No. III/13 - 27 September 2013

PSI photon, neutron and muon user facilities newsletter

Editorial

Frithjof Nolting

Dear Colleagues

It starts with small little charges, accelerated and forced along vertiginous paths, giving away their energy and creating something which again is bounced and guided towards a new aim, the sample. This is the common starting point for the muon, neutron and photon facilities at PSI. But not only are the muons, neutrons or photons generated this way. Our scientific ideas also follow a similar path, initially looking easy and straightforward, but later taking surprising turns and transformations until in the end something like a result arises. Yes, performing experiments and achieving results is often a long journey filled with many set-backs - but when a surprising and beautiful result does show up, it is a rewarding moment.

Seeing how many excellent results are achieved at the PSI large-scale facilities, one can only guess how much time and determination this has cost. While we scientists are often aware of our contributions, we should not forget the invisible effort needed to keep this all running. But as we say, we make the invisible visible, so we should acknowledge the contribution of all the people behind the scene, such as machine workshops, secretaries, administration, designers, safety people, storekeepers, techni-

New calls for proposals

SLS: PX-beamlines
deadline: October 15, 2013
SLS: non-PX beamlines
deadline: March 15, 2014
more information
<http://www.psi.ch/sls/calls>

SINQ
deadline: November 15, 2013
more information
<http://www.psi.ch/sinq/call-for-proposals>

SμS
deadline: December 2013
more information
<http://lmu.web.psi.ch/facilities/next_call.html>

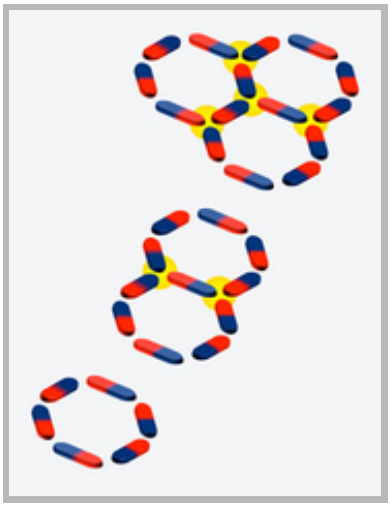
An **overview** about all proposal submission deadlines of the PSI facilities can be obtained **here** <http://www.psi.ch/useroffice/proposal-deadlines> **.**

cians, lab assistance, electricians, plumbers, cleaners, cooks, workmen, engineers and many more ... a long list of professional people we all rely on. Thank you!

Frithjof Nolting, Head of Laboratory for Synchrotron Radiation - Condensed Matter, PSI

Research highlights

SLS - Material Science: Atoms are in motion



Scientists use nano-rods to investigate how matter assembles

A. Farhan et al, Nature Physics 9, 375 (2013), DOI:10.1038/nphys2613

<http://www.nature.com/nphys/journal/v9/n6/full/nphys2613.html>

In the microscopic world, everything is in motion: atoms and molecules vibrate, proteins fold, even glass is a slow flowing liquid. And during each movement there are interactions between the smallest elements - for example, the atoms - and their neighbours. To make these movements visible, scientists at the Paul Scherrer Institute PSI have developed a special model system. It is so big that it can be easily observed under an X-ray microscope, and mimics the tiniest movements in Nature. The model: rings made from six nanoscale magnetic rods, whose north and south poles attract each other. At room temperature, the magnetisation direction of each of these tiny rods varies spontaneously. Scientists were able to observe the magnetic interactions between these active rods in real time. These research results were published

Facility news

SLS: Proprietary shifts available through Swiss Light Source Techno Trans AG (SLS TT AG)

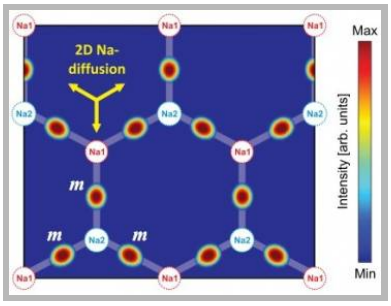
The main goal of the SLS TT AG is to facilitate industrial use of the Swiss Light Source. If you are not an expert in a particular technique or you are unsure of which technique is best suited for your application(s), we can help you. Our Mission is to coordinate any and all services for industrial/proprietary users - we want to be your one stop shop! **Read more** <http://www.psi.ch/sls-techno-trans-ag/sls-techno-trans-ag> .

