method is applied to clinical images and shows superior performance. The resulting reconstructed images show much reduced streak-like artifacts and related shadows.