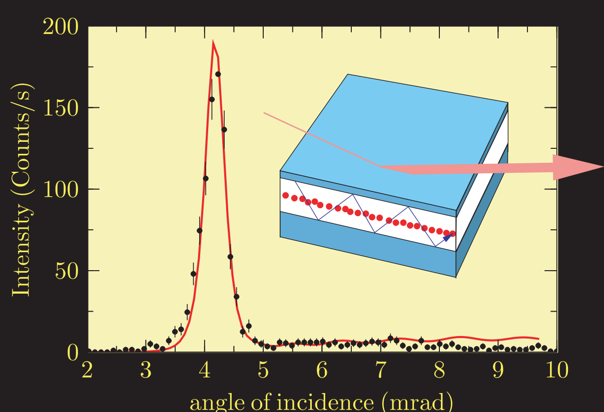
Ralf Röhlsberger

"Boosting the Light: X-ray Physics in Confinement"

Ralf Röhlsberger received his Ph.D. from the University of Hamburg. Following a postdoc appointment at the Advanced Photon Source, he was scientific assistant at the University of Rostock in the group of Prof. Dr. E. Burkel, where he habilitated in 2002. In the same year he received the innovation award "Synchrotron Radiation" of BESSY (Germany). After an interim professorship at the Technical University of Munich, he has been a staff scientist at HASYLAB/DESY in Hamburg since 2003 and is deputy leader of the Experimental Facility Division at the PETRA III project. His research interests include the development of novel x-ray scattering methods, nuclear resonant scattering, physics of thin films, and magnetic properties of low-dimensional systems.

Remarkable effects are observed if light is confined to dimensions comparable to the wavelength of the light. The lifetime of atomic resonances excited by the radiation is strongly reduced in photonic traps, such as cavities or waveguides. Moreover, one observes an anomalous boost of the intensity scattered from the resonant atoms. These phenomena result from the strong enhancement of the photonic density of states in such geometries. Many of these effects are currently being explored in the regime of visible light due to their relevance for optical information processing. It is thus appealing to study these phenomena also for much shorter wavelengths. This talk illuminates recent experiments where synchrotron x-rays were trapped in planar waveguides to resonantly excite atoms (^{57}Fe nuclei) embedded in them. In fact, one observes that the radiative decay of these excited atoms is strongly accelerated. The temporal acceleration of the decay goes along with a strong boost of the radiation coherently scattered from the confined atoms. This can be exploited to obtain a high signal-to-noise ratio from tiny quantities of material, leading to manifold applications in the investigation of nanostructured materials. One application is the use of ultrathin probe layers to image the internal structure of magnetic layer systems.



Wednesday, March 1, 2006

3:00 p.m.

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