SINQ: New CAMEA Spectrometer

As joint venture with the Laboratory for Quantum Magnetism (LQM, EPF Lausanne) construction of the new spectrometer CAMEA (Continuous Angle Multiple Energy Analyzer) has started, which will be installed as option at the current RITA-II instrument at SINQ. This new spectrometer will be particularly suited for parametric studies under ex-

on May 5 in the journal “Nature Physics”.
Read the full story <http://www.psi.ch/sls/scientific-highlights>

SINQ - Towards the tuning of physical properties



1D to 2D Na^+ Ion Diffusion Inherently Linked to Structural Transitions in $Na_{0.7}CoO_2$

M. Medarde et al, Physical Review Letters 110, 266401 (2013), DOI: 10.1103/PhysRevLett.110.266401 <http://dx.doi.org/10.1103/PhysRevLett.110.266401>

We report the observation of a stepwise "melting" of the low-temperature Na-vacancy order in the layered transition-metal oxide $Na_{0.7}CoO_2$. High-resolution neutron powder diffraction analysis indicates the existence of two first-order structural transitions, one at $T_1 \approx 290$ K followed by a second at $T_2 \approx 400$ K. Detailed analysis strongly suggests that both transitions are linked to changes in the Na mobility. Our data are consistent with a two-step disappearance of Na-vacancy order through the successive opening of first quasi-1D ($T_1 > T > T_2$) and then 2D ($T > T_2$) Na diffusion paths. These results shed new light on previous, seemingly incompatible, experimental interpretations regarding the relationship between Na-vacancy order and Na dynamics in this material. They also represent an important step towards the tuning of physical properties and the design of tailored functional materials through an improved control and understanding of ionic diffusion.
Read the full story <http://www.psi.ch/num/2013#medarde>

SμS - Semiconductor technology: manipulating charge carrier concentrations with light

treme conditions requiring restrictive sample environments such as high magnetic field magnets or pressure cells, and for experiments on small samples of novel materials. The novelty of the CAMEA design is that it employs a series of several upward-scattering analyzer arcs. This design allows each analyzer to collect neutrons over different energy ranges and a large solid angle that are measured simultaneously by position sensitive detectors. In a single data acquisition an entire constant-energy line in the horizontal scattering plane is recorded for a quasi-continuous angular coverage with tremendous gains in data collection rates. The project is financed by the R'Equip program of the Swiss National Science Foundation, EPF Lausanne and PSI.

SμS: Direct access to μSR analysis computer and raw data from outside PSI

A new computer (musruser.psi.ch) has been installed at PSI to allow μSR facility users to access their raw data and to perform data analysis using the MUSRFIT package without the

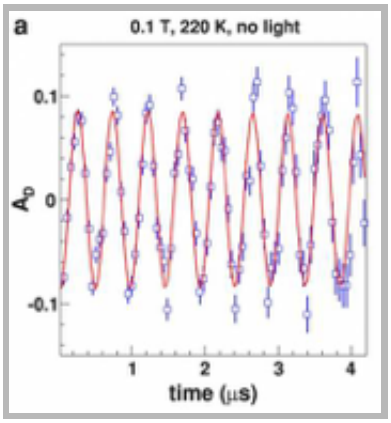


Photo-induced persistent inversion of germanium in a 200-nm-deep surface region

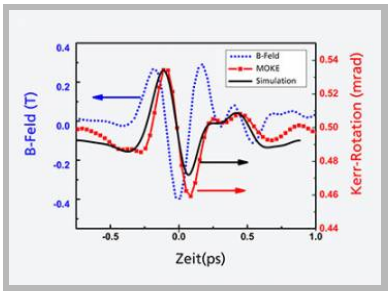
T. Prokscha et al, Scientific Reports 3, 2569 (2013), DOI: 10.1038/srep02569

