



No. III/10 - 30 September 2010

PSI photon, neutron and muon user facilities newsletter

Editorial



Kurt Clausen

Dear colleagues,

training of the next generation of scientists and increasing the awareness about the vast opportunities that Large Scale Facilities offer, both, to study and solve topical scientific problems or grand challenges, is an important part of our mission. It is thus a great pleasure that about 50%

of our facilities' users are either PhD students (30%) or PostDocs (20%) and show a huge interest in our training activities. At our last summer school - the 9th PSI Summer School on Condensed Matter Research – from 7-13 August 2010, the topic was Magnetic Phenomena. 114 participants attended the lectures in Zuoz and 27 of these took part in the subsequent hands on training at PSI, using all three different probes (muons, neutrons and photons).

On August 24, the first part of our planned future user facility – the 250 MeV injector for the Swiss Free electron laser project SwissFEL – was inaugurated at PSI. The Swiss Bundesrat Didier Burkhalter and the PSI Director Joel Mesot jointly switched on the first beam. This was a very important milestone for the project.

In October we will start commissioning the new Ultracold Neutron Source (UCN) at PSI and expect to be able to see the first Ultra Cold Neutrons before the end of the year. The first major components for the High Field μ Sr project will arrive shortly, and our new 7T horizontal field magnet

New calls for proposals

SLS/PX-beamlines

deadline: October 15, 2010

more information

<<http://www.psi.ch/sls/px-beamlines-call-for-proposals>>

SINQ/all instruments

deadline: November 15, 2010

more information

<http://sinq.web.psi.ch/sinq/sinq_call.html>

μ S/all instruments

deadline: December 2010

more information

<http://lmu.web.psi.ch/facilities/next_call.html>

An overview about all proposal submission deadlines of the PSI facilities can be obtained here

<<http://www.psi.ch/useroffice/proposal-deadlines>> .

Upcoming events

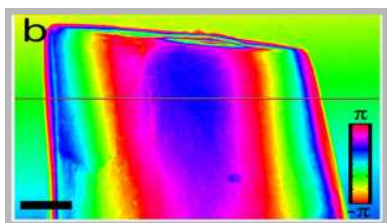
Next Joint User Meeting

for neutron scattering has arrived at PSI. The 7T magnet will be commissioned in autumn and should be on the user programme for 2011.

We have exciting times ahead of us and I look forward to see many of you as users of the PSI facilities.

Kurt Clausen on behalf of PSI

Research highlights



SLS: High-resolution method for computed nano-tomography developed

Martin Dierolf, Andreas

Menzel, Pierre Thibault, Philipp Schneider, Cameron M. Kewish, Roger Wepf, Oliver Bunk, Franz Pfeiffer: Nature, September 23, 2010 - DOI: 10.1038/nature09419

A novel nano-tomography method developed by a team of researchers from the Technische Universität München (TUM), the Paul Scherrer Institute (PSI) and the ETH Zurich opens the door to computed tomography examinations of minute structures at nanometer resolutions. The new method makes possible, for example, three-dimensional internal imaging of fragile bone structures. The first nano-CT images generated with this procedure was published in the renowned journal Nature on September 23, 2010. This new technique will facilitate advances in both life sciences and materials sciences.

Read the full story

Please note **September 15-16, 2011** as the dates for the next joint user meeting **JUM@P11** <<http://indico.psi.ch/event/jump11>> of the PSI facilities.

5th Int. Symposium Hydrogen and Energy

January 23-28, 2011 organized by the EMPA academy, **more information**

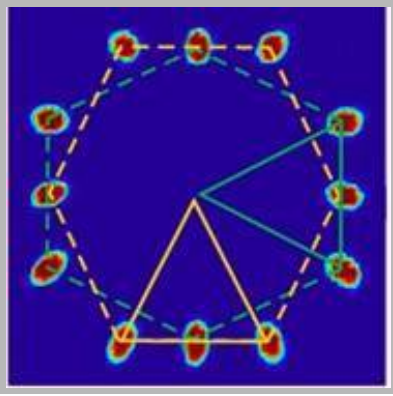
<<http://www.empa.ch/plugin/template/empa/22/95818/---/l=2>>

Please have a look at the full conference calendar

<<http://www.psi.ch/useroffice/conference-calendar>>

Facility news

SLS: Materials science beamline upgrade The MS beamline actually undergoes a comprehensive upgrade. The wiggler will be replaced by a shortperiod (14 mm) in-vacuum, cryogenically cooled, permanent-magnet undulator, (CPMU, U14), while the front end and optics will completely be redesigned to optimally exploit the characteristics of the U14 source. In addition to providing fundamental



<http://num.web.psi.ch/highlights.html#laver_nature>

SINQ: Magnetic flux lines in type-II superconductors and the 'hairy ball' theorem

Mark Laver, Edward M. Forgan, Nature Communications 1, 45 (July 2010)

Many prominent phenomena originate from geometrical effects rather than from local physics. For example, the 'hairy ball' (HB) theorem asserts that a hairy sphere cannot be combed without introducing at least one singularity, and is fulfilled by the atmospheric circulation with the existence of stratospheric polar vortices and the fact that there is always at least one place on Earth where the horizontal wind is still. In this study, we examine the consequences of the HB theorem for the lattice of flux lines that form when a magnetic field is applied to a type-II superconducting crystal. We find that discontinuities must exist in lattice shape as a function of field direction relative to the crystal. Extraordinary, 'unconventional' flux line lattice shapes that spontaneously break the underlying crystal symmetry are thus remarkably likely across all type-II superconductors, both conventional and unconventional.

