Neutron Imaging System for Radioactive-waste Analysis

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Motivation & content:
• Feasibility study of a compact fast neutron imaging system for radioactive waste assay
• 14 MeV neutron source and an advanced detector system (aSi-flat-panel-detector) linked to an exclusive converter/scintillator for fast neutrons
• Simulations of the neutron and photon transport performed with MCNPX and GEANT4
• Novel image reconstruction algorithm for correction of neutron beam divergence

Experimental Setup
The compact system will be installed in a irradiation room at the FZJ. Main features of the system are:
• 14 MeV neutron generator from SODERN, with 2·10^8 n/s
• Flat panel detector from PerkinElmer 41 cm x 41 cm field of view

Actual Status and Outlook:
• Preparation of the irradiation room December 2012
• Installation of the interlock system January 2013
• Installation of the neutron generator February 2013
• Preparation of the converter April 2013
• Installation of the flat-panel detector April 2013
• Starting experimental phase Mai 2013

Modelling
• A CAD Model of the irradiation room and the imaging system
• Simulation studies with MCNPX to develop an appropriate neutron shielding
• Simulation studies with GEANT4 for the photon transport in flat-panel detector

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Reconstruction algorithm
• Development of preliminary 2-D and 3-D versions of the reconstruction algorithm
• Generation of data for the algorithm test
• Comparison of current algorithm with classic parallel beam algorithm
• Contrast sharpening through source calibration

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