



No. II/14 - 30 June 2014

## PSI photon, neutron and muon user facilities newsletter

### Editorial



Stefan Müller

Dear Colleagues

I have the pleasure to announce the second call for applications for the PSI-FELLOW programme. This EU co-financed funding program addresses international postdocs from all over the world and offers 30 successful postdoc applicants a two years contract (2015-2016) and the unique opportunity to perform their innovative project in one of the four attractive scientific fields tackled at PSI: i) materials and matter, ii) life-sciences, iii) energy and environment and iv) accelerator technologies.

The application has to be made together with a senior scientist at PSI, who will act as the fellow's mentor. The list of mentors and open themes is published **here** <<http://www.psi.ch/psi-fellow/list-of-mentors-and-themes>> . Please get in contact with your potential mentor and discuss the **eligibility** <<http://www.psi.ch/psi-fellow/eligibility-criteria>> of your application. The project proposal together with CV and two reference letters has to be submitted not later than by August 4, 2014. For more details about the application process please consult the **homepage** <<http://www.psi.ch/psi-fellow/>> of the PSI-FELLOW programme.

The PSI-FELLOW management team wishes you a successful application and looks forward to welcome you at PSI in your new position next year.

### New calls for proposals

#### **SLS: PX-beamlines**

deadline: October 15, 2014

#### **SLS: non-PX beamlines**

deadline: September 15, 2014

#### **more information**

<<http://www.psi.ch/sls/calls>>

#### **SINQ**

deadline: November 15, 2014

#### **more information**

<<http://www.psi.ch/sinq/call-for-proposals>>

#### **SμS**

deadline: December 2014

#### **more information**

<<http://www.psi.ch/smus/calls>>

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

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## Research highlights

### SLS - Human Health: Phase contrast improves mammography



### New imaging technology

Zhentian Wang et al, *Nature Communications*, published online 15th May

2014, DOI: [10.1038/ncomms4797](https://doi.org/10.1038/ncomms4797) <<http://dx.doi.org/10.1038/ncomms4797>>

[doi.org/10.1038/ncomms4797](http://dx.doi.org/10.1038/ncomms4797)

Phase contrast X-ray imaging has enabled researchers at ETH Zurich, the Paul Scherrer Institute (PSI) and the Kantonsspital Baden to perform mammographic imaging that allows greater precision in the assessment of breast cancer and its precursors. The technique could improve biopsy diagnostics and follow-up.

**Read the full story** <<http://www.psi.ch/media/phase-contrast-improves-mammography>>

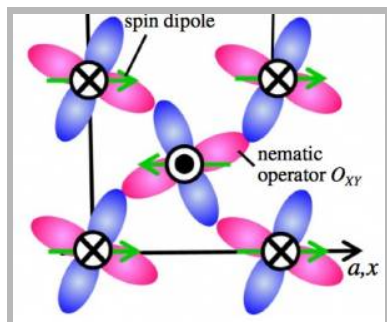
### SINQ - The physics of spin and electric dipoles in multiferroics

Spin-Nematic Interaction in the Multiferroic Compound  $\text{Ba}_2\text{CoGe}_2\text{O}_7$

## Facility news

### SLS: Tomographic nano-imaging reaches 16 nm isotropic 3D resolution

**OMNY** (tOMography Nano crYo stage) is an ongoing instrumentation project at the SLS implementing an end-station for tomographic nano-imaging at 10 nm resolution in 3D using ptychography. When complete, OMNY will image biomaterial and materials science samples at cryogenic temperatures in an ultra-high vacuum environment. Cryogenic sample fixation will permit measurements of biological samples such as soft tissue and entire cells close to their native state without chemical fixation. A prototype system called OMNI (tOMography Nano Imaging) operating at room temperature and atmospheric pressure has now reached a world record isotropic 3D resolution of 16 nm on a nanoporous test structure. OMNI routinely reaches 30 nm 3D resolution on many types of scientific samples that are radiation hard and is available to users at the cSAXS beamline. Please have a look at the **original publication** <<http://dx.doi.org/>>



**M. Soda et al, Physical Review Letters 112, 127205 (2014), DOI: 10.1103/PhysRevLett.112.127205**

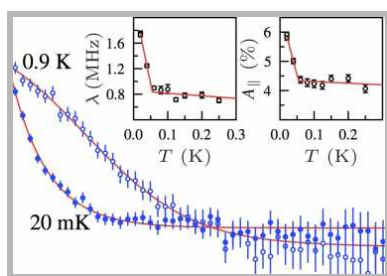
[doi.org/10.1038/srep03857](https://doi.org/10.1038/srep03857) .