<http://dx.doi.org/10.1038/srep02569>

The controlled manipulation of the charge carrier concentration in nanometer thin layers is the basis of current semiconductor technology and of fundamental importance for device applications. Here we show that it is possible to induce a persistent inversion from n- to p-type in a 200-nm-thick surface layer of a germanium wafer by illumination with white and blue light. We induce the inversion with a half-life of ~12 hours at a temperature of 220 K which disappears above 280 K. The photo-induced inversion is absent for a sample with a 20-nm-thick gold capping layer providing a Schottky barrier at the interface. This indicates that charge accumulation at the surface is essential to explain the observed inversion. The contactless change of carrier concentration is potentially interesting for device applications in opto-electronics where the gate electrode and gate oxide could be replaced by the semiconductor surface.

Read the full story <http://www.psi.ch/num/2013#prokscha>

SwissFEL - Magnetisation controlled at picosecond intervals



Off-resonant magnetization dynamics phase-locked to an intense phase-stable THz transient .

C. Vicario et al, Nature Photonics, Advance Online Publication 11 August 2013, DOI: 10.1038/nphoton.2013.209 <http://www.nature.-

necessity to have an own user account at PSI. This computer is especially intended to provide new users with all necessary analysis tools which are easily accessible from their home institutions. Interested users are asked to contact their instrument scientist for the login information.

SwissFEL: SwissFEL foundation stone ceremony

On the 3rd of July 2013 the SwissFEL foundation stone ceremony took place at the Paul Scherrer Institute. Around 130 guests from politics, science and industry were participating, **read more.** <http://www.psi.ch/media/laying-of-the-corner-stone-for-the-new-large-scale-research-facility-swissfel>

Upcoming events

GISAXS 2013: Workshop on Grazing Incidence Small Angle X-Ray Scattering

<http://gisaxs2013.desy.de>

October 7-9, 2013, Hamburg, Germany

JCNS 2013 workshop: Trends and Perspectives in

com/nphoton/journal/vaop/ncurrent/full/nphoton.2013.209.html>

A terahertz laser developed at the Paul Scherrer Institute makes it possible to control a material's magnetisation at a timescale of picoseconds (0.000 000 000 001 seconds). In their experiment, the researchers shone extremely short light pulses from the laser onto a magnetic material, where the magnetic moments - "elementary magnets" - were all aligned in parallel. The light pulse's magnetic field was able to deflect the magnetic moments from their idle state in such a way that they exactly followed the change of the laser's magnetic field with only a minor delay. The terahertz laser used in the experiment is one of the strongest of its kind in the world. One special feature is the fact that it is phase-stable, which enables the exact change in the electrical and magnetic field within the individual pulses to be defined reliably for each laser pulse. As the majority of data is stored magnetically these days, the possibility to quickly change a material's magnetisation is crucial for new, rapid storage systems. The researchers report on their results in the journal Nature Photonics.

Read the full story <http://www.psi.ch/media/magnetisation-controlled-at-picosecond-intervals>

Meetings

Third Joint Users Meeting at PSI - JUM@P13

From September 18-20, 2013 the 3rd edition of the **JUM@P user meetings** was organized. The meeting brought together more than 150 scientists and users of SLS, SINQ and SμS. JUM@P'13 started with a

Neutron Scattering: Magnetism and Correlated Electron Systems <http://www.fz-juelich.de/jcns/JCNS-Workshop2013>

October 7-10, 2013, Tutzing, Germany

HZG Autumn School 2013: Application of Neutrons and Synchrotron Radiation in Engineering Materials Science

<http://www.hzg.de/mw/autumnschool/>

October 7-11, 2013, Ammersbek, Germany

X-ray lasers in biology: at The Royal Society <http://royalsociety.org/events/2013/x-ray-lasers/>

