MI 7: Synchrotron Radiation (Focus Session with Accelerator Physics)

Time: Wednesday 15:00–17:15 Location: MOL 213

Invited Talk MI 7.1 Wed 15:00 MOL 213

Short-Pulse Operation of Synchrotron Radiation Sources — •Anke-Susanne Müller — Karlsruhe Institute of Technology

Short-pulse operation of synchrotron light source storage rings can be useful for both the production of IR and (coherent) THz-band radiation and high repetition rate pump-probe science in the X-ray regime. Amongst the different approaches to short-pulse generation, in particular the use of dedicated magnet optics for short (ps) electron bunches and the technique of Coherent Harmonic Generation for the production of coherent THz and UV radiation, respectively, will be discussed in this talk.

Invited Talk MI 7.2 Wed 15:30 MOL 213

Progress in White Beam Diffraction Imaging — •Andreas Danilewsky — Kristallographie, Universität Freiburg, Freiburg

Monochromatic X-ray diffraction imaging (topography) has been used for over half a century for the characterization of extended defects such as dislocations, slip bands, stacking faults, etc. in single crystals and devices fabricated thereupon. The advantage of using the synchrotron white beam is a Laue pattern of reflections on X-ray sensitive film, each containing a topograph from the same sample volume. It allows a fast Burgers vector analysis, even in case of high dislocation densities and in high absorbing crystals. The actual development of fast and high resolving indirect digital detector systems supports a tremendous reduction of the exposure time for a single diffraction image. Integration times of less than 0.2 s allow e.g. the real-time metrology of 450 mm Si wafers in less than 4 hours or the in-situ topography at high temperatures to analyse dislocation dynamics in Si or GaAs. A very promising new development is the 3-dimensional diffraction imaging. It results from the 3-dimensional rendering of a high number of section transmission topographs across the sample with the beam collimated to 15 μm and a step size of 15 μm. This new approach allows the measurement of the absolute strain value around defects.

Invited Talk MI 7.3 Wed 16:00 MOL 213

Short pulses @ SOLEIL: Femto-Slicing and Low-Alpha — •Marie Labat — SYnchrotron SOLEIL - Saint-Aubin - FRANCE

In order to produce shorter pulses of synchrotron radiation, two setups have been studied at SOLEIL. Operation in low-alpha mode now enables to deliver few ps pulses to users on several beamlines. And a femto-slicing experiment is presently under commissioning. In the magnetic field of a wiggler, the electron bunch interacts with a Ti:Sa laser of 50 fs-fwhm pulse duration. The energy modulation over this short slice is used to separate it spatially from the core beam in different undulators downstream, allowing the delivery of about 100 fs-fwhm pulses to at least two beamlines. We will report on the commissioning of this femto-slicing experiment and on the operation in low-alpha mode.

Invited Talk MI 7.4 Wed 16:30 MOL 213

Nanomagnets and artificial multiferroics studied with X-ray photoemission electron microscopy — •Frithjof Nolting — Paul Scherrer Institut, Switzerland

Bringing different materials in contact at the nanoscale opens the door to improving or creating new functionalities by tuning the properties of the resulting interfaces. Employing photoemission electron microscopy (PEEM) and X-ray magnetic circular dichroism (XMCD) their magnetic properties can be studied. Using recent results I will explain the technique and its possibilities. One example is the study of the magnetic properties and scaling laws of nanoparticles, were we discovered a size-dependent transition from a single domain state to a non-collinear spin structure in isotropic nanoparticles with sizes ranging from 25 down to 5 nm [1]. A second example will be the demonstration of in situ 90 degree electric field-induced uniform magnetization rotation in single domain submicron ferromagnetic islands grown on a ferroelectric single crystal [2]. Further examples will be about patterned magnetic nanostructures and how the magnetization of ferromagnetic systems can be manipulated by ultrashort laser pulses studied with time resolved measurements [3].

[1]A. Fraile-Rodríguez et al. Phys. Rev. Lett. 104, 127201 (2010).
[2]M. Buzzi et al. Phys Rev. Lett. 111, 027204 (2013).
[3]L. Le Guyader et al. App Phys. Lett. 101, 022410 (2012).

MI 7.5 Wed 17:00 MOL 213

Plans for EEHG and Femtoslicing at DELTA — •Robert Molo, Svenja Hilbrich, Markus Höner, Holger Huck, Maryam Huck, Shaukat Khan, Arne Meyer auf der Heide, Carsten Mai, Helge Rast, Andreas Schick, and Peter Ungelenk — Center for Synchrotron Radiation (DELTA), TU Dortmund University, D-44221 Dortmund, Germany

In order to reach shorter wavelengths, the short-pulse facility based on the Coherent Harmonic Generation (CHG) technique at DELTA, a 1.5-GeV synchrotron light source operated by the TU Dortmund University, will be upgraded using Echo-Enabled Harmonic Generation (EEHG). Both the CHG and the EEHG scheme employ a laser-induced energy modulation, which additionally can be used to generate ultrashort pulses of incoherent radiation at arbitrary wavelengths by transversely displacing the off-energy electrons (femtoslicing). A new storage ring lattice will be presented that not only offers enough space for an EEHG and femtoslicing setup, but also allows to operate both radiation sources simultaneously.