<<http://dx.doi.org/10.1103/PhysRevLett.112.127205>>

We demonstrate the existence of the spin-nematic interactions in an easy-plane type antiferromagnet  $\text{Ba}_2\text{CoGe}_2\text{O}_7$  by exploring the magnetic anisotropy and spin dynamics. The combination of neutron scattering and magnetic susceptibility measurements reveals that the origin of the in-plane anisotropy is an antiferro-type interaction of the spin-nematic operator. The relation between the nematic operator and the electric polarization in the ligand symmetry of this compound is presented. The introduction of the spin-nematic interaction is useful to understand the physics of spin and electric dipole in multiferroic compounds.

**Read the full story** <<http://www.psi.ch/num/2014#soda>>

### **$\mu\text{S}$ - 1D-Magnetism: Field Induced Quantum Phase Transitions**



**Controlling Magnetic Order and Quantum Disorder in Molecule-Based Magnets**

**T. Lancaster et al, Physical Review Letters 112, 207201 (2014), DOI: 10.1103/PhysRevLett.112.207201** <<http://dx.doi.org/10.1103/PhysRevLett.112.207201>>

We investigate the structural and magnetic properties of two molecule-based magnets synthesized from the same starting components. Their different structural motifs promote contrasting exchange pathways and consequently lead to markedly different magnetic ground

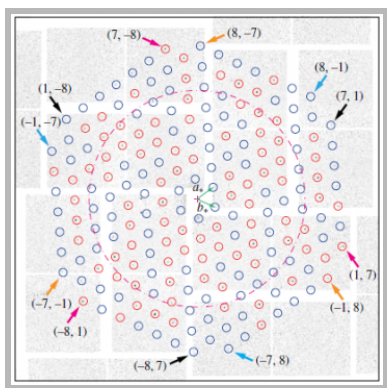
### **SINQ: Instruments for the ESS**

An instrumentation consortium including laboratories at PSI and EPF Lausanne and further partner institutes in Denmark proposed four instruments for construction at the European Spallation Source (**ESS**) <<http://europeanspallationsource.se>> and received positive evaluation by the ESS Scientific Advisory Council. An extreme environment spectrometer, a pioneering reflectometer optimized for functional thin-film devices, a small-angle neutron scattering instrument for biology, and a diffractometer for multiple-length scales structural studies will offer unprecedented experimental opportunities to the Swiss and international user community of the ESS. A fifth neutron-imaging instrument with Swiss contribution was selected for construction already last year. We thank the Swiss State Secretariat for Education, Research and Innovation (SERI) for supporting ESS activities in Switzerland.

states. Through examination of their structural and magnetic properties we show that  $[\text{Cu}(\text{pyz})(\text{H}_2\text{O})(\text{gly})_2](\text{ClO}_4)_2$  may be considered a quasi-one-dimensional quantum Heisenberg antiferromagnet whereas the related compound  $[\text{Cu}(\text{pyz})(\text{gly})](\text{ClO}_4)$ , which is formed from dimers of antiferromagnetically interacting  $\text{Cu}^{2+}$  spins, remains disordered down to at least 0.03 K in zero field but shows a field-temperature phase diagram reminiscent of that seen in materials showing a Bose-Einstein condensation of magnons.