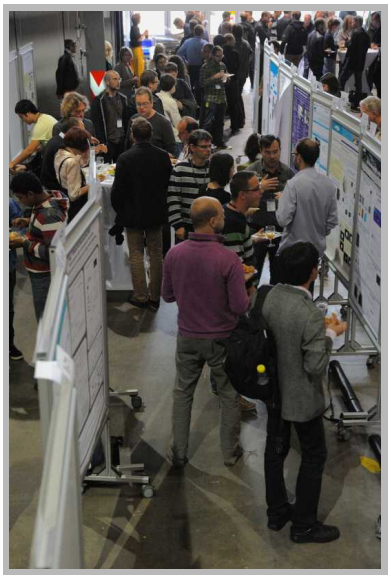
October 14-15, 2013, London , UK

SoXRES-2013: International workshop on Soft X-ray Resonant Elastic Scattering

<http://www.synchrotron-soleil.fr/portal/page/portal/Soleil/ToutesActualites/Workshops/2013/SoXRES/Tab1>

October 14-16, 2013, Synchrotron SOLEIL, France

Workshop on Mott Physics Beyond the Heisenberg Model in Iridates and Related Materials <http://mott-physics.epfl.ch/page-94239-en.html>



plenary session with invited lectures as well as information about PSI and its user facilities. One highlight of the session was the award of the third **PSI Thesis Medal** to Matti M. van Schooneveld from the MPI for Chemical Energy Conversion, Mülheim a.d. Ruhr, Germany. On the second day three **topical parallel workshops** <http://indico.psi.ch/internalPage.py?pageId=4&confId=2034> have been organized. Two poster sessions and the 2013 annual meeting of the European Synchrotron User Organisation **ESUO** <http://www.esuo.org> completed the program. In total, 55 talks and more than 70 posters have been presented by our highly active user community. Thanks to everybody helping us to make that meeting being a success. The full program is still available from the **JUM@P website** <http://indico.psi.ch/event/jump13> .

October 27-31, 2013, Monte Verita, Switzerland

6th Annual School on Advanced Neutron Diffraction Data Treatment using the FULLPROF suite
<http://www.ill.fr/FPSchool2013/>
November 18-22, 2013, Grenoble, France

PSDI 2013: Protein Structure Determination in Industry <http://indico.psi.ch/event/psdi2013>
November 21-22, 2013, Luzern, Switzerland

SCNAT Annual Congress 2013: The Quantum Atom at 100 - Niels Bohr's Legacy
<http://www.kongress13.scnat.ch/index.en.php>
November 21-22, 2013, Winterthur, Switzerland

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

Current Openings

Job opportunities at PSI
<http://www.psi.ch/en/pa/offenestellen/>

Announcements

µSR 2014

The 13th International Conference on Muon Spin Rotation, Relaxation and Resonance (µSR2014) will be held in Grindelwald, Switzerland, from Sunday, June 1st to Friday, June 6th, 2014. It is organized by the Paul Scherrer Institut (PSI), the University of Zurich and the University of Fribourg. The conference provides a forum to researchers from around the world with interests in the applications of µSR to study a wide range of topics including condensed matter physics, materials and molecular sciences, chemistry and biology. The Conference will consist of invited and contributed talks as well as poster sessions. µSR2014 continues the series of international conferences on Muon Spin Rotation/ Relaxation usually held every three years. The deadline for abstract submission will be February 15, 2014. More information can be obtained from the **conference website.** <http://www.psi.ch/musr2014>

Wireless network (WLAN) available in the PSI guesthouse

A public wireless network (WLAN) is available everywhere in the PSI guesthouse since mid of August to satisfy the increasing request of our guests for WLAN connections for their mobiles, tablets or laptop computers.

PSI Scientific Report 2012

The **PSI annual scientific report 2012** has been published and is available now either as printed or online version. Please download or order your copy **here**!

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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