Read the full story <<http://num.web.psi.ch/highlights.html#laver-nature>>

improvements to both powder and SXR experiments, the upgrade should allow new experimental setups previously excluded to the beamline.

Read the MS upgrade newsletter

SINQ: The dedicated SINQ sample environment group

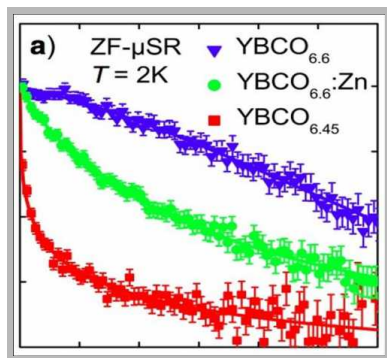
is able to offer a wide range of accessible parameters for the user experiments: available temperatures between **50 mK and 1800 K**, vertical magnetic fields up to **15 Tesla**, horizontal fields up to **11 Tesla**, even in combination with the lowest possible temperatures. Even a maximal pressure of **100 kbar** may be achieved with the compact Paris-Edinburgh cell, which can be used at temperatures down to 4 K.

More information

<<http://lns00.psi.ch/sinqwiki/Wiki.jsp?page=SampleEnvironment>> .

SμS: Time-differential μSR

measurements in transverse fields up to 5 T are now possible at the ALC spectrometer. The switchover from the standard high intensity time-integral mode with 2 million events per second to the time-differential mode is



<<http://num.web.psi.ch/highlights.html#suchaneck>>

μSR: Incommensurate Magnetic Order and Dynamics Induced by Spinless Impurities in $\text{YBa}_2\text{Cu}_3\text{O}_{6.6}$

A. Suchaneck et al, Physical Review Letters 105, 037207 (2010)

We report an inelastic-neutron-scattering and muon-spin-relaxation study of the effect of 2% spinless (Zn) impurities on the magnetic order and dynamics of $\text{YBa}_2\text{Cu}_3\text{O}_{6.6}$, an underdoped high-temperature superconductor that exhibits a prominent spin pseudogap in its normal state. Zn substitution induces static magnetic order at low temperatures and triggers a large-scale spectral-weight redistribution from the magnetic resonant mode at 38 meV into uniaxial, incommensurate spin excitations with energies well below the spin pseudogap. These observations indicate a competition between incommensurate magnetic order and superconductivity close to a quantum critical point. Comparison to prior data on $\text{La}_{2-x}\text{Sr}_x\text{CuO}_4$ suggests that this behavior is universal for the layered copper oxides and analogous to impurity-induced magnetic order in one-dimensional quantum magnets.

Read the full story <<http://num.web.psi.ch/highlights.html#suchaneck>>

News from the SwissFEL project

fast and nearly automated. In addition, the two different data acquisition modes can be conveniently controlled by a single graphical user interface.

SwissFEL: FEL award for outstanding PSI-scientist At

the 32nd International Free Electron Laser Conference in Malmö, Sweden, the Prize Committee decided to award the prestigious 2010 FEL prize to Dr. Sven Reiche for “his outstanding contributions to the advancement of the field of Free-Electron Laser science and technology”. The FEL simulation code, GENESIS 1.3 developed by Dr. Reiche, is used as design tool worldwide, and the anticipated performances of new projects have been very successfully benchmarked with experimental results in the most advanced FEL facilities.

New SwissFEL publication

SwissFEL Conceptual Design Reports have been published in July and August 2010. The documents official designation is „PSI Bericht Nr. 10-04 and 10-05”. The PDF-documents are downloadable from the **SwissFEL web page** <<http://www.psi.ch/swissfel/>> .

Inauguration of the SwissFEL Injector Test Facility

An important milestone for the realization of the new SwissFEL facility was reached on the 24th of August 2010, when the core of the new Swiss Free Electron Laser facility (SwissFEL) was set into operation at Paul Scherrer Institut. Guest of Honour, Federal Councillor Didier Burkhalter, pressed the red button, and the SwissFEL Injector Test Facility produced its first electron beam.



PSI-Director Joël Mesot in dialogue with Federal Councillor Didier Burkhalter.

In his welcome PSI Director Joël Mesot appealed to the present political representatives: "With SwissFEL we have the unique opportunity to offer our researchers a competitive advantage, and thus contribute to Switzerland's global leading position in research."

Read the full story

Announcements

PSI annual report 2009

Please download the 2009 PSI annual scientific report <<http://www.psi.ch/info/info>> .

Facility publications

Obtain a comprehensive list of publications sorted by different criteria:

- **SLS publications**
- **SINQ & S μ S publications** <http://num.web.psi.ch/publ_all.htm>

iPhone App PSI user facilities

The PSI user office has developed an iPhone App, which summarizes the most important information about the PSI user facilities such as upcoming proposal submission deadlines, accelerator status or direct links to the beamline webpages. As a special feature even the weekly menu of the OASE is in-

cluded. The 'App' is compatible with all versions of iPhone and iPod touch and can be downloaded free of charge from the iTunes **App Store** <<http://itunes.apple.com/ch/app/psi-duo/id375328818?mt=8>> .

Proprietary research

A certain fraction of the beamtime at PSI research facilities is reserved for proprietary use. This is handled by **Technology Transfer PSI** <<http://www.psi.ch/industry/technology-transfer>> .

The following **directory** <<http://www.psi.ch/industry/randd-services>> lists services on offer by these facilities.

Imprint

PSI Facility News addresses the users of the PSI large facilities and appears quarterly in English. Any feedback is highly welcome! **More information.** <<http://www.psi.ch/imprint>>

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