**Read the full story** <<http://www.psi.ch/num/2014#lancaster>>

### SwissFEL - Undulator U15



### 7 Å resolution in protein two-dimensional-crystal X-ray diffraction at Linac Coherent Light Source

**B. Pedrini et al, Phil. Trans.**

**R. Soc. B 2014 369, 20130500, published 9 June 2014,**

**DOI:10.1098/rstb.2013.0500** <<http://dx.doi.org/10.1098/rstb.2013.0500>>

[doi.org/10.1098/rstb.2013.0500](http://dx.doi.org/10.1098/rstb.2013.0500)

Membrane proteins arranged as two-dimensional (2D) crystals in the lipid environment provide close-to-physiological structural information, which is essential for understanding the molecular mechanisms of protein function. Previously, X-ray diffraction from individual 2D crystals did not represent a suitable investigation tool because of radiation damage. That the recently available ultrashort pulses from X-ray Free Electron Lasers (X-FELs) provide a mean to outrun the damage is now well established for the 3D crystal case. This is now demonstrated also for the 2D crystal case, within the work of an international collaboration led by Matthias Frank from the Lawrence Livermore National Laboratory (CA, USA), to which scientists from PSI had the opportunity to partici-

### µS: Recent µSR Conference

The 13th International Conference on Muon Spin Rotation Relaxation and Resonance (**µSR2014**)

<<http://www.psi.ch/musr2014>> , organized by PSI in collaboration with the University of Zürich and the University of Fribourg, closed on June 6th in Grindelwald. We would like to thank the more than 160 participants from 19 countries for their 227 contributions and the interesting and stimulating discussions during day and evening sessions. During the conference Roberto De Renzi from the University of Parma was awarded the 2014 Yamazaki Prize for muon science by the International Society for Muon Spin Spectroscopy (ISMS) for his sustained and exceptional contributions to the development of µSR. In addition, Thomas Prokscha, head of the LEM group, was chosen as president elect of the ISMS for the next three years as well as Martin Mansson, user of the PSI facility, elected as Vice-President Europe of the Society.

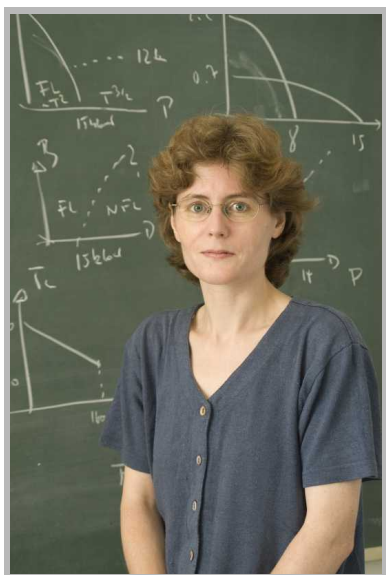
### Upcoming events

pate and contribute. We report on the measurements performed in May 2013 at the Coherent Diffraction Imaging station of the Linac Coherent Light Source X-FEL, and using bacteriorhodopsin 2D crystals as samples.

**Read the full story** <<http://www.psi.ch/swissfel/highlights>>

## Users Association

### JUSAP - The Joint Users Association



Sarah Dunsiger, chair of JUSAP

<<http://ec.europa.eu/programmes/horizon2020/en>> may discontinue the financial support of transnational access (TNA) to large scale facilities. The European Synchrotron User Organisation **ESUO** <<http://www.esuo.org>> , has expressed enormous concern over this development. The ESUO has thus launched several lobbying initiatives for the second call 2016:

i) a letter of concern entitled 'The benefit of the European User Community from transnational access to national radiation facilities' has been accepted for publication (Journal of Synchrotron Radiation 21, 638–639 (2014)).

The new European Framework Program **Horizon2020**

### PSI Powder Diffraction

**School 2014** <<http://www.psi.ch/pds2014>>

July 1-4, 2014, PSI Villigen, Switzerland

### International Conference on Highly Frustrated Magnetism 2014

<<http://hfm2014.tcm-phy.cam.ac.uk>>

July 7-11, 2014, Cambridge, UK

### Neutrons and Food 2014

<<http://www.neutronsandfood.com/>>

July 9-11, 2014, Paris, France

### ICSOS'11: 11th International Conference on the Structure of Surfaces

<<https://www.events-force.net/iop/front-end/reg/thome.csp?pageID=106741&eventID=264&eventID=264>>

