Contribution ID: **222** Type: **poster**

Numerical simulation of phase-sensitive X-ray imaging by combining wave-optics and Monte Carlo methods

Wednesday, 18 September 2013 12:15 (2 hours)

The high sensitivity towards electron density variations makes phase-sensitive X-ray imaging well suited for the imaging of soft tissue matter. A recently established phase-sensitive imaging method is grating interferometry (GI) which has the advantage of producing three complementary types of contrast: absorption, phase and dark-field [1]. However there are still open questions about the image formation process, for example details of the dark-field contrast formation process are not yet fully understood.
We present a numerical simulations framework for the investigation of these contrast mechanisms. Since for a realistic simulation of phase-sensitive X-ray imaging both particle- and wave-like properties of X-rays have to be taken into account, we developed a framework that combines Monte Carlo (MC) methods with wave-optics. The framework was validated through comparisons between simulations and measurements obtained at TOMCAT beamline [2]. The results show that the combination of MC with wave-optics was successful and the comparisons showed good agreement between simulations and experimental results, establishing the framework as a reliable method for modelling GI. The simulation framework can now be used for detailed investigations of the phase contrast formation process and is, due to the inclusion of refraction as well as Compton and Rayleigh scattering, particularly suited to study the scattering contribution of such processes.

References
[1] T. Weitkamp et al, Opt. Express 2005; 13(16):6296
[2] S. McDonald et al, J. Synchrotron Rad. 2009 16, 562

Primary author: PETER, Silvia (Paul Scherrer Institut)

Co-authors: STAMPANONI, Marco (Paul Scherrer Institut); Dr FIX, Michael (Division of Medical Radiation Physics and Department of Radiation Oncology, Inselspital, Bern University Hospital and University of Bern, Switzerland); Dr MANSER, Peter (Division of Medical Radiation Physics and Department of Radiation Oncology, Inselspital, Bern University Hospital and University of Bern, Switzerland); Dr MODREGGER, Peter (Swiss Light Source, Paul Scherrer Institut, Switzerland); Dr VOLKEN, Werner (Division of Medical Radiation Physics and Department of Radiation Oncology, Inselspital, Bern University Hospital and University of Bern, Switzerland)

Presenter: PETER, Silvia (Paul Scherrer Institut)

Session Classification: Poster session I and lunch