July 21-25, 2014, Coventry, UK

### 13th PSI Summer School on Condensed Matter Research: Exploring time, energy and length scales in condensed matter

<<http://www.psi.ch/summer-school>>

August 9-15, 2014, Zug, Switzerland

### FEL 2014

<<http://www.fel2014.ch/>>

ii) at a recent action group meeting the current draft of a brochure for the promotion of TNA activities written by science writer, Dirk Rathje, was presented. The final draft of the brochure, foreseen to be ready by the end of July 2014, will be sent to all synchrotron facilities, together with an accompanying letter asking for permission to publish. A recommendation was also made to contact the neutron community to coordinate a response. The printed version of the brochure will be ready for further distribution by mid September 2014.

iii) a decision was taken to lobby national program committee members for the promotion of a possible TNA proposal in Horizon 2020, with more added emphasis on networking and joint research activities. This lobbying initiative will be the main topic of the 7th ESUO annual meeting.

Sarah Dunsiger (JUSAP chair) and Annick Froideval

August 25-29, 2014, Basel,  
Switzerland

**18th JCNS Laboratory  
Course Neutron Scattering**

<<http://www.neutronlab.de>>  
September 1-12, 2014, Jülich  
and Garching, Germany

**SGK/SSCr Annual Meeting  
2014** <<http://www.sgk-sscr.ch/>>

September 8, 2014, Dübendorf,  
Switzerland

**Science at FELs** <<http://science-at-fels-2014.eurofel.eu/>>

September 14-17, 2014, PSI  
Villigen, Switzerland

**Deutsche Tagung fuer  
Forschung mit Synchrotron-  
strahlung, Neutronen und  
Ionenstrahlen an Gross-  
geräten 2014** <<http://www.s-ni2014.de>>

September 21-23, 2014,  
Bonn, Germany

**WCNR10: 10th World Con-  
ference on Radiography**

<<http://www.psi.ch/wcnr10>>  
October 5-10, 2014, Grindelwald,  
Switzerland

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

## Current Openings

### Job opportunities at PSI

<<http://www.psi.ch/en/pa/offenstellen/>>

## Announcements

### Science@FELs 2014 at the Paul Scherrer Institute

The Collaboration FELs of Europe announces the Science@FELs 2014. The 2nd international Science at FELs Conference, organized by the Paul Scherrer Institute, will take place from Monday September 15 to Wednesday September 17, 2014 in the Auditorium of the Paul Scherrer Institute in Villigen, Switzerland. This conference is a follow up of the Science@FELs 2012 jointly organized by DESY and the European XFEL in Hamburg, Germany, in July 2012 and will henceforth be organized regularly as an activity of the Collaboration FELs of Europe. We invite you to participate in this Science at FELs 2014 conference with focus on the scientific highlights achieved during the last years in the fast evolving development and operation of free electron lasers. The scientific programme of the conference will consist of invited talks and contributed presentations, either in the form of oral presentations or posters. There will be a small amount of money available for supporting and encouraging the participation of students in Science@FELs2014. **Sci@FELs 2014 web page.** <<http://indico.psi.ch/internal-Page.py?pagelId=2&confId=2910>>

### World Congress on Neutron Radiography 2014

The Neutron Imaging group of the NUM department organizes the 10th World Conference on Neutron Radiography in Grindelwald, Switzerland from October 5-10, 2014. WCNr14 will attract scientists active in the field of neutron imaging either as designers and/or operators of facilities or as users of such installations. During the conference the latest methodical developments, instrumentation layout and improvements and new applications will be presented and discussed. More information can be obtained from the **conference website.** <<http://www.psi.ch/wcnr10>>

### Proprietary research

A certain fraction of the beamtime at PSI research facilities is reserved for proprietary use. This is handled by the **PSI Technology Transfer** <<http://www.psi.ch/industry/technology-transfer>> . The following **directory** <<http://www.psi.ch/industry/expertise>> lists services on offer by these facilities. For the SLS beam lines industrial use is facilitated by the **SLS Technology Transfer AG** <<http://www.psi.ch/sls-techno-trans-ag/sls-techno-trans-ag>> . If you are not an expert in a particular technique or you are unsure which technique is best suited for your application(s), please **contact us**.